UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

FORM 10-K

(Mark One)

☒ **ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

For the fiscal year ended December 31, 2016

OR

☐ **TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

For the transition period from __________to

Commission file number: 001-36481

ASPEN AEROGELS, INC.
(Exact name of registrant as specified in its charter)

Delaware **(State or other jurisdiction of incorporation or organization)**	**04-3559972** **(I.R.S. Employer Identification No.)**
30 Forbes Road, Building B **Northborough, Massachusetts** **(Address of principal executive offices)**	**01532** **(Zip Code)**

Registrant's telephone number, including area code (508) 691-1111

Securities registered pursuant to Section 12(b) of the Exchange Act:

Title of each class	Name of each exchange on which registered
Common Stock, par value $0.00001 per share	New York Stock Exchange

Securities registered pursuant to Section 12(g) of the Exchange Act: None

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes ☐ No ☒

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Exchange Act. Yes ☐ No ☒

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes ☒ No ☐

Indicate by check mark whether the registrant has submitted electronically and posted on its corporate Web site, if any, every Interactive Data File required to be submitted and posted pursuant to Rule 405 of Regulation S-T during the preceding 12 months (or for such shorter period that the registrant was required to submit and post such files). Yes ☒ No ☐

Indicate by check mark if disclosure of delinquent filers pursuant to Item 405 of Regulation S-K is not contained herein, and will not be contained, to the best of registrant's knowledge, in definitive proxy or information statements incorporated by reference in Part III of this Form 10-K or any amendment to this Form 10-K. ☒

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, or a smaller reporting company. See the definitions of "large accelerated filer", "accelerated filer" and "smaller reporting company" in Rule 12b-2 of the Exchange Act.

Large accelerated filer	☐	Accelerated filer	☒
Non-accelerated filer	☐ (Do not check if a smaller reporting company)	Smaller reporting company	☐

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act). Yes ☐ No ☒

The aggregate market value of the registrant's common stock held by non-affiliates of the registrant (without admitting that any person whose shares are not included in such calculation is an affiliate) computed by reference to the price at which the common stock was last sold as of the last business day of the registrant's most recently completed second fiscal quarter was approximately $98.3 million.

As of March 1, 2017, the registrant had 23,369,838 shares of common stock outstanding.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the registrant's definitive Proxy Statement for its Annual Meeting of Stockholders to be held on June 14, 2017 are incorporated by reference into Part III of this Annual Report on Form 10-K to the extent stated herein.

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PART I

Item 1. BUSINESS

Aspen Aerogels, Inc. is an aerogel technology company that designs, develops and manufactures innovative, high-performance aerogel insulation used primarily in the energy infrastructure and building materials markets. The Company also conducts research and development related to aerogel technology supported by funding from several agencies of the U.S. government and other institutions in the form of research and development contracts. When used in this report, the terms “we,” “us,” “our” and “the Company” refer to Aspen Aerogels, Inc. and its subsidiaries.

We design, develop and manufacture innovative, high-performance aerogel insulation. We believe our aerogel blankets deliver the best thermal performance of any widely used insulation product available on the market today and provide a combination of performance attributes unmatched by traditional insulation materials. Our products provide two to five times the thermal performance of widely used traditional insulation in a thin, easy-to-use and durable blanket form. Our end-use customers select our products where thermal performance is critical, and to save money, reduce energy use, preserve operating assets and protect workers.

Our technologically advanced products are targeted at the estimated $3.1 billion annual global market for energy infrastructure insulation materials. Our aerogel insulation has undergone rigorous technical validation and is used by many of the world’s largest oil producers and the owners and operators of refineries, petrochemical plants, LNG facilities and power generating assets, such as ExxonMobil, Pemex Gas and Royal Dutch Shell. Our products replace traditional insulation in existing facilities during regular maintenance, upgrades and capacity expansions. In addition, we are increasingly being specified for use in new-build energy infrastructure facilities.

We introduced our two key product lines, Pyrogel and Cryogel in 2008. Our product revenue has grown from $17.2 million in 2008 to $115.5 million in 2016, representing an eight year compound annual growth rate of 27%. During this period, we have sold more than $600 million of our products globally, representing an installed base of more than 240 million square feet of insulation. We believe that this initial success positions us for future growth and continued gain in market share.

We currently target our sales efforts in the energy infrastructure market, where we believe our products have the highest value applications. We continue to develop and optimize aerogel products for applications within the building materials market. As we continue to enhance our technology, we believe we will have opportunities to address additional high value applications in the global insulation market.

We have grown our business by forming technical and commercial relationships with industry leaders, which has allowed us to optimize our products to meet the particular demands of targeted market sectors. We have benefited from our technical and commercial relationships with ExxonMobil in the oil refinery and petrochemical sector, with TechnipFMC in the offshore oil sector and with BASF in the building materials market. We will continue our strategy of working with innovative companies to target and penetrate additional market opportunities.

Our patented aerogel product and manufacturing technologies are significant assets. Aerogels are complex structures in which 97% of the volume consists of air trapped between intertwined clusters of amorphous silica solids. These extremely low density solids provide superior insulating properties. Although aerogels are usually fragile materials, we have developed innovative and proprietary manufacturing processes that enable us to produce industrially robust aerogel insulation cost-effectively and at commercial scale.

Our products enable compact design, reduce installation time and costs, promote freight and logistics cost savings, reduce system weight and required storage space and enhance job site safety. Our products reduce the incidence of corrosion under insulation, which is a significant maintenance cost and safety issue in energy infrastructure facilities. Our products also offer strong fire protection, which is a critical performance requirement in our markets. We believe our array of product attributes provides strong competitive advantages over traditional insulation. Although competing insulation materials may have one or more comparable attributes, we believe that no single insulation material currently available offers all of the properties of our aerogel insulation products.

For the years ended December 31, 2016, 2015 and 2014, based on shipment destination or research services location, our U.S. revenues were $35.7 million, $44.5 million and $39.8 million, respectively, and our international revenues were $82.0 million, $78.0 million and $62.6 million, respectively.

We manufacture our products using proprietary technology at our facility in East Providence, Rhode Island. We have operated the East Providence facility since 2008 and have significantly increased manufacturing capacity and productivity during the period. We successfully commenced operation of our third production line in the East Providence facility in 2015 which increased our annual nameplate capacity to approximately 50 million square feet of aerogel blankets. During 2015, we announced the planned constr uction of a second manufacturing facility in Statesboro, Georgia. During the fourth quarter of 2016, we elected to temporarily delay construction of this second facility to better align the capacity expansion with our assessment of demand for the 2018 to 2020 period.

Financial information about our product and research services revenues, net loss per share and our total assets are provided in our consolidated financial statements included elsewhere in this Annual Report on Form 10-K.

Our Markets and Competition

Our core market is the energy infrastructure insulation market. This market is global, well-established and includes large and well-capitalized end-users. This market includes companies operating refinery, petrochemical, oil production, LNG production and storage facilities. The market also includes firms operating gas, coal, nuclear, hydro and solar thermal power generating plants and district energy systems. Insulation systems in the energy infrastructure market are designed to maintain hot and cold process piping and storage tanks at optimal temperatures, to protect plant and equipment from the elements and from the risk of fire, and to protect workers. The market is served by a well-organized, well-established, worldwide network of distributors, contractors and engineers.

Demand for insulation in the energy infrastructure market is composed of demand associated with new-build construction of facilities, capital expansions and related capital projects, as well as with routine, non-discretionary maintenance programs within existing facilities. Capital expansions and related capital projects in the energy infrastructure market are driven primarily by overall economic growth and projected growth in energy demand. Maintenance programs are essential to optimal operation of processing equipment, to protect workers and to minimize the risk of a catastrophic loss. Accordingly, we believe that demand for insulation for maintenance purposes in comparison to capital projects is less affected by volatility associated with economic cycles, energy prices and similar macroeconomic factors.

The major end-use markets that drive demand for our products include oil refining, petrochemical, natural gas and LNG, onshore oil production (including oil sands), offshore oil production and power generation. Global energy demand is expected to increase in the long-term and, in order to serve this growing demand, we believe our end-use customers will continue to invest in major energy infrastructure projects.

We also sell our products in the building materials and other end markets, including the supply of fabricated insulation parts to original equipment manufacturers, or OEMs. These global OEMs develop products incorporating our aerogel blankets for applications as diverse as military and commercial aircraft, trains, buses, appliances, apparel, footwear and outdoor gear. While these are not presently our core markets, we anticipate that we will allocate a growing portion of our manufacturing capacity to serve these markets in the long term. We believe the key performance criteria for insulation in these markets includes thermal performance, compact design, durability and fire resistance.

We operate in a highly competitive environment. In general, we compete with traditional insulation materials based on product performance, price, availability and proximity to the customer. Customers may choose among a variety of traditional insulation materials that offer a range of characteristics including thermal performance, durability, vapor permeability, moisture resistance, ease of installation and upfront and lifecycle costs. Within each type of insulation material, there is also competition between the manufacturers of that material. Most types of traditional insulation materials are produced by a number of different manufacturers and once customers have chosen the type of insulation material that they intend to use, they will choose a manufacturer of that material based primarily on each manufacturer's price and delivery schedule. Insulation manufacturers include a range of large, high-volume, multinational manufacturers offering branded products and strong technical support services to small, low-volume, local manufacturers offering low prices and limited customer support.

We believe the primary competitive factors in our market are:

- product performance (along multiple criteria), quality and fitness for purpose;
- product price, installed cost and lifecycle cost;
- product availability; and
- proximity to customer and logistics.

Our products are priced at a premium to traditional insulation materials. While our competitors offer many traditional insulation products that are priced below our products on a per-unit basis, we believe our products have superior performance attributes and have the lowest cost on a fully-installed basis or offer significant life-cycle cost savings.

We compete in the aerogel insulation market with Cabot Corporation, or Cabot , and competitors in China , including Guangdong Alison Hi-Tech Co., Ltd. and Nano Tech Co., Ltd., which manufacture and sell aerogel insulation products.

Within each of our target markets, we encounter one or more of these organizations or their resellers and a significant number of other aggressive national, regional and local suppliers of traditional insulation products. Our competitors are seeking to enhance traditional insulation materials and to develop and introduce new and emerging insulation technologies. Competing technologies that outperform our insulation products in one or more performance attributes could be developed and successfully introduced. See "Risk Factors — The energy infrastructure insulation market is highly competitive; if we are unable to compete successfully, we may not be able to increase or maintain our market share and revenues."

Our market share in 2016 was less than 4% of the estimated $3.1 billion annual global market for energy infrastructure insulation materials. Many of our competitors have greater market presence, larger market share, longer operating histories, stronger name recognition, larger customer bases and significantly greater financial, technical, sales and marketing, manufacturing and other resources than we have and may be better able to withstand volatility within the industry and throughout the economy as a whole while retaining greater operating and financial flexibility. If our competitors lower their prices, or develop new products with better performance, or if we are unable to compete effectively, our growth opportunities, share of the market, margins and profitability may decline.

Our Competitive Strengths

Because insulation is used in a wide variety of demanding applications, insulation materials must satisfy a wide range of performance criteria on a cost-effective basis. We believe that our aerogel technology has allowed us to create superior insulation products for our core markets that will allow us to continue to grow our share of the global insulation market. We believe that the potential for significant technological innovation in traditional insulation materials is limited and that new high-performance materials will be required to meet evolving market requirements for energy efficient insulation systems. Our line of high-performance aerogel blankets is positioned to meet these requirements. Our solution is driven by our innovative and proprietary technology that produces aerogels in a flexible and industrially robust blanket form and is supported by over 15 years of research and development dedicated to new aerogel compositions, form factors and manufacturing technologies. We believe our aerogel blankets deliver a superior combination of performance attributes that enable end-users to save money, reduce energy use, preserve operating assets and protect workers across a wide range of applications in our target markets.

We believe the following combination of capabilities distinguishes us from our competitors and positions us to continue to gain market share in the energy infrastructure insulation market:

- ***Disruptive Products with a Compelling Value Proposition.*** Our aerogel products provide two to five times the thermal performance of widely used traditional insulation in a thin, easy-to-use and durable blanket form. We believe our array of product attributes provides strong competitive advantages over traditional insulation and will enable us to gain a larger share of the energy infrastructure insulation market. Although competing insulation materials may have one or more comparable attributes, we believe that no single insulation material currently available offers all of the properties of our aerogel insulation.
- ***Important Energy End Markets.*** Our products are primarily used in large scale energy infrastructure facilities. Given continued growth in global energy consumption in the long-term, and the construction of new facilities to satisfy this demand, we believe that we serve well capitalized and growing global end markets. In order to capture the opportunities in our end markets, we have a network of sales professionals and qualified distributors in more than 40 countries around the world.
- ***Growing Installed Base with Industry-leading End-Users.*** We have an installed base of more than 240 million square feet of insulation, representing more than $600 million in cumulative product sales since 2008. Through our relationships with industry leading end-use customers, our products have undergone rigorous testing and technical validation and are now in use at many of the world's largest oil producers, refiners and petrochemical companies. These relationships have shortened the sales cycle with other customers and have helped to facilitate our market penetration. We also have strong relationships with a global network of energy-focused distributors, contractors and engineering firms that understand the significant advantages our products provide to end-users.
- ***Proven, Scalable Business Model.*** Our proprietary manufacturing technology is proven and has been successfully scaled up to meet increasing demand. We have operated the East Providence facility since 2008 and have significantly increased manufacturing capacity and productivity during the period. We successfully commenced operation of our second production line at this facility in March 2011 and doubled our annual nameplate capacity to 40 million to 44 million square feet of aerogel blankets. We commenced operations of a third line in the East Providence facility during the first

quarter of 2015 which increased our annual nameplate capacity by 25% to approxi mately 50 million square feet of aerogel blankets.

- ***Protected Technology Platform and Proprietary Manufacturing Capability.*** Our product solution is the result of more than 15 years of research and development dedicated to new aerogel compositions, form factors and manufacturing technologies. Our intellectual property portfolio is supported by 93 issued patents, with an additional 80 pending in U.S. and foreign jurisdictions in areas related to product design, chemistry, process technology and market applications. In addition, we believe we have significant trade secrets related to product formulations and manufacturing techniques. We believe our portfolio of patents, trade secrets and know-how presents a barrier to potential new entrants in the production of aerogel blanket insulation.
- ***Experienced Management Team with a Demonstrated Track Record.*** Our executive officers have an average of more than 20 years each of experience in global industrial companies, specialty chemical companies or related material science research. This management team is responsible for the development of our proprietary manufacturing technology, the commercial acceptance of our products, and the creation of a global distribution and marketing platform. As of December 31, 2016, we employed 281 people including research scientists, engineers, manufacturing line operators, sales personnel, administrative staff, and management. We believe our dedicated and experienced team is an important competitive asset.

Our Growth Strategy

We are targeting continued expansion of the use of our products within energy infrastructure facilities during regular maintenance, upgrades and expansions. In addition to opportunities to replace traditional insulation at existing facilities, we are also pursuing insulation applications at new-build and large capacity expansion projects around the world.

Our strategy is to create economic value by leveraging our technological and market leadership in aerogels to be the premier provider of high-performance insulation products serving global energy infrastructure customers. We also will pursue high-value opportunities for our aerogel products within other segments of the global insulation market, including the building materials market. In addition, we will leverage our aerogel technology platform to develop innovative, aerogel enhanced products for applications outside the global insulation market. Key elements of our strategy include:

- ***Broaden Energy Market Diversity and Grow Market Share.*** We plan to focus additional resources to continue to grow our share of the energy infrastructure insulation market, both through increased sales to our existing customers and through sales to new customers. We plan to continue to expand our global sales force and distribution network and seek to promote greater enterprise-wide utilization of our products by existing end-use customers. To date, the majority of our revenue has been generated from applications in refineries and petrochemical facilities. We will continue to pursue and expect greater adoption of our products in district heating systems, LNG production and storage, and power generation markets. In addition, our product revenue has been and will be generated in large part by demand for insulation associated with scheduled plant shutdowns, or turnarounds, and other maintenance-related projects. With our broad adoption and growing installed base, we expect that our products will be specified during the design phase in a growing number of new plant construction and capital expansion projects. We expect that growth in global energy demand over time will result in increased new-build and large capacity expansion projects, driving demand for our aerogel products.
- ***Develop and Leverage Strategic Relationships in the Building Materials Market.*** We are pursuing market opportunities with leading building materials manufacturers and distributors across multiple regions to address the increasingly stringent regulatory environment governing the thermal performance of buildings. During 2016, we entered into a multi-faceted strategic partnership with BASF to develop and commercialize a set of products optimized to meet the needs of the building materials market. The strategic partnership offers a near-term commercial opportunity through the supply and sale of our Spaceloft A2 product line and long-term commercial potential through our joint development efforts focused on innovative products and technologies. We believe our strategic partnership with BASF will facilitate our penetration of the building materials market by combining the strength of our aerogel technology platform with BASF's broad technical, commercial and distribution capabilities.
- ***Partner to Accelerate Diversification into New Markets.*** We are seeking to partner with industry leaders to develop a set of diverse market opportunities beyond the energy infrastructure and building materials markets. With these partners, we will seek to exploit the unique characteristics of aerogels, including low thermal conductivity, high surface area, high electrical conductivity, and tunable porosity, to develop aerogel enhanced products and next generation technology addressing unmet market needs. We will prioritize potential partnerships that include a mix of commercial, technical and financial elements to realize the full potential offered by our proprietary aerogel technology platform in targeted markets.
- ***Strategically Increase Capacity to Meet Demand.*** Demand for our aerogel products has grown significantly since our inception. From 2008 through 2016, our product revenue has grown at a compound annual growth rate of 27% to $115.5 million. To meet growth in demand for our products, we constructed a third production line in our East Providence facility

which began production in 2015. In addition, we plan to construct a second manufacturing facility in Statesboro, Georgia . Based on our preliminary plans for this facility, our projected cost to construc t plant infrastructure and a first production line in two phases is between $120 million and $130 million. We currently expect the first line will increase our estimated annual nameplate capacity by approximately 4 0 million square feet of aerogel blankets. The plant site, layout and design will support future development of two additional similar production lines. During the fourth quarter of 2016, we elected to temporarily delay construction of this facility to better align the capacity expansion with our assessment of demand for the 2018 to 2020 period.

- ***Expand Our Profit Margins and Return on Invested Capital.*** We will seek to continuously improve the cost efficiency of our manufacturing process to optimize the formulation of our products and to manage our supply chain to reduce costs. As our overall manufacturing scale grows, we believe there will be additional opportunities to realize efficiencies and to reduce our per unit overhead costs. We believe our current expansion plans offer attractive returns on incremental invested capital. In addition, we will focus our development efforts on new products and next generation technology with application in new, high value market segments
- ***Capitalize on Innovation.*** We employ a team of research scientists and process engineers focused on advancing our current aerogel technology and developing next generation aerogel compositions, form factors and manufacturing processes. As we continue to enhance our technology and expand our capacity, we believe we will have opportunities to address additional high value applications in the estimated $3.1 billion global insulation market. In addition, we believe that we are well positioned to leverage a decade’s worth of research and development to design and commercialize disruptive aerogel products for a wide array of new markets.

Our Products

Aerogels are highly porous structures in which 97% of the volume consists of air trapped between intertwined clusters of amorphous silica solids. Aerogels are a very low density solid and are usually extremely fragile materials. However, our proprietary manufacturing process produces aerogels in a flexible, resilient, durable and easy-to-use blanket form.

The core raw material in the production of our aerogel products is a silica precursor. Our manufacturing process initially creates a semi-solid alcogel in which the silica structure is filled with ethanol. We produce aerogel by means of a supercritical extraction process that removes ethanol from the gel and replaces it with air. Our process allows the liquid ethanol to be extracted without causing the solid matrix in the gel to collapse from capillary forces.

Our material costs were 41%, 45% and 46% of product revenue for the years ended December 31, 2016, 2015 and 2014, respectively. We are seeking to lower our manufacturing costs and to improve the per square foot costs of our aerogel blankets by optimizing our chemistries and manufacturing processes to improve yields, by obtaining material price reductions from existing vendors, by qualifying new vendors for certain materials and by reducing shipping costs. Our objective is both to reduce costs to enhance our competitive advantage and to ensure we deliver high quality finished products.

The materials used in the production of our products consist primarily of polyester and fiberglass battings, silica precursor and ethanol, which is used in the delivery of the silica precursor. Multiple sources of supply exist for all of our raw materials, and we believe the markets for these products are competitive and prices are relatively stable. We purchase silica precursor from several suppliers. Based on the current level of demand for our products, we believe that an adequate long-term supply of silica precursor is available. However, if demand for our products increases rapidly, we will need to work with suppliers to ensure that an adequate long-term supply of silica precursor will be available. Suppliers of silica precursor include industrial companies that produce it directly or that produce it as a byproduct of other industrial processes. We are working with a number of suppliers to plan for our potential future needs and to develop processes to reduce the long-term cost of the silica precursor used in our products. See “Risk Factors — Shortages of the raw materials used in the production of our products, increases in the cost of such materials or disruptions in our supply chain could adversely impact our financial condition and results of operations.”

Our aerogel blankets are reinforced with non-woven fiber batting. We manufacture and sell our blankets in 60 inch wide, three foot diameter rolls with a standard range of thickness of 5 millimeters to 10 millimeters. Our base products are all flexible, hydrophobic, vapor permeable, compression resistant and able to be cut with conventional tools. We have specifically developed our line of aerogel blankets to meet the requirements of a broad set of applications within our target markets. The composition and attributes of our aerogel blankets are described below:

Energy Infrastructure Markets

- ***Pyrogel XT/XT-E.*** Pyrogel XT/XT-E, our best-selling product, is reinforced with a glass-fiber batting and has an upper use temperature of 650° C. Pyrogel XT was initially designed for use in high temperature systems in refineries and petrochemical facilities, and we believe that it has wide applicability throughout the energy infrastructure market. Pyrogel XT's hydrophobicity and vapor permeability reduce the risk of corrosion under insulation in high temperatu re operating systems when compared to traditional insulation.

- ***Pyrogel XTF.*** Pyrogel XTF provides similar thermal performance to Pyrogel XT, but is reinforced with a glass- and silica-fiber batting. Pyrogel XTF is specially formulated to provide strong protection against fire.
- ***Cryogel Z.*** Cryogel Z is designed for sub-ambient and cryogenic applications in the energy infrastructure market. Cryogel Z is reinforced with a glass- and polyester-fiber batting and is produced with an integral vapor barrier. Cryogel Z is also specially formulated to minimize the incidence of stress corrosion cracking in stainless steel systems. Cryogel Z's combination of properties allow for simplified designs and reduced installation costs in cold applications throughout the energy infrastructure market when compared to traditional insulation.
- ***Spaceloft Subsea.*** Spaceloft Subsea is reinforced with glass- and polyester-fiber batting and is designed for use in pipe-in-pipe applications in offshore oil production. Spaceloft Subsea can be fabricated and pre-packaged to permit faster installation. Spaceloft Subsea allows for small profile carrier pipelines and associated reductions in capital costs.

Other Markets

- ***Spaceloft.*** Spaceloft is reinforced with a glass/polyester fiber batting and is designed for use in the building materials market. Spaceloft is either utilized in roll form by contractors in the field or fabricated by OEMs into strips, panels and systems that meet industry standards. Spaceloft is designed for use in solid wall buildings and where space is at a premium. Spaceloft A2, a variant of Spaceloft, is reinforced with a glass-fiber batting and specifically designed to meet Euroclass A2 fire standards.
- ***Cryogel X201.*** Cryogel X201 is similar in composition to Cryogel Z, but is produced without a vapor barrier. Cryogel X201 is designed for use in cold system designs where space is at a premium. Cryogel X201 is targeted to OEMs that design, produce and sell refrigerated appliances, cold storage equipment and aerospace systems.

R-Values by Material

Insulation is a material or combination of materials that slows the transfer of heat from one side of the material to the other. The composition of our aerogel products minimizes the three mechanisms of thermal transport:

- ***Conduction.*** Heat conduction through a material is correlated to the material's density. Aerogels are very low density solids. As a result, thermal conductivity through the aerogel material itself is extremely low.
- ***Convection.*** Heat convection in gases is through movement of gas molecules. Due to the restricted movement of gases in the aerogel structure, thermal convection is eliminated inside the aerogels.
- ***Radiation.*** Radiation requires no medium to transfer the heat. Thermal radiation is partially absorbed by aerogels. Our aerogel products also contain infrared absorbing additives to significantly reduce radiant heat transfer.

We believe our aerogel products offer the lowest levels of thermal conductivity, or best insulating performance, of any widely used insulation available on the market today.

The lower a material's thermal conductivity, the more slowly heat is transferred across it. R-values are a commonly used measure of an insulating material's resistance to heat transfer. R-value is calculated as the thickness of an insulation material divided by the thermal conductivity of the insulation material. Materials with higher R-values have lower thermal conductivity and are better insulators. Traditional and specialty insulation materials provide a range of R-values. Aerogels have the highest R-value per meter of thickness in comparison to traditional insulation materials.

Qualification for Use

Our products have undergone rigorous testing and are now qualified for global usage in both routine maintenance and in capital projects at many of the world's largest oil producers, refiners and petrochemical companies. These end-users of our products have well defined practices, codes, specification and standards for materials and systems installed or used in their facilities. These specifications include insulation system design standards, material qualification and selection processes, and insulation application practices. As part of the material qualification process run by these companies, a new insulation must meet general industry standards, such as consensus standards developed by ASTM International, and, in some cases, company-specific internal standards to be considered for use. In addition, most of these companies require one or more field trials to establish fitness for use in specific applications. The companies either run these qualification processes and field trials internally or through third parties engaged by them, and they generally do not publicly disclose the results of their testing. While the specific processes and timelines vary from company to com pany, in general, upon successful completion of the qualification process for an insulation material, an end-user will typically deem the material to be qualified for use in its facilities on a local, regional or global basis for one or more applications. Because our end-use customers are typically businesses with very large operations, our insulation sales likely represent only a small portion of the total insulation used by any one of these companies. Accordingly, once our products are qualified at a comp any, we continue to seek to expand use of our products by the end-use customer.

Our Sales Channel

We market and sell our products primarily through our sales force. Our salespeople are based in North America, Europe and Asia and travel extensively to market and sell our products to new and existing customers. The efforts of our sales force are supported by a small number of sales consultants with extensive knowledge of a particular market or region. Our sales force is required to establish and maintain customer and partner relationships, to deliver highly technical information and to provide first class customer service. We plan to expand our sales force globally to support anticipated growth in customers and demand for our products.

Our sales force calls on and maintains relationships with participants at all levels of the insulation industry supply chain. We have established and manage a network of insulation distributors to ensure rapid delivery of our products in critical regions. Our salespeople work to educate insulation contractors about the technical and operating cost advantages of aerogel blankets. Our sales force works directly with end-users and engineering firms to promote qualification, specification and acceptance of our products in existing and new applications. In the energy infrastructure market, we rely heavily on the existing and well-established channel of distributors and contractors to deliver products to our customers. In addition, our salespeople work with OEMs and strategic partners to create new products and solutions to expand our market reach.

The sales cycle for a new insulation material is typically lengthy. Our sales cycle from initial customer trials to widespread use can take from one to three years, although we typically realize increasing revenue at each stage in the cycle. We believe our relationships with technically sophisticated customers and strategic partners serve to validate our technology, products and value proposition within a target market. These relationships have proven to shorten the sales cycle with other customers within specific markets and to facilitate growth in market share. We have focused our marketing efforts on developing technical support materials, installation guides, case studies and general awareness of the superior performance of our aerogel blankets. We rely on our website, printed technical materials, participation in industry conferences and tradeshows and presentation of technical papers to communicate our message to existing and potential customers. We also receive strong word-of-mouth support from the growing network of distributors, contractors, OEMs, strategic partners and end-users that understand the benefits of our products.

As of December 31, 2016, we had 38 employees in our sales and marketing organization worldwide. Their efforts were supported by a team of four sales consultants.

Our Customers and End-Users

Customers

As described below, our primary customers are distributors, contractors and OEMs that stock, install and fabricate insulation products, components and systems for technically sophisticated end-users that require high-performance insulation.

- ***Distributors:*** We currently operate through a global network of over 58 insulation distributors. In general, insulation distributors stock, sell and distribute aerogel materials to insulation contractors and end-users. The distribution of our product outside the United States is typically conducted under agreements that provide for exclusivity by geography linked to annual purchase volume minimums. These insulation distributors often will also proactively market and promote aerogel materials across their market.
- ***Contractors:*** We currently sell directly to a number of insulation contractors under project specific contracts or general purchase orders. Insulation contractors generally perform insulation installation, inspection and maintenance and project management for end-users. In addition, some insulation contractors provide end-users with project engineering and design services. Several of our agreements with contractors provide for exclusivity by market sector or geography linked to annual purchase volume minimums.

- ***OEMs:*** We currently sell directly to a small network of OEMs that design, fabricate and manufacture insulation components and systems for use in the energy infrastructure, industrial, building materials, transportation, appliance and apparel markets.
- ***Direct Sales to End-Users:*** In certain instances, we sell directly to end-use customers in the energy infrastructure insulation market. In these instances, our end-use customer directly manages and controls specification, logistic, installation, inspection, maintenance and fabrication activities of our aerogel products.

Reliance Industries Limited and Distribution International, Inc. represented 25% and 15%, respectively, of our total revenue for 2016 and were our only customers representing 10% or more of our revenue for that period.

Our product revenue is generated by sales to customers around the world. In 2016, 29% of our product revenue was generated in the United States, 56% in Asia-Pacific, 10% in Europe, 3% in Canada, 2% in Latin America and less than 1% in the Middle East and Africa based on shipment destination.

A substantial portion of our sales are to shipment destinations located outside the United States, including India, Hong Kong, Singapore, Korea, Thailand, Germany, Canada, Japan, Australia and Columbia based on our shipment destination or the location in which research services are performed. Total revenue generated from outside of the United States amounted to $82.0 million or 70% of total revenue, $78.0 million or 64% of total revenue and $62.6 million or 61% of total revenue, in the years ended December 31, 2016, 2015 and 2014, respectively. In addition, we may expand our operations outside of the United States. As a result, we are subject to a number of risks; see "Risk Factors — A substantial portion of our revenue comes from sales in foreign countries and we may expand our operations outside of the United States, which subjects us to increased economic, foreign exchange, operational and political risks that could increase our costs and make it difficult for us to operate profitably."

End-Users

The end-users of our aerogel blankets include some of the largest and most well capitalized companies in the world. Our products are installed in more than 40 countries worldwide.

Energy Infrastructure

- ***Oil Refining:*** We believe we have had initial product deployments in approximately 30% of the world's 640 refineries. In addition, we believe our aerogel blankets are used by 24 of the world's 25 largest refining companies including ExxonMobil, Shell and Chevron, among others. Over time, these companies have used our products in an increasing range of applications and throughout an increasing number of their facilities.
- ***Petrochemical:*** We believe our aerogel blankets are used by all of the world's 20 largest petrochemical companies including Reliance Industries, Formosa Petrochemical, and LyondellBasell Industries, among others.
- ***Natural Gas and LNG:*** Our products are in use at facilities operated by PTT LNG, ExxonMobil, and Pemex Gas, among others.
- ***Onshore:*** Our aerogel blankets are in use in several Canadian oil sands facilities owned and operated by Suncor Energy, ConocoPhillips and Husky Energy, among others.
- ***Offshore:*** Our products are currently used in subsea projects off the coast of Brazil, in the Gulf of Mexico, in the North Sea, off the coast of Malaysia and off the west coast of Africa. Our products are installed in offshore projects owned by Total, Marathon Oil, ConocoPhillips and Shell, among others.
- ***Power Generation:*** We are targeting operators of gas, coal, nuclear, hydro and solar power generating facilities. Although not a significant portion of our revenue today, our products are currently used at facilities owned and operated by NextEra Energy Resources, among others.

Building Materials and Other Markets

Traditionally, we have relied on the efforts of a small network of partners, OEMs and fabrication houses to serve the building materials, transportation, apparel and appliance markets. These partners, OEMs and fabricators are manufacturers of components and systems for buildings, refrigerated and hot appliances, cold storage equipment, automobiles, aircraft, trains and electronic sectors and manufacturers of outdoor gear and apparel. In addition, we have partnered with BASF to develop and commercialize a set of innovative products optimized to meet the needs of the building materials market. While our products have not yet been widely adopted in these markets, we expect that the end-users of o ur products in these markets will include a wide range of institutions, businesses, individuals, and government agencies.

Manufacturing

We manufacture our products using our proprietary technology at our facility located in East Providence, Rhode Island. We have operated the East Providence facility since 2008 and have significantly increased manufacturing capacity and productivity during the period. Our manufacturing process is proven, scalable and can meet increasing demand.

Our manufacturing group is led by a seasoned team with management experience at global industrial and specialty chemical companies. Our manufacturing workforce is experienced and, to date, we have experienced employee turnover consistent with others in our industry. We have well-defined maintenance, environmental, health and safety programs and operating processes in place. We utilize statistical processes and quality controls to measure the thermal conductivity, hydrophobicity and thickness of our aerogel blankets during the manufacturing process. We are ISO 9001:2008 certified.

We successfully commenced operation of our third production line at the East Providence facility at the end of March 2015, which increased our annual nameplate capacity to approximately 50 million square feet of aerogel blankets. In November 2015, we announced the selection of Statesboro, Georgia, as the site for our second manufacturing plant. The 43 acre site is served by rail and provides convenient access to local ports. The Statesboro region is served by a well-developed technical educational system, and provides a strong workforce, secure and low-cost utilities and easy access to critical raw materials. State and local governmental authorities also provided us with a package of incentives including outright grants, free land, infrastructure support, tax credits and abatements, training programs and related benefits.

Based on our preliminary plans for the second facility, our projected cost to construct plant infrastructure and a first production line in two phases is between $120 million and $130 million. We currently expect the first line will increase our estimated annual nameplate capacity by approximately 40 million square feet of aerogel blankets. The plant site, layout and design will support future development of two additional similar production lines. During the fourth quarter of 2016, we elected to temporarily delay construction of this facility to better align the capacity expansion with our assessment of demand for the 2018 to 2020 period.

We directly control all stages in the manufacture of our aerogel blankets. Our direct ownership of manufacturing operations allows us to maintain control of proprietary process technologies and to control product quality. Our production of aerogel blankets utilizes a continuous process and consists of the following key steps:

- ***Sol Preparation.*** Mixing of a silica precursor in ethanol, a catalyst and additives in set formulas to deliver the target properties of the resultant aerogel.
- ***Casting.*** Application of the sol into a non-woven batting and initial formation of the gel structure.
- ***Aging.*** Bathing of the gel-saturated blankets in fluids to impart desired physical and thermal properties.
- ***Extraction.*** Supercritical extraction of the ethanol liquid from the gel-saturated blanket to produce an aerogel blanket.
- ***Heat Treatment.*** Drying to remove trace ethanol, salts and water from the aerogel blankets.
- ***Finishing.*** Coating to enhance quality and product handling.
- ***Quality Control.*** Utilizing statistical process and quality controls to measure thermal conductivity, hydrophobicity and thickness of our aerogel blankets.

Our material costs were the equivalent of 41%, 45% and 46% of product revenue for the years ended December 31, 2016, 2015 and 2014, respectively. The materials used in the production of our products consist primarily of polyester and fiberglass battings, silica precursors and ethanol, which is used in the delivery of the silica precursor. Multiple sources of supply exist for all of our raw materials, and we believe the markets for these products are competitive and prices are relatively stable. We purchase silica precursor from several suppliers. Based on the current level of demand for our products, we believe that an adequate long-term supply of silica precursor is available. However, if demand for our products increases rapidly, we will need to work with suppliers to ensure that an adequate long-term supply of silica precursor will be available. Suppliers of silica precursor include industrial companies that produce it directly or that produce it as a byproduct of other industrial processes. We are working with a number of suppliers to plan for our potential future needs and to develop processes to reduce the long-term cost of the silica precursor used in our products. See “Risk Factors — Risks Related to Our Business and Strategy —. Shortages of the raw materials used in the production of our products, increases in the cost of such materials or disruptions in our supply chain could adversely impact our financial condition and results of operations.”

We are seeking to lower our manufacturing costs and to improve the per square foot costs of our aerogel blankets by optimizing our chemistries and manufacturing processes to i mprove yields, by obtaining material price reductions from existing vendors, by qualifying new vendors for certain materials and by optimizing shipping costs. Our objective is both to reduce costs to enhance our competitive advantage and to ensure we deliv er high quality finished products.

Research and Development

The mission of our research and development team is to leverage innovation in support of our commercial objectives, including by designing additional disruptive products for the energy infrastructure and building materials markets and seeking methods to lower our manufacturing costs and to improve yields. Our research and development expenditures were $5.3 million, $5.3 million and $6.0 million for the years ended December 31, 2016, 2015 and 2014, respectively. In addition, we spent $1.3 million, $1.0 million and $1.6 million for the years ended December 31, 2016, 2015 and 2014, respectively, on research and development activities sponsored by federal and other government agencies. Our scientists and engineers work closely with customers to study and assess insulation application requirements and guide advancements in aerogel materials and manufacturing.

Contract Research and Government Support

We regularly seek funding from a number of federal and other government agencies in support of our research and development and manufacturing activities. Research performed under contract to the Department of Defense, the Department of Energy and other institutions allows us to develop and leverage technologies into broader commercial applications. We also work closely with customers in government and industry to develop potential aerogel solutions that leverage not only the thermal insulation performance but other benefits of aerogels as well. The research and development activities that we conduct under such contracts may produce intellectual property to which we may not have ownership or exclusive rights and will be unable to protect or monetize.

Under our contracts, the U.S. government generally has the right not to exercise options to extend or expand our contracts and may modify, curtail or terminate the contracts at its convenience. Our government customers may not renew our existing contracts after the conclusion of their terms and we may not be able to enter into new contracts with U.S. government agencies. Any decision by the U.S. government not to exercise contract options or to modify, curtail or terminate our contracts or not to renew our contracts or enter into new contracts with us would adversely affect our revenues.

We have received $51.7 million in funding under government contracts from inception through December 31, 2016. Our contract research revenue was $2.2 million, $2.0 million and $3.1 million for the fiscal years ended December 31, 2016, 2015 and 2014, respectively.

Intellectual Property

Our success depends in part upon our ability to obtain, maintain, protect and enforce intellectual property rights that cover our product forms, applications and/or manufacturing technologies and specifications and the technology or know-how that enables these product forms, applications, technologies and specifications, to avoid and defend against claims that we infringe the intellectual property rights of others, and to prevent the unauthorized use of our intellectual property. Since aerogels were developed approximately 80 years ago, there has been a wide range of research, development and publication on aerogels, which makes it difficult to establish intellectual property rights to many key elements of aerogel technology and to obtain patent protection. Where we consider it appropriate, our policy is to seek to protect our proprietary rights by filing United States and foreign patent applications related to technology, inventions and improvements that we consider patentable and important to the development and conduct of our business and, in particular, our aerogel technology, product forms and their applications in promising markets and our manufacturing technologies. We also rely on trade secrets, trademarks, licensing agreements, confidentiality and nondisclosure agreements and continuing technological innovation to safeguard our intellectual property rights and develop and maintain our competitive advantage.

As of December 31, 2016, we owned 37 issued U.S. patents, 21 pending U.S. patent applications (including three issued U.S. patents and one pending U.S. patent application that we co-own with third parties), 56 issued foreign patents and 59 pending foreign patent applications (including 17 issued foreign patents and four pending foreign patent applications that we co-own with third parties). The U.S. patents that we own are generally effective for 20 years from the filing date of the earliest application to which each U.S. patent claims priority. The scope and duration of each of our foreign patents varies in accordance with local law. Our patents start to expire in December 2021.

In May 2016, we filed a complaint against Guangdong Alison Hi-Tech Co., Ltd., or Alison, and Nano Tech Co., Ltd, or Nano, in the United States International Trade Commission in which we allege that these two China-based companies are engaging in unfair trade practices by importing aerogel products in the United States that infringe several of our patents. We refer to Alison and Nano as the Respondents. In the complaint, we are seeking exclusion orders directing United States Customs and Border Protection to sto p the importation of infringing products. In June 2016, the ITC instituted an investigation based on our complaint. The investigation is ongoing with participation from Alison and Nano through their respective counsel. In addition to Alison and Nano's cont ention at the ITC that the patents we have asserted are invalid, Alison has also filed petitions with United States Patent and Trademark Office requesting Inter-Partes Review to cancel certain claims in three of the asserted manufacturing process patents a nd a product form patent . Alison has also filed similar requests with the Chinese Patent Office to invalidate our product form patent, two manufacturing process related patent s and another unrelated patent in China.

In April 2016, we also filed a patent infringement suit at the District Court in Mannheim, Germany against the Respondents and two European distributors. We have since settled with one European distributor in exchange for a commitment not to procure infringing products and cooperation with our case. The litigation against the other defendants is ongoing. In addition, Nano has initiated a nullity action in German Federal Patent Court against one of our manufacturing process patents in Germany.

Due to their nature, it is difficult to predict the outcome in any litigation. Furthermore, Alison and Nano may have significant resources and interest to litigate and therefore, this litigation could be protracted and may ultimately involve significant legal expenses. We have incurred approximately $3.8 million of expenses related to this litigation through December 31, 2016.

We believe that having distinctive names is an important factor in marketing our products, and therefore we use trademarks to brand some of our products, including Pyrogel, Cryogel and Spaceloft. As of December 31, 2016, we had five trademark registrations in the United States and 48 trademark registrations in foreign jurisdictions, including the European Union, Japan, China, Canada, South Korea and Brazil. Although we have a foreign trademark registration program for selected marks, our approach may not be comprehensive enough or we may not be able to register or use such marks in each foreign country in which we seek registration.

Cross License Agreement with Cabot Corporation

In April 2006, we entered into a cross license agreement with Cabot Corporation, as amended in September 2007, in which each party granted certain intellectual property rights to the other party. The cross license agreement remains in effect until the expiration of the last to expire of the issued patents or patent applications and acquired patents licensed thereunder. We hold a non-exclusive, worldwide license to those patents and patent applications owned or licensed by Cabot that are necessary for us to (i) practice our manufacturing technology within a field of use, which is defined in accordance with the specific chemistry of our aerogel products and the supercritical fluid technology that we use in our manufacturing technology and (ii) use and sell the resulting aerogel blanket and derivative products. We paid Cabot $38 million over a period of approximately seven years, with the last payment made in March 2013, in connection with this license agreement. We have granted to Cabot a reciprocal, non-exclusive, worldwide license to certain patents and patent applications that we own that are necessary for Cabot to practice its processes within a field of use defined in accordance with the specific chemistry in its aerogel products and the drying technology that it uses to manufacture its products. The grant of license to each party covers issued patents, patent applications and patents issued from such counterpart applications, as well as patents licensed or acquired during a specified term, in each case that claim aerogels, or methods, materials of manufacture, or uses of aerogels.

Our Company

We are a corporation organized under the laws of Delaware. In June 2008, we completed a reorganization pursuant to which our predecessor company merged with and into a newly formed Delaware corporation, renamed Aspen Aerogels, Inc. We own three wholly owned subsidiaries: Aspen Aerogels Rhode Island, LLC, Aspen Aerogels Germany, GmbH and Aspen Aerogels Georgia, LLC, which was formed in August 2016. We maintain our corporate offices in Northborough, Massachusetts.

On June 18, 2014, we completed our initial public offering, or IPO, of 7,500,000 shares of our common stock at a public offering price of $11.00 per share. As of March 1, 2017, we had 23,369,838 shares of our common stock outstanding.

We are required to file annual, quarterly and current reports, proxy statements and other information required by the Securities Exchange Act of 1934, as amended, or the Exchange Act, with the Securities and Exchange Commission, or the SEC. You may read and copy the reports and other information we file with the SEC at the SEC's Public Reference Room at 100 F Street, N.E., Room 1580, Washington, D.C. 20549. You may also obtain copies of this information by mail from the public reference section of the SEC, 100 F Street, N.E., Washington, D.C. 20549, at prescribed rates. You may obtain information regarding the operation of the public reference room by calling 1-800-SEC-0330. The SEC also maintains a website that contains reports, proxy statements and other information about issuers, like us, who file electronically with the SEC. The address of that website is http://www.sec.gov.

We maintain a public internet site at http://www.aerogel.com , including an Investors section through which we make available, free of charge, our Annual Reports on Form 10-K, Quarterly Reports on Form 10-Q, Current Reports on Form 8-K, Proxy Statements and Forms 3, 4 and 5 filed on behalf of directors and executive officers, as well as any amendments to those reports filed or furnished pursuant to the Exchange Act as soon as reasonably practicable after we electronically file such material with, or furnish it to, the SEC. We also make available on our website the ch arters for our Board of Directors' Audit Committee, Compensation and Leadership Development Committee and Nominating and Corporate Governance Committee, as well as our Code of Business Conduct and Ethics, our Corporate Governance Guidelines and other relat ed materials. The information on our website is not part of this annual report.

Our Investor Relations Department can be contacted at Aspen Aerogels, Inc., 30 Forbes Road, Building B, Northborough, MA 01532, Attention: Investor Relations; telephone: 508-691-1111; e-mail: ir@aerogel.com.

Employees

As of December 31, 2016, we had 281 full-time employees and one part-time employee, with 31 in research and development, 187 in manufacturing operations and supply chain, 38 in sales and marketing and 25 in general and administrative functions. Of our employees, 272 are located in the United States and nine are located abroad. We consider our current relationship with our employees to be of good standing. None of our employees are represented by labor unions or have collective bargaining agreements.

Seasonality

Our industry and product offering makes us less susceptible to seasonal patterns as our operating results are generated in part by demand for insulation associated with new-build construction of facilities, capital expansions and related capital projects, and larger maintenance-related projects in the energy infrastructure market. Historically, our second and fourth quarter results have shown an increase in revenue, which we believe is associated with our end-use customers' maintenance schedules and timing of capital projects.

Environmental Matters

We are subject to federal, state, local and foreign laws and regulations designed to protect the environment and to regulate the discharge of materials into the environment. We believe that our policies, practices, and procedures are properly designed to prevent unreasonable risk of environmental damage and associated financial liability. To date, environmental control regulations have not had a significant adverse effect on our overall operations. See "Risk Factors — We may incur significant costs complying with environmental, health and safety laws and related claims, and failure to comply with these laws and regulations could expose us to significant liabilities, which could adversely affect our results of operations."

Item 1A. RISK FACTORS

Risks Related to Our Business and Strategy

We have incurred annual net losses since our inception, and we may continue to incur net losses in the future and may never reach profitability.

We have a history of losses, and we may not ever achieve full year profitability. We experienced net losses of $12.0 million, $6.4 million and $66.3 million for the years ended December 31, 2016, 2015 and 2014, respectively. As of December 31, 2016, our accumulated deficit was $417.5 million. We expect to continue to incur operating losses as a result of expenses associated with the continued development and expansion of our business. Our expenses include research and development, sales and marketing, and general and administrative costs. Furthermore, these expenses are not the only factors that may contribute to our net losses. For example, interest expense on any future financing arrangements that we incur could contribute to our net losses. Any failure to increase revenue or manage our cost structure as we implement initiatives to grow our business could prevent us from achieving profitability, or sustaining profitability if we do achieve it. In addition, our ability to achieve profitability is subject to a number of risks and uncertainties discussed below, many of which are beyond our control. Failure to become and remain profitable may adversely affect the market price of our common stock and our ability to raise capital and continue operations.

We have yet to achieve positive total cash flow, and our ability to generate positive cash flow is uncertain.

To develop and expand our business, we have made significant up-front investments in our manufacturing capacity and incurred research and development, sales and marketing and general and administrative expenses. In addition, our growth has required a significant investment in working capital. We experienced negative cash flows from operating activities of $0.6 million for the year ended December 31, 2016 and positive cash flows from operating activities of $5.4 million and $6.6 million for the years ended December 31, 2015 and 2014, respectively. These cash flows from operating activities were insufficient to offset cash flows used in investing activities principally to expand our manufacturing capacity during the three year period. As a result, we experienced negative total cash flows during the three year period, excluding the proceeds from our initial public offering in 2014.

We expect that for th e foreseeable future our total cash flow will remain negative. In particular, we will need cash to fund our significant planned future capital expenditures to expand manufacturing capacity with the construction of our second manufacturing plant. We will al so require significant amounts of working capital to support our growth and we will need to increase our inventories of raw materials and our products as we seek to grow our business. In addition, from time to time, we may have debt maturities that will re quire cash in order to repay those obligations. We may not achieve sufficient revenue growth to generate positive future cash flow and, therefore, we may need to raise additional capital from investors to achieve our expected growth. An inability to genera te positive cash flow for the foreseeable future or raise additional capital on reasonable terms, if at all, may decrease our long-term viability.

We are dependent on a single manufacturing facility. Any significant disruption to this facility or the failure of any of our three production lines in this facility to operate according to our expectation could have a material adverse effect on our business and results of operations.

We have three production lines in one manufacturing facility, which is located in East Providence, Rhode Island. Our ability to meet the demands of our customers depends on efficient, proper and uninterrupted operations at this manufacturing facility. In the event of a significant disruption to our sole manufacturing facility or breakdown of any of the production lines, we currently do not expect that we would have sufficient inventory in stock to meet demand until the production lines return to operation.

Power failures or disruptions, the breakdown, failure or substandard performance of equipment, or the damage or destruction of buildings and other facilities due to fire or natural disasters could severely affect our ability to continue our operations. In the event of such disruptions, we are unlikely to find suitable alternatives or may not be able to make needed repairs on a timely basis and at reasonable cost, which could have a material adverse effect on our business and results of operations. In particular, our manufacturing processes include the use of both high temperatures and flammable chemicals, which subjects us to a significant risk of loss resulting from fire.

We had occasional incidences of fires at our initial facility in Northborough, Massachusetts that preceded our current manufacturing facility in East Providence, Rhode Island. If our manufacturing facility were to be damaged or cease operations, it may reduce revenue, cause us to lose customers and otherwise adversely affect our business. The insurance policies we maintain to cover losses caused by fire or natural disaster, including business interruption insurance, may not adequately compensate us for any such losses and will not address a loss of customers that we expect would result. If our existing manufacturing facility was damaged or destroyed prior to the commencement of operations at a second manufacturing facility, we would be unable to operate our business for an extended period of time and our business and results of operations may be materially adversely affected, potentially even threatening our viability.

If the expected growth in the demand for our products does not follow each of our planned capacity expansions, then our business will be materially adversely affected.

Our long-term growth plan requires that we increase our production capacity. As we pursue our capacity expansion plans, we will incur significant capital expenditures and increased levels of manufacturing expenses in anticipation of expected growth in demand for our products. In particular, we expect that these substantial additional expenditures will be made by us significantly in advance of the existence of the level of demand that would ensure the most efficient use of our planned new capacity. As a result, if the expected growth in demand for our products fails to materialize within a reasonable amount of time following each of our planned capacity expansions, whether because of low oil and gas prices or for any other reasons, then we would suffer decreased levels of cash flow and our financial condition and results of operations would be adversely affected.

If we fail to achieve the increase in production capacity that our continued growth requires in a timely manner, or at all, our growth may be hindered and our business or results of operations may be materially adversely affected.

If, for any reason, including our inability to obtain financing, our planned second manufacturing facility to be constructed in Statesboro, Georgia should fail to be completed in a timely manner, or at all, or any of the production lines in any future manufacturing facilities do not operate according to our expectations, sales may be impeded, our growth may be hindered and our business or results of operations may be materially adversely affected.

Many factors could delay or prevent the construction of a second manufacturing facility or cause us to reduce the scale or scope of the new facility, including:

- our inability to obtain financing on favorable terms, or at all;
- design, engineering and construction difficulties or delays;

- our failure or delay in obtaining necessary legal, regulatory and other approvals;
- interruptions in the supply of the necessary equipment, or construction materials or labor or an increase in their price;
- opposition of local interests; and
- natural disasters, accidents, political unrest or unforeseen events.

Many factors could prevent the second manufacturing facility from producing at its expected effective or nameplate capacity or could cause us to reduce the scale or scope of the new facility, including:

- design and engineering failures;
- inability to retain and train a skilled workforce;
- the challenges of operating significantly higher volume equipment at the planned second facility than currently employed at our existing facility in East Providence;
- improper operation of the manufacturing equipment;
- decreases in our manufacturing yields due to the inefficient use of the materials needed to make our products in our manufacturing process;
- the availability of raw materials to support the levels of production that we anticipate at these facilities;
- strikes or labor disputes; and
- damage to the manufacturing equipment due to design and engineering flaws, construction difficulties or operator error.

Any such expansion will place a significant strain on our senior management team and our financial and other resources. The costs associated with and the resources necessary for our expansion could exceed our expectations and result in a materially adverse impact on our business, results of operations, financial condition and cash flows.

If we are unable to complete the projects contemplated, the costs incurred in connection with such projects may not be recoverable. For example, during 2013, we redesigned and reduced the planned scale of the third production line. As a result, we reviewed the construction in progress assets associated with the third production line and determined that $3.0 million of such assets had no future use. In addition, we concluded that an additional $0.4 million of construction in progress assets were not utilized or functional. Accordingly, we recorded a $3.4 million impairment charge during 2013 related to the write-off of construction in progress assets. As of December 31, 2016, we have capitalized approximately $7.2 million related to engineering designs and other pre-construction costs related to our planned manufacturing facility in Statesboro, Georgia. A redesign of, reduction in scale of, or failure to complete the second manufacturing facility and similar impairments of our assets in the future could result in a materially adverse impact on our business, results of operations, and financial condition.

We will require significant additional capital to pursue our growth strategy, but we may not be able to obtain additional financing on acceptable terms or at all.

The growth of our business will depend on substantial amounts of additional capital for construction of new production lines or facilities, ongoing operating expenses and continued development of our aerogel product lines. Our capital requirements will depend on many factors, including the rate of our revenue growth, our introduction of new products and enhancements to existing products, and our expansion of sales and marketing and product development activities. In particular, our plans to construct a second manufacturing facility in Statesboro, Georgia are dependent on our ability to raise debt and potentially equity. There is no assurance of our ability to obtain any such type of financing on terms acceptable to us or at all.

In addition, we may consider strategic acquisitions of complementary businesses or technologies to grow our business, which would require significant capital and could increase our capital expenditures related to future operation of the acquired business or technology.

We may not be able to obtain loans or raise additional capital on acceptable terms or at all. Our loan and security agreement with Silicon Valley Bank, under which we have the ability to borrow up to $20.0 million, contains restrictions on our ability to incur additional indebtedness, which, if not waived, could prevent us from obtaining needed capital. In addition, our revolving credit facility with Silicon Valley Bank will mature in January 2018. Any future credit facilities or debt instruments would likely contain similar restrictions. We may not be able to obtain bank credit arrangements or effect an equity or debt financing on terms acceptable to us or at all in order to fund our future capacity expansion plans. A failure to obtain additional financing when needed could adversely affect our ability to maintain and grow our business.

A sustained downturn in the energy industry, due to lower oil and gas prices or reduced energy demand, could decrease demand for some of our products and services, which could have a material adverse effect on our business, financial condition and results of operations.

Demand for a significant portion of our products and services depends upon the level of capital expenditure by companies in the energy industry, which depends, in part, on energy prices. Prices of oil and gas have been highly volatile in the past several years with oil prices reaching a high above $100 per barrel in mid-2014 to a low below $30 per barrel in early 2016. The volatility in oil prices, decline in oil prices and continued lower oil prices have resulted in a reduction in capital expenditures by many companies in the energy industry, and in particular by end-users of our products involved in the construction and expansion of offshore and onshore oil and gas production facilities. Sustained lower energy prices may also reduce our end-users' need to improve energy savings by using premium-priced insulation products like ours, thus reducing demand for our products and causing downward pressure on the pricing of our products. A sustained downturn in the capital expenditures of our customers, whether due to a continued lower energy prices or a further decrease in the market price of oil and gas or otherwise, may delay projects, decrease demand for our products and services and cause downward pressure on the prices we charge, which, in turn, could have a material adverse effect on our business, financial condition and results of operations. Such downturns, including the perception that they might continue, could have a significant negative impact on the market price of our common stock.

The markets we serve are subject to general economic conditions and cyclical demand, which could harm our business and lead to significant shifts in our results of operations from quarter to quarter that make it difficult to project long-term performance.

Our results of operations have been, and may in the future be, adversely affected by general economic conditions and the cyclical pattern of certain industries in which our customers and end-users operate. Demand for our products and services depends in large part upon the level of capital and maintenance expenditures by many of our customers and end-users, in particular those in the energy, petrochemical and power generation industries, and firms that design, construct and operate facilities for these industries.

These customers' expenditures historically have been cyclical in nature and vulnerable to economic downturns. In particular, profitability in the energy industry is highly sensitive to supply and demand cycles and commodity prices, which historically have been volatile; and our customers in this industry historically have tended to delay large capital projects, including expensive maintenance and upgrades, during industry downturns. Customer project delays may cause fluctuations in the timing or the amount of revenue earned and our results of operations in a particular period. Prolonged periods of little or no economic growth could decrease demand for oil and gas which, in turn, could result in lower demand for our products and a negative impact on our results of operations and cash flows. In addition, this historically cyclical demand and potential customer project delays may lead to significant shifts in our results of operations from quarter to quarter, which limits our ability to make accurate long-term predictions about our future performance. We estimate that sales to end-use customers in the energy industry accounted for approximately 93% of our 2016 revenues and we expect that they will account for a significant portion of our future revenues.

If we fail to meet required investment and job requirement goals for the second manufacturing facility in a timely fashion, we will be required to repay the value of incentives received from governmental authorities, which could adversely impact our financial condition and results of operations.

We have been offered incentives by The State of Georgia, Bulloch County and The City of Statesboro to site and operate our second manufacturing facility in Statesboro, Georgia. These incentives include a cash grant, income and withholding tax credits, training assistance, the gift of a 43 acre site, a 10 year property tax abatement, infrastructure improvements, reduced fees, site preparation services, and temporary office space. If we do not achieve specific investment and job creation goals at the Statesboro, Georgia site by 2021, and maintain such levels for a period of seven years, we will be required to repay the value of the incentives received to the governmental authorities, which would adversely impact or financial condition and results of operations.

During the fourth quarter of 2016, we decided to temporarily delay the second manufacturing facility due to constrained capital investment and low activity levels in the global energy markets and to better align our capacity expansion with our assessment of demand for the 2018 to 2020 period. As a result, the Company has not yet incurred an obligation to repay any incentives that may be provided.

Growth has placed significant demands on our management systems and our infrastructure. If we fail to manage our growth effectively, we may be unable to execute our business plan, address competitive c hallenges and meet applicable product specifications and technical and delivery requirements.

We may be unable to manage our growth. To manage our anticipated future growth, we must continue to:

- improve our existing, and implement additional, managerial capabilities, manufacturing, sales and marketing, and engineering operations, research and development capabilities, regulatory compliance systems and financial control and reporting systems;
- expand our manufacturing and distribution facilities; and
- continue to recruit and train additional qualified personnel.

All of these measures will require significant expenditures and will demand the attention of management. At certain points in the past, significant growth in demand for our products has put our management and manufacturing systems under strain. In addition, the physical expansion of our operations may lead to significant costs and may divert our management and business development resources. Furthermore, we compete for personnel and advisors with other companies and other organizations, many of which are larger and have greater name recognition and financial and other resources than we do. Due to our limited resources, we may not be able to effectively manage the expansion of our operations or recruit and adequately train additional qualified personnel or retain personnel. Any inability to manage growth could result in a loss of existing customers and revenues, delays in the execution of our business plans, and disruption of our operations. If we fail to achieve the necessary level of efficiency in our organization as it grows, our business, results of operations and financial condition would be harmed.

We allocate our manufacturing operations, sales and marketing, research and development, general and administrative and financial resources based on our business plan, which includes assumptions about current and future orders from customers. However, these factors are uncertain. If our assumptions regarding these factors prove to be incorrect or if competing products gain further acceptance, then actual demand for our aerogel products could be significantly less than the demand we anticipate and we may not be able to sustain our revenue growth or achieve profitability.

Shortages of the raw materials used in the production of our products, increases in the cost of such materials or disruptions in our supply chain could adversely impact our financial condition and results of operations.

The raw materials used in the production of our products consist primarily of polyester and glass fiber battings, silica precursors and additives. In addition, the production process requires the use of process gases and other materials typical of the silica-based chemical processing industry, as well as access to electricity, natural gas, water and other basic utilities. Although we are not dependent on any one supplier, we are dependent on the ability of our third-party suppliers to supply such materials on a timely and consistent basis. While these materials and utilities are available from numerous sources, they may be subject to fluctuations in availability and price.

Our third-party suppliers may not dedicate sufficient resources to meet our scheduled delivery requirements or our suppliers may not have sufficient resources to satisfy our requirements during any period of sustained demand. Failure of suppliers to supply, delays in supplying or disruptions in the supply chain for our raw materials, or allocations in the supply of certain high demand raw components, could materially adversely affect our results of operations. Supply disruptions may affect our ability to meet our delivery schedules on a timely basis and negatively impact our results of operations. For example, in September 2015, pursuant to a force majeure notification, our primary carbon dioxide gas supplier temporarily curtailed supply of carbon dioxide to us due to a feedstock issue impacting the northeastern United States. During this period, the supply disruption required that we intermittently idle a portion of our manufacturing equipment thereby reducing our production volume.

Most of our raw materials are procured through individual purchase orders or short-term contracts and not through long-term contracts that ensure a fixed price or guaranteed supply for an extended period of time. This procurement strategy may not support sustained long-term supply chain stability. Fluctuations in the prices of these raw materials could have a material adverse effect on results of operations. Our ability to pass increases in raw material prices on to our customers is limited due to competitive pricing pressure and the time lag between increased costs and implementation of related price increases.

In particular, we purchase silica precursors from several suppliers, mostly pursuant to individual purchase orders or short-term contracts and not pursuant to long-term contracts. We do not have a secure, long-term supply of silica precursors. We may not be able to establish arrangements for secure, long-term silica precursor supplies at prices consistent with our current costs or may incur a delay in supply while we seek alternative sources. In addition, fluctuations in ethanol prices may affect the cost of silica precursors. Any inability to continue to purchase silica precursors without long-term agreements in place, or to otherwise establish a long-term supply of silica precursors at prices consistent with our current costs, would have a material adverse effect on our ability to increase our sales and achieve profitability.

From time to time we have had difficulty consistently producing product that meets applicable product specifications and technical and delivery requirements, and such difficulties could expose us to financial, contractual or other liabilities.

Our insulation products are technologically advanced and require a precise and complex manufacturing process. Because of the precision and complexity of this manufacturing process and the high-performance characteristics of our products, from time to time we have had difficulty consistently producing product that meets applicable specifications and technical and delivery requirements, including, our customers' and the end-users' specifications and requirements. The rapid growth in demand for our products has contributed to this difficulty by putting significant pressure on our management, our personnel and our production facilities. See "Risk Factors — Growth has placed significant demands on our management systems and our infrastructure. If we fail to manage our growth effectively, we may be unable to execute our business plan, address competitive challenges and meet applicable product specifications and technical and delivery requirements."

Any failure to meet these product specifications or technical and delivery requirements could result in the termination of existing customer contracts or purchase orders, the elimination or reduction of future purchase orders, the impairment of customer relationships, and the incurrence of financial, contractual or other liabilities. Products that do not meet these specifications or requirements may also expose us to warranty and product liability claims and associated adverse publicity. Any such termination, reduction, impairment, liability or publicity could result in a broader loss of existing customers and revenues and delay the execution of our business plans, disrupt our operations and harm our results of operation and financial condition.

The market for insulation products incorporating aerogel blankets is relatively undeveloped and our products may never be widely adopted, which would have a material adverse effect on our business.

The market for insulation products utilizing aerogel blankets is relatively undeveloped. Accordingly, our future results of operations will depend in large part on our ability to gain market share of the global energy infrastructure insulation market. Our ability to gain market share in this market is highly dependent on the acceptance of our products by large, well-established end-users, distributors, contractors and OEMs. The insulation market has historically been slow to adopt new technologies and products. Most insulation types currently in use in these markets have been in use for over 50 years. In addition, there is a tendency of end-users in some of our markets to opt for the lower short-term costs of traditional insulation materials. If we fail to successfully educate existing and potential end-users, distributors, contractors and OEMs regarding the benefits of our aerogel products, or if existing users of our products no longer rely on aerogel insulation for their insulation needs, our ability to sell our products and grow our business could be limited.

Our business strategy also includes the development of next generation products with the performance characteristics and price points required by markets outside the energy infrastructure market, including the building materials market. In the event that we are unable to develop products that meet market needs, we may be unable to successfully penetrate such markets. In addition, the innovative product development process requires the dedication of significant time by our personnel and use of significant financial resources, with no certainty of success or recovery of our related expenses. As a result, we may be unable to grow our business in markets outside of the energy infrastructure market, which could adversely affect the demand for our products.

Because we are often a new supplier to our end-use customers, we also may face concerns from these end-use customers about our reliability and our ability to produce our products in a volume sufficient to meet their supply needs. As a result, we may experience a reluctance or unwillingness by existing end-use customers to expand their use of our products and by potential end-use customers to begin using our products. Our products may never reach mass adoption, and changes or advances in technologies could adversely affect the demand for our products.

A failure to increase, or a decrease in, demand for aerogel insulation products caused by lack of end-user, market or distribution channel acceptance, technological challenges or competing technologies and products would result in a lower revenue growth rate or decreased revenue, either of which could materially adversely affect our business and results of operations.

Our products are expensive relative to other insulation products, which could make it more difficult for us to grow our revenue and achieve broader adoption of our aerogel products.

While we believe our products have superior performance attributes and may sometimes have the lowest cost on a fully-installed basis or offer life-cycle cost savings, our competitors offer many traditional insulation products that are priced below our products. Our products are expensive relative to other insulation products and end-use customers may not value our products' performance attributes sufficiently to pay their premium price. This could make it more difficult for us to grow our revenue and achieve broader adopti on of our aerogel products. In addition, some of the benefits of our products are based on reduced installation time and related labor expense. In regions where labor costs are significantly lower than in the United States and Europe, the cost benefits of reduced installation times may not be adequate to overcome the relatively high price of our products and may make it more difficult for us to grow our revenue in such regions.

The insulation market we serve is highly competitive; if we are unable to compete successfully, we may not be able to increase or maintain our market share and revenues.

We face strong competition primarily from established manufacturers of traditional insulation materials. Large producers of traditional insulation materials, such as Johns Mansville, Saint-Gobain, Knauf Gips, Owens Corning and Rockwool, dominate the insulation market. In addition, we face competition from other companies seeking to develop high-performance insulation materials, including aerogel insulation. For example, Cabot Corporation manufactures, markets and sells a different form of aerogel insulation that is competitive with our products, particularly in the offshore oil and gas sector for use in pipe-in-pipe applications. Many of our competitors are substantially larger and better capitalized than we are and possess greater financial resources. In addition, we are aware of competitors in China, including Guangdong Alison Hi-Tech Co, Ltd and Nano Tech Co, Ltd, which manufacture and market aerogel insulation products in blanket form. Our competitors could focus their substantial financial resources to develop new or additional competing products or develop products that are more attractive to potential customers than the products that we offer.

Because some insulation manufacturers are substantially larger and better capitalized than we are, they may have the ability to sell their products at substantially lower costs to a large, existing customer base. Our products are expensive relative to other insulation products and end-use customers may not value our products' superior performance attributes sufficiently to pay their premium price. In addition, from time to time we may increase the prices for our products and these price increases may not be accepted by our end-use customers and could result in a decreased demand for our products. Similarly, we may make changes to our products in order to respond to customer demand or to improve their performance attributes and these changes may not be accepted by our end-use customers and could result in a decrease in demand for our products. These competitive factors could:

- make it more difficult for us to attract and retain customers;
- cause us to slow the rate of increase of our prices, delay or cancel planned price increases, lower our prices or discount our prices in order to compete; and
- reduce our market share and revenues.

Any of the above outcomes could have a material adverse effect on our results of operations, financial condition and cash flows.

A substantial portion of our revenue comes from sales in foreign countries and we may expand our operations outside of the United States, which subjects us to increased economic, trade, foreign exchange, operational and political risks that could adversely impact our business, financial conditions and results of operations and also increase our costs and make it difficult for us to operate profitably.

A substantial portion of our sales are to shipment destinations outside the United States, including India, Hong Kong, Singapore, Korea, Thailand, Germany, Canada, Japan, Australia and Columbia. Total revenue generated from outside of the United States, based on our shipment destination or research services location, amounted to $82.0 million or 70% of total revenue, $78.0 million or 64% of total revenue and $62.6 million or 61% of total revenue, for the years ended December 31, 2016, 2015 and 2014, respectively. As a result, we are subject to a number of risks, including, but not limited to:

- the effect of applicable U.S. and foreign tax structures, including tax rates that may be higher than tax rates in the United States or taxes that may be duplicative of those imposed in the United States;
- trade relations among the United States and those foreign countries in which our customers and suppliers have operations, including protectionist measures such as tariffs and import or export licensing requirements, whether imposed by the United States or such foreign countries;
- general economic and political conditions in each country, which may interfere with, among other things, our supply chain, our customers and all of our activities in a particular location;
- difficulty in the enforcement of contractual obligations in non-U.S. jurisdictions and the collection of accounts receivable from foreign accounts;
- different regulatory regimes in the various countries in which we operate or sell our products;
- inadequate intellectual property protection in foreign countries;

- the difficulties and increased expense in complying with mu ltiple and potentially conflicting domestic and foreign laws, regulations, product approvals and trade standards, including the U.S. Foreign Corrupt Practices Act and similar anti-bribery laws in non-U.S. jurisdictions, as well as the rules and regulations of the U.S. Office of Foreign Assets Control and similar sanctions laws;
- foreign currency exchange controls, restrictions and fluctuations, which could result in reduced revenue and increased operating expense;
- transportation delays or interruptions;
- labor rules and collective bargaining arrangements in foreign jurisdictions;
- difficulty in staffing and managing (including ensuring compliance with internal policies and controls) geographically widespread operations; and
- terrorist activity and political unrest, particularly given the use of our products at energy facilities.

In addition, sales of our products are generally conducted in U.S. dollars and we also bid for foreign projects in U.S. dollars. The recent strengthening of the U.S. dollar against the local currencies in many of the countries into which we sell our products has resulted in our products becoming more expensive relative to competing insulation products priced in the local currency. If the U.S. dollar remains at its current levels or strengthens further, our sales into foreign countries with relatively weaker currencies may be adversely impacted and we may be less competitive in bidding for projects in those markets.

Our success will depend in large part on our ability to manage the effects of continued global political and economic uncertainty, especially in our significant geographic markets.

Because of our significant international operations, we could be materially adversely affected by violations of the U.S. Foreign Corrupt Practices Act and similar anti-corruption, anti-bribery and anti-kickback laws.

We operate on a global basis, with 70% of our product sales in 2016 being made to destinations outside the United States, including Canada, Mexico, Europe, Asia, South America and the Middle East. Our business operations and sales in countries outside the United States are subject to anti-corruption, anti-bribery and anti-kickback laws and regulations, including restrictions imposed by the Foreign Corrupt Practices Act, or FCPA, as well as the United Kingdom Bribery Act of 2010, or UK Bribery Act. The FCPA, UK Bribery Act, and similar anti-corruption, anti-bribery and anti-kickback laws in other jurisdictions generally prohibit companies and their intermediaries and agents from making improper payments to government officials or any other persons for the purpose of obtaining or retaining business. We operate and sell our products in many parts of the world that have experienced governmental corruption to some degree and, in certain circumstances, strict compliance with anti-corruption, anti-bribery and anti-kickback laws may conflict with local customs and practices. We train our employees concerning anti-corruption, anti-bribery and anti-kickback laws and have policies in place that prohibit employees from making improper payments. We continue to implement internal controls and procedures designed to ensure that we comply with anti-corruption, anti-bribery and anti-kickback laws, rules and regulations and mitigate and protect against corruption risks. We cannot provide assurance that our internal controls and procedures will protect us from reckless, criminal or other acts committed by our employees or third-parties with whom we work. If we are found to be liable for violations of the FCPA or similar anti-corruption, anti-bribery and anti-kickback laws in international jurisdictions, either due to our own acts or out of inadvertence, or due to the acts or inadvertence of others, we could suffer criminal or civil fines or penalties or other repercussions, including reputational harm, which could have a material and adverse effect on our business, results of operations and financial condition.

A failure to comply with export control or economic sanctions laws and regulations could have a material adverse impact on our business, results of operations or financial condition. We may be unable to ensure that our distributors comply with applicable sanctions and export control laws.

We operate on a global basis, with 70% of our product sales in 2016 being made to destinations outside the United States, including Canada, Mexico, Europe, Asia, South America and the Middle East. We face several risks inherent in conducting business internationally, including compliance with applicable economic sanctions laws and regulations, such as laws and regulations administered by the United States Department of Treasury's Office of Foreign Assets Control, or OFAC, the United States Department of State and the United States Department of Commerce. We must also comply with all applicable export control laws and regulations of the United States and other countries. Violations of these laws or regulations could result in significant additional sanctions including criminal or civil fines or penalties, more onerous compliance requirements, more extensive debarments from export privileges or loss of authorizations needed to conduct aspects of our international business.

In certain countries, we may engage third party agents or intermediaries, such as customs agents, to act on our behalf and if these third party agents or intermediaries violate applicable laws, their actions may resu lt in criminal or civil fines or penalties or other sanctions being assessed against us. We take certain measures designed to ensure our compliance with U.S. export and economic sanctions law and we believe that we have never sold our products to Iran, Cub a, Sudan or Syria through third party agents or intermediaries or made any effort to attract business from any of these countries. However, it is possible that some of our products were sold or will be sold to distributors or other parties that, without ou r knowledge or consent, re-exported or will re-export such products to these countries. Although none of our non-U.S. distributors are located in, or to our knowledge, conduct business with Iran, Cuba, Sudan or Syria, we may not be successful in ensuring c ompliance with limitations or restrictions on business with these or other countries subject to economic sanctions. There can be no assurance that we will be in compliance with export control or economic sanctions laws and regulations in the future.

Any such violation could result in significant criminal or civil fines, penalties or other sanctions and repercussions, including reputational harm that could materially adversely impact our business, results of operations or financial condition.

We rely on sales to a limited number of direct customers, including distributors, contractors, OEMs, partners and end-use customers for the substantial majority of our revenue, and the loss of one or more significant direct customers or several of our smaller direct customers could materially harm our business. In addition, we understand from our direct customers that a substantial majority of their sales of our products are to a small number of end-use customers and the loss of one or more significant end-use customers or several of our smaller end-use customers could materially harm our business.

A substantial majority of our revenue is generated from sales to a limited number of direct customers, including distributors, contractors, OEMs, partners and end-use customers. For the years ended December 31, 2016, 2015 and 2014, total revenue from our top ten direct customers represented 67%, 64% and 63% of our revenues, respectively. Reliance Industries Limited and Distribution International, Inc. represented 25% and 15% of our total revenue in 2016, respectively; 14% and 12% of our total revenue in 2015, respectively; and 13% and 12% of our total revenue in 2014, respectively. For each of these periods, there were no other customers that represented 10% or more of our total revenues. Although the composition of our significant distributors, contractors, OEMs, partners and end-use customers will vary from period to period, we expect that most of our revenues will continue, for the foreseeable future, to come from sales to a relatively small number of direct customers. In addition, we understand from our direct customers that a substantial majority of their sales of our products are to a small number of end-use customers.

Our direct customer concentration also creates accounts receivable concentrations and related risks. As of December 31, 2016, Reliance Industries Limited, Distribution International, Inc. and Aerogel Korea Company, Ltd. accounted for 31%, 17% and 10% of our accounts receivable, respectively.

The substantial majority of our sales to distributors are transacted on a purchase order basis. The contracts we enter into with our direct customers generally do not include long-term commitments or minimum volumes that ensure future sales of our products. In addition, we understand that our direct customers’ contracts with end-use customers also generally do not include such commitments or minimums. Consequently, our results of operations may fluctuate significantly from period-to-period based on the actions of one or more significant direct customers or end-use customers.

A direct customer may take actions that affect us for reasons that we cannot anticipate or control, such as reasons related to an end-use customer’s financial condition, changes in business strategy or operations, the introduction of alternative competing products, or as the result of the perceived quality or cost-effectiveness of our products. Our agreements with these direct customers may be cancelled if we fail to meet certain product specifications or materially breach the agreement or for other reasons outside of our control. In addition, our direct customers may seek to renegotiate the terms of current agreements or renewals. The loss of, or a reduction in sales or anticipated sales to, one or more of our significant direct customers or end-use customers or several of our smaller direct customers or end-use customers could have a material adverse effect on our business, financial condition and results of operations.

If we are unable to maintain our technological advantage over our competitors, our business may be adversely affected.

We research, develop, manufacture and sell high-performance aerogel insulation products. Rapid and ongoing changes in technology and product standards could quickly render our products less competitive, or even obsolete, particularly if we fail to continue to improve the performance of our insulation products. We are currently developing new applications for our existing products as well as new aerogel technologies; however, we may not be successful in doing so and new applications or technologies may not be commercially useful. Other companies that are seeking to enhance traditional insulation materials have recently introduced or are developing other emerging insulation technologies. These competitors are engaged in significant development work on these various insulation products. Competing technologies that outperform our insulation in one or more performance attributes could be developed and successfully introduced.

We a re also aware of certain companies , including Guangdong Alison Hi-Tech Co, Ltd and Nano Tech Co, Ltd , that have developed or are developing products using aerogel technology similar to our technology and these or other companies have introduced or could in troduce aerogel products that compete directly with our products and could in the future outperform them in one or more performance attributes. As a result of this competition and potential competition, our products may not compete effectively in our targe t markets.

Negative perceptions regarding the safety, quality or other attributes of our products or a failure or a perceived failure of our products could have a material adverse effect on our results of operations and could make us unable to continue our business.

Given the history of asbestos as an insulation material, we believe that there is an elevated level of attention towards perceived health and safety risks in the insulation industry. As a consequence, it is essential to our existing business and to our future growth that our products are considered safe. Even modest perceptions by existing or potential distributors, contractors or end-use customers in our target markets that our products are not safe could have a critical impact on our ability to sell our products and to continue as a business. Further, our competitors have in the past, and may in the future, seek to create or perpetuate such perceptions. There is risk of an actual or perceived failure of our products or other negative perceptions regarding our products, such as perceived health hazards. For example, dust is produced by our products during their installation and use, which increases the likelihood of the perception of a hazard. Another example is the potential in very high temperature applications for material failure. Like most insulation products, our Pyrogel XT and XT-E products will normally go through a controlled burn-in process immediately after exposure to high temperatures. If installed improperly, the burn-in may proceed too rapidly and the material may become damaged. In addition, the thermal performance of our materials may degrade over time due to a variety of operational or environmental conditions. We are currently taking steps to educate our distributors, contractors, OEMs and end-use customers on the nature of our products and the proper installation and operating procedures in order to mitigate these risks. Such an event, or the perception of such an event, could quickly result in our direct and end-use customers replacing our products with traditional insulation materials which could have a material adverse effect on our results of operations.

Our activities and operations are subject to numerous health and safety laws and regulations. If we violate such regulations, we could face penalties and fines or be required to curtail or cease operations.

We are subject to numerous health and safety laws and regulations in each of the jurisdictions in which we operate. These health and safety laws and regulations apply to us including with regard to hazardous substances that we use in our manufacturing process and that certain of our products contain. These substances include titanium dioxide, iron oxide, ethanol and carbon black, each of which has been determined, in certain forms, with certain contaminants and at certain levels, to be hazardous, possibly carcinogenic or otherwise harmful to humans. We may also consider and adopt the use of other hazardous substances or substances potentially containing hazardous contaminants, with similar or higher risks in connection with new products or modifications to our current products and related manufacturing.

Our processes also require the use of other regulated substances in raw material delivery and manufacturing, including among others, ethanol. Applicable laws and regulations require us to obtain and maintain permits and approvals and implement health and safety programs and procedures to control risks associated with our operations. Compliance with those laws and regulations can require us to incur substantial costs. Moreover, if our compliance programs are not successful, we could be subject to penalties or to revocation of our permits, which may require us to curtail or cease operations of the affected facilities. In particular, the construction of our second manufacturing facility will require us to obtain and maintain new permits from various regulatory authorities and if the issuance of such permits is delayed or denied, it would slow or potentially prevent the expansion of our manufacturing capacity. Violations of laws, regulations and permit requirements may also result in criminal sanctions, injunctions and the denial or revocation of our various permits.

While we use hazardous substances, including titanium dioxide and carbon black, in forms and at levels that are subject to current rules and regulations, such rules and regulations may become more stringent such that we are required to modify our manufacturing process and such that our customers’ use of our products may be impacted. Changes in the products or manufacturing processes may require the customers to perform an extensive re-qualification process, which our customers may not want to undertake for various reasons, resulting in the customer switching to competing products. In addition, changes in our production or manufacturing process may result in uses above currently permitted levels. Such uses or changes in rules or regulations could materially adversely affect our business, financial condition and results of operations.

Health and safety laws, regulations and permit requirements may become more stringent or otherwise change. Any such changes could require us to incur materially higher costs than we currently have. Our costs of complying with current and future health and safety laws, regulations and permit requirements, and any liabilities, fines or other sanctions resulting from violations of them, could adversely affect our business, financial condition and results of operations.

We may face certain product liabili ty or warranty claims from our products, including from improper installation of our products by third parties. As a consequence, we could lose existing and future business and our ability to develop, market and sell our insulation could be harmed.

The design, development, production and sale of our products involve an inherent risk of product liability claims and associated adverse publicity. We may be named directly in product liability suits relating to our products, even for defects resulting from errors of our distributors, contractors, OEMs, partners or end-use customers. These claims could be brought by various parties, including distributors, contactors, OEMs, partners and other direct end-use customers who are purchasing products directly from us, or end-use customers who purchase our products from our distributors. We could also be named as co-parties in product liability suits that are brought against the distributors, contractors, OEMs, partners and end-use customers. Our products are often installed in our end-use customers' complex and capital intensive facilities in inherently hazardous or dangerous environments, including in the energy, petrochemical and power generation industries, where the potential liability from risk of loss could be substantial. The failure of our products to perform to customer expectations, whether or not because of improper installation, could give rise to warranty claims against us. We are currently taking steps to educate our distributors, contractors, OEMs, partners and end-use customers about the proper installation procedures to mitigate the risk of an uncontrolled burn-in for very high temperature applications of Pyrogel XT and XT-E. However, installation of our products is handled by third parties over whom we have no control and errors or defects in their installation may also give rise to claims against us, diminish our brand or divert our resources from other purposes. Any of these claims, even if without merit, could result in costly litigation or divert management's attention and resources. In addition, many of our products are integrated into the final products of our customers. The integration of our products may entail the risk of product liability or warranty claims based on malfunctions or hazards from both our products and the final products of our customers.

A material product liability claim may seriously harm our results of operations, as well as damage our customer relationships and reputation. Although we carry general liability insurance, our current insurance coverage could be insufficient to protect us from all liability that may be imposed under these types of claims. Insurance coverage is expensive, may be difficult to obtain and may not be available in the future on acceptable terms or at all. Our distributors, contractors, OEMs, partners and end-use customers may not have adequate insurance to cover against potential claims. This insurance may not provide adequate coverage against potential losses, and if claims or losses exceed our liability insurance coverage, we may go out of business. In addition, insurance coverage may become more expensive, which would harm our results of operations.

We may incur significant costs complying with environmental, health and safety laws and related claims, and failure to comply with these laws and regulations could expose us to significant liabilities, which could adversely affect our results of operations.

Costs of compliance with regional, national, state and local existing and future environmental, health and safety laws and regulations could adversely affect our cash flow and results of operations. We are required to comply with numerous environmental laws and regulations and to obtain numerous governmental permits in order to operate our facilities and in connection with the design, development, manufacture and transport of our products and the storage, use, handling and disposal of hazardous substances, including environmental, health and safety laws, regulations and permits governing air emissions. We may incur significant additional costs to comply with these requirements. If we fail to comply with these requirements, we could be subject to civil or criminal liability, damages and fines, and our operations could be curtailed, suspended or shutdown. In addition, certain foreign laws and regulations may affect our ability to export products outside of the United States. Existing environmental, health and safety laws and regulations could be revised or reinterpreted and new laws and regulations could be adopted or become applicable to us or our products, and future changes in environmental, health and safety laws and regulations could occur. These factors may materially increase the amount we must invest to bring our processes into compliance and impose additional expense on our operations.

Among the changes to environmental laws and regulations that could occur is the adoption of regulatory frameworks to reduce greenhouse gas emissions, which a number of countries, particularly in the European Union, have adopted, or are considering adopting, including the 2015 Paris Agreement on climate change. These include adoption of cap and trade regimes, carbon taxes, restrictive permitting, increased efficiency standards, and incentives or mandates for renewable energy, any of which could increase the costs of manufacturing our products and increase our compliance costs, which could materially adversely affect our business and results of operations.

In addition, private lawsuits, including claims for remediation of contamination, personal injury or property damage, or actions by regional, national, state and local regulatory agencies, including enforcement or cost-recovery actions, may materially increase our costs. Certain environmental laws make us potentially liable on a joint and several basis for the remediation of contamination at or emanating from properties or facilities that we currently or formerly owned or operated or properties to which we arranged for the disposal of hazardous substances. Such liability may require us to pay more than our fair share and could require us to address contamination caused by others. For example, the site of our East Providence facility contains certain levels of contamination caused by prior third-party activities on and near the site. Such contamination remains in place under a state-approved deed restriction, and we are required to comply with such deed restriction and the accompanying soil management plan. In general, the deed restriction prohibits the residential use of the property and the use of groundwater as potable wate r, and requires the maintenance of engineering controls and annual inspections to help prevent exposure to contaminated soils. The soil management plan requires us to notify the state environmental agency with respect to any soil excavation, stockpiling, s ampling and off-site disposal of excavated soil. Although we have not had to make material expenditures to satisfy these requirements to date, in the future, we may incur additional costs to comply with these requirements and failure to do so could disrupt the operation of our facility or could subject us to liability for environmental remediation. We may incur liability relating to the remediation of contamination, including contamination we did not cause. Furthermore, ethanol, one of the materials that we handle in large quantities in our manufacturing process is subject to additional laws and regulations including those administered by the U.S. Alcohol and Tobacco Tax and Trade Bureau. While we seek to comply with the stringent requirements of these laws and regulations, these laws and regulations are complex and are subject to interpretation. Any changes in these laws or regulations or changes in our manufacturing processes may require us to request changes to our existing permits or obtain new permits. A ny requests to change our existing permits or obtain new permits may be delayed or denied and may require us to modify our manufacturing processes, which could be costly and time consuming and could adversely affect our business and results of operations.

We may not be able to obtain or maintain, from time to time, all required environmental regulatory approvals. A delay in obtaining any required environmental regulatory approvals or failure to obtain and comply with them could materially adversely affect our business and results of operations.

Failure by us to develop, maintain and strengthen strategic relationships with industry leaders to commercialize our products, particularly in the building materials market, may adversely affect our results of operations and our ability to grow our business.

Our business strategy requires us to align the design and performance attributes of our products to the evolving needs of the market. To facilitate this process, we have sought out partnerships and relationships with industry leaders in order to assist in the development and commercialization of our products. We face competition from other manufacturers of insulation in seeking out and entering into such partnerships and relationships with industry leaders in our target markets and we may therefore not be successful in establishing strategic relationships in those markets.

In the building materials market, we have entered into a supply agreement and a side agreement (together, the supply agreement) and a joint development agreement with BASF SE (BASF). Pursuant to the supply agreement, we will sell exclusively to BASF our Spaceloft ® A2 product at annual volumes to be specified by BASF, subject to certain volume limits. The joint development agreement is designed to facilitate the collaboration between the parties on the development and commercialization of new products.

In addition, under the supply agreement, BASF will make a non-interest bearing prepayment to us in the aggregate amount of $22 million during the construction of the planned manufacturing facility in Statesboro, Georgia (Plant Two), subject to our prior satisfaction of certain preconditions related to the finalization of certain aspects of the product specification and the progress of the financing and construction of Plant Two. Once commenced, BASF's obligation to make such quarterly payments will be subject to postponement in the event of delays of three months or more in the projected date of completion of Plant Two by a commensurate number of months. Prior to BASF paying any prepayment, we will be required to secure our obligation to repay the prepayments with a first priority security interest in all of our interest in real estate, machinery and equipment located at our existing manufacturing facility in East Providence, Rhode Island and that may, in the future, be located at Plant Two. Additionally, we will grant non-exclusive licenses to our subsidiaries under our intellectual property as necessary to operate such machinery and equipment and such license will be transferable to BASF should it take possession of such collateral. BASF has no obligation to purchase products under the supply agreement and BASF may require us to repay any amount of the prepayment that remains uncredited against amounts invoiced by us.

Although BASF has placed orders for product under the supply agreement, there can be no assurance that BASF will ever be a significant customer for our products. With respect to the prepayment by BASF, we may be unable to meet the conditions to which the prepayment by BASF is subject, including with respect to the progress of the financing and construction of our planned Plant Two, which would eliminate one of our expected sources of financing for a portion of the construction of Plant Two. Furthermore, there can be no assurance that we or BASF will be able to perform under the supply agreement or the joint development agreement or achieve our or its respective goals with respect to the supply agreement, the joint development agreement or the broader relationship between us and BASF.

In the event that we are unable to develop products that meet market needs or maintain our relationship with BASF, we may be required to find less prominent partners in the building materials market and we may be less able or unable to successfully penetrate that market. As a result of any of the above, we may lessen or lose our ability to grow our business in the building materials market and to finance and construct our planned Plant Two, which could adversely affe ct our business, financial condition and results of operations, including impairing our profitability.

We have entered into and may enter into in the future agreements that may limit our ability to broadly market our products or could involve future obligations, which could make it more difficult for us to commercialize certain of our products and negatively affect our business and results of operations.

We have a joint development agreement with BASF to develop products in the building materials market. In order to develop and commercialize our products, we may enter into additional joint development agreements or commercial arrangements. We cannot be certain that any products will be successfully developed under any such agreement or, even if developed, that they will be successfully produced or commercialized. These agreements may contain exclusivity, ownership and other terms that may limit our ability to commercialize any products or technology developed in connection with such agreements, including in ways that we do not envision at the time of entering into the agreement. In addition, these agreements may not obligate either party to make any purchases and may contain technical specifications that must be achieved to the satisfaction of our partner, which we cannot be certain we will be able to achieve. If our ability to commercialize products or technology developed in connection with these agreements is limited or if we fail to achieve the technical specifications that may be required, then our business, financial condition and results of operations could be materially adversely affected.

If we do not continue to develop and maintain distribution channels for our products and to meet our customers' demand for our products, our results of operations could be adversely affected.

For a significant portion of our revenues, we rely on sales to distributors who then sell our products to end-users in our target markets. Our success depends, in part, on our maintaining satisfactory relationships with these distributors. Our distributors require us to meet expectations of delivery, quality and pricing of our products, at both the distribution channel level and at the level of the end-user of our products. If we fail to meet expected standards, our revenues would decline and this could materially adversely affect our business, results of operations and financial condition. In addition, we have been unable at times to produce sufficient amounts of our products to meet demand from our customers and we may not be able to avoid capacity constraints in the future if demand exceeds our expectations or we fail to bring into operation as planned the second manufacturing facility to be located in Statesboro, Georgia. If we are unable to deliver our products within such short timeframes, we may be at risk of losing direct or end-use customers. Accordingly, shortfalls in sales could materially adversely affect our business and results of operations.

The qualification process for our products can be lengthy and unpredictable, potentially delaying adoption of our products and causing us to incur significant expense potentially without recovery.

Qualification of our products by many of our direct and end-use customers can be lengthy and unpredictable and many of these direct and end-use customers have extended budgeting and procurement processes. This extended sales process requires the dedication of significant time by our personnel and our use of significant financial resources, with no certainty of success or recovery of our related expenses. Furthermore, even after an extensive qualification process, our products may fail to meet the standards sought by our end-use customers and may not be qualified for use by such end-use customers. Additionally, our continued process improvements and cost-reduction efforts may require us or the end-users to re-qualify our products. Failure to qualify or re-qualify our products may result in us losing such companies as end-users of our products, which would cause a decrease in our revenue or revenue growth rate either of which could materially adversely affect our business and results of operations.

Our revenue may fluctuate, which may result in a high degree of variability in our results of operations and make it difficult for us to plan based on our future outlook and to forecast our future performance.

Our revenue may fluctuate from period to period due to a wide variety of factors. Since we rely on sales to a limited number of direct customers and end-use customers, changes in demand from one or more direct customers or end-users can significantly impact our revenue from period to period. In addition, the sales cycles for our products, including their qualification for use, are long and can result in unpredictability in our revenues. We expect to have an increasing percentage of our products sold for use in capital projects, which orders tend to be larger and more sporadic, that will further increase this unpredictability and the difficulty for us in forecasting quarterly or annual performance. Because of these factors, we have a limited basis on which to predict our quarterly revenue. Our profitability from period-to-period may also vary due to the mix of products that we sell in different periods. These factors may result in a high degree of variability in our results of operations and will make it difficult for us to accurately evaluate and plan based on our future outlook and to forecast quarterly or annual performance.

Our results of operations could be adversely affected if our operating expenses incurred do not correspond with the timing of our revenues.

Most of our operating expenses, such as manufacturing facility expenses, employee compensation and research expenses, are either relatively fixed in the short-term or incurred in advance of sales. In addition, our spending levels are based in part on our expectations regarding future revenues. As a result, if revenues for a particular quarter are below expectations, we may not be able to proportionately reduce operating expenses for that quarter. Our reliance on sales to a limited number of direct customers and end-use customers, the length of our sales cycles and the potentially increasing percentage of our products sold for use in capital projects each can cause sporadic demand for our products which would limit our ability to predict future sales. This limitation could result in our being unable to reduce spending quickly enough to compensate for reductions in sales and could therefore adversely affect our results of operations for any particular operating period.

We are exposed to the credit risk of some of our direct customers, including distributors, contractors and OEMs, which subjects us to the risk of non-payment for our products.

We distribute our products through a network of distributors, contractors and OEMs, some of which may not be well-capitalized and may be of a lower credit quality. This direct customer network subjects us to the risk of non-payment for our products. Although we have not experienced a significant incidence of non-payment for our products, such non-payments may occur in the future. In addition, during periods of economic downturn in the global economy, our exposure to credit risks from our direct customers may increase, and our efforts to monitor and mitigate the associated risks may not be effective. In the event of non-payment by one or more of our direct customers, our business, financial condition and results of operations could be materially adversely affected.

Our working capital requirements involve estimates based on demand and production expectations and may decrease or increase beyond those currently anticipated, which could harm our results of operations and financial condition.

In order to fulfill the product delivery requirements of our direct and end-use customers, we plan for working capital needs in advance of customer orders. As a result, we base our funding and inventory decisions on estimates of future demand. If demand for our products does not increase as quickly as we have estimated or drops off sharply, our inventory and expenses could rise, and our business and results of operations could suffer. Alternatively, if we experience sales in excess of our estimates, our working capital needs may be higher than those currently anticipated. Our ability to meet this excess customer demand depends on our ability to arrange for additional financing for any ongoing working capital shortages, since it is likely that cash flow from sales will lag behind these investment requirements. In addition, we plan to increase our inventory in the longer term in order to meet our expected future demand. This would result in an increase in our working capital requirements that could harm our results of operations and financial condition.

Breakdowns, security breaches, loss of data and other disruptions of our information technology systems could compromise sensitive information related to our business, prevent us from accessing critical information and expose us to liability, which would cause our business and reputation to suffer.

In the ordinary course of our business, we collect and store sensitive data, including intellectual property, our proprietary business information and that of our suppliers, customers and business partners, and personally identifiable information about our employees. We manage and maintain our applications and data utilizing on-site and off-site systems. These applications and data encompass a wide variety of business critical information including research and development information, commercial information and business and financial information.

The secure processing, storage, maintenance and transmission of this critical information is vital to our operations and business strategy, and we devote resources to protecting such information. Although we take measures to protect sensitive information from unauthorized access or disclosure, our information technology and infrastructure may be vulnerable to breakdowns, attacks by hackers, viruses, breaches or interruptions due to employee error, malfeasance or other disruptions, or lapses in compliance with privacy and security mandates. Any such virus, breakdown, attack, breach or interruption could compromise our networks and the information stored there could be accessed by unauthorized parties, publicly disclosed, lost or stolen. We have measures in place that are designed to detect and respond to such security incidents and breaches of privacy and security mandates, but there can be no assurance that our management or diligence efforts will prevent such breakdowns or breaches in our systems. Any such access, disclosure or other loss of information could result in legal claims or proceedings, liability under laws that protect the privacy of personal information or other laws, government enforcement actions and regulatory penalties. Unauthorized access, loss or dissemination could also disrupt our operations, customer support services, research and development activities, capture of company financial information, various general and administrative aspects of our business and damage our reputation, any of which could adversely affect our business.

Our contracts with U.S. government agencies may subject us to audits, criminal penalties, sanctions and other expenses and fines.

We perform contract research services for U.S. government agencies and our products are sold to customers that may incorporate them into government projects. U.S. government agencies, including the Defense Contract Audit Agency and the Department of Labor, routinely audit government contractors. These agencies review a contractor's compliance with contract terms and conditions, performance under its contracts, cost structure and compliance with applicable laws, regulations and standards. The U.S. government also may review the adequacy of a contractor's systems and policies, including a contractor's purchasing, property, estimating, billing, accounting, compensation and management information systems. Any costs found to be overcharged or improperly allocated to a specific contract or any amounts improperly billed or charged for products or services will be subject to reimbursement to the government. As a government contractor, we are required to disclose to the U.S. government credible evidence of certain violations of law and contract overpayments. If we are found to have participated in improper or illegal activities, we may be subject to civil and criminal penalties and administrative sanctions, including termination of contracts, forfeiture of profits, suspension of payments, fines and suspension or prohibition from doing business with the U.S. government. Any negative publicity related to such contracts, regardless of the accuracy of such publicity, may adversely affect our business or reputation.

Our contracts with U.S. government agencies may not be funded by future appropriations and are subject to modification or termination at any time prior to their completion.

Our contracts with U.S. government agencies are subject to the availability of appropriated funds. The U.S. government funds our contract research work through a variety of funding programs that rely on monies appropriated by Congress. At any point, the availability of funding could change, thus reducing the opportunities for new or continued revenues to us from government contract work. Revenue from contracts with U.S. government agencies constituted 2%, 2% and 3% of our total revenue in 2016, 2015 and 2014, respectively. We expect that our revenue under such contracts will continue to decline due to the recent trend toward tightening of federal spending guidelines and programs.

In addition, under our contracts, the U.S. government generally has the right not to exercise options to extend or expand our contracts and may modify, curtail or terminate the contracts at its convenience. Our government customers may not renew our existing contracts after the conclusion of their terms and we may not be able to enter into new contracts with U.S. government agencies. Any decision by the U.S. government not to exercise contract options or to modify, curtail or terminate our contracts or not to renew our contracts or enter into new contracts with us would adversely affect our revenues.

Our revolving credit facility contains financial and operating restrictions that may limit our access to credit. In addition, our revolving credit facility expires on January 28, 2018 and we may not be able to renew, extend or replace the expiring facility. If we fail to comply with covenants in our revolving credit facility or if facility is terminated, we may be required to repay our indebtedness thereunder, which may have an adverse effect on our liquidity .

Provisions governing our revolving credit facility impose restrictions on our ability to operate, including, for some of the agreements and instruments, but not for others, our ability to:

- incur capital expenditures;
- incur additional debt;
- pay dividends and make distributions;
- redeem or repurchase capital stock;
- create liens;
- enter into transactions with affiliates; and
- merge or consolidate with or into other entities.

Our revolving credit facility also contains other customary covenants. We may not be able to comply with these covenants in the future. Our failure to comply with these covenants may result in the declaration of an event of default and could cause us to be unable to borrow funds under our revolving credit facility. In addition to preventing additional borrowings under our revolving credit facility, an event of default, if not cured or waived, may result in the acceleration of the maturity of indebtedness outstanding under the revolving credit facility, which would require us to pay all amounts outstanding. Such an event may also lead our lenders to exercise their security interest in our assets, including all of our real property and equipment at our East Providence facility. If an event of default occurs, we may not be able to cure it within any applicable cure period, if at all. If the maturity of our indebtedness is accelerated, we may not have sufficient funds available for repayment or we may not have the ability to borrow or obtain sufficient funds to replace the accelerated indebtedness on terms acceptable to us, or at all.

If we lose key personnel upon whom we are dependent, or if we are unable to successfully recruit and retain sk illed employees, we may not be able to manage our operations and meet our strategic objectives.

Our continued success depends to a considerable degree upon the continued services of a small number of our employees with critical knowledge of our products, our manufacturing process, our intellectual property, our customers and our global operations. The loss or unavailability of any of these individuals could harm our ability to execute our business plan, maintain important business relationships and complete certain product development initiatives, which could harm our business. In the event that any of these key individuals leave their employment with us or take new employment with a competitor, our business and results of operations could be materially adversely affected. In addition, our continued success depends upon the availability, contributions, vision, skills, experience and effort of our senior management, financial, sales and marketing, engineering and production teams. We do not maintain "key person" insurance on any of our employees. We have entered into employment agreements with certain members of our senior management team, but none of these agreements guarantee the services of the individual for a specified period of time. All of the agreements with members of our senior management team provide that employment is at-will and may be terminated by the employee at any time and without notice.

Although we do not have any reason to believe that we may lose the services of any our employees with critical knowledge of our products, our manufacturing processes, our customers and our global operations or any of our senior management, financial, sales and marketing, engineering and production teams in the foreseeable future, the loss of the services of any of these individuals might impede our operations or the achievement of our strategic and financial objectives. The loss or interruption of the service of any of these individuals or our inability to attract or retain other qualified personnel or advisors could have a material adverse effect on our business, financial condition and results of operations and could significantly reduce our ability to manage our operations and implement our strategy.

Our ability to use our net operating loss carryforwards may be subject to limitation, which could result in a higher effective tax rate and adversely affect our financial condition and results of operations.

During 2014, we performed analyses pursuant to Section 382 of the Internal Revenue Code of 1986, as amended, or the Internal Revenue Code, as well as similar state provisions, in order to determine whether any limitations might exist on the utilization of net operating losses and other tax attributes. Generally, a change of more than 50% in the ownership of a company's stock, by value, over a three year period constitutes an ownership change for U.S. federal income tax purposes. An ownership change may limit a company's ability to use its net operating loss carryforwards attributable to the period prior to such change. Based on these analyses, we determined that it is more likely than not that an ownership change occurred on June 18, 2014 upon the closing of our IPO, resulting in an annual limitation on the use of our net operating losses and other tax attributes as of such date. As a result, our prior net operating losses were limited to $155.2 million, including built-in gains of $42.0 million at the date of that ownership change. The use of our net operating loss carryforwards may be restricted further in the event of any future changes in our ownership.

Risks Related to Our Intellectual Property

Our inability to protect our intellectual property rights could negatively affect our business and results of operations.

Our ability to compete effectively depends in part upon developing, maintaining and/or protecting intellectual property rights relevant to our aerogel product forms, applications, manufacturing technologies and brand names. We rely principally on a combination of patent protection, trade secret laws, confidentiality and nondisclosure agreements, trademark registrations, common law rights and licensing arrangements to establish and protect the intellectual property rights relevant to our business. However, these measures may not be adequate in every given case to permit us to gain or keep any competitive advantage, particularly in those countries where the laws do not protect our proprietary rights as fully as or where the enforcement tools are weaker or less effective than those in the United States. In particular, since aerogels were developed approximately 80 years ago, there has been a wide range of research, development and publication related to aerogels, which makes it difficult to establish intellectual property rights to many key elements of aerogel technology and to obtain patent protection. Accordingly, much of the general technology that we use in our manufacture of aerogel blankets is not protected by patents.

Where we consider it appropriate, our strategy is to seek patent protection in the United States and other countries on technologies used in or relating to our aerogel product forms, applications and manufacturing technologies. As of December 31, 2016, we had 37 issued U.S. patents and 56 issued foreign patents, including three U.S. patents and 17 foreign patents that we co-own with third parties. The issuance of a patent is not conclusive as to its scope, validity or enforceability. Thus, any patent held by us or to be issued to us from a pending patent application, could be challenged, invalidated or held unenforceable in litigation or proceedings before the U.S. Patent and Trademark Office, or USPTO, and/or other patent tribunals. Third parties could develop technologies that circumvent the patent protection we have secured. No consistent policy regarding the breadth of patent claims has emerged to date in the United States and the landscape could become more uncertain in view of future rule changes by the USPTO, the introduction of patent reform legislation and decisions in patent law cases by the federal courts including the United States Supreme Court.

The patent landscape outside the United States is even less predictable. As a result, the validity and enforceability of patents cannot be predicted with certainty. For example, we are awa re of competitors that manufacture and market aerogel insulation products in China, where it may be difficult for us to enforce our intellectual property rights against these or other competitors. On May 5, 2016, we filed a complaint for patent infringemen t against Nano Tech Co., Ltd. ("Nano") and Guangdong Alison Hi-Tech., Ltd., ("Alison") which we refer to collectively as the Respondents, in the United States International Trade Commission, or ITC. In addition to Respondents' contention at the ITC that th e patents we have asserted there are invalid, Alison has also filed petitions with United States Patent and Trademark Office requesting Inter-Partes Review to cancel certain claims in t hree of our manufacturing process patents and a product patent . Alison has also filed similar requests with the Chinese Patent Office to invalidate two of our manufacturing process patent s, a product patent and another unrelated patent in China. The ITC investigation is ongoing with participation of both Respondents through t heir respective counsel. We also filed a patent infringement suit on April 11, 2016 at the District Court in Mannheim, Germany against the Respondents and two European distributors. We have since settled with one European distributor in exchange for a comm itment not to procure infringing products and cooperation with our case. Nano has initiated a nullity action in German Federal Court against one of our manufacturing process patents in Germany. The litigation against the other defendants is ongoing. See " R isk Factors —We have initiated intellectual property litigation that will be costly, and could limit or invalidate our intellectual property rights, divert time and efforts away from business operations, require us to pay damages and/or costs and expenses and/or otherwise have an adverse material impact on our business, and we could become subject to additional intellectual property litigation in the future" below.

In addition, we may fail to apply for patents on important technologies or product candidates in a timely fashion, if at all, and our existing and future patents may not be sufficiently broad to prevent others from practicing our technologies or from developing competing products or technologies, in particular given the long history of aerogel development. Furthermore, third parties could practice our intellectual property rights in territories where we do not have patent protection. Such third parties may then try to import products made using our intellectual property rights into the United States or other countries. Our strategy is to seek registration of trademarks for our brands in many, but not all, of the jurisdictions in which we sell our products based on various factors, including our sales volumes in the jurisdiction, our ability to enforce local laws and cost. Our strategy may not be adequate to protect our brands in all circumstances, especially in foreign jurisdictions.

As of December 31, 2016, we had 21 pending U.S. patent applications and 59 pending foreign patent applications, including two pending U.S. patent application and four foreign pending patent applications that we co-own with other third parties. Our pending patent applications are directed to various enabling technologies for the product forms, applications and manufacturing technologies that support our current business, as well as aspects of products under development or contemplated for the future. The issuance of patents from these applications involves complex legal and factual questions and, thus, we cannot provide assurance that any of our pending patent applications will result in the issuance of patents to us. The USPTO, relevant foreign patent offices and other relevant patent tribunals may deny or require significant narrowing of claims in our pending patent applications. Patents issued as a result of any of our pending patent applications may not cover our enabling technology and/or the products or processes that support our current or future business or afford us with significant commercial protection against others with similar technology. Proceedings before the USPTO could result in adverse decisions as to the priority of our inventions and the narrowing or invalidation of claims in issued patents. In addition, our pending patent applications filed in foreign countries are subject to laws, rules and procedures that differ from those of the United States, and thus foreign patent applications may not be granted even if counterpart United States patents are issued.

We have initiated intellectual property litigation that will be costly, and could limit or invalidate our intellectual property rights, divert time and efforts away from business operations, require us to pay damages and/or costs and expenses and/or otherwise have an adverse material impact on our business, and we could become subject to additional such intellectual property litigation in the future.

The success of our business is highly dependent on protecting our intellectual property rights. Unauthorized parties may attempt to copy or otherwise obtain and use our products and/or enabling technology. Policing the unauthorized use of our intellectual property rights is difficult and expensive, as is enforcing these rights against unauthorized use by others. Identifying unauthorized use of our intellectual property rights is difficult because we may be unable to monitor the technologies and/or materials being employed by other parties. The steps we have taken or will take may not prevent unauthorized use of our intellectual property rights, particularly in foreign countries where enforcement of intellectual property rights may be more difficult than in the United States.

On May 5, 2016, we filed a complaint for patent infringement against Nano Tech Co., Ltd. and Guangdong Alison Hi-Tech., Ltd. in the United States International Trade Commission. The ITC complaint alleges that these two China-based companies have engaged and are engaging in unfair trade practices by importing and selling aerogel products in the United States that infringe several of our patents. In the ITC complaint, we are seeking exclusion orders directing United States Customs and Border Protection to stop the importation of infringing products. On June 2, 2016, the ITC instituted an investigation based on our complaint. The investigation is ongoing with participation from the Respondents through their respective counsel. In addition to Respondents' contention at the ITC that the patents we have asserted there are invalid, Alison has also filed petitions with USPTO requesting Inter-Partes Review to cancel certain claims in three manufacturing process patents and a product patent . Alison has also filed similar requests with the Chinese Patent Office to invalidate two of our manufacturing process patent , a product patent and another unrelated patent in China. We also filed a patent infringement suit on April 11, 2016 at the District Court in Mannheim, Germany against the Respondents and two European distributors. We have since settled with one European dis tributor in exchange for a commitment not to procure infringing products and cooperation with our case. The litigation against the other defendants is ongoing. Nano has initiated a nullity action in German Federal Court against one of our manufacturing pro cess patents in Germany. The defendants have sought to invalidate our patents in various jurisdictions and we expect defendants to bring similar actions in additional jurisdictions or against additional patents. We will incur additional costs to defend su ch actions. Due to their nature, it is difficult to predict the outcome or the costs involved in any litigation. Furthermore, the Respondents may have significant resources and interest to litigate and, therefore, this litigation could be protracted and ma y ultimately involve significant legal expenses.

Our continued commercial success will also depend in part upon not infringing the patents or violating other intellectual property rights of third parties. We are aware of patents and patent applications generally relating to aspects of our technologies filed by, and issued to, third parties. Our knowledge of the patent landscape with respect to the technologies currently embodied within our aerogel products and the technologies that we practice in manufacturing those products indicates that the third-party patent rights most relevant to our business are those owned by Cabot and licensed to us under the cross license agreement with Cabot. Nevertheless, we cannot determine with certainty whether patents or patent applications of other parties may materially affect our ability to conduct our business. There may be existing patents of which we are unaware that we may inadvertently infringe, resulting in claims against us or our customers. In recent years, Chinese, Japanese and South Korean entities have filed a significant number of patent applications related to aerogel products in both their home countries and in foreign countries. These patents in application areas of aerogels may make it more difficult for OEMs and end-use customers in these countries to use our products in new and different applications, which in turn may limit our ability to penetrate new markets.

In the event that the manufacture, use and/or sale of our products or technologies is challenged, or if our product forms or technologies conflict with patent rights of others or our operations conflict with trademark or similar rights of others, third parties could bring legal actions against us in the United States, Europe or other countries, claiming damages and seeking to enjoin the manufacturing and/or marketing of our products. In addition, it is not possible to predict with certainty what patent claims may arise from pending patent applications of third parties. In the United States, for example, patent prosecution can proceed in secret prior to issuance of a patent, provided such application is not filed in a foreign jurisdiction. For U.S. patent applications that are also filed in foreign jurisdictions, such patent applications will not be published until 18 months from the filing date of the application. As a result, third parties may be able to obtain patents with claims relating to our product forms, applications and/or manufacturing processes which they could attempt to assert against us or our end-users.

In the case of any of the above, litigation may be necessary to enforce, protect or defend our intellectual property rights or to determine the validity and scope of the intellectual property rights of others. Any such litigation, including our ongoing patent enforcement actions described above, could be unsuccessful, cause us to incur substantial costs, divert resources and the efforts of our personnel away from daily operations, harm our reputation and/or result in the impairment of our intellectual property rights. In some cases, litigation may be threatened or brought by a patent holding company (otherwise known as non-practicing entities or patent “trolls”) or other adverse patent owner who has no relevant product revenues and against which our patents may provide little or no deterrence. If we are found to infringe any patents, regardless of whether litigation is brought against us by third parties or, as in the case of our ongoing patent enforcement actions described above, brought by us against third parties, we could be required to:

- pay substantial monetary damages, including lost profits, reasonable royalties and/or treble damages if an infringement is found to be willful;
- totally discontinue or substantially modify any products or processes that are found to be in violation of another party’s intellectual property rights; and/or
- seek a license to continue making and selling our products and/or using our manufacturing processes, which we may not be able to obtain on reasonable terms, if at all, which could significantly increase our operating expenses and/or decrease our revenue.

In the actions brought by us against third parties, including our ongoing patent enforcement actions described above, we may be required to pay costs and expenses of opposing parties, including attorney fees, if we lose.

If our competitors are able to use our technology without payment to us, our ability to compete effectively could be harmed. Our contracts generally indemnify our customers for third-party claims of intellectual property infringement related to the manufacture and use of our products, and typically up to the amount of the purchase price paid for the product, which could cause us to become involved, and subject to liability, in litigation between our customers and third parties. The expense of defending these claims may adversely affect our results of operations.

Patents covering technologies that are similar or superior to our technologies may be developed or obtained by third parties. We may need to seek licenses to these technologies, which could limit our ability to manufacture our products and have a material adverse effect on our business and results of operations.

Competitors or other third parties may independently develop and obtain patents covering technologies that are similar or superior to the product forms, applications or manufacturing technologies that we employ. In such event, we may need to obtain licenses for these technologies. However, we may not be able to obtain licenses on reasonable terms, if at all, which could limit our ability to manufacture our current and/or future products and operate our business.

Our contracts with the U.S. government and other third parties could negatively affect our intellectual property rights.

To further our product development efforts, our scientists and engineers work closely with customers, the U.S. government and other third parties to research and develop advancements in aerogel product forms, applications and manufacturing technologies. We have entered into agreements with private third parties and have been awarded numerous research contracts with the U.S. government to independently or jointly research, design and develop new devices and systems that incorporate aerogel material. We also expect to enter into similar private agreements and be awarded similar government contracts in the future. In some instances, the research and development activities that we conduct under contract with the U.S. government and/or with private third parties may produce intellectual property to which we may not have ownership or exclusive rights and will be unable to protect or monetize.

Moreover, when we develop new technologies using U.S. government funding, the government may obtain certain rights in any resulting patents, technical data and/or other confidential and proprietary information, generally including, at a minimum, a non-exclusive license authorizing the U.S. government to use the invention, technical data or software for non-commercial purposes. Federal government funding may limit when and how we can deploy our technology developed under those contracts. In addition, inventions must be reported promptly to the funding agencies, the federal funding must be disclosed in any resulting patent applications, and our rights in such inventions will normally be subject to government license rights, periodic post-contract utilization reporting, foreign manufacturing restrictions and “march-in” rights. March-in rights refer to the right of the U.S. government to require us to grant a license to the technology to a responsible applicant or, if we refuse, the government may grant the license itself. The U.S. government may exercise its march-in rights if it determines that action is necessary because we fail to achieve practical application of any technology developed under contract with the government or because action is necessary to alleviate health or safety needs, to meet requirements of federal regulations or to give preference to United States industry. The U.S. government may also have the right to disclose our confidential and proprietary information to third parties. In addition, failure to comply with all the government contract requirements may result in us losing the patent rights.

Our U.S. government-sponsored research contracts are also subject to audit and require that we provide regular written technical updates on a monthly, quarterly or annual basis, and, at the conclusion of the research contract, a final report on the results of our technical research. Because these reports are generally available to the public, third parties may obtain some aspects of our confidential and proprietary information relating to our product forms, applications and/or manufacturing processes. If we fail to provide these reports or to provide accurate and complete reports, the U.S. government could obtain rights to any intellectual property arising from the related research.

Furthermore, there could be disputes between us and a private third party as to the ownership rights to any inventions that we develop in collaboration with such third party. Any such dispute may cause us to incur substantial costs including potential license obligations, and could place a significant strain on our financial resources, divert the attention of management from our core business and harm our reputation.

We rely on trade secrets to protect our technology, and our failure to obtain or maintain trade secret protection could adversely affect our competitive business position.

We rely in part on trade secret protection to protect confidential and proprietary information relating to our technology, particularly where we do not believe patent protection is appropriate or obtainable. We continue to develop and refine the manufacturing technologies used to produce our aerogel products and believe that we have already developed, and will continue to develop, significant know-how related to these technologies. However, trade secrets can be difficult to protect. We may not be able to maintain the secrecy of this information and competitors may develop or acquire equally or more valuable information related to the manufacture of comparable aerogel products. Our strategy for scale-up of commercial production will continue to require us to share confidential and proprietary information with the U.S. government and other third parties. While we take reasonable efforts to protect our trade secrets, our employees, consultants, contractors or scientific and other advisors, or those of our business partners, may intentionally or inadvertently disclose our confidential and proprietary information to competitors. Any enforcement of claims by us that a third party has obtained and is using our trade secrets is expensive, time consuming and uncertain. In addition, foreign courts are sometimes less willing than United States courts to protect trade secrets.

We require all employees and consultants to execute confidentiality and/or nondisclosure agreements upon the commencement of an employment or consulting arrangement with us, which agreements generally require that all confidential and proprietary information developed by the individual or made known to the individual by us during the course of the individual's relationship with us be kept confidential and not disclosed to third parties. These agreements further generally provide that inventions conceived by the individual in the course of rendering services to us will be our exclusive property. Nevertheless, these agreements may not be honored and our confi dential and proprietary information may be disclosed, or these agreements may be unenforceable or difficult to enforce. We also require customers and vendors to execute confidentiality and/or nondisclosure agreements. However, we have not obtained such agr eements from all of our customers and vendors. Moreover, some of our customers may be subject to laws and regulations that require them to disclose information that we would otherwise seek to keep confidential. Our confidential and proprietary information may be otherwise disclosed without our authorization or knowledge. Moreover, third parties could reverse engineer our manufacturing processes, independently develop substantially equivalent confidential and proprietary information or otherwise gain access to our trade secrets. Failure to maintain trade secret protection could enable others to produce competing products and adversely affect our competitive business position.

Loss of the intellectual property rights that we license from Cabot Corporation would have a material adverse impact on our business.

We have licensed certain intellectual property rights from Cabot under a cross license agreement. These intellectual property rights have been and continue to be critical to the manufacture of our existing products and may also be important to our research, development and manufacture of new products. Any loss of the intellectual property rights granted to us thereunder, including as a result of ineffective protection of such rights by Cabot or a breach of or dispute under the agreement by either party would have a material adverse impact on our financial condition, results of operations and growth prospects, and might prevent us from continuing our business.

Risks Related to Our Common Stock

We have incurred and will continue to incur costs and demands upon management as a result of complying with the laws and regulations affecting public companies in the United States, which may adversely affect our results of operations.

We are subject to the reporting requirements of the Exchange Act that require us to file, among other things, quarterly reports on Form 10-Q and annual reports on Form 10-K. Under Section 302 of the Sarbanes-Oxley Act of 2002, or the Sarbanes-Oxley Act, as a part of each of these reports, our chief executive officer and chief financial officer are required to evaluate and report their conclusions regarding the effectiveness of our disclosure controls and procedures and to certify that they have done so. Effective internal controls are necessary for us to provide reliable financial reports and prevent fraud. Under Section 404 of the Sarbanes-Oxley Act, we have included a report of management on our internal control over financial reporting in our Form 10-K for our fiscal year ended December 31, 2016. In addition, upon the first annual report required to be filed with the SEC following the date we are no longer an "emerging growth company" as defined in the Jumpstart Our Business Startups Act, or JOBS Act, the independent registered public accounting firm auditing our financial statements will be required to attest to and report on the effectiveness of our internal control over financial reporting. The process of improving and documenting our internal controls and complying with Section 404 is expensive and time consuming, and requires significant attention of management.

Complying with these requirements applicable to public companies may place a strain on our personnel, information technology systems and resources while diverting management's attention from other business concerns. We have engaged outside service providers with appropriate public company compliance experience and technical accounting knowledge to support our compliance efforts. We may need to engage additional service providers to ensure compliance which may cause us to incur additional operating costs.

These and other requirements may also make it more difficult or more costly for us to obtain or maintain certain types of insurance, including directors' and officers' liability insurance. We may be forced to accept reduced policy limits and coverage or incur substantially higher costs to obtain the same or similar coverage.

The impact of these requirements could also make it more difficult for us to attract and retain qualified persons to serve on our board of directors, our board committees or as executive officers. Any one of these requirements could have a material adverse effect on our business, financial condition and results of operations.

Because we are a public company, we ar e obligated to develop and maintain proper and effective internal control over financial reporting. If our internal controls over financial reporting are determined to be ineffective, or if our auditors are otherwise unable to attest to their effectiveness when required, investor confidence in our company, and our common stock price, may be adversely affected.

Pursuant to Section 404a of the Sarbanes-Oxley Act, we have furnished a report by management on the effectiveness of our internal control over financial reporting for the fiscal year ended December 31, 2016 and will continue to do so in each year thereafter. This assessment will be required to include disclosure of any material weaknesses identified by our management in our internal control over financial reporting. Our independent registered public accounting firm will not be required to formally attest to the effectiveness of our internal control over financial reporting until the first annual report required to be filed with the SEC following the date we are no longer an "emerging growth company," as defined in the JOBS Act.

We continue to assess our system of internal controls over financial reporting and successfully completed documentation necessary to perform the annual evaluation required to comply with Section 404. In future periods, we may discover, and not be able to remediate timely, significant deficiencies or material weaknesses. During the evaluation and testing process in 2016, we did not identify any material weaknesses in our internal controls over financial reporting. In future periods, if we were to identify one or more material weaknesses in our internal control, we may be unable to assert that our internal controls are effective. If we are unable to assert that our internal controls over financial reporting are effective, we could lose investor confidence in the accuracy and completeness of our financial reports or it could cause us to fail to meet our reporting obligations, which could have a material adverse effect on the price of our common stock. In addition, any failure to comply with Section 404 could subject us to a variety of administrative sanctions, including SEC action, ineligibility for short form resale registration, the suspension or delisting of our common stock from The New York Stock Exchange, and the inability of registered broker-dealers to make a market in our common stock, which would further reduce our stock price and could harm our business.

We are eligible to be treated as an "emerging growth company" as defined in the JOBS Act, and we cannot be certain if the reduced disclosure requirements applicable to emerging growth companies makes or will make our common stock less attractive to investors.

We are an "emerging growth company", as defined in the JOBS Act. For as long as we continue to be an emerging growth company, we may take advantage of exemptions from various reporting requirements that are applicable to other public companies that are not emerging growth companies, including:

- not being required to comply with the auditor attestation requirements of Section 404 of the Sarbanes-Oxley Act, as described above;
- reduced disclosure obligations regarding executive compensation in our periodic reports and proxy statements; and
- exemptions from the requirements of holding a nonbinding advisory vote on executive compensation and stockholder approval of any golden parachute payments not previously approved.

We will remain an emerging growth company until the earliest to occur of (i) the end of the fiscal year for which we report $1.0 billion or more in annual revenues, (ii) the end of the fiscal year in which the market value of our common stock held by non-affiliates exceeds $700 million on the last business day of our second fiscal quarter, (iii) our issuance, in a three year period, of more than $1.0 billion of non-convertible debt, and (iv) December 31, 2019. We cannot predict if investors find or will find our common stock less attractive because we may rely on these exemptions. If some investors find our common stock less attractive as a result, there may be a less active trading market for our common stock and our stock price may be more volatile.

The trading market in our common stock has been limited and substantially less liquid than the average trading market for a stock quoted on The New York Stock Exchange.

Since our initial listing on The New York Stock Exchange on June 13, 2014, the trading market in our common stock has been limited and substantially less liquid than the average trading market for companies listed on The New York Stock Exchange. The listing of our common stock on The New York Stock Exchange does not assure that a meaningful, consistent and liquid trading market currently exists or will exist in the future. We cannot predict whether a more active market for our common stock will develop in the future. An absence of an active trading market could adversely affect our stockholders' ability to sell our common stock at current market prices in short time periods, or possibly at all. An inactive market may also impair our ability to raise capital by selling our common stock and may impair our ability to acquire other companies, products or technologies by using our common stock as consideration. Additionally, analyst coverage of our common stock may be limited and such lack of coverage may have a depressive effect on the market price for our common stock. As of December 31, 2016, approximately 36% of our outstanding shares of common stock were held by our executive officers, directors, principal stockholders and their respective affiliates, which may adversely affect the liquidity of the trading market for our common stock, in as much as federal securities laws restrict sales of our shares by these stockholders. If our affiliates continue to hold their shares of common stock, there will be a more lim ited trading volume in our common stock, which may make it more difficult for investors to sell their shares or increase the volatility of our stock price.

We expect that the price of our common stock will fluctuate substantially, which could subject us to securities class action litigation and result in substantial losses to our stockholders.

The price of our common stock may fluctuate substantially due to a number of factors, including the following, some of which are beyond our control:

- volume and timing of orders for our products;
- quarterly and yearly variations in our or our competitors' results of operations;
- our announcement or our competitors' announcements regarding new products, product enhancements, significant contracts, number of distributors, acquisitions or strategic investments;
- announcements of technological innovations relating to aerogels, thermal management and energy infrastructure insulation;
- results of operations that vary from the expectations of securities analysts and investors;
- the periodic nature of our sales cycles, in particular for capital projects in the energy infrastructure market;
- our ability to develop, obtain regulatory clearance or approval for and market new and enhanced products on a timely basis;
- future sales of our common stock, including sales by our executive officers, directors and significant stockholders and their respective affiliates;
- announcements by third parties of significant claims or proceedings against us, including with regard to intellectual property and product liability;
- changes in accounting principles; and
- general U.S. and global economic conditions and other factors, including factors unrelated to our operating performance or the operating performance of our competitors.

Furthermore, the U.S. stock market has at times experienced extreme volatility that in some cases has been unrelated or disproportionate to the operating performance of particular companies. These broad market and industry fluctuations may adversely affect the market price of our common stock, regardless of our actual operating performance.

In the past, following periods of market volatility, stockholders have instituted securities class action litigation. If we become involved in securities litigation, it could have a substantial cost and divert resources and the attention of our senior management team from our business regardless of the outcome of such litigation.

Securities analysts may not continue coverage of our common stock or may issue negative reports, which may have a negative impact on the market price of our common stock.

The trading market for our common stock relies in part on the research and reports that industry or financial analysts publish about us or our business. Securities analysts may elect not to provide research coverage of our common stock. If securities analysts do not cover or continue to cover our common stock, the lack of research coverage may cause the market price of our common stock to decline. If one or more of the analysts who elects to cover us downgrades our stock, our stock price would likely decline substantially. If one or more of these analysts ceases coverage of us, we could lose visibility in the market, which in turn could cause our stock price to decline. In addition, rules mandated by the Sarbanes-Oxley Act and a global settlement reached in 2003 between the SEC, other regulatory agencies and a number of investment banks have led to a number of fundamental changes in how analysts are reviewed and compensated. In particular, many investment banking firms are required to contract with independent financial analysts for their stock research. It may be difficult for companies such as ours, with smaller market capitalizations, to attract independent financial analysts that will cover our common stock. This could have a negative effect on the market price of our stock.

Our directors, officers and principal stockholders have significant voting power and may take actions that may not be in the best interests of our other stockholders.

As of December 31, 2016, our executive officers, directors and principal stockholders and their affiliates collectively controlled approximately 36% of our outstanding shares of common stock. As a result, these stockholders, if they act together, will be able to control the management and affairs of our company and most matters requiring stockholder approval, including the election of directors and approval of significant corporate transactions. This concentration of ownership may have the effect of delaying or preventing a change of control and might adversely affect the market price of our common stock. This concentration of ownership may not be in the best interests of our other stockholders.

Anti-takeover provisions in our restated certificate of incorporation and restated bylaws, and Delaware law, could delay or discourage a takeover.

Anti-takeover provisions in our restated certificate of incorporation and restated bylaws and Delaware law may have the effect of deterring or delaying attempts by our stockholders to remove or replace management, engage in proxy contests and effect changes in control. The provisions of our charter documents include:

- procedures for advance notification of stockholder nominations and proposals;
- the inability of our stockholders to call a special meeting of the stockholders and the inability of our stockholders to act by written consent;
- the ability of our board of directors to create new directorships and to fill any vacancies on the board of directors;
- the ability of our board of directors to amend our restated bylaws without stockholder approval; and
- the ability of our board of directors to issue up to 5,000,000 shares of preferred stock without stockholder approval upon the terms and conditions and with the rights, privileges and preferences as our board of directors may determine.

In addition, as a Delaware corporation, we are subject to Delaware law, including Section 203 of the Delaware General Corporation Law. In general, Section 203 prohibits a Delaware corporation from engaging in any business combination with any interested stockholder for a period of three years following the date that the stockholder became an interested stockholder unless certain specific requirements are met as set forth in Section 203. These provisions, alone or together, could have the effect of deterring or delaying changes in incumbent management, proxy contests or changes in control.

Our restated certificate of incorporation designates a state or federal court located within the State of Delaware as the exclusive forum for certain types of actions and proceedings that may be initiated by our stockholders, which could limit our stockholders' ability to obtain a favorable judicial forum for disputes with us or our directors, officers or employees.

Our restated certificate of incorporation provides that, subject to limited exceptions, a state or federal court located within the State of Delaware will be the exclusive forum for (1) any derivative action or proceeding brought on our behalf, (2) any action asserting a claim of breach of a fiduciary duty owed by any of our directors, officers or other employees to us or our stockholders, (3) any action asserting a claim against us arising pursuant to any provision of the Delaware General Corporation Law, our restated certificate of incorporation or our restated bylaws, or (4) any other action asserting a claim against us that is governed by the internal affairs doctrine. Any person or entity purchasing or otherwise acquiring any interest in shares of our capital stock shall be deemed to have notice of and to have consented to the provisions of our restated certificate of incorporation described above. This choice of forum provision may limit a stockholder's ability to bring a claim in a judicial forum that it finds favorable for disputes with us or our directors, officers or other employees, which may discourage such lawsuits against us and our directors, officers and employees. Alternatively, if a court were to find these provisions of our restated certificate of incorporation inapplicable to, or unenforceable in respect of, one or more of the specified types of actions or proceedings, we may incur additional costs associated with resolving such matters in other jurisdictions, which could adversely affect our business and financial condition.

Our shareholders may experience future dilution as a result of future equity offerings.

In the future, we may offer additional shares of our common stock or other securities convertible into or exchangeable for our common stock in order to raise additional capital. We cannot assure our shareholders that we will be able to sell shares or other securities in any other offering at a price per share that is equal to or greater than the price per share our shareholders paid for our shares. Investors purchasing shares or other securities in the future could have rights, preferences or privileges senior to those of our shareholders and our shareholders may experience dilution. Our shareholders may incur additional dilution upon the exercise of any outstanding stock options or warrants, the issuance of shares of restricted stock, the vesting of restricted stock units, or the issuance, vesting or exercise of other equity awards.

We do not intend to pay cash dividends in the foreseeable future and, consequently, our shareholders' ability to achieve a return on your investment will depend on appreciation in the price of our common stock.

We have never declared or paid cash dividends on our common stock and we do not intend to pay any cash dividends on our common stock in the foreseeable future. We currently expect to retain all available funds and any future earnings for use in the operation and expansion of our business. In addition, the terms of our revolving credit facility restrict our ability to pay dividends and any future credit facilities, loan agreements, debt instruments or other agreements may further restrict our ability to pay dividends. Payments of future dividends, if any, will be at the discretion of our board of directors after taking into account various factors, including our business, results of operations and financial condition, current and anticipated cash needs, plans for expansion and any legal or contractual limitations on our ability to pay dividends. As a result, capital appreciation, if any, of our common stock will be our shareholders' sole source of potential gain for the foreseeable future.

CAUTIONARY STATEMENT REGARDING FORWARD-LOOKING STATEMENTS

This report includes forward-looking statements within the meaning of Section 27A of the Securities Act of 1933, as amended, or the Securities Act, and Section 21E of the Exchange Act that relate to future events or our future financial performance and involve known and unknown risks, uncertainties and other factors that may cause our actual results, levels of activity, performance or achievements to differ materially from any future results, levels of activity, performance or achievements expressed or implied by these forward-looking statements. Words such as, but not limited to, "believe," "expect," "anticipate," "estimate," "intend," "seek," "may," "plan," "potential," "predict," "project," "targets," "likely," "will," "would," "could," "should," "continue," and similar expressions or phrases, or the negative of those expressions or phrases, are intended to identify forward-looking statements, although not all forward-looking statements contain these identifying words. Although we believe that we have a reasonable basis for each forward-looking statement contained in this report, we caution you that these statements are based on our projections of the future that are subject to known and unknown risks and uncertainties and other factors that may cause our actual results, level of activity, performance or achievements expressed or implied by these forward-looking statements, to differ. The description of our Business set forth in Item 1, the Risk Factors set forth in this Item 1A and our Management's Discussion and Analysis of Financial Condition and Results of Operations set forth in Item 7 as well as other sections in this report, discuss some of the factors that could contribute to these differences. These forward-looking statements include, among other things, statements about:

- the expected future growth of the market for aerogel insulation and continued gain in market share, in particular in the energy infrastructure insulation market;
- our plans to continue to develop and optimize aerogel products for applications within the building materials market;
- our pursuit of high-value opportunities for our aerogel products within different segments of the global insulation market, including the building materials market, and our plans to leverage our aerogel technology platform to develop innovative, aerogel enhanced products for applications outside the global insulation market;
- our plans to focus additional resources to continue to grow our share of the energy infrastructure insulation market;
- our pursuit of and the expected greater adoption of our products in district heating systems, LNG production and storage, and power generation markets and our expectation that product revenue will be generated in large part by demand for insulation associated with scheduled plant shutdowns, or turnarounds, and other maintenance-related projects;
- our expectation that our products will be specified during the design phase in a growing number of new plant construction and capital expansion projects and our expectation that we will have an increasing percentage of our products sold for use in capital projects;
- our expectation that the growth in global energy demand will result in increased new-build and large capacity expansion projects, driving demand for our aerogel products;
- our plans to continue our strategy of working with innovative companies to target and penetrate additional market opportunities;
- our plans to develop strategic partnerships to facilitate market penetration beyond the energy infrastructure and building materials market, as well as the expected goals and priorities of such strategic partnerships;
- our belief that an adequate long-term supply of silica-precursor is available;
- our belief that our portfolio of patents, trade secrets and know-how presents a significant barrier to potential new entrants in the production of aerogel blanket insulation;

- our expectation that we will be successful in enforcing and defending our patents against competitors and that such patents are valid and enforceable , as well as our expec tations about the costs and consequences of our current o r potential future patent litigation and the potential for additional patent litigation ;
- our belief that our products possess strong competitive advantages over traditional insulation materials, including the superior thermal performance and the thin, easy-to-use and durable blanket form of our products;
- our plans to construct a second manufacturing facility in Statesboro, Georgia;
- our expectation that the first phase of the first production line at the planned second manufacturing facility will become operational in a timely manner to support the demand;
- our belief that our end-use customers will continue to invest in major energy infrastructure projects;
- our expectation that we will continue to sell our products in the building materials and other end markets;
- our expectation that we will develop, manufacture and sell new products and technologies through the strategic partnership with BASF, that our strategic partnership with BASF will facilitate our penetration of the building materials market, and that we will fulfill the preconditions necessary for BASF to, and that BASF then will commence prepayments;
- our current estimate that design, development and construction costs for this second manufacturing facility and its first production line, to be built in two phases, will range from $120 million to $130 million;
- our expectation that our planned second manufacturing facility and its first production line will provide an additional annual nameplate capacity of 40 million square feet of aerogel blankets, and that the plant site, layout and design will support future development of two additional similar production lines;
- our belief that we can finance our planned second manufacturing facility and its first production line with anticipated cash flows from operations, local government grants, debt financings and potentially equity financings;
- our belief that the potential for significant technological innovation in traditional insulation materials is limited and that new high-performance materials will be required to meet evolving market requirements for energy efficient insulations systems;
- our belief that our aerogel products and manufacturing processes are proprietary and that we can protect our patents, trade secrets and know-how associated therewith;
- our belief that we can continue to improve the cost efficiency of our manufacturing process, that our current expansion plans offer attractive returns on incremental invested capital, and that we will focus our development efforts on new products and next generation technology with application in new, high value market segments;
- our belief that we will have opportunities to address additional high value applications in the estimated $3.1 billion global insulation market, and that we are well positioned to leverage a decade's worth of research and development to design and commercialize disruptive aerogel products for a wide array of new markets;
- our belief that our products have the lowest cost on a fully-installed basis or offer significant life-cycle cost savings in energy infrastructure and certain other applications as compared to traditional insulation materials;
- our plans to continue to expand our global sales force and distribution network to support anticipated growth in customers and demand for our products and our plans to seek to promote greater enterprise-wide utilization of our products by existing end-use customers;
- our expectation to continue to hire a significant number of employees in order to support our anticipated growth, and that in the long-term we will continue to increase investment in research, development and engineering personnel, projects and infrastructure in support of efforts to develop new products, technologies and markets;
- our expectations about future revenues, expenses, gross profit, net loss, loss per share and Adjusted EBITDA, sources and uses of cash, capital requirements and the sufficiency of our existing cash balance and available credit;
- our expectations that most of our revenue will continue to come from a relatively small number of customers for the foreseeable future;
- our expectations of long-term revenue growth, with increasing levels of gross profit and improved cash flows from operations and our expectations that we will incur significant capital expenditures related to the expansion of our manufacturing capacity to support this expected long term growth in demand;

- our expectations that the constrained capital investment and low activity levels in the global energy markets will continue into 2017 ;
- our expectations about the impact of new accounting pronouncements on our consolidated financial statements and related disclosures;
- our belief that our experienced and dedicated leadership team will provide us with a competitive advantage in the industry;
- the expected future development of new aerogel technologies; and
- our expectations about limitations of net operating losses.

We may not actually achieve the plans, intentions or expectations disclosed in our forward-looking statements, and you should not place undue reliance on our forward-looking statements. Actual results or events could differ materially from the plans, intentions and expectations disclosed in the forward-looking statements we make. We have included important cautionary statements in this report, particularly in the Risk Factors set forth in Item 1A of this Annual Report on Form 10-K, that we believe could cause actual results or events to differ materially from the forward-looking statements that we make. Our forward-looking statements do not reflect the potential impact of any future acquisitions, mergers, dispositions, joint ventures or investments we may make.

You should read this report and the documents that we reference in this report and have filed as exhibits to this report completely and with the understanding that our actual future results may be materially different from what we expect. The forward-looking statements contained in this report are made as of the date of this report, and we do not assume, and specifically disclaim, any obligation to update any forward-looking statements, whether as a result of new information, future events or otherwise.

Item 1B. UNRESOLVED STAFF COMMENTS

None.

Item 2. PROPERTIES

Our corporate headquarters are located in Northborough, Massachusetts, where we occupy approximately 51,650 square feet under a lease expiring on December 31, 2026. We also own an approximately 143,000 square foot manufacturing facility in East Providence, Rhode Island. In addition, we lease a 10,500 square foot facility, a 24,000 square foot facility and a 128,000 square foot facility in East Providence, Rhode Island, which leases expire on March 31, 2021, March 31, 2021 and March 31, 2019, respectively. We also intend to construct a second manufacturing facility to be located in Statesboro, Georgia.

Item 3. LEGAL PROCEEDINGS

On May 5, 2016, we filed a complaint for patent infringement against Nano Tech Co., Ltd. (“Nano”) and Guangdong Alison Hi-Tech., Ltd. (“Alison” and, together with Nano, the “Respondents”) in the United States International Trade Commission (the “ITC”). The ITC complaint alleges that these two China-based companies have engaged and are engaging in unfair trade practices by importing aerogel products in the United States that infringe several of the Company’s patents. In the ITC complaint, we are seeking exclusion orders directing United States Customs and Border Protection to stop the importation of infringing products. On June 2, 2016, the ITC instituted an investigation based on our complaint. The investigation is ongoing with participation from the Respondents through their respective counsel. In addition to Respondents’ contention at the ITC that the patents we have asserted are invalid, Alison has also filed petitions with United States Patent and Trademark Office requesting Inter-Partes Review to cancel certain claims in three of the asserted manufacturing process patents and a product patent. Alison has also filed similar requests with the Chinese Patent Office to invalidate two of our manufacturing process patents, a product patent and another unrelated patent in China.

On April 11, 2016, we also filed a patent infringement suit at the District Court in Mannheim, Germany against the Respondents and two European distributors. We have since settled with one European distributor in exchange for a commitment not to procure infringing products and cooperation with our case. The litigation against the other defendants is ongoing. In addition, Nano has initiated a nullity action in German Federal Patent Court against one of our manufacturing process patents in Germany.

Due to their nature, it is difficult to predict the outcome or the costs involved in any litigation. Furthermore, the Respondents may have significant resources and interest to litigate and therefore, this litigation could be protracted and may ultimately involve significant legal expenses. In addition to the foregoing, we have been and may be from time to time party to other legal proceedings that arise in the ordinary course of business and to other patent enforcement actions to assert our patent rights.

Item 4. MINE SAF ETY DISCLOSURES

Not applicable.

PART II

Item 5. MARKET FOR REGISTRANT’S COMMON EQUITY, RELATED STOCKHOLDER MATTERS AND ISSUER PURCHASES OF EQUITY SECURITIES

Market Information and Dividend Policy

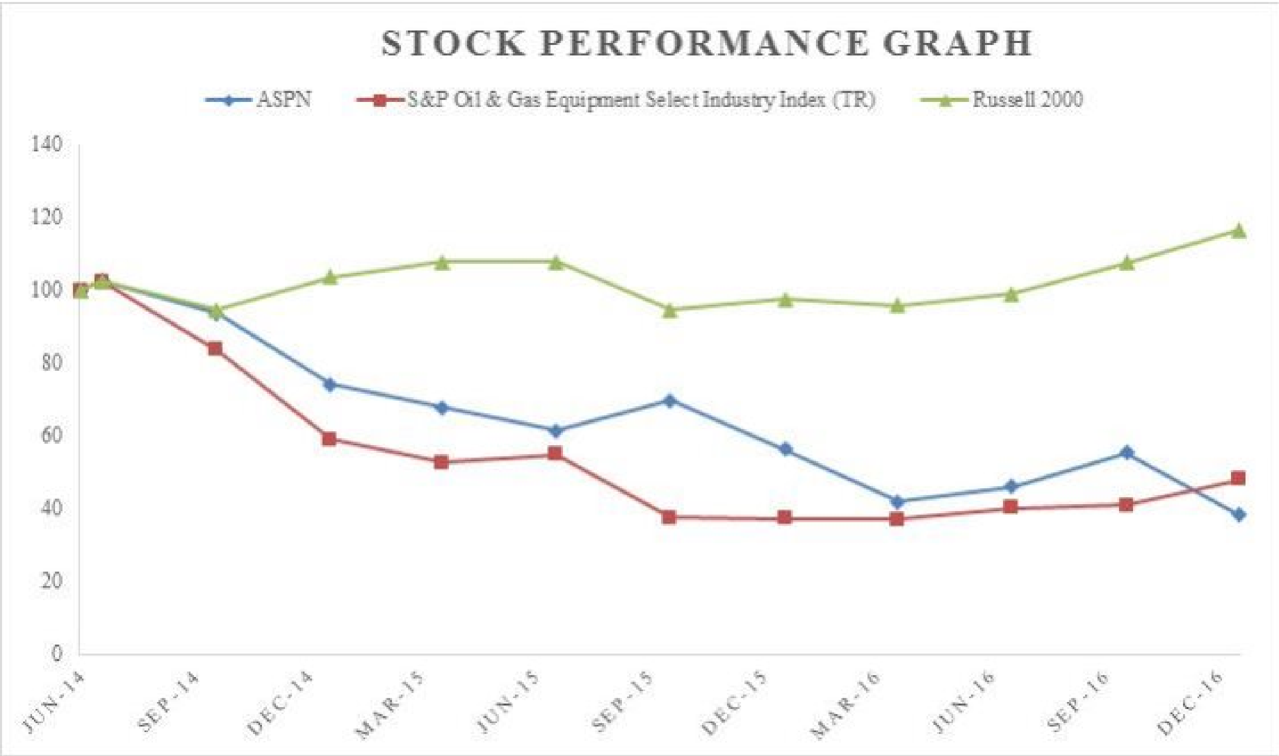
Our common stock is trading on The New York Stock Exchange, or NYSE, under the symbol “ASPN.” The following table sets forth, for the period indicated, the high and low sales prices of our common stock as reported by the NYSE:

2015	High	Low
First Quarter	$ 8.58	$ 6.50
Second Quarter	$ 7.94	$ 6.21
Third Quarter	$ 9.03	$ 6.27
Fourth Quarter	$ 8.87	$ 5.24
2016		
First Quarter	$ 6.58	$ 3.38
Second Quarter	$ 5.39	$ 3.91
Third Quarter	$ 6.29	$ 4.42
Fourth Quarter	$ 6.71	$ 3.61

As of February 21, 2017, there were 57 stockholders of record of our common stock. We have not paid dividends to our stockholders since our inception and we do not plan to pay cash dividends in the foreseeable future. We currently intend to retain earnings, if any, to finance the development and expansion of our business.

Stock Performance Graph

The following graph and table compare the cumulative total stockholder return for our common stock during the period from June 13, 2014 (the date our common stock commenced trading on the NYSE) through December 31, 2016 in comparison to the S&P Oil & Gas Equipment Select Industry Index and the Russell 2000. The graph and the table below assume (i) that $100 was invested at the market close on June 13, 2014 in the common stock of Aspen Aerogels, Inc., the S&P Oil & Gas Equipment Select Industry Index and the Russell 2000, and (ii) reinvestment of dividends. The comparisons in the graph and table are not intended to be indicative of the possible future performance of our common stock.



	6/13/2014	Jun-14	Sep-15	Dec-14	Mar-15	Jun-15
Aspen Aerogels, Inc.	100.00	102.79	93.77	74.14	67.72	61.58
S&P Oil & Gas Equipment Select Industry Index (TR)	100.00	102.43	83.68	59.08	52.83	54.98
Russell 2000	100.00	102.60	94.75	103.61	107.75	107.85

	Sep-15	Dec-15	Mar-16	Jun-16	Sep-16	Dec-16
Aspen Aerogels, Inc.	69.77	56.47	41.86	46.23	55.44	38.42
S&P Oil & Gas Equipment Select Industry Index (TR)	37.68	37.42	37.03	40.22	40.95	48.16
Russell 2000	94.67	97.70	95.82	99.07	107.65	116.72

The performance graph and table above are being furnished and shall not be deemed “filed” for purposes of Section 18 of the Exchange Act, or otherwise subject to the liabilities under that section, nor shall it be deemed incorporated by reference into any registration statement or other filing under the Securities Act or the Exchange Act, except as shall be expressly set forth by specific reference in such filing.

Unregistered Sales of Equity Securities and Use of Proceeds

(a) *Unregistered Sales of Equity Securities* . Not applicable.

(b) *Use of Proceeds from Initial Public Offering of Common Stock* . We registered shares of our common stock in connection with our initial public offering pursuant to a registration statement on Form S-1 (File No. 333-195523), which was declared effective by the SEC on June 12, 2014, and a registration statement on Form S-1 (File No. 333-196719) filed pursuant to Rule 462(b) of the Securities Act.

We received aggregate net proceeds from the offering of approximately $74.7 million, after deducting $4.3 million of underwriting discounts and approximately $3.5 million of offering expenses.

As of December 31, 2016, we used $19.8 million of the net proceeds of the offering to repay all amounts outstanding under our subordinated notes and our revolving credit facility; $31.0 million of the net proceeds of the offering for capital expenditures related to our third production line in East Providence, Rhode Island; and $7.2 million of the net proceeds of the offering for the design of our planned second manufacturing facility in Statesboro, Georgia. The remainder of the net proceeds are held in a deposit account and money market account with a major financial institution in North America. We have broad discretion in the use of the net proceeds from our initial public offering and could spend the proceeds in ways that do not improve our results of operations or enhance the value of our stock. There has been no material change in our planned use of the balance of the net proceeds from the offering as described in our final prospectus filed with the SEC on June 16, 2014.

(c) *Purchases of Equity Securities By the Issuer and Affiliated Purchasers* . We did not repurchase any of our equity securities during the year ended December 31, 2016.

Item 6. SELECTED FINANCIAL DATA

The following table sets forth our selected consolidated financial data for the periods, and as of the dates, indicated. You should read the following selected consolidated financial data in conjunction with our consolidated financial statements and the related notes thereto included elsewhere in this Annual Report on Form 10-K and the “Management’s Discussion and Analysis of Financial Condition and Results of Operations” section of this Annual Report on Form 10-K.

We derived the consolidated statement of operations data for the years ended December 31, 2016, 2015 and 2014, and the consolidated bala nce sheet data as of December 31, 2016 and 2015, from our audited consolidated financial statements and the related notes thereto included elsewhere in this Annual Report, which financial statements have been audited by KPMG LLP, independent registered pub lic accounting firm. We derived the consolidated statement of operations data for the fiscal years ended December 31, 2013 and 2012, and the consolidated balance sheet data as of December 31, 2014, 2013 and 2012, from our audited consolidated financial sta tements and the related notes thereto that are not included in this Annual Report, which financial statements have been audited by KPMG LLP, independent registered public accounting firm.

	Year Ended December 31,				
	2016	2015	2014	2013	2012
	($ in thousands, except share and per share data)				
Consolidated statements of operations data:					
Revenue:					
Product	$ 115,490	$ 120,532	$ 99,259	$ 82,057	$ 60,389
Research services	2,248	1,986	3,140	4,037	3,064
Total revenue	117,738	122,518	102,399	86,094	63,453
Cost of revenue:					
Product	93,123	96,865	83,677	73,399	70,025
Research services	1,304	1,005	1,642	1,964	1,396
Gross profit (loss)	23,311	24,648	17,080	(10,731)	(7,968)
Operating expenses:					
Research and development	5,306	5,253	5,980	5,159	5,142
Sales and marketing	11,810	10,562	10,290	9,271	8,564
General and administrative	17,415	15,068	16,853	12,833	11,299
Write-off of construction in progress	—	—	—	3,440	—
Total operating expenses	34,531	30,883	33,123	30,703	25,005
Loss from operations	(11,220)	(6,235)	(16,043)	(19,972)	(32,973)
Other expense, net:					
Interest expense, net	(147)	(182)	(50,281)	(30,599)	(21,790)
Gain on extinguishment of convertible notes	—	—	—	8,898	—
Loss on exchange of convertible notes	—	—	—	(5,697)	—
Debt extinguishment costs	—	—	—	—	(1,379)
Financing costs	(656)	—	—	—	—
Costs associated with postponed public offering	—	—	—	(241)	(—)
Total other expense, net	(803)	(182)	(50,281)	(27,639)	(23,169)
Net loss	(12,023)	(6,417)	(66,324)	(47,611)	(56,142)
Accretion (deemed dividends) on preferred stock	—	—	—	(996)	47,201
Extinguishment of redeemable feature for convertible preferred stock	—	—	—	86,161	—
Earnings attributable to preferred stock shareholders	—	—	—	(36,216)	—
Net income (loss) attributable to common stockholders	$ (12,023)	$ (6,417)	$ (66,324)	$ 1,338	$ (8,941)
Per share data:					
Net income (loss) attributable to common stockholders per share:					
Basic	$ (0.52)	$ (0.28)	$ (5.37)	$ 426.52	$ (2,851.08)
Diluted	$ (0.52)	$ (0.28)	$ (5.37)	$ 410.56	$ (2,851.08)
Weighted-average common shares outstanding:					
Basic	23,139,807	22,986,931	12,349,456	3,137	3,136
Diluted	23,139,807	22,986,931	12,349,456	3,259	3,136

	As of December 31,				
	2016	2015	2014	2013	2012
Consolidated balance sheet data:					
Cash and cash equivalents	$ 18,086	$ 32,804	$ 49,719	$ 1,574	$ 1,343
Working capital (1)	32,056	44,238	53,168	(3,370)	1,132
Total assets	134,669	140,074	145,043	90,233	95,301
Total debt	39	107	165	138,555	110,083
Redeemable preferred stock	—	—	—	—	86,250
Total stockholders' equity (deficit)	115,564	122,474	123,716	(61,966)	(120,795)

(1) Working capital means current assets minus current liabilities.

Item 7. MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS

The following discussion of our financial condition and results of operations should be read in conjunction with the "Selected Financial Data" and our consolidated financial statements and the related notes thereto included in this Annual Report on Form 10-K. In addition to historical information, some of the information contained in the following discussion and analysis or set forth elsewhere in this report, including information with respect to our plans and strategy for our business, includes forward looking information that involves risks, uncertainties and assumptions. You should read the Risk Factors set forth in Item 1A of this Annual Report on Form 10-K for a discussion of important factors that could cause actual results to differ materially from the results described in or implied by the forward-looking statements contained in the following discussion and analysis. Our actual results and the timing of events could differ materially from those anticipated by these forward looking statements.

Overview

We design, develop and manufacture innovative, high-performance aerogel insulation used primarily in the energy infrastructure and building materials markets. We believe our aerogel blankets deliver the best thermal performance of any widely used insulation product available on the market today and provide a combination of performance attributes unmatched by traditional insulation materials. Our end-use customers select our products where thermal performance is critical and to save money, reduce energy use, preserve operating assets and protect workers.

Our insulation is used by oil producers and the owners and operators of refineries, petrochemical plants, LNG facilities, power generating assets and other energy infrastructure. Our Pyrogel and Cryogel product lines have undergone rigorous technical validation by industry leading end-users and achieved significant market adoption. We also derive product revenue from the building materials and other end markets. Customers in these markets use our aerogels for applications as diverse as wall systems, military and commercial aircraft, trains, buses, appliances, apparel, footwear and outdoor gear.

We generate product revenue through the sale of our line of aerogel blankets. We market and sell our products primarily through a sales force based in North America, Europe and Asia. The efforts of our sales force are supported by a small number of sales consultants with extensive knowledge of a particular market or region. Our sales force is responsible for establishing and maintaining customer and partner relationships, delivering highly technical information and ensuring high-quality customer service.

Our salespeople work directly with end-use customers and engineering firms to promote the qualification, specification and acceptance of our products. We also rely on an existing and well-established channel of qualified insulation distributors and contractors in more than 30 countries around the world that ensures rapid delivery of our products and strong end-user support. Our salespeople also work to educate insulation contractors about the technical and operating cost advantages of our aerogel blankets.

We also perform research services under contracts with various agencies of the U.S. government, including the Department of Defense and the Department of Energy, and other institutions. Research performed under contract with government agencies and other institutions enables us to develop and leverage technologies into broader commercial applications.

We manufacture our products using our proprietary process and technology at our facility in East Providence, Rhode Island. We completed the construction and start-up of a third production line in the East Providence facility during 2015 with a total construction cost of $31.8 million. This third production line increased our annual nameplate capacity to approximately 50 million square feet of aerogel blankets. In February 2016, we announced the planned construction of a second manufacturing facility in Statesboro, Georgia supported by a package of incentives including outright grants, free land, infrastructure support, tax credits and abatements, training programs and related benefits from the State of Georgia and local governmental authorities. During the fourth quarter of 2016, we elect ed to temporarily delay construction of this facility to better align the capacity expansion with our assessment of demand for the 2018 to 2020 period.

During 2016, we entered into a multi-faceted strategic partnership with BASF SE to develop and commercialize a set of products optimized to meet the needs of the building materials markets. The strategic partnership offers a near-term commercial opportunity through the supply and sale of our Spaceloft A2 product to BASF and long-term commercial potential through our joint development efforts with BASF focused on innovative products and technologies. Subject to certain preconditions, BASF also will make a series of prepayments to us in the aggregate of $22 million during the construction of our planned manufacturing facility in Statesboro, Georgia. The prepayments will be either credited against amounts invoiced to BASF for Spaceloft A2 or repaid by us to BASF after December 31, 2023. As a result of our decision to temporarily delay construction of the Statesboro facility, we have yet to fulfill the preconditions, and commencement of the prepayments from BASF will be delayed until the preconditions are satisfied.

Our revenue for the year ended December 31, 2016 was $117.7 million, which represented a decrease of 4% from the year ended December 31, 2015. Net loss for the year ended December 31, 2016 was $12.0 million and diluted loss per share was $0.52.

Key Metrics and Non-GAAP Financial Measures

We regularly review a number of metrics, including the following key metrics, to evaluate our business, measure our performance, identify trends affecting our business, formulate financial projections and make strategic decisions.

Square Foot Operating Metric

We price our product and measure our product shipments in square feet. We estimate our annual nameplate capacity was approximately 50 million square feet of aerogel blankets at December 31, 2016. We believe the square foot operating metric allows us and our investors to measure the growth in our manufacturing capacity and product shipments on a uniform and consistent basis. The following chart sets forth product shipments associated with recognized revenue in square feet for the periods presented:

	Year Ended December 31,		
	2016	2015	2014
	(Square feet in thousands)		
Product shipments in square feet	44,286	42,246	38,222

Adjusted EBITDA

We use Adjusted EBITDA, a non-GAAP financial measure, as a means to assess our operating performance. We define Adjusted EBITDA as net income (loss) before interest expense, taxes, depreciation, amortization, stock-based compensation expense and other items, which occur from time to time, that we do not believe are indicative of our core operating performance, which included financing costs during the year ended December 31, 2016. Adjusted EBITDA is a supplemental measure of our performance that is not presented in accordance with U.S. GAAP. Adjusted EBITDA should not be considered as an alternative to net income (loss) or any other measure of financial performance calculated and presented in accordance with U.S. GAAP. In addition, our definition and presentation of Adjusted EBITDA may not be comparable to similarly titled measures presented by other companies.

We use Adjusted EBITDA:

- as a measure of operating performance because it does not include the impact of items that we do not consider indicative of our core operating performance;
- for planning purposes, including the preparation of our annual operating budget,
- to allocate resources to enhance the financial performance of our business; and
- as a performance measure used under our bonus plan.

We also believe that the presentation of Adjusted EBITDA provides useful information to investors with respect to our results of operations and in assessing the performance and value of our business. Various measures of EBITDA are widely used by investors to measure a company's operating performance without regard to items that can vary substantially from company to company depending upon financing and accounting methods, book values of assets, capital structures and the methods by which assets were acquired.

Although measures similar to Adjusted EBITDA are frequently used by investors and securities analysts in their evaluation of companies, we understand that Adjusted EBITDA has limitations as an analytical tool, and you should not consider it in isolation or as a substitute for net income, income from operations, net cash provided by operating activities or an analysis of our results of operations as reported under U.S. GAAP. Some of these limitations are:

- Adjusted EBITDA does not reflect our historical cash expenditures or future requirements for capital expenditures or other contractual commitments;
- Adjusted EBITDA does not reflect changes in, or cash requirements for, our working capital needs;
- Adjusted EBITDA does not reflect stock-based compensation expense;
- Adjusted EBITDA does not reflect our tax expense or cash requirements to pay our income taxes;
- Adjusted EBITDA does not reflect our interest expense, or the cash requirements necessary to service interest or principal payments on our debt;
- Although depreciation, amortization and impairment charges are non-cash charges, the assets being depreciated, amortized or impaired will often have to be replaced in the future, and Adjusted EBITDA does not reflect any cash requirements for these replacements; and
- Other companies in our industry may calculate EBITDA or Adjusted EBITDA differently than we do, limiting their usefulness as a comparative measure.

Because of these limitations, our Adjusted EBITDA should not be considered as a measure of discretionary cash available to us to reinvest in the growth of our business or as a measure of cash available for us to meet our obligations.

To properly and prudently evaluate our business, we encourage you to review the GAAP financial statements included elsewhere in this Annual Report on Form 10-K, and not to rely on any single financial measure to evaluate our business.

The following table presents a reconciliation of net loss, the most directly comparable GAAP measure, to Adjusted EBITDA for the years presented:

	Year Ended December 31,		
	2016	2015	2014
	($ in thousands)		
Net loss	$ (12,023)	$ (6,417)	$ (66,324)
Depreciation and amortization	9,853	9,887	10,183
Stock-based compensation (1)	5,313	5,413	8,781
Interest expense, net (2)	147	182	50,281
Financing costs	656	—	—
Loss on disposal of assets	—	—	119
Adjusted EBITDA	$ 3,946	$ 9,065	$ 3,040

(1) Represents non-cash stock-based compensation related to vesting and modifications of stock option grants, vesting of restricted stock units and vesting of restricted common stock.

(2) Interest expense in 2014 consists primarily of fair market value adjustments and issuance costs related to our then outstanding subordinated notes, senior convertible notes and convertible notes and certain imputed interest on previously settled obligations.

The following table presents a reconciliation of net income (loss), the most directly comparable GAAP measure, to Adjusted EBITDA for the quarters presented:

	Three months ended 2016				Three months ended 2015			
	March 31	June 30	Sept. 30	Dec. 31	March 31	June 30	Sept. 30	Dec. 31
Net income (loss)	$ (1,797)	$ (1,387)	$ (3,097)	$ (5,742)	$ (2,790)	$ (2,743)	$ (2,522)	$ 1,638
Depreciation and amortization	2,410	2,416	2,472	2,555	2,184	2,574	2,664	2,465
Stock-based compensation (1)	1,370	1,433	1,474	1,036	1,295	1,404	1,476	1,238
Interest expense, net	39	39	37	32	45	45	46	46
Financing costs	—	—	656	—	—	—	—	—
Adjusted EBITDA	$ 2,022	$ 2,501	$ 1,542	$ (2,119)	$ 734	$ 1,280	$ 1,664	$ 5,387

(1) Represents non-cash stock-based compensation related to vesting and modifications of stock option grants, vesting of restricted stock units and vesting of restricted common stock.

Our financial performance, including such measures as net income (loss), earnings per share and Adjusted EBITDA, are affected by a number of factors including volume and mix of aerogel products sold, average selling prices, our material and manufacturing costs, the costs associated with and timing of expansions and start-up of additional production capacity, and the amount and timing of operating expenses, including patent enforcement costs. As we build out our manufacturing capacity in the longer term, we expect increased manufacturing expenses will periodically have a negative impact on net income (loss), earnings per share and Adjusted EBITDA, but will set the framework for improved performance in the long term. Accordingly, we expect that our net income (loss), earnings per share and Adjusted EBITDA will vary from period to period, in particular as and when we expand our manufacturing capacity.

In the near term, as a result of the conclusion of the major petrochemical project with Reliance Industries Limited, which comprised 25% of our product revenue during 2016, in combination with the impact of constrained capital investment and low activity levels in the global energy infrastructure market, we expect a decrease in revenue and an associated increase in net loss and loss per share and a decrease in Adjusted EBITDA. Given fixed cost structures and lag times for implementing reductions of certain variable costs, the percentage increase in net loss and loss per share and decrease in Adjusted EBITDA could be significantly greater than any percentage decrease in revenue.

Emerging Growth Company Status

The JOBS Act permits an "emerging growth company" such as us to take advantage of an extended transition period to comply with new or revised accounting standards applicable to public companies. We have opted out of this provision and, as a result, we comply with new or revised accounting standards as required when they are adopted. This decision to opt out of the extended transition period under the JOBS Act is irrevocable.

Components of Our Results of Operations

Revenue

We recognize product revenue from the sale of our line of aerogel products and research services revenue from the provision of services under contracts with various agencies of the U.S. government and other institutions. Product revenue is recognized upon transfer of title and risk of loss, which is upon shipment or delivery. The following table sets forth the total revenue for the periods presented:

	Year Ended December 31,		
	2016	2015	2014
	($ in thousands)		
Revenue:			
Product	$ 115,490	$ 120,532	$ 99,259
Research services	2,248	1,986	3,140
Total revenue	$ 117,738	$ 122,518	$ 102,399

Product revenue accounted for 98%, 98% and 97% of total revenue for the years ended December 31, 2016, 2015 and 2014, respectively. In the near term, we expect a decrease in product revenue as a result of the conclusion of the major petrochemical project with Reliance Industries Limited, which comprised 25% of our product revenue during 2016, in combination with the impact of constrained capital investment and low activity levels in the global energy infrastructure market. However, we expect a resumption of growth in product revenue in the long term due to increasing market adoption of our line of aerogel blankets in the energy infrastructure market, particularly in the power generation and district energy markets, and increasing penetration of new markets, including the building materials market. We expect that research services revenue will remain a small percentage of total revenue due to limitations on our eligibility to receive contract awards under federal guidelines.

A substantial majority of our revenue is generated from a limited number of direct customers, including distributors, contractors, OEMs, partners and end-use customers. Our 10 largest customers accounted for approximately 67% of our total revenue during the year ended December 31, 2016, and we expect that most of our revenue will continue to come from a relatively small number of customers for the foreseeable future. In 2016, sales to Reliance Industries Limited and Distribution International, Inc. represented 25% and 15% of our total revenue, respectively. In 2015, sales to Distribution International, Inc. and Reliance Industries Limited represented 14% and 12% of our total revenue, respectively. In 2014, sales to Reliance Industries Limited and Distribution

Int ernational, Inc. represented 13% and 12% of total revenue, respectively. For each of the periods discussed above, there were no other customers that represented 10% or more of our total revenues.

We conduct business across the globe and a substantial portion of our revenue is generated outside of the United States. Total revenue from outside of the United States, based on shipment destination or services location, amounted to $82.0 million, or 70% of our total revenue, $78.0 million, or 64% of our total revenue, and $62.6 million or 61% of our total revenue, in the years ended December 31, 2016, 2015 and 2014, respectively.

Cost of Revenue

Cost of revenue for our product revenue consists primarily of materials and manufacturing expense, including labor, utilities, maintenance expense and depreciation on manufacturing assets. Cost of product revenue is recorded when the related product revenue is recognized. Cost of product revenue also includes stock-based compensation of manufacturing employees and shipping costs.

Material is our most significant component of cost of product revenue and includes fibrous batting, silica materials and additives. Material costs as a percentage of product revenue were 41%, 45% and 46% for the years ended December 31, 2016, 2015 and 2014, respectively.

Material costs as a percentage of product revenue vary from product to product due to differences in average selling prices, material requirements, blanket thicknesses and manufacturing yields. In addition, we provide warranties for our products and record the estimated cost within cost of sales in the period that the related revenue is recorded. As a result, material costs as a percentage of revenue will vary from period to period due to changes in the mix of aerogel products sold or the estimated cost of warranties. However, in general, we expect material costs in the aggregate to decline as a percentage of revenue as we seek to achieve higher selling prices, material sourcing improvements, quality improvements and manufacturing yield enhancements for our aerogel products.

Manufacturing expense is also a significant component of cost of revenue. Manufacturing expense as a percentage of product revenue was 39%, 36% and 38% for the years ended December 31, 2016, 2015 and 2014, respectively. During 2016, manufacturing expense increased as a percentage of product revenue as a result of the decline in product revenue in 2016 versus the comparable period in 2015 in combination with an increase in manufacturing expense associated with operation of the third production line in East Providence for the full year. As we increase manufacturing capacity through our planned construction and operation of a second manufacturing facility and, over time, potentially expand the production lines at the second facility, we expect manufacturing expense as a percentage of product revenue will increase following each expansion but will decrease in the long-term with increased revenues supported by the effect of completed capacity expansions.

In the near term, as a result of the conclusion of the major petrochemical project with Reliance Industries Limited, which comprised 25% of our product revenue during 2016, in combination with the impact of constrained capital investment and low activity levels in the global energy infrastructure market, we expect a decrease in product revenue and an associated increase in manufacturing expense as a percentage of revenue.

Cost of revenue for our research services revenue consists of direct labor costs of research personnel engaged in the contract research, third-party consulting expense, and associated direct material costs. This cost of revenue also includes overhead expenses associated with project resources, development tools and supplies. Cost of revenue for our research services revenue is recorded when the related research services revenue is recognized.

Gross Profit

Our gross profit as a percentage of revenue is affected by a number of factors, including the volume of aerogel products produced and sold, the mix of aerogel products sold, average selling prices, our material and manufacturing costs, realized capacity utilization and the costs associated with expansions and start-up of production capacity. Accordingly, we expect our gross profit in absolute dollars and as a percentage of revenue to vary significantly from period to period. As and when we build out our manufacturing capacity, we expect increased manufacturing expenses will periodically have a significant negative impact on gross profit in the periods following any such expansion. In the near term, as a result of the conclusion of the major petrochemical project with Reliance Industries Limited, which comprised 25% of our product revenue during 2016, in combination with the impact of constrained capital investment and low activity levels in the global energy infrastructure market, we expect a decrease in revenue and an associated decrease in gross profit as a percentage of revenue. However, in general, we expect gross profit to improve as a percentage of revenue in the longer term due to expected increases in manufacturing productivity and production volumes, supported by expected capacity expansions, improvements in manufacturing yields and realization of material purchasing efficiencies.

Operating Expenses

Operating expenses consist of research and development, sales and marketing, and general and administrative expenses. Operating expenses include personnel costs, legal fees, professional fees, service fees, insurance premiums, travel expense, facilities related costs and other costs and fees. The largest component of our operating expenses is personnel costs, consisting of salaries, benefits, incentive compensation and stock-based compensation. In any particular period, the timing and extent of personnel additions or reductions, legal activities, including patent enforcement actions, marketing programs, research efforts and a range of similar activities or actions could materially affect our operating expenses, both in absolute dollars and as a percentage of revenue.

Research and Development Expenses

Research and development expenses consist primarily of expenses for personnel engaged in the development of next generation aerogel compositions, form factors and manufacturing technologies. These expenses also include testing services, prototype expenses, consulting services, equipment depreciation, facilities costs and related overhead. We expense research and development costs as incurred. We expect to continue to devote substantial resources to the development of new aerogel technology. We believe that these investments are necessary to maintain and improve our competitive position. We expect to continue to invest in research and engineering personnel and the infrastructure required in support of their efforts. While we expect that our research and development expenses will increase in absolute dollars but decrease as a percentage of revenue in the longer term, in the nearer term we expect such expenses will increase as a percentage of revenue.

Sales and Marketing Expenses

Sales and marketing expenses consist primarily of personnel costs, incentive compensation, marketing programs, travel and related costs, consulting expenses and facilities related costs. We plan to expand our sales force and sales consultants globally to drive anticipated growth in customers and demand for our products. While we expect that sales and marketing expenses will increase in absolute dollars but decrease as a percentage of revenue in the longer-term, in the nearer term we expect such expenses will increase as a percentage of revenue.

General and Administrative Expenses

General and administrative expenses consist primarily of personnel costs, legal expenses, consulting and professional services, audit and tax consulting costs, and expenses for our executive, finance, human resources and information technology organizations. General and administrative expenses have increased as we have incurred additional costs related to operating as a publicly-traded company, which include costs of compliance with securities, corporate governance and related laws and regulations, investor relations expenses, increased insurance premiums, including director and officer insurance, and increased audit and legal fees. In addition, we expect our general and administrative expenses to increase as we add general and administrative personnel to support the anticipated growth of our business and continued expansion of our manufacturing operations. We also expect that the patent enforcement actions, described in more detail under “Legal Proceedings” in Part I, Item 3 of this Annual Report on Form 10-K, will result in a near-term increase in legal expense and, if such litigation is protracted, could result in significant additional legal expense over the medium to long-term. In the near term, we expect general and administrative expense will increase both in absolute dollars and as a percentage of revenue. In the longer term, we expect that general and administrative expenses will decrease both in absolute dollars and as a percentage of revenue.

Other Expense, Net

For the year ended December 31, 2016, other expense, net consisted primarily of financing costs, as well as costs related to our revolving credit facility. For the year ended December 31, 2015, other expense, net consisted primarily of fees related to our revolving credit facility. For the year ended December 31, 2014, other expense, net consisted of interest expense related to fair market value adjustments to our subordinated notes, senior convertible notes and convertible notes, debt issuance costs and imputed interest on a prior obligations.

Provision for Income Taxes

We have incurred net losses since inception and have not recorded benefit provisions for U.S. federal income taxes or state income taxes since the tax benefits of our net losses have been offset by valuation allowances due to the uncertainty associated with the utilization of net operating loss carryforwards.

For the year ended December 31, 2014, we performed an analysis pursuant to Internal Revenue Code Section 382, as well as similar state provisions, in order to determine whether any limitations might exist on the utilization of net operating losses and other tax attributes. Based on this analysis, we have determined that an ownership change occurred as a result of our initial public offering in June 2014, resulting in an annual limitation on the use of our net operating losses and other tax attributes as of such date. As a result, our prior net operating losses were limited to $155.2 million, including built-in gains of $42.0 million at the date of that ownership change. At December 31, 2016, we had $176.6 million of net operating losses available to offset f uture federal income, if any, and which expire on various dates through December 31, 2036 .

Results of Operations

The following tables set forth our results of operations for the periods presented:

	Year Ended December 31,		
	2016	2015	2014
	($ in thousands)		
Revenue:			
Product	$ 115,490	$ 120,532	$ 99,259
Research services	2,248	1,986	3,140
Total revenue	117,738	122,518	102,399
Cost of revenue:			
Product	93,123	96,865	83,677
Research services	1,304	1,005	1,642
Gross profit	23,311	24,648	17,080
Operating expenses:			
Research and development	5,306	5,253	5,980
Sales and marketing	11,810	10,562	10,290
General and administrative	17,415	15,068	16,853
Total operating expenses	34,531	30,883	33,123
Loss from operations	(11,220)	(6,235)	(16,043)
Other expense, net:			
Financing costs	(656)	—	—
Interest expense, net (1)	(147)	(182)	(50,281)
Total other expense, net	(803)	(182)	(50,281)
Net loss	$ (12,023)	$ (6,417)	$ (66,324)

(1) For the years ended December 31, 2016 and 2015, interest expense, net consisted primarily of costs related to our revolving credit facility. For the year ended December 31, 2014, interest expense, net consisted primarily of fair market value adjustments related to our subordinated notes, senior convertible notes, convertible notes, debt issuance costs and imputed interest on prior obligations.

Year ended D ecember 31, 2016 compared to year ended December 31, 2015

The following tables set forth our results of operations for the periods presented:

	Year Ended December 31, 2016	Year Ended December 31, 2015	$ Change	% Change	Year Ended December 31, 2016	Year Ended December 31, 2015
	($ in thousands)				(Percentage of total revenue)	
Revenue:						
Product	$ 115,490	$ 120,532	$ (5,042)	(4)%	98%	98%
Research services	2,248	1,986	262	13%	2%	2%
Total revenue	117,738	122,518	(4,780)	(4)%	100%	100%
Cost of revenue:						
Product	93,123	96,865	(3,742)	(4)%	79%	79%
Research services	1,304	1,005	299	30%	1%	1%
Gross profit	23,311	24,648	(1,337)	(5)%	20%	20%
Operating expenses:						
Research and development	5,306	5,253	53	1%	5%	4%
Sales and marketing	11,810	10,562	1,248	12%	10%	9%
General and administrative	17,415	15,068	2,347	16%	15%	12%
Total operating expenses	34,531	30,883	3,648	12%	29%	25%
Loss from operations	(11,220)	(6,235)	(4,985)	80%	(10)%	(5)%
Other expense, net:						
Financing costs	(656)	—	(656)	(NA)	(1)%	0%
Interest expense, net	(147)	(182)	35	(19)%	0%	0%
Total other expense, net	(803)	(182)	(621)	341%	(1)%	(0)%
Net loss	$ (12,023)	$ (6,417)	$ (5,606)	87%	(10)%	(5)%

Revenue

	Year Ended December 31, 2016 Amount	2016 Percentage of Revenue	2015 Amount	2015 Percentage of Revenue	Change Amount	Change Percentage
	($ in thousands)					
Revenue:						
Product	$ 115,490	98%	$ 120,532	98%	$ (5,042)	(4)%
Research services	2,248	2%	1,986	2%	262	13%
Total Revenue	$ 117,738	100%	$ 122,518	100%	$ (4,780)	(4)%

The following chart sets forth product shipments in square feet for the periods presented:

	Year Ended December 31, 2016	Year Ended December 31, 2015	Change Amount	Change Percentage
Product shipments in square feet (in thousands)	44,286	42,246	2,040	5%

Total revenue decreased by $4.8 million, or 4%, in 2016 to $117.7 million from $122.5 million in 2015 due principally to a decrease in product revenue associated with the impact of constrained capital investment and low activity levels in the global energy infrastructure market.

Product revenue decreased by $5.0 million, or 4%, to $115.5 million in 2016 from $120.5 million in 2015. This decrease was principally the result of a decrease in the sales of our aerogel products in the subsea market and the European energy market offset, in part, by an increase in sales in the Asian energy market and the building materials market.

The average selling price per square foot of our products decreased by an effective $0.24, or 8%, to $2.61 per square foot for the year ended December 31, 2016 from $2.85 per square foot for the year ended December 31, 2015. The decrease in average selling price reflects a year-over-year decline in the mix of high- priced subsea products, combined with an increase in the mix of products sold to Reliance Industries Limited with project-based pricing. This de crease in average selling price had the effect of decreasing product revenue by $10.7 million for the year ended December 31, 2016.

In volume terms, product shipments increased 2.0 million square feet, or 5%, to 44.3 million square feet of aerogel products for the year ended December 31, 2016, as compared to 42.2 million square feet in the year ended December 31, 2015. The increase in volume was supported by the increase in manufacturing capacity associated with the operation of the third production line in the East Providence facility for a full year. The increase in product volume had the effect of increasing product revenue by approximately $5.7 million for the year ended December 31, 2016.

Research services revenue increased by $0.3 million, or 13%, to $2.2 million in 2016 from $2.0 million in 2015. The increase was primarily due to the timing and amount of funding available under research contracts during the year ended December 31, 2016 from the comparable period in 2015.

Product revenue as a percentage of total revenue was 98% of total revenue in 2016 and 2015, respectively. Research services revenue was 2% of total revenue in 2016 and 2015, respectively. We expect that product revenue will continue to comprise a significant and growing percentage of our total revenue in the long-term due to the anticipated demand growth from adoption of our products in the energy infrastructure market, particularly in the district energy and power markets, and through penetration of new and existing markets, including the building materials market.

During 2017, we expect a decrease in product revenue as a result of the conclusion of the major petrochemical project with Reliance Industries Limited, which comprised 25% of our product revenue during 2016, in combination with the impact of constrained capital investment and low activity levels in the global energy infrastructure market. Accordingly, we are projecting a decline in product revenue and total revenue in the year ending December 31, 2017 versus the comparable period in 2016.

Cost of Revenue

	Year Ended December 31,						Change	
	2016			2015				
	Amount	Percentage of Related Revenue	Percentage of Total Revenue	Amount	Percentage of Related Revenue	Percentage of Total Revenue	Amount	Percentage
	($ in thousands)							
Cost of revenue:								
Product	$ 93,123	81%	79%	$ 96,865	80%	79%	$ (3,742)	(4)%
Research services	1,304	58%	1%	1,005	51%	1%	299	30%
Total cost of revenue	$ 94,427	80%	80%	$ 97,870	80%	80%	$ (3,443)	(4)%

Total cost of revenue decreased by $3.4 million, or 4%, to $94.4 million in 2016 from $97.9 million in 2015. The decrease in total cost of revenue was the result of a decrease of $6.0 million in material costs, offset, in part, by an increase of $2.3 million in manufacturing expense and an increase of $0.3 million in cost of research services.

Product cost of revenue decreased $3.7 million, or 4%, to $93.1 million in 2016 from $96.9 million in 2015. The $3.7 million decrease was the result of a $6.0 million decrease in material costs, offset, in part, by a $2.3 million increase in manufacturing expense year over year. The increase in manufacturing expense included increases in compensation expense of $0.9 million, utility expenses of $0.3 million and maintenance and facility expense of $1.1 million. The increased level of manufacturing expense was driven by operation of the third production line in the East Providence facility for a full year in 2016 versus three quarters in 2015. Despite growth in product volume of 5% during the year ended December 31, 2016, material costs declined due to strong improvement in manufacturing yields and a shift in mix to lower cost products versus the comparable period in 2015.

Product cost of revenue as a percentage of product revenue increased to 81% during 2016 from 80% in 2015. This increase was the result of the combination of the increase in manufacturing expense associated with operation of the third production line in the East Providence facility for a full year in 2016 and the decline in product revenue associated with the impact of constrained capital investment and low activity levels in the global energy infrastructure market. The impact of the increase in manufacturing expense and decline in product revenue was offset, in part, by the improvement in manufacturing yields and the shift in mix to lower cost products during the year ended December 31, 2016 versus the comparable period in 2015.

We expect that cost of product revenue will decrease during 2017 versus 2016. The projected decrease in cost of product revenue reflects planned actions to reduce manufacturing spending and an expected decrease in material costs due to lower projected sales volumes. However, we expect that cost of product revenue as a percentage of product revenue will increase during the year. This projected increase reflects our expectation that, given high fixed cost levels in our manufacturing facility, the expected percentage reduction in cost of product revenue will not fully offset the expected percentage reduction in revenue in 2017 .

Research services cost of revenue increased by $0.3 million, or 30%, to $1.3 million in 2016 from $1.0 million in 2015. The increase in research services cost of revenue was due to the 13% increase in research services revenue during 2016 and an unfavorable mix of labor and expense required to perform the contracted research.

Gross Profit

	Year Ended December 31,				Change	
	2016		2015			
	Amount	Percentage of Revenue	Amount	Percentage of Revenue	Amount	Percentage
	($ in thousands)					
Gross profit	$ 23,311	20%	$ 24,648	20%	$ (1,337)	(5)%

Gross profit decreased $1.3 million, or 5%, to $23.3 million in 2016 from $24.6 million in 2015. This $1.3 million decrease was the result of the $4.8 million decrease in total revenue and a related $3.4 million decrease in total costs of sales. The decrease in revenue was principally associated with the impact of constrained capital investment and low activity levels in the global energy infrastructure market. The decrease in total cost of sales was driven by the reduction in material costs offset, in part, by the increase in manufacturing expense and the increase in contract research expense.

Gross profit as a percentage of total revenue remained essentially unchanged at 20% of total revenue for both 2016 and 2015. The percentage decline in total revenue and total cost of revenue during 2016 each approximated 4% during 2016. As a result, gross profit as a percentage of total revenue remained essentially constant for the years ended December 31, 2016 and 2015.

In 2017, we expect gross profit as a percentage of total revenue will decrease versus 2016. The projected decrease in gross profit reflects our expectation that, given the fixed cost levels in our manufacturing facility, the expected percentage reduction in cost of total revenue will not fully offset the expected percentage reduction in total revenue in 2017.

Research and Development Expenses

	Year Ended December 31,				Change	
	2016		2015			
	Amount	Percentage of Revenue	Amount	Percentage of Revenue	Amount	Percentage
	($ in thousands)					
Research and development expenses	$ 5,306	5%	$ 5,253	4%	$ 53	1%

Research and development expenses remained flat at $5.3 million for the years ended December 31, 2016 and 2015. An increase in depreciation expense of $0.1 million was offset by a decrease in employee compensation of $0.1 million.

We expect that our research and development expenses during 2017 will increase from 2016 expense levels in support of new product development, improved manufacturing technology and the costs associated with the operation of our newly constructed full scale pilot line. Due to the expected growth in research and development expenses and the projected decline in total revenue, we expect research and development expenses as a percentage of total revenue to increase in 2017.

In the long-term, we expect to continue to increase investment in research, development and engineering personnel, projects and infrastructure in support of efforts to develop new products, technologies and markets. However, we expect that research and development expenses will decline as a percentage of total revenue in the long-term due to projected growth in product revenue.

Sales and Marke ting Expenses

	Year Ended December 31,				Change	
	2016		2015			
	Amount	Percentage of Revenue	Amount	Percentage of Revenue	Amount	Percentage
			($ in thousands)			
Sales and marketing expenses	$ 11,810	10%	$ 10,562	9%	$ 1,248	12%

Sales and marketing expenses increased by $1.2 million, or 12%, to $11.8 million in 2016 from $10.6 million during 2015. The $1.2 million increase was the result of a $0.3 million increase in payroll and related costs associated with an increase in sales personnel, $0.6 million in professional and commission fees and $0.4 million in travel expenses of our sales force, offset, in part, by a reduction in marketing expense of $0.1 million. We expect sales and marketing expenses to increase modestly during 2017 in line with a planned increase in sales personnel and marketing efforts. Due to the expected growth in sales and marketing expenses and the projected decline in total revenue, we expect sales and marketing expenses as a percentage of total revenue to increase in 2017.

We expect that sales and marketing expenses will increase in absolute dollars in the long term as we continue to increase sales personnel and marketing efforts in support of expected growth in demand for our products. However, we expect that sales and marketing expenses will decrease as a percentage of total revenue in the long-term due to projected growth in product revenue.

General and Administrative Expenses

	Year Ended December 31,				Change	
	2016		2015			
	Amount	Percentage of Revenue	Amount	Percentage of Revenue	Amount	Percentage
			($ in thousands)			
General and administrative expenses	$ 17,415	15%	$ 15,068	12%	$ 2,347	16%

General and administrative expenses increased by $2.3 million, or 16%, to $17.4 million in 2016 from $15.1 million in 2015. The $2.3 million increase was primarily the result of increases in the patent enforcement expense of $3.3 million offset, in part, by decreases in payroll and related costs of $0.6 million and facility expenses of $0.4 million. We expect general and administrative expenses to increase during 2017 due to an expected incentive based compensation payout in 2017 that did not occur in 2016. Due to the expected growth in general and administrative expenses and the projected decline in total revenue, we expect general and administrative expenses as a percentage of total revenue to increase in 2017.

We expect to continue to increase general and administrative personnel and expense levels in the long term to support the anticipated growth of our business and continued expansion of our manufacturing operations. We also expect that the patent enforcement actions, described in more detail under “Legal Proceedings” in part I, Item 3, of this Annual Report on Form 10-K, will result in high levels of legal expense in the near term and, if such actions are protracted, could result in significant additional legal expense over the medium to long term. In the longer term, we expect that general and administrative expenses will increase in absolute dollars but decrease as a percentage of revenue due to projected growth in product revenue.

Other Expense, Net

	Year Ended December 31,				Change	
	2016		2015			
	Amount	Percentage of Revenue	Amount	Percentage of Revenue	Amount	Percentage
			($ in thousands)			
Other expense, net						
Financing costs	$ (656)	(1)%	$ —	—%	$ (656)	(NA)
Interest expense, net	(147)	(0)%	(182)	(0)%	35	(19)%
Total other expense, net	$ (803)	(1)%	$ (182)	(0)%	$ (621)	341%

Total other expense, net, increased by $0.6 million to $0.8 million in 2016 from $0.2 million in 2015. The $0.6 million increase was primarily the result of a $0.7 million charge relating to financing costs, offset, in part, by a small decrease in interest expense. Interest expense in 2016 and 2015 was comprised primarily of costs related to our revolving credit facility.

Year ended December 31, 2015 compared to year ended December 31, 2014

The following tables set forth our results of operations for the periods presented:

	Year Ended December 31,				Year Ended December 31,	
	2015	2014	$ Change	% Change	2015	2014
	($ in thousands)				(Percentage of total revenue)	
Revenue:						
Product	$ 120,532	$ 99,259	$ 21,273	21%	98%	97%
Research services	1,986	3,140	(1,154)	(37)%	2%	3%
Total revenue	122,518	102,399	20,119	20%	100%	100%
Cost of revenue:						
Product	96,865	83,677	13,188	16%	79%	82%
Research services	1,005	1,642	(637)	(39)%	1%	2%
Gross profit	24,648	17,080	7,568	44%	20%	17%
Operating expenses:						
Research and development	5,253	5,980	(727)	(12)%	4%	6%
Sales and marketing	10,562	10,290	272	3%	9%	10%
General and administrative	15,068	16,853	(1,785)	(11)%	12%	16%
Total operating expenses	30,883	33,123	(2,240)	(7)%	25%	32%
Loss from operations	(6,235)	(16,043)	9,808	61%	(5)%	(16)%
Other income (expense), net:						
Interest expense, net	(182)	(50,281)	50,099	100%	(0)%	(49)%
Total other income (expense), net	(182)	(50,281)	50,099	100%	(0)%	(49)%
Net loss	$ (6,417)	$ (66,324)	$ 59,907	90%	(5)%	(65)%

Revenue

	Year Ended December 31,				Change	
	2015		2014			
	Amount	Percentage of Revenue	Amount	Percentage of Revenue	Amount	Percentage
	($ in thousands)					
Revenue:						
Product	$ 120,532	98%	$ 99,259	97%	$ 21,273	21%
Research services	1,986	2%	3,140	3%	(1,154)	(37)%
Total Revenue	$ 122,518	100%	$ 102,399	100%	$ 20,119	20%

The following chart sets forth product shipments in square feet for the periods presented:

	Year Ended December 31,		Change	
	2015	2014	Amount	Percentage
Product shipments in square feet (in thousands)	42,246	38,222	4,024	11%

Total revenue increased by $20.1 million, or 20%, in 2015 to $122.5 million from $102.4 million in 2014 as a result of an increase in product revenue.

Product revenue increased by $21.3 million, or 21%, to $120.5 million in 2015 from $99.3 million in 2014. This increase was principally the result of an increase in sales of our aerogel products in the European and Asian petrochemical markets and in the subsea market. The revenue increase reflects price increases enacted in late 2014 and a shift in mix of aerogel products sold toward higher priced products, most notably those sold in the subsea market. The average selling price per square foot of our products increased by an effective $0.26, or 9.9%, to $2.85 per square foot for the year ended December 31, 2015 from $2.60 per square foot for the year ended December 31, 2014. This increase in average selling price contributed $10.3 million to the increase in product revenue. In volume terms, product shipments increased 4.0 million square feet, or 11%, to 42.2 million square feet of aerogel products for the year ended December 31, 2015, as compared to 38.2 million square feet in the year ended December 31, 2014. The increase in volume was supported by the increase in manufacturing capacity associated with operation of the third production line in the East Providence facility. The increase in product volume contributed approximately $11.0 million to the increase in product revenue.

Research services revenue decreased by $1.2 million, or 37%, to $2.0 million in 2015 from $3.1 million in 2014. The decrease was primarily due to a reduction in the total value of active research contracts with government agencies in 2015. The reduction in the total value of active contracts is principally the result of limitations on our eligibility to receive contract awards under federal guidelines due to a variety of factors including the amount of our revenue, the number of our employees and the makeup of our ownership.

Product revenue as a percentage of total revenue was 98% and 97% of total revenue in 2015 and 2014, respectively. Research services revenue was 2% and 3% of total revenue in 2015 and 2014, respectively.

Cost of Revenue

	Year Ended December 31,						Change	
	2015			2014				
	Amount	Percentage of Related Revenue	Percentage of Total Revenue	Amount	Percentage of Related Revenue	Percentage of Total Revenue	Amount	Percentage
	($ in thousands)							
Cost of revenue:								
Product	$ 96,865	80%	79%	$ 83,677	84%	82%	$ 13,188	16%
Research services	1,005	51%	1%	1,642	52%	2%	(637)	(39)%
Total cost of revenue	$ 97,870	80%	80%	$ 85,319	83%	83%	$ 12,551	15%

Total cost of revenue increased by $12.6 million, or 15%, to $97.9 million in 2015 from $85.3 million in 2014. The increase in total cost of revenue was the result of an increase of $8.1 million in material costs and an increase of $5.1 million in manufacturing expense to support increased product revenue offset by a decrease of $0.6 million in cost of research services.

Product cost of revenue increased $13.2 million, or 16%, to $96.9 million in 2015 from $83.7 million in the comparable period in 2014. The $13.2 million increase was the result of an $8.1 million increase in material costs and a $5.1 million increase in manufacturing expense year over year. The increase in manufacturing expense was the result of increases in compensation expense of $2.0 million, utility expenses of $1.6 million and maintenance and facility expense of $1.5 million. The increased level of manufacturing expense was driven by the addition of the third production line in the East Providence facility, which commenced operation in the first quarter of 2015. Material costs in 2015 increased $8.1 million versus the comparable period in 2014 due to an 11% increase in product volume and a slight decline in product yields in 2015.

Product cost of revenue as a percentage of product revenue decreased to 80% during 2015 from 84% in 2014. The decrease was principally the result of a decrease in manufacturing expense as a percentage of product revenue. Strong revenue growth supported by output from the third production line in the East Providence facility and improved manufacturing productivity contributed to the decrease in manufacturing expense as a percentage of product revenue.

Research services cost of revenue decreased by $0.6 million, or 39%, to $1.0 million in 2015 from $1.6 million in 2014. The decrease in research services cost of revenue was due to a reduction in active research contracts during 2015, offset, in part, by an unfavorable mix of labor and expense required to perform the contracted research. The decrease in cost of research services revenue was due principally to the reduction in research services revenue during 2015.

Gross Profit

	Year Ended December 31,				Change	
	2015		2014			
	Amount	Percentage of Revenue	Amount	Percentage of Revenue	Amount	Percentage
	($ in thousands)					
Gross profit	$ 24,648	20%	$ 17,080	17%	$ 7,568	44%

Gross profit increased by $7.6 million, or 44%, to $24.6 million in 2015 from $17.1 million in 2014. Gross profit as a percentage of total revenue increased to 20% of total revenue for 2015 from 17% in 2014. The increase in gross profit as a percentage of revenue was principally the result of strong revenue growth supported by output from the third production line in the East

Providence facility and improved manufacturi ng productivity. Price increases enacted late in 2014 and a favorable mix of aerogel products sold also contributed to the increase in gross profit as a percentage of revenue during 2015.

Research and Development Expenses

	Year Ended December 31,				Change	
	2015		2014			
	Amount	Percentage of Revenue	Amount	Percentage of Revenue	Amount	Percentage
	($ in thousands)					
Research and development expenses	$ 5,253	4%	$ 5,980	6%	$ (727)	(12)%

Research and development expenses decreased by $0.7 million to $5.3 million in 2015 from $6.0 million in 2014. This decrease was primarily the result of a decrease in employee compensation expenses, including $0.4 million of stock-based compensation charges and $0.3 million of payroll and related costs.

Sales and Marketing Expenses

	Year Ended December 31,				Change	
	2015		2014			
	Amount	Percentage of Revenue	Amount	Percentage of Revenue	Amount	Percentage
	($ in thousands)					
Sales and marketing expenses	$ 10,562	9%	$ 10,290	10%	$ 272	3%

Sales and marketing expenses increased by $0.3 million, or 3%, to $10.6 million in 2015 from $10.3 million during 2014. The $0.3 million increase was the result of a $0.6 million increase in payroll and related costs associated with an increase in sales personnel and $0.1 million increase in product marketing expenses, offset by a reduction in stock-based compensation expense of $0.4 million.

General and Administrative Expenses

	Year Ended December 31,				Change	
	2015		2014			
	Amount	Percentage of Revenue	Amount	Percentage of Revenue	Amount	Percentage
	($ in thousands)					
General and administrative expenses	$ 15,068	12%	$ 16,853	16%	$ (1,785)	(11)%

General and administrative expenses decreased by $1.8 million, or 11%, to $15.1 million in 2015 from $16.9 million in 2014. The $1.8 million decrease was primarily the result of decreases in stock-based compensation expense of $2.3 million, depreciation expense of $0.4 million, and payroll and related costs of $0.6 million, offset, in part, by an increase in legal, professional services and insurance expenses associated with operating as a public company of $1.5 million.

Other Income (Expense), net

	Year Ended December 31,				Change	
	2015		2014			
	Amount	Percentage of Revenue	Amount	Percentage of Revenue	Amount	Percentage
	($ in thousands)					
Interest expense, net	$ (182)	(0)%	$ (50,281)	(49)%	$ 50,099	100%

Total other expense, net was less than $0.2 million for the year ended December 31, 2015 as compared to $50.3 million in the comparable period in 2014.

Interest expense of less than $0.2 million for the year ended December 31, 2015 was comprised primarily of costs related to our revolving credit facility. During 2014, we incurred $50.3 million in interest expense comprised of changes in fair value of $1.5 million for the subordinated notes, $11.4 million for the senior convertible notes and $37.1 million for the convertible notes, and $0.3 million in debt closing costs and other interest expense. The changes in fair va lue of the respective notes were calculated based on the final payment and conversion amounts of the notes into equity upon the consummation of our IPO on June 18, 2014.

Liquidity and Capital Resources

Overview

We have experienced significant losses and invested substantial resources since our inception to develop and commercialize our aerogel technology and to build a manufacturing infrastructure capable of supplying aerogel products at the volumes and costs required by our customers. These investments have included research and development and other operating expenses, capital expenditures and investment in working capital balances.

Through 2015, we experienced revenue growth and gained share in our target markets. Despite a decline in revenue in 2016 and an expected decline in revenue in 2017, our financial projections anticipate long-term revenue growth, with increasing levels of gross profit and improved cash flows from operations. However, we expect to incur significant capital expenditures related to the expansion of our manufacturing capacity to support this expected long term growth in demand.

We believe that our existing cash balance and available credit will be sufficient to fund the design and development and a portion of the construction of our second manufacturing facility. We expect to supplement our cash balance and available credit with anticipated cash flows from operations, local government grants, debt financings, customer prepayments and potentially equity financings to provide the capital required to complete the first production line in our second manufacturing facility.

We currently anticipate that constrained capital investment and low activity levels in the global energy markets will continue into 2017. With this view of the market, we elected in late 2016 to temporarily delay the board approved project to construct a second manufacturing facility and its related financing to better align the capacity expansion with our assessment of demand for the 2018 to 2020 period.

Primary Sources of Liquidity

Our principal sources of liquidity are currently our cash and cash equivalents and our revolving credit facility with Silicon Valley Bank. Cash and cash equivalents consist primarily of cash and money market accounts on deposit with banks. As of December 31, 2016, we had $18.1 million of cash and cash equivalents.

At December 31, 2016, our debt obligations were limited to $0.1 million related to capital lease obligations. At December 31, 2016, we also had $2.7 million of outstanding letters of credit secured by our revolving credit facility with Silicon Valley Bank.

We have maintained a revolving credit facility with Silicon Valley Bank since March 2011, which has been amended from time to time. Under our revolving credit facility, we are permitted to borrow a maximum of $20.0 million, subject to continued covenant compliance and borrowing base requirements. At our election, the interest rate applicable to borrowings under the amended revolving credit facility may be based on the prime rate or LIBOR. Prime rate-based rates vary from prime rate plus 0.75% per annum to prime rate plus 1.75% per annum, while LIBOR-based rates vary from LIBOR plus 3.75% per annum to LIBOR plus 4.25% per annum. In addition, we are required to pay a monthly unused revolving line facility fee of 0.5% per annum of the average unused portion of the revolving credit facility. The revolving credit facility matures on January 28, 2018.

Due to the borrowing base limitations of the revolving credit facility, the effective amount available to us under the facility at December 31, 2016 was $12.1 million after giving effect to the $2.7 million of letters of credit outstanding. As of December 31, 2016, we had no outstanding balances drawn on the revolving credit facility.

Analysis of Cash Flow

The following table summarizes our cash flows for the periods indicated:

	Year Ended December 31, 2016	2015	2014
	($ in thousands)		
Net cash (used in) provided by:			
Operating activities	$ (578)	$ 5,359	$ 6,648
Investing activities	(13,216)	(21,956)	(13,241)
Financing activities	(924)	(318)	54,738
Net (decrease) increase in cash	(14,718)	(16,915)	48,145
Cash, beginning of period	32,804	49,719	1,574
Cash and cash equivalents, end of period	$ 18,086	$ 32,804	$ 49,719

Operating Activities

During 2016, we used $0.6 million net cash in operating activities, as compared to generating $5.4 million in net cash during the comparable period of 2015, a decrease of $6.0 million. This decrease was the result of a decrease in cash from changes in operating assets and liabilities of $1.0 million and an unfavorable year-to-year change in net loss adjusted for non-cash items of $5.0 million.

During 2015, we generated $5.4 million net cash in operating activities, as compared to generating $6.6 million in net cash during the comparable period of 2014, a decrease of $1.2 million. This decrease was primarily the result of a decrease in cash from changes in operating assets and liabilities of $7.2 million, offset, in part, by a favorable year-to-year change in net loss adjusted for non-cash items of $6.0 million.

Investing Activities

Net cash used in investing activities is primarily related to capital expenditures to support our growth. Net cash used in investing activities for 2016 and 2015 totaled $13.2 million and $22.0 million, respectively.

Net cash used in investing activities in 2016 included $7.2 million in capital expenditures for engineering design and other pre-construction costs related to our planned manufacturing facility in Statesboro, Georgia. In addition, net cash used in investing activities in 2016 included capital expenditures for machinery and equipment for our full scale pilot line, to support our new product line for the power market and to improve the throughput and efficiency of our East Providence facility.

Net cash used in investing activities in 2015 included capital expenditures of approximately $16.2 million to complete the construction of the third production line to expand the capacity of our East Providence manufacturing facility. In addition, net cash used in investing activities in 2015 included capital expenditures for machinery and equipment to improve the throughput and efficiency of our East Providence facility, engineering designs and other pre-construction costs related to our planned manufacturing facility in Statesboro, Georgia as well as the purchase and maturity of $2.5 million of marketable securities.

Financing Activities

Net cash used in financing activities in 2016 totaled $0.9 million and consisted of $0.2 million for payments made for employee tax withholdings associated with the vesting of restricted stock units, approximately $0.7 million related to financing costs and less than $0.1 million for repayments of obligations under capital leases. Net cash used in financing activities in 2015 totaled $0.3 million and consisted of $0.1 million for repayments of obligations under capital leases and $0.2 million for payments made for employee minimum tax withholdings associated with the vesting of restricted stock units.

Capital Spending and Future Capital Requirements

We have made capital expenditures primarily to develop and expand our manufacturing capacity. Our capital expenditures totaled $13.2 million in 2016, $22.0 million in 2015 and $13.2 million in 2014. As of December 31, 2016, we had capital commitments of approximately $1.1 million, which included commitments for which we have entered into contracts as well as commitments authorized by our Board of Directors. These commitments relate to the improvement of our existing production lines and the design and engineering of our second manufacturing facility to be built in Statesboro, Georgia. These commitments consist of engineering costs, equipment costs, construction costs and related financing costs. We plan to fund these capital commitments from available cash proceeds from our IPO and anticipated available credit.

We intend to fund capital expenditures related to the design, development and construction of our planned second manufacturing facility with the remaining proceeds from our IPO, anticipated available credit, cash flow from operations, local government grants , debt financings , customer prepayments and potentially equity financings. We estimate that the total expenditures for the second plant infrastructure and the first production line in our second manufacturing facilit y will be approximately $1 2 0 million to $1 3 0 million.

Off-Balance Sheet Arrangements

Since inception, we have not engaged in any off balance sheet activities as defined in Item 303(a)(4) of Regulation S-K.

Contractual Obligations and Commitments

The following table summarizes our contractual obligations as of December 31, 2016, under contracts that provide for fixed and determinable payments over the periods indicated:

Contractual Obligations	Total	Less than 1 Year	1-3 Years	4-5 Years	More than 5 Years
			($ in thousands)		
Purchase order commitments	$ 4,333	$ 4,333	$ —	$ —	$ —
Supplier purchase commitments	21,450	9,097	12,353	—	—
Operating leases	6,932	1,222	2,693	505	2,512
Capital leases	43	38	5	—	—
Total	$ 32,758	$ 14,690	$ 15,051	$ 505	$ 2,512

Operating and Capital Leases

We lease our office space for our corporate offices in Northborough, Massachusetts, which expires in 2026, and warehouse space and land nearby our East Providence facility, which expire at various dates from 2017 through 2021, under non-cancelable operating lease agreements. See “Item 2 — Properties.” We also lease vehicles and equipment under non-cancelable capital and operating leases that expire at various dates.

Operating Leases

On June 29, 2016, we entered into an Industrial Real Estate Lease, or the Lease, with Cabot II- MA1M03, LLC, or Cabot Properties, to lease approximately 51,650 square feet of space located at 30 Forbes Road, Northborough, MA 01532, the location of our current headquarters. The Lease supersedes the Multi-Tenant Industrial Net Lease dated as of August 20, 2001, as amended, by and between us and TMT 290 Industrial Park, Inc., Cabot Properties’ predecessor-in-interest. The term of the Lease began on January 1, 2017 and ends on December 31, 2026. The annual base rent associated with the Lease will be approximately $408,000 during the first year, increasing by approximately 3% annually for the term of the Lease, to be paid monthly. The Lease also provides for our payment of our pro rata share of real estate taxes and certain other expenses. Upon expiration of the Lease term, we will have the right to extend the Lease for an additional term of three years.

Supply Agreement

On June 21, 2016, we entered into a supply agreement and a side agreement (together, the Supply Agreement) with BASF SE, or BASF. Pursuant to the Supply Agreement, we will sell exclusively to BASF our Spaceloft ® A2 product, or the Product, at annual volumes to be specified by BASF, subject to certain volume limits. Pricing shall be based on a cost-plus formula. The Supply Agreement also specifies the markets in which BASF will be permitted to sell Product. The Supply Agreement will terminate on December 31, 2027, if not renewed prior to such date. Upon expiration of the Supply Agreement, we will be subject to a post-termination supply commitment for an additional two years. In addition to the customary terms associated with supply agreements, in order to support our anticipated investment in Plant Two, BASF will make a non-interest bearing advance to us in the aggregate amount of $22 million, or the Pre-Payment, during the construction of Plant Two, subject to our prior satisfaction of certain preconditions related to the finalization of certain aspects of the Product specification and the progress of the financing and construction of Plant Two, including securing a debt commitment from a third party lender for at least $30 million. In addition, prior to BASF paying any Pre-Payment, we will be required to secure our obligation to repay the Pre-Payment with a first priority security interest in all of our interest in real estate, machinery and equipment located at our existing manufacturing facility in East Providence, Rhode Island and that may, in the future, be located at Plant Two. Additionally, we will grant non-exclusive licenses to our subsidiaries under our intellectual property as necessary to operate such machinery and equipment. BASF will pay the Pre-Payment to us in eight equal consecutive quarterly installments commencing on the later of (i) October 1, 2016 or (ii) the first day of the calendar quarter following the da te on which the Plant Two progress preconditions are met. Once commenced, BASF's obligation to make such quarterly payments will be subject to postponement in the event of delays of three months or more in the projected date of completion of Plant Two by a commensurate number of months. After October 1, 2018, we will, at BASF's instruction, credit up to 25.3% of any amounts that we invoice for Product sold to BASF against the Pre-Payment. BASF has no obligation to purchase Product under the supply agreement . If any of the Pre-Payment remains uncredited against amounts that we invoice as described above as of September 30, 2023, BASF may request that we repay the unused amount to BASF in four equal quarterly installments beginning on December 31, 2023. Notwit hstanding the foregoing, we may repay the Pre-Payment to BASF at any time in whole or in part for any reason. In the event of a sale of all or substantially all of our assets or a change of control of the Company, BASF may in certain instances have the rig ht to terminate the supply agreement, in which case any uncredited amount of the Pre-Payment as of such sale or change of control will be due and payable to BASF within 30 days of the relevant transaction.

As of December 31, 2016, we anticipate that the impact of constrained capital investment and low activity levels in the global energy markets will continue into 2017. With this view of the market, we decided, at our sole discretion, to temporarily delay the board approved Plant Two project and its related financing to better align the capacity expansion with our assessment of demand for the 2018 to 2020 period. As a result, we have yet to fulfill certain of the prepayment preconditions, and commencement of the quarterly prepayments from BASF will be delayed until such preconditions are satisfied.

Joint Development Agreement

Contemporaneous with the execution of the Supply Agreement, we and BASF also entered into a Joint Development Agreement, or the JDA, setting forth the rights and obligations of us and BASF with respect to collaboration between the parties on the development and commercialization of new products. Under the JDA, each party may propose that the parties enter into joint efforts to seek to develop one or more products or services for commercialization on terms to be agreed by the parties. The JDA establishes a joint steering committee with equal representation from each of us and BASF to oversee any such collaboration. Unless otherwise agreed, all intellectual property created in the performance of joint development activities will generally be jointly owned by us and BASF. The JDA will have an initial term of two years with the option for the parties to renew at the expiration. Either party may terminate the JDA for any reason with 90-days prior notice to the other party, provided that such termination will not terminate any project under the JDA then in progress, with any such ongoing project able to be terminated by either party for any reason on 90-days prior notice to the other party.

Revolving Credit Facility

In March 2011, we entered into a revolving credit facility with Silicon Valley Bank. This facility has been amended at various dates through December 2016. We further negotiated an extension of the facility on January 27, 2017 to extend the maturity date to January 28, 2018. Under the facility, we are permitted to borrow a maximum of $20.0 million, subject to continued covenant compliance and borrowing base requirements. At our election, the interest rate applicable to borrowings under the amended revolving credit facility may be based on the prime rate or LIBOR. Prime rate-based rates vary from prime rate plus 0.75% per annum to prime rate plus 1.75% per annum, while LIBOR-based rates vary from LIBOR plus 3.75% per annum to LIBOR plus 4.25% per annum. In addition, we are required to pay a monthly unused revolving line facility fee of 0.5% per annum of the average unused portion of the revolving credit facility.

Due to the borrowing base limitations, the effective amount available to us under the revolving credit facility at December 31, 2016 was $12.1 million after giving effect to the $2.7 million of letters of credit outstanding. As of December 31, 2016, we had no outstanding balances drawn on the revolving credit facility.

Accrued Asset Retirement Obligations

As of December 31, 2015, the Company had asset retirement obligations (ARO) arising from requirements to perform certain asset retirement activities upon the termination of its Northborough, Massachusetts facility lease and upon disposal of certain machinery and equipment. The liability was initially measured at fair value and subsequently adjusted for accretion expense and changes in the amount or timing of the estimated cash flows. The corresponding asset retirement costs are capitalized as part of the carrying amount of the related long-lived asset and depreciated over the asset's remaining useful life.

During the year ended December 31, 2016, the Company incurred approximately $0.2 million in expenditures in support of completing the restoration of 31,577 square feet of space formerly utilized for manufacturing operations in the Northborough, Massachusetts facility. This manufacturing space was vacated and returned to the landlord on July 1, 2016.

On June 29, 2016, the Company executed an agreement to remain at the Northborough, Massachusetts facility through December 31, 2026. As part of the new agreement, the Company's obligation to restore the remaining space in the Northborough facility was eliminated. The settle ment of the remaining reserve balance of approximately $0.2 million was reclassified to accrued expenses and will be amortized as a reduction to rent expense over the term of the new lease agreement.

Recent Accounting Pronouncements

In August 2016, the Financial Accounting Standards Board (FASB) issued Accounting Standards Update (ASU) No. 2016-15, Statement of Cash Flows (Topic 230): Classification of Certain Cash Receipts and Cash Payments (FASB ASU 2016-15). This amendment addresses eight classification issues related to the statement of cash flows. For public business entities, the amendments in FASB ASU 2016-15 are effective for public business entities for annual and interim periods in fiscal years beginning after December 15, 2017. Early adoption is permitted, including adoption in an interim period. We have not yet selected a transition method and are evaluating the effect the updated standard will have on our consolidated financial statements and related disclosures.

In March 2016, the FASB issued ASU No. 2016-09, Compensation – Stock Compensation (Topic 718): Improvements to Employee Share-Based Payment Accounting (FASB ASU 2016-09). The amendment is to simplify several aspects of the accounting for share-based payment transactions including the income tax consequences, classification of awards as either equity or liabilities, and classification on the statement of cash flows. For public entities, the amendments in FASB ASU 2016-09 are effective for interim and annual reporting periods beginning after December 15, 2016. We evaluated the impact of the adoption of this standard and have determined that it will not have a material impact on our consolidated results of operations and financial condition.

In February 2016, the FASB issued ASU 2016-02, Leases (Topic 842) (FASB ASU 2016-02). FASB ASU 2016-02 changes the accounting for leases and includes a requirement to record all leases on the consolidated balance sheets as assets and liabilities. This update is effective for fiscal years beginning after December 15, 2018. Early application is permitted. We have not yet selected a transition method and are evaluating the effect the updated standard will have on our consolidated financial statements and related disclosures.

In November 2015, the FASB issued ASU 2015-17, *Income Taxes: Balance Sheet Classification of Deferred Taxes* (FASB ASU 2015-17). FASB ASU 2015-17 requires that deferred tax assets and liabilities be classified as noncurrent on the balance sheet. This update is effective for fiscal years, and interim periods within those years, beginning after December 15, 2015. Earlier adoption is permitted and the standard may be applied either retrospectively or on a prospective basis to all deferred tax assets and liabilities. We have elected, as permitted by the standard, to early adopt FASB ASU 2015-17 prospectively, effective for the period ended December 31, 2016. The adoption of this update did not have a material impact on our consolidated financial statements.

In August 2015, the FASB issued a deferral of ASU 2014-09, *Revenue from Contracts with Customers* . The standard will eliminate the transaction- and industry-specific revenue recognition guidance under current U.S. GAAP and replace it with a principle based approach for determining revenue recognition. As a result of the deferral, public entities are required to apply the revenue recognition standard for annual reporting period beginning on or after December 15, 2017, including interim periods within that annual reporting period. Early application is permitted only as of annual and interim periods in fiscal years beginning after December 15, 2016. We have not yet selected a transition method and are evaluating the effect that the updated standard will have on our consolidated financial statements and related disclosures.

In July 2015, the FASB issued ASU 2015-11, *Inventory Topic 330,* which, for entities that do not measure inventory using the last-in, first-out (LIFO) or retail inventory method, changes the measurement principle for inventory from the lower of cost or market to lower of cost and net realizable value. The ASU also eliminates the requirement for these entities to consider replacement cost or net realizable value less an approximately normal profit margin when measuring inventory. Public entities are required to apply the new standard for annual reporting periods beginning after December 15, 2016 and interim periods within those fiscal periods. This standard is to be applied prospectively. Early adoption is permitted as of the beginning of an interim or annual period. We do not expect the adoption of this standard to have a material impact on our consolidated financial statements and related disclosures.

From time to time, new accounting pronouncements are issued by the FASB or other standard setting bodies and adopted by the Company as of the specified effective date. Unless otherwise discussed, we believe that the impact of recently issued standards that are not yet effective will not have a material impact on our financial position or results of operations upon adoption.

Critical Accounting Policies and Estimates

Our financial statements are prepared in accordance with accounting principles generally accepted in the United States of America. The preparation of our financial statements and related disclosures requires us to make estimates, assumptions and judgments that affect the reported amount of assets, liabilities, revenue, costs and expenses and related disclosures. We bel ieve that the estimates, assumptions and judgments involved in these accounting policies have the greatest potential impact on our financial statements; and therefore, we consider these to be our critical accounting policies. Accordingly, we evaluate our e stimates and assumptions on an ongoing basis. Our actual results may differ from these estimates under different assumptions and conditions. See note 2 to our consolidated financial statements included elsewhere in this Annual Report on Form 10-K for infor mation about these critical accounting policies, as well as a description of our other significant accounting policies.

Revenue Recognition

We recognize product revenue from the sale of our line of aerogel products upon shipment or delivery, and research services revenue upon delivery of research and development services, including under contracts with various agencies of the U.S. government. Revenue is recognized when all of the following criteria are met: persuasive evidence of an arrangement exists, the price to the buyer is fixed or determinable, delivery has occurred or services have been provided and collectability is reasonably assured. Product revenue is recognized upon transfer of title and risk of loss, which is upon shipment or delivery. In general, our customary shipping terms are FOB shipping point. Products are typically delivered without significant post-sale obligations to customers other than standard warranty obligations for product defects. We provide warranties for our products and record the estimated cost within cost of sales in the period that the revenue is recorded. Our standard warranty period extends one to two years from the date of shipment, depending on the type of product purchased. Our warranties provide that our products will be free from defects in material and workmanship, and will, under normal use, conform to the specifications for the product. In 2016, we recorded warranty expense of $0.5 million. This specific reserve was principally related to product warranty claims for a specific project. These claims were outside of the Company’s typical experience. As of December 31, 2016, we had satisfied all outstanding warranty claims. For the years ended December 31, 2015 and 2014, warranty charges were immaterial to our consolidated financial statements.

Research services revenue is derived from the execution of contracts awarded by the U.S. government, other government agencies and other institutions. Our research and development arrangements require us to provide research in which we investigate new applications of aerogel technology. We record revenue earned on research services contracts using the percentage-of-completion method in two ways: (1) for firm-fixed-price contracts, we accrue that portion of the total contract price that is allocable, on the basis of our estimates of costs incurred to date to total contract cost; (2) for cost-plus-fixed-fee contracts, we record revenue that is equal to total payroll cost incurred times a stated factor plus reimbursable expenses, to a stated upper limit. The primary cost in these arrangements is the labor effort expended in completing the research and the only deliverable other than labor hours expended is the reporting of the research results to the customer. Because the input measure of labor hours expended is also reflective of the output measure, it is a reliable means to measure the extent of progress towards completion. Contract costs and rates used to allocate overhead to contracts are subject to audit by the respective contracting government agency. Revisions in cost estimates and fees during the course of the contract are reflected in the accounting period in which the facts that require the revisions become known.

Stock-based Compensation

We maintain an equity incentive plan pursuant to which our board of directors may grant qualified and nonqualified stock options, restricted stock, restricted stock units and other stock-based awards to board members, officers, key employees and others who provide or have provided service to us.

We measure the costs associated with stock-based awards based on their estimated fair value at date of grant. We recognize the costs of stock-based awards as service, performance or market conditions are met. Future expense amounts for any particular quarterly or annual period could be affected by changes in our assumptions or changes in market conditions.

Stock Options

We use the Black-Scholes option-pricing model to estimate the fair value of stock option awards. The determination of the estimated fair value of stock option awards is based on a number of complex and subjective assumptions. These assumptions include the determination of the estimated fair value of the underlying security (prior to our IPO), the expected volatility of the underlying security, a risk-free interest rate, the expected term of the option, and the forfeiture rate for the award class. The following assumptions were used to estimate the fair value of the option awards:

	Year Ended December 31,		
	2016	**2015**	**2014**
Weighted-average assumptions:			
Expected term (in years)	5.86	6.02	6.17
Expected volatility	53.56%	57.95%	50.09%
Risk free rate	1.36%	1.79%	1.94%
Expected dividend yield	—%	—%	—%

- The expected term represents the period that our stock-based awards are expected to be outstanding and is determined using the simplified method described in ASC Topic 718, *Compensation — Stock Compensation* , for all grants. We believe this is a better representation of the estimated life than our actual limited historical exercise behavior.
- For the years ended December 31, 2016, 2015 and 2014, the expected volatility is based on the weighted-average volatility of up to 19 companies within various industries that we believe are similar to our own
- The risk-free interest rate is based on U.S. Treasury zero-coupon issues with a remaining term equal to the expected life assumed at the date of grant.
- We use an expected dividend yield of zero, since we do not intend to pay cash dividends on our common stock in the foreseeable future, nor have we paid dividends on our common stock in the past.

As share-based compensation expense is recognized based on awards ultimately expected to vest, it has been reduced for an estimated forfeiture rate of 7.0%, 7.0% and 6.5% for the years ended December 31, 2016, 2015 and 2014, respectively. Forfeitures are required to be estimated at the time of grant and revised, if necessary, in subsequent periods, if actual forfeitures differ from those estimates. Forfeitures were estimated based on voluntary termination behavior as well as analysis of actual option forfeitures.

For performance-based stock options issued during the year ended December 31, 2013, we used a Monte Carlo simulation model to estimate the number of options we expected to remain outstanding and eligible for vesting upon completion of an initial public offering (IPO). The simulation model was based on a number of complex assumptions including the terms of the performance condition, the expected value of our common stock at the time of an IPO, the expected time from the date of grant to an IPO, and expected volatility. The compensation cost of these performance-based options was determined by multiplying the Black-Scholes estimate of grant date fair value by the percentage of options expected to remain outstanding and eligible for vesting upon completion of an IPO. As a result of the closing of our IPO, the awards began to vest and we recorded $6.4 million of stock-based compensation related to these performance-based awards during the year ended December 31, 2014.

For stock options that contained a market condition issued to the Company's chief executive officer (the CEO Options) during the year ended December 31, 2015, the Company used a Monte Carlo Simulation model to estimate the grant date fair value of awards expected to vest. The simulation model was based on a number of complex assumptions including (i) if the vesting condition is satisfied within the time-vesting periods, and (ii) the date the common stock price target is met per the terms of the agreement. For restricted stock awards issued to the Company's Chief Executive Officer that contain a performance condition, the Company assesses the probability that the performance condition will be satisfied. As of December 31, 2016, the Company has determined that the performance-based condition of this restricted stock awards was not probable, and no compensation has been recorded to date in conjunction with the award.

Income Taxes

Income taxes are accounted for under the asset and liability method. Deferred tax assets and liabilities are recognized for the future tax consequences attributable to differences between the financial statement carrying amounts of existing assets and liabilities and their respective tax bases and operating loss and tax credit carryforwards. Deferred tax assets and liabilities are measured using enacted tax rates expected to apply to taxable income in the years in which those temporary differences are expected to be recovered or settled. The effect on deferred tax assets and liabilities of a change in tax rates is recognized in income in the period that includes the enactment date.

We recognize the effect of income tax position s only if those positions are more likely than not of being sustained. We account for uncertain tax positions using a recognition threshold and measurement attribute for the financial statement recognition and measurement of a tax position taken or expecte d to be taken in a tax return. Differences between tax positions taken in a tax return and amounts recognized in the financial statements are recorded as adjustments to income taxes payable or receivable, or adjustments to deferred taxes, or both. Changes in recognition or measurement are reflected in the period in which the change in judgment occurs. We recognize penalties and interest related to recognized tax positions, if any, as a component of income tax expense.

Management's judgment and estimates are required in determining our tax provision, deferred tax assets and liabilities and any valuation allowance recorded against deferred tax assets. We review the recoverability of deferred tax assets during each reporting period by reviewing estimates of future taxable income, future reversals of existing taxable temporary differences and tax planning strategies that would, if necessary, be implemented to realize the benefit of a deferred tax asset before expiration. We have recorded a full valuation allowance against our deferred tax assets due to the uncertainty associated with the utilization of the net operating loss carryforwards. In assessing the realizability of deferred tax assets, we consider all available evidence, historical and prospective, with greater weight given to historical evidence, in determining whether it is more likely than not that some portion or all of the deferred tax assets will not be realized. The ultimate realization of our deferred tax assets generally is dependent upon generation of future taxable income.

Impairment of Long-Lived Assets

Long-lived assets are reviewed for impairment whenever events or changes in circumstances indicate that the carrying amount of an asset may not be recoverable. Recoverability of assets to be held and used is measured by a comparison of the carrying amount of an asset to future undiscounted net cash flows expected to be generated by the asset. If the carrying amount of an asset exceeds its estimated undiscounted future cash flows, an impairment charge is recognized for the amount by which the carrying amount of the asset exceeds the fair value of the asset. Fair value is determined through various valuation techniques including discounted cash flows models, quoted market values and third-party independent appraisals, as considered necessary.

Item 7A. QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK

Market risk represents the risk of loss that may impact our financial position due to adverse changes in financial market prices and rates. Our market risk exposure results primarily from fluctuations in interest rates as well as from inflation. In the normal course of business, we are exposed to market risks, including changes in interest rates which affect our line of credit under our revolving credit facility as well as cash flows. We may also face additional exchange rate risk in the future as we expand our business internationally.

Interest Rate Risk

We are exposed to changes in interest rates in the normal course of our business. At December 31, 2016, we had unrestricted cash and cash equivalents of $18.1 million. These amounts were held for working capital and capital expansion purposes and were invested primarily in deposit and money market accounts at a major financial institution in North America. Due to the short-term nature of these investments, we believe that our exposure to changes in the fair value of our cash as a result of changes in interest rates is not material.

As of December 31, 2016, we had no debt outstanding other than capital lease obligations of approximately $0.1 million with fixed interest rates. At December 31, 2016, we also had $2.7 million of outstanding letters of credit.

Under our revolving credit facility, we are permitted to borrow a maximum of $20.0 million, subject to continued covenant compliance and borrowing base requirements. At our election, the interest rate applicable to borrowings under the amended revolving credit facility may be based on the prime rate or LIBOR. Prime rate-based rates vary from prime rate plus 0.75% per annum to prime rate plus 1.75% per annum, while LIBOR-based rates vary from LIBOR plus 3.75% per annum to LIBOR plus 4.25% per annum. In addition, we are required to pay a monthly unused revolving line facility fee of 0.5% per annum of the average unused portion of the revolving credit facility. The maturity date of our revolving credit facility is January 28, 2018.

Due to the borrowing base limitations, the effective amount available to us under the revolving credit facility at December 31, 2016 was $12.1 million after giving effect to the $$2.7 million of letters of credit outstanding. As of December 31, 2016, we had no outstanding balances drawn on the revolving credit facility.

Inflation Risk

Although we expect that our operating results will be influenced by general economic conditions, we do not believe that inflation has had a material effect on our results of operations during the periods presented in this report. However, our business may be affected by inflation in the future.

Foreign Currency Exchange Risk

We are subject to inherent risks attributed to operating in a global economy. Principally all of our revenue, receivables, purchases and debts are denominated in U.S. dollars.

Item 8. FINANCIAL STATEMEN TS AND SUPPLEMENTARY DATA

Report of Independent Registered Public Accounting Firm

The Board of Directors and Stockholders
Aspen Aerogels, Inc.:

We have audited the accompanying consolidated balance sheets of Aspen Aerogels, Inc. and subsidiaries as of December 31, 2016 and 2015, and the related consolidated statements of operations, stockholders' equity, and cash flows for each of the years in the three-year period ended December 31, 2016. These consolidated financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on these consolidated financial statements based on our audits.

We conducted our audits in accordance with the standards of the Public Company Accounting Oversight Board (United States). Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audits provide a reasonable basis for our opinion.

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of Aspen Aerogels, Inc. and subsidiaries as of December 31, 2016 and 2015, and the results of their operations and their cash flows for each of the years in the three-year period ended December 31, 2016, in conformity with U.S. generally accepted accounting principles.

/s/ KPMG LLP

Boston, Massachusetts
March 2, 2017

ASPEN AEROGELS, INC.

Consolidated Balance Sheets

	December 31, 2016	December 31, 2015
	(In thousands, except share and per share data)	
Assets		
Current assets:		
Cash and cash equivalents	$ 18,086	$ 32,804
Accounts receivable, net of allowances of $93 and $89	17,535	20,624
Inventories	12,868	6,532
Prepaid expenses and other current assets	1,697	1,687
Total current assets	50,186	61,647
Property, plant and equipment, net	84,394	78,322
Other long-term assets	89	105
Total assets	$ 134,669	$ 140,074
Liabilities and Stockholders' Equity		
Current liabilities:		
Capital leases, current portion	$ 35	$ 67
Accounts payable	13,065	10,684
Accrued expenses	3,987	5,568
Deferred revenue	1,043	681
Other current liabilities	—	409
Total current liabilities	18,130	17,409
Capital leases, excluding current portion	4	40
Other long-term liabilities	971	151
Total liabilities	19,105	17,600
Commitments and contingencies (Note 9)		
Stockholders' equity:		
Preferred stock, $0.00001 par value; 5,000,000 shares authorized, no shares issued or outstanding at December 31, 2016 and 2015	—	—
Common stock, $0.00001 par value; 125,000,000 shares authorized, 23,369,838 shares issued and outstanding at December 31, 2016; 23,184,852 shares issued and outstanding at December 31, 2015	—	—
Additional paid-in capital	533,088	527,975
Accumulated deficit	(417,524)	(405,501)
Total stockholders' equity	115,564	122,474
Total liabilities and stockholders' equity	$ 134,669	$ 140,074

See accompanying notes to consolidated financial statements.

ASPEN AEROGELS, INC.

Consolidated Statements of Operations

	Year Ended December 31,		
	2016	2015	2014
		(In thousands, except share and per share data)	
Revenue:			
Product	$ 115,490	$ 120,532	$ 99,259
Research services	2,248	1,986	3,140
Total revenue	117,738	122,518	102,399
Cost of revenue:			
Product	93,123	96,865	83,677
Research services	1,304	1,005	1,642
Gross profit	23,311	24,648	17,080
Operating expenses:			
Research and development	5,306	5,253	5,980
Sales and marketing	11,810	10,562	10,290
General and administrative	17,415	15,068	16,853
Total operating expenses	34,531	30,883	33,123
Loss from operations	(11,220)	(6,235)	(16,043)
Other expense, net:			
Financing costs	(656)	—	—
Interest expense, net	(147)	(182)	(50,281)
Total other expense, net	(803)	(182)	(50,281)
Net loss	$ (12,023)	$ (6,417)	$ (66,324)
Net loss per share:			
Basic and diluted	$ (0.52)	$ (0.28)	$ (5.37)
Weighted-average common shares outstanding:			
Basic and diluted	23,139,807	22,986,931	12,349,456

See accompanying notes to consolidated financial statements.

ASPEN AEROGELS, INC.

Consolidated Statements of Stockholders' Equity
(In thousands, except share and per share data)

	Series C convertible preferred stock $0.00001 Par Value		Series B convertible preferred stock $0.00001 Par Value		Series A convertible preferred stock $0.00001 Par Value		Preferred Stock $0.00001 Par Value		Common Stock $0.00001 Par Value		Additional Paid-in Capital	Accumulated Deficit	Total Stockholders' Equity (Deficit)
	Shares	Value	Shares	Value	Shares	Value	Shares	Value	Shares	Value			
Balance at December 31, 2013	20,000	$ —	1,601,053	$ —	5,284,347	$ —	—	$ —	3,137	$ —	$ 270,794	$ (332,760)	$ (61,966)
Net loss	—	—	—	—	—	—	—	—	—	—	—	(66,324)	(66,324)
Issuance of common stock	—	—	—	—	—	—	—	—	31	—	3	—	3
Stock compensation expense	—	—	—	—	—	—	—	—	—	—	8,781	—	8,781
Net cashless exercise of Series C warrants	86,997,362	—	—	—	—	—	—	—	—	—	—	—	—
Conversion of convertible preferred stock to common stock	(87,017,362)	—	(1,601,053)	—	(5,284,347)	—	—	—	115,982	—	—	—	—
Conversion of convertible debt to common stock	—	—	—	—	—	—	—	—	15,319,034	—	168,510	—	168,510
Proceeds from initial public offering, net of issuance costs	—	—	—	—	—	—	—	—	7,500,000	—	74,712	—	74,712
Issuance of restricted stock	—	—	—	—	—	—	—	—	61,816	—	—	—	—
Forfeiture of restricted stock	—	—	—	—	—	—	—	—	(7,727)	—	—	—	—
Balance at December 31, 2014	—	—	—	—	—	—	—	—	22,992,273	—	522,800	(399,084)	123,716
Net loss	—	—	—	—	—	—	—	—	—	—	—	(6,417)	(6,417)
Stock compensation expense	—	—	—	—	—	—	—	—	—	—	5,413	—	5,413
Issuance of restricted stock	—	—	—	—	—	—	—	—	132,130	—	—	—	—
Vesting of restricted stock units	—	—	—	—	—	—	—	—	60,449	—	(238)	—	(238)
Balance at December 31, 2015	—	—	—	—	—	—	—	—	23,184,852	—	527,975	(405,501)	122,474
Net loss	—	—	—	—	—	—	—	—	—	—	—	(12,023)	(12,023)
Stock compensation expense	—	—	—	—	—	—	—	—	—	—	5,313	—	5,313
Issuance of restricted stock	—	—	—	—	—	—	—	—	75,152	—	—	—	—
Vesting of restricted stock units	—	—	—	—	—	—	—	—	109,834	—	(200)	—	(200)
Balance at December 31, 2016	—	$ —	—	$ —	—	$ —	—	$ —	23,369,838	$ —	$ 533,088	$ (417,524)	$ 115,564

See accompanying notes to consolidated financial statements.

ASPEN AEROGELS, INC.

Consolidated Statements of Cash Flows

	Year Ended December 31,		
	2016	2015	2014
	(In thousands)		
Cash flows from operating activities:			
Net loss	$ (12,023)	$ (6,417)	$ (66,324)
Adjustments to reconcile net loss to net cash (used in) provided by operating activities:			
Depreciation and amortization	9,853	9,887	10,183
Loss on disposal of assets	—	—	119
Financing and debt issuance costs	656	—	47
Accretion of debt to fair value	—	—	50,011
Stock compensation expense	5,313	5,413	8,781
Other	—	(139)	(31)
Changes in operating assets and liabilities:			
Accounts receivable	3,089	(2,644)	838
Inventories	(6,336)	(1,635)	1,995
Prepaid expenses and other assets	(19)	(881)	(129)
Accounts payable	105	1,517	687
Accrued expenses	(2,178)	(227)	774
Deferred revenue	362	333	(303)
Other liabilities	600	152	—
Net cash (used in) provided by operating activities	(578)	5,359	6,648
Cash flows from investing activities:			
Capital expenditures	(13,216)	(21,956)	(13,241)
Purchase of marketable securities	—	(2,500)	—
Maturity and sale of marketable securities	—	2,500	—
Net cash used in investing activities	(13,216)	(21,956)	(13,241)
Cash flows from financing activities:			
Borrowings under line of credit	—	—	4,500
Repayments under line of credit	—	—	(5,500)
Repayment of borrowings under long-term debt	—	—	(18,849)
Financing costs	(656)	—	(47)
Proceeds from initial public offering	—	—	74,712
Repayment of obligations under capital lease	(68)	(80)	(80)
Payments made for employee restricted stock minimum tax withholdings	(200)	(238)	—
Proceeds from issuance of common stock	—	—	2
Net cash (used in) provided by financing activities	(924)	(318)	54,738
Net (decrease) increase in cash	(14,718)	(16,915)	48,145
Cash and cash equivalents at beginning of period	32,804	49,719	1,574
Cash and cash equivalents at end of period	$ 18,086	$ 32,804	$ 49,719
Supplemental disclosures of cash flow information:			
Interest paid	$ 196	$ 198	$ 223
Income taxes paid	$ —	$ —	$ —
Supplemental disclosures of non-cash activities:			
Conversion of convertible and senior convertible notes to common stock	$ —	$ —	$ 168,510
Changes in accrued capital expenditures	$ 2,116	$ (5,332)	$ 6,401
Capitalized interest	$ —	$ —	$ 34
Capital lease	$ —	$ 21	$ 5

See accompanying notes to consolidated financial statements.

(1) Description of Business

Nature of Business

Aspen Aerogels, Inc. (the Company) is an aerogel technology company that designs, develops and manufactures innovative, high-performance aerogel insulation used primarily in the energy infrastructure and building materials markets. The Company also conducts research and development related to aerogel technology supported by funding from several agencies of the U.S. government and other institutions in the form of research and development contracts.

The Company maintains its corporate offices in Northborough, Massachusetts. The Company has three wholly owned subsidiaries: Aspen Aerogels Rhode Island, LLC, Aspen Aerogels Germany, GmbH and Aspen Aerogels Georgia, LLC .

On June 18, 2014, the Company completed an initial public offering (IPO) of 7,500,000 shares of its common stock at a public offering price of $11.00 per share. The Company received net proceeds of $74.7 million after deducting underwriting discounts and commissions of $4.3 million and offering expenses of approximately $3.5 million. Upon the closing of the offering, all of the Company's then-outstanding (i) warrants to purchase Series C preferred stock, (the "Series C warrants") were subject to an automatic net cashless exercise, (ii) convertible preferred stock (including the shares of Series C preferred stock issued upon the automatic net cashless exercise of Series C warrants) automatically converted into 115,982 shares of common stock, and (iii) convertible notes automatically converted into 15,319,034 shares of common stock.

(2) Summary of Basis of Presentation and Significant Accounting Policies

Principles of Consolidation

The accompanying consolidated financial statements, which have been prepared in accordance with U.S. generally accepted accounting principles (U.S. GAAP), include the accounts of the Company and its wholly owned subsidiaries. All intercompany balances and transactions have been eliminated in consolidation.

Use of Estimates

The preparation of the consolidated financial statements requires the Company to make a number of estimates and assumptions that affect the reported amounts of assets and liabilities at the date of the consolidated financial statements and the reported amounts of revenues and expenses during the reporting period. Significant items subject to such estimates and assumptions include allowances for doubtful accounts, sales returns and allowances, product warranty costs, inventory valuation, the carrying amount of property and equipment, stock-based compensation and deferred income taxes. The Company evaluates its estimates and assumptions on an on-going basis using historical experience and other factors, including the current economic environment, which are believed to be reasonable under the circumstances. Management adjusts such estimates and assumptions when facts and circumstances dictate. Illiquid credit markets, volatile equity markets and declines in business investment increase the uncertainty inherent in such estimates and assumptions. As future events and their effects cannot be determined with precision, actual results could differ significantly from these estimates. Changes in these estimates resulting from continuing changes in the economic environment will be reflected in the financial statements in future periods.

Cash & Cash Equivalents

Cash equivalents include short-term, highly liquid instruments, which consist of money market accounts. All cash and cash equivalents are maintained with major financial institutions in North America. Deposits with these financial institutions may exceed the amount of insurance provided on such deposits; however, these deposits typically may be redeemed upon demand and, therefore, bear minimal risk.

Marketable Securities

Marketable securities consisted primarily of marketable debt securities which are classified as available-for-sale and are carried at fair value. The Company held no marketable securities as of December 31, 2016 or 2015. During the year ended December 31, 2015, the Company purchased $2.5 million of marketable securities which matured during the same period. The unrealized gains and losses on available-for-sale securities are recorded in accumulated other comprehensive income (loss). The Company considers all highly liquid investments with maturities of 90 days or less at the time of purchase to be cash equivalents, and investments with maturities of greater than 90 days at th e time of purchase to be marketable securities. When a marketable security incurs a significant unrealized loss for a sustained period of time, the Company will review the instrument to determine if it is other-than-temporarily impaired. If it is determine d that an instrument is other-than-temporarily impaired, the Company will record the unrealized loss in the consolidated statement of operations.

Accumulated Other Comprehensive Income (Loss)

Accumulated other comprehensive income (loss) consisted of changes in the fair market value of available-for-sale securities. As of December 31, 2016 and 2015, the Company held no marketable securities.

Fair Value of Financial Instruments

Fair value is an exit price that represents the amount that would be received from the sale of an asset or paid to transfer a liability in an orderly transaction between market participants. Accordingly, fair value is a market-based measurement that should be determined based on assumptions that market participants would use in pricing an asset or liability. The Company discloses the manner in which fair value is determined for assets and liabilities based on a three-tiered fair value hierarchy. The hierarchy ranks the quality and reliability of the information used to determine the fair values. The three levels of inputs described in the standard are:

Level 1: Quoted prices in active markets for identical assets or liabilities.

Level 2: Observable inputs, other than Level 1 prices, for the assets or liabilities, either directly or indirectly, for substantially the full term of the assets or liabilities.

Level 3: Unobservable inputs that are supported by little or no market activity and that are significant to the fair value of the assets or liabilities. Under the Fair Value Option Subsections of Financial Accounting Standards Board (FASB) ASC Subtopic 825-10, *Financial Instruments — Overall* , the Company has the irrevocable option to report most financial assets and financial liabilities at fair value on an instrument by instrument basis, with changes in fair value reported in earnings each reporting period. As a result of electing this option, the Company recorded its Subordinated Notes, Senior Convertible Notes and Convertible Notes at fair value in order to measure these liabilities at amounts that more accurately reflect the economics of these instruments during the year ended December 31, 2014.

At December 31, 2016 and 2015, no financial assets or liabilities were measured at fair value.

During the year ended December 31, 2014 (prior to the completion of the Company's IPO on June 18, 2014), the Company valued its then outstanding debt instruments utilizing Level 3 inputs.

During the year ended December 31, 2015, the Company purchased $2.5 million of marketable securities which matured during the same period. During this period, the instruments were valued utilizing Level 1 inputs. As of December 31, 2016 and December 31, 2015, the Company held no marketable securities.

Concentration of Credit Risk

Financial instruments, which potentially expose the Company to concentrations of credit risk, consist principally of accounts receivable. The Company's customers are primarily insulation distributors, insulation contractors, insulation fabricators and select end-users located throughout the world. The Company performs ongoing credit evaluations of its customers' financial condition and generally requires no collateral to secure accounts receivable. The Company maintains an allowance for doubtful accounts based on its assessment of the collectability of accounts receivable. The Company reviews the allowance for doubtful accounts quarterly. The Company has not experienced any meaningful non-payment or write-offs of accounts receivable. Accordingly, the allowance for doubtful accounts was zero at December 31, 2016 and 2015. The Company does not have any off-balance-sheet credit exposure related to its customers.

For the year ended December 31, 2016, two customers represented 25% and 15% of total revenue, respectively. For the year ended December 31, 2015, two customers represented 14% and 12% of total revenue, respectively. For the year ended December 31, 2014, two customers represented 13% and 12% of total revenue, respectively.

At December 31, 2016, the Company had three customers that accounted for 31%, 17% and 10% of accounts receivable, respectively. At December 31, 2015, the Company had three customers that accounted for 17%, 14% and 13% of accounts receivable, respectively.

In ventories

Inventory consists of finished products and raw materials. Inventories are carried at lower of cost, determined using the first-in, first-out (FIFO) method, or market. Cost includes materials, labor and manufacturing overhead. Manufacturing overhead is allocated to the costs of conversion based on normal capacity of the Company's production facility. Abnormal freight, handling costs and material waste is expensed in the period it occurs.

The Company periodically reviews its inventories and makes provisions as necessary for estimated excess, obsolete or damaged goods to ensure values approximate the lower of cost or market. The amount of any such provision is equal to the difference between the cost of inventory and the estimated market value based upon assumptions about future demand, selling prices and market conditions.

Property, Plant and Equipment, Net

Property, plant and equipment are stated at cost. Assets held under capital leases are stated at the lesser of the present value of future minimum payments, using the Company's incremental borrowing rate, or the fair value of the property at the inception of the lease. Expenditures for maintenance and repairs are charged to expense as incurred, whereas major betterments are capitalized as additions to property, plant and equipment.

Interest expense capitalization commences at the time a capital project begins construction and concludes when the project is completed. The Company has capitalized interest costs as part of the historical cost of constructing its manufacturing facilities. The Company capitalized $0.0 million, $0.0 million and $0.1 million in interest costs related to the build-out of the East Providence facility during the years ended December 31, 2016, 2015 and 2014, respectively.

Depreciation on plant and equipment is calculated on the straight-line method over the estimated useful lives of the assets. Assets related to capital leases are amortized on a straight-line basis over the shorter of the lease term or estimated useful life of the asset.

Assets utilized in the Company's operations that are taken out of service with no future use are charged to cost of sales or operating expenses, depending on the department in which the asset was utilized. Write-offs of construction in progress are charged to operating expenses upon the determination of no future use.

Other Assets

Other assets primarily include long-term deposits.

Impairment of Long-Lived Assets

Long-lived assets are reviewed for impairment whenever events or changes in circumstances indicate that the carrying amount of an asset or asset group may not be recoverable. Recognition and measurement of a potential impairment is performed on assets grouped with other assets and liabilities at the lowest level where identifiable cash flows are largely independent of the cash flows of other assets and liabilities. Recoverability of assets to be held and used is measured by a comparison of the carrying amount of an asset or asset group to future undiscounted net cash flows expected to be generated by the asset or asset group. If the carrying amount of an asset or asset group exceeds its estimated undiscounted future cash flows, an impairment charge is recognized for the amount by which the carrying amount of the asset or asset group exceeds the fair value of the asset or asset group. Fair value is determined through various valuation techniques including discounted cash flow models, quoted market values and third-party independent appraisals, as considered necessary.

Asset Retirement Obligations

The Company records asset retirement obligations associated with its lease obligations and the retirement of tangible long-lived assets. The Company reviews legal obligations associated with the retirement of long-lived assets that result from contractual obligations or the acquisition, construction, development and/or normal use of the assets. If it is determined that a legal obligation exists, regardless of whether the obligation is conditional on a future event, the fair value of the liability for an asset retirement obligation is recognized in the period in which it is incurred, if a reasonable estimate of fair value can be made. An amount equal to the fair value of the liability is also recorded as a long-term asset that is depreciated over the estimated life of the asset. The difference between the gross expected future cash outflow and its present value is accreted over the life of the related lease as an operating expense. The Company fully satisfied its asset retirement obligation during the year ended December 31, 2016.

Deferred Revenue

The Company records deferred revenue for product sales when (i) the Company has delivered products but other revenue recognition criteria have not been satisfied, (ii) payments have been received in advance of products being delivered, or (iii) subject to customer rebate agreements.

Deferred Rent

For leases that contain fixed increases in the minimum annual lease payment during the original term of the lease, the Company recognizes rental expense on a straight-line basis over the lease term, and records the difference between rent expense and the amount currently payable as deferred rent. Lease incentives for allowances for qualified leasehold improvements received from landlords are amortized on a straight-line basis over the lease term. Deferred rent is included in other long-term liabilities on the consolidated balance sheet.

Revenue Recognition

The Company recognizes revenue from the sale of products and performance of research and development services. Revenue is recognized when all of the following criteria are met: persuasive evidence of an arrangement exists, the price to the buyer is fixed or determinable, delivery has occurred or services have been provided, and collectability is reasonably assured.

Product Revenue

Product revenue is recognized upon transfer of title and risk of loss, which is upon shipment or delivery. The Company's customary shipping terms are free on board shipping point.

Sales returns are recorded based on historical sales and return information. Products that exhibit unusual sales return patterns due to quality or other manufacturing matters are specifically investigated and analyzed as part of the sales return accrual. The sales return accrual represents a reserve for products that may be returned due to quality concerns or authorized for destruction in the field. Sales return reserves are recorded at full original sales value. The Company rarely exchanges products from inventory for returned products. Sales return reserves were $0.1 million at December 31, 2016 and 2015.

For initial shipments of products where the Company is unsure of meeting the customer's specifications, the Company will defer the recognition of product revenue and related costs until written customer acceptance is obtained.

Research Services Revenue

The Company performs research services under contracts with various government agencies and other institutions. The Company records revenue earned on research services contracts using the percentage-of-completion method in two ways: (1) for firm-fixed-price contracts, the Company accrues that portion of the total contract price that is allocable, on the basis of the Company's estimates of costs incurred to date to total contract costs; and (2) for cost-plus-fixed-fee contracts, the Company records revenue that is equal to total payroll cost incurred times a stated factor plus reimbursable expenses, to a stated upper limit. The primary cost is the labor effort expended in completing research, and the only deliverable, other than the labor hours expended, is reporting of research results to the customer. Because the input measure of labor hours expended is also reflective of the output measure, it is a reliable means to measure the extent of progress towards completion. Revisions in cost estimates and fees during the course of the contract are reflected in the accounting period in which the facts that require the revisions become known. Contract costs and rates used to allocate overhead to contracts are subject to audit by the respective contracting government agency. Adjustments to revenue as a result of audit are recorded in the period they become known. To date, adjustments to revenue as a result of audit have been insignificant.

Warranty

The Company provides warranties for its products and records the estimated cost within cost of sales in the period that the related revenue is recorded. The Company's standard warranty period extends to one to two years from the date of shipment. The standard warranties provide that the Company's products will be free from defects in material and workmanship, and will, under normal use, conform to the specifications for the product. Historically, warranty claims and charges have been insignificant.

The Company's products may be utilized in systems that may involve new technical demands and new configurations. As such, the Company regularly reviews and assesses whether warranty reserves shall be recorded in the period the related revenue is recorded.

For the year ended December 31, 2016, the Company recorded warranty expense of $0.5 million. This specific reserve was principally related to product warranty claims for specific project s . Th ese claim s were outside of the Company's typical experience. As of December 31, 2016, the Company had satisfied all outstanding warranty claims.

Additionally, during the year ended December 31, 2016, a customer notified the Company of a specific product application issue. The customer continues to request and receive shipment of additional aerogel product and no claim has been made. The Company cannot be certain that it will not be subject to a future warranty claim.

Shipping and Handling Costs

Shipping and handling costs are classified as a component of cost of revenue. Customer payments of shipping and handling costs are recorded as product revenue.

Stock-based Compensation

The Company grants share-based awards to its employees and non-employee directors. All share-based awards granted, including grants of stock options, restricted stock and restricted stock units (RSUs), are recognized in the statement of operations based on their fair value as of the date of grant. Expense is recognized on a straight-line basis over the requisite service period for all awards with service conditions. For performance-based awards, the grant date fair value is recognized as expense when the condition is probable of being achieved, and then on a graded basis over the requisite service period. The Company uses the Black-Scholes option-pricing model to determine the fair value of service-based option awards, which requires a number of complex and subjective assumptions including fair value of the underlying security, the expected volatility of the underlying security, a risk-free interest rate and the expected term of the option.

The fair value of restricted stock and RSUs is determined using the closing price of the Company's common stock on the date of grant. All shares of restricted stock are not transferable until they vest. Restricted stock is typically issued to non-employee directors and typically vests over a one-year period from the date of issuance. RSUs are issued to employees and typically vest over a three to four year period from the date of issuance. The fair value of restricted stock and RSUs upon which vesting is solely service-based is expensed ratably over the vesting period. If the service condition underlying shares of restricted stock is not met for any reason, the shares of unvested restricted stock will be forfeited and returned to the Company.

For stock options that contain a market condition, the Company uses the Monte-Carlo simulation option-pricing model to determine the fair value of market based awards. The Monte-Carlo simulation option-pricing model takes into account the same input assumptions as the Black-Scholes model; however, it also further incorporates into the fair-value determination, the possibility that the market condition may not be satisfied. Compensation costs related to awards with a market condition are recognized regardless of whether the market condition is satisfied, provided that the requisite service has been provided. Stock-based compensation expense is recognized on a straight-line basis over the requisite service period for each such award.

Pursuant to the evergreen provisions of the 2014 Employee, Director and Consultant Equity Incentive Plan, the number of shares of common stock authorized for issuance under the plan automatically increased by 463,697 shares to 6,069,201 shares effective January 1, 2016.

Research and Development

Costs incurred in the research and development of the Company's products include compensation and related costs, services provided by third-party contractors, materials and supplies and are classified as research and development expenses as incurred. Research and development costs directly associated with research services revenue are classified as research services in cost of revenue.

Earnings per Share

The Company calculates net income (loss) per common share based on the weighted-average number of common shares outstanding during each period. Potential common stock equivalents are determined using the treasury stock method. The weighted-average number of common shares included in the computation of diluted net income (loss) gives effect to all potentially dilutive common equivalent shares, including outstanding stock options, RSUs and warrants. Common equivalent shares are excluded from the computation of diluted net income (loss) per share if their effect is antidilutive.

Diluted net income (loss) per share is computed using the more dilutive of (a) the two-class method, or (b) the if-converted method. The Company allocates net income (loss) first to preferred stockholders and holders of warrants to purchase preferred stock based on dividend rights and then to common stockholders, preferred stockholders and preferred warrant holders based on ownership interests. The weighted-average number of common share s included in the computation of diluted net income (loss) gives effect to all potentially dilutive common equivalent shares, including outstanding stock options , RSUs and warrants. Common equivalent shares are excluded from the computation of diluted net income (loss) per share if their effect is antidilutive.

Income Taxes

Income taxes are accounted for under the asset and liability method. Deferred tax assets and liabilities are recognized for the future tax consequences attributable to differences between the financial statement carrying amounts of existing assets and liabilities and their respective tax bases and operating loss and tax credit carryforwards. Deferred tax assets and liabilities are measured using enacted tax rates expected to apply to taxable income in the years in which those temporary differences are expected to be recovered or settled. The effect on deferred tax assets and liabilities of a change in tax rates is recognized in income in the period that includes the enactment date.

The Company recognizes the effect of income tax positions only if those positions are more likely than not of being sustained. The Company accounts for uncertain tax positions using a recognition threshold and measurement attribute for the financial statement recognition and measurement of a tax position taken or expected to be taken in a tax return. Differences between tax positions taken in a tax return and amounts recognized in the financial statements are recorded as adjustments to income taxes payable or receivable, or adjustments to deferred taxes, or both. Changes in recognition or measurement are reflected in the period in which the change in judgment occurs. The Company recognizes penalties and interest related to uncertain tax positions, if any, as a component of income tax expense.

Segments

Operating segments are identified as components of an enterprise about which separate, discrete financial information is available for evaluation by the chief operating decision maker in making decisions on how to allocate resources and assess performance. The Company’s chief operating decision maker is the Chief Executive Officer. The Company’s chief operating decision maker reviews consolidated operating results to make decisions about allocating resources and assessing performance for the entire Company. The Company views its operations and manages its business as one operating segment.

Information about the Company’s revenues, based on shipment destination or research services location, is presented in the following table:

	Year Ended December 31,		
	2016	**2015**	**2014**
		(In thousands)	
Revenue:			
U.S.	$ 35,726	$ 44,553	$ 39,809
International	82,012	77,965	62,590
Total	$ 117,738	$ 122,518	$ 102,399

Recently Issued Accounting Standards

In August 2016, the (FASB) issued Accounting Standards Update (ASU) No. 2016-15, Statement of Cash Flows (Topic 230): Classification of Certain Cash Receipts and Cash Payments (FASB ASU 2016-15). This amendment addresses eight classification issues related to the statement of cash flows. For public business entities, the amendments in FASB ASU 2016-15 are effective for public business entities for annual and interim periods in fiscal years beginning after December 15, 2017. Early adoption is permitted, including adoption in an interim period. The Company has not yet selected a transition method and is evaluating the effect the updated standard will have on its consolidated financial statements and related disclosures.

In March 2016, the FASB issued FASB ASU No. 2016-09, Compensation – Stock Compensation (Topic 718): Improvements to Employee Share-Based Payment Accounting (FASB ASU 2016-09). The amendment is to simplify several aspects of the accounting for share-based payment transactions including the income tax consequences, classification of awards as either equity or liabilities, and classification on the statement of cash flows. For public entities, the amendments in FASB ASU 2016-09 are effective for interim and annual reporting periods beginning after December 15, 2016. The Company has determined that the adoption of this standard will not have a material impact on its consolidated results of operations and financial condition.

In February 2016, the FASB issued ASU 2016-02, *Leases (Topic 842)* (FASB ASU 2016-02). FASB ASU 2016-02 changes the accounting for leases and includes a requirement to record all leases on the consolidated balance sheets as assets and liabilities. This update is effec tive for fiscal years beginning after December 15, 2018. Early application is permitted. The Company has not yet selected a transition method and is evaluating the effect the updated standard will have on its consolidated financial statements and related d isclosures.

In November 2015, the FASB issued ASU 2015-17, *Income Taxes: Balance Sheet Classification of Deferred Taxes* (FASB ASU 2015-17). FASB ASU 2015-17 requires that deferred tax assets and liabilities be classified as noncurrent on the balance sheet. This update is effective for fiscal years, and interim periods within those years, beginning after December 15, 2016. Earlier adoption is permitted and the standard may be applied either retrospectively or on a prospective basis to all deferred tax assets and liabilities. The Company has elected, as permitted by the standard, to early adopt FASB ASU 2015-17 prospectively, effective for the period ended December 31, 2015. The adoption of this update did not have a material impact on the Company's consolidated financial statements.

In August 2015, the FASB issued a deferral of ASU 2014-09, *Revenue from Contracts with Customers* . The standard will eliminate the transaction and industry-specific revenue recognition guidance under current U.S. GAAP and replace it with a principle based approach for determining revenue recognition. As a result of the deferral, public entities are required to apply the revenue recognition standard for annual reporting period beginning on or after December 15, 2017, including interim periods within that annual reporting period. Early application is permitted only as of annual and interim periods in fiscal years beginning after December 15, 2016. The Company has not yet selected a transition method and is evaluating the effect that the updated standard will have on its consolidated financial statements and related disclosures.

In July 2015, the FASB issued ASU 2015-11, which, for entities that do not measure inventory using the last-in, first-out (LIFO) or retail inventory method, changes the measurement principle for inventory from the lower of cost or market to lower of cost and net realizable value. The ASU also eliminates the requirement for these entities to consider replacement cost or net realizable value less an approximately normal profit margin when measuring inventory. Public entities are required to apply the new standard for annual reporting periods beginning after December 15, 2016 and interim periods within those fiscal periods. This standard is to be applied prospectively. Early adoption is permitted as of the beginning of an interim or annual period. The Company does not expect the adoption of this standard to have a material impact on its consolidated financial statements and related disclosures.

From time to time, new accounting pronouncements are issued by the FASB or other standard setting bodies and adopted by the Company as of the specified effective date. Unless otherwise discussed, the Company believes that the impact of recently issued standards that are not yet effective will not have a material impact on its financial position or results of operations upon adoption.

(3) Inventories

Inventories consist of the following:

	December 31,	
	2016	2015
	(In thousands)	
Raw material	$ 3,511	$ 4,432
Finished goods	9,357	2,100
Total	$ 12,868	$ 6,532

(4) Property, Plant and Equipment, Net

Property, plant and equipment consist of the following:

	December 31, 2016	December 31, 2015	Useful life
	(In thousands)		
Construction in progress	$ 11,139	$ 5,138	—
Buildings	23,901	23,884	30 years
Machinery and equipment	113,659	104,658	3 — 10 years
Computer equipment and software	7,679	6,888	3 years
Total	156,378	140,568	
Accumulated depreciation and amortization	(71,984)	(62,246)	
Property, plant and equipment, net	$ 84,394	$ 78,322	

Plant and equipment under capital leases included in the table above was $0.1 million at both December 31, 2016 and 2015.

Depreciation expense was $9.8 million, $9.8 million and $10.1 million for the years ended December 31, 2016, 2015 and 2014, respectively. Amortization associated with assets under capital leases was less than $0.1 million for each of the years ended December 31, 2016, 2015 and 2014.

Construction in progress totaled $11.1 million and $5.1 million at December 31, 2016 and 2015, respectively. Construction in progress at December 31, 2016 included engineering designs and other pre-construction costs for our planned manufacturing facility in Statesboro, Georgia of $7.2 million and other capital improvement projects at the East Providence facility. Construction in process at December 31, 2015 included engineering designs and other pre-construction costs for our planned manufacturing facility in Statesboro, Georgia of $2.3 million and other capital improvement projects at the East Providence facility.

(5) Accrued Expenses

Accrued expenses consist of the following:

	December 31, 2016	December 31, 2015
	(In thousands)	
Employee compensation	$ 2,796	$ 4,184
Other accrued expenses	1,191	1,384
	$ 3,987	$ 5,568

(6) Revolving Line of Credit

The Company entered into an Amended and Restated Loan and Security Agreement with Silicon Valley Bank (Loan Agreement), on August 31, 2014, which has been subsequently amended from time to time. On January 27, 2017, the Loan Agreement was amended to extend the maturity date of the facility to January 28, 2018. Under the Loan Agreement, the Company may borrow up to $20 million subject to compliance with certain covenants and borrowing base limitations. At the Company's election, the interest rate applicable to borrowings may be based on the prime rate or LIBOR. Prime rate-based rates vary from prime rate plus 0.75% per annum to prime rate plus 1.75% per annum, while LIBOR-based rates vary from LIBOR plus 3.75% per annum to LIBOR plus 4.25% per annum. In addition, the Company is required to pay a monthly unused line fee of 0.5% per annum of the average unused portion of the facility. Obligations under the Loan Agreement are secured by a first priority security interest in all assets of the Company, including those at the East Providence facility, except for certain exclusions.

At December 31, 2016 and 2015, the Company had no amounts drawn under the Loan Agreement. Under the Loan Agreement, the Company is required to comply with both non-financial and financial covenants, including minimum Adjusted EBITDA and minimum Adjusted Quick Ratio, as defined. At December 31, 2016, the Company was in compliance with all such covenants.

The Company has been required to provide its landlord with letters of credit securing certain obligations. In addition, the Company has been required to provide certain customers with letters of credit securing obligations under commercial contracts. The Company had outstanding letters of credit backed by the revolving credit facility of $2.7 million at December 31, 2016 and 2015, which reduce the funds otherwise available to the Company under the Loan Agreement. Based on the available borrowing base and net of the $2.7 million of outstanding letters of credit, the amount available to the Company under the Loan Agreement at December 31, 2016 was $12.1 million.

(7) Other Expense, net

For the year ended December 31, 2016, other expense, net of $0.8 million consisted of financing costs and interest expense. During the year, the Company engaged with a third party lender to secure a term loan to fund, in part, the construction of the planned manufacturing facility in Statesboro, Georgia. In 2016, the Company decided, at its sole discretion, to temporarily delay construction of the facility and its related financing to better align the capacity expansion with the Company's assessment of demand for the 2018 to 2020 period. As a result, the Company recorded a $0.7 million charge for postponed financing costs. The charge included legal fees incurred by the Company itself and on behalf of the potential lender. In addition, the Company recognized interest expense of $0.1 million of commitment and legal fees associated with its Loan Agreement with Silicon Valley Bank.

For the year ended December 31, 2015, other expense, net consisted primarily of commitment and legal fees associated with the Loan Agreement of $0.2 million.

For the year ended December 31, 2014, the Company held debt instruments outstanding that were measured at fair value. The charge recognized as a result of the change in fair value of the debt instruments was $50.0 million for the year ended December 31, 2014. In addition, the Company incurred an aggregate of $0.3 million in interest expense associated with the Loan Agreement and for debt closing costs during the year.

(8) Other Long-term Liabilities

Other long-term liabilities consist of the following:

	December 31,	
	2016	2015
	(In thousands)	
Asset retirement obligations (ARO)	$ —	$ 397
Deferred rent	1,125	163
	1,125	560
Current maturities of other long-term liabilities	(154)	(409)
Other long-term liabilities, less current maturities	$ 971	$ 151

As of December 31, 2015, the Company had asset retirement obligations (ARO) of $0.4 million arising from requirements to perform certain asset retirement activities upon the termination of its Northborough, Massachusetts facility lease and upon disposal of certain machinery and equipment.

A summary of ARO activity consists of the following:

	Year Ended December 31,	
	2016	2015
	(In thousands)	
Balance at beginning of period	$ 397	$ 1,018
Accretion of discount expense	—	21
Settlement costs	(397)	(642)
Balance at end of period	$ —	$ 397

During the year ended December 31, 2016, the Company incurred approximately $0.2 million in expenditures in support of completing the restoration of space under the facility lease. This space was vacated and returned to the landlord on July 1, 2016.

On June 29, 2016, the Company executed an agreement to remain at the Northborough, Massachusetts facility through December 31, 2026. As part of the new agreement, the Company's obligation to restore the remaining space in the Northborough facility was eliminated. The settlement of the remaining reserve balance of approximately $0.2 million was reclassified to other long-term liabilities and will be amortized as a reduction to rent expense over the term of the new lease agreement.

(9) Commitments and Contingencies

Capital Leases

The Company has entered into certain capital leases for computer equipment and vehicles. The leases are payable in monthly installments and expire at various dates through 2018. The recorded balance of capital lease obligations as of December 31, 2016 and 2015 was $0.1 million and less than $0.1 million, respectively. Future minimum payments under capital leases at December 31, 2016 are as follows:

Year	Capital Lease Obligations
	(In thousands)
2017	$ 37
2018	5
Total	42
Less portion representing interest	(3)
Present value of future minimum payments	39
Current maturities of capital lease payments	(35)
Capital leases, excluding current portion	$ 4

Operating Leases

On June 29, 2016, the Company entered into a new agreement to lease approximately 51,650 square feet of office space in Northborough, MA, the location of the Company's current headquarters. The new lease succeeds the existing lease between the Company and the landlord that expires on December 31, 2016. The lease term commences on January 1, 2017 and expires on December 31, 2026. The annual base rent associated with the lease will be approximately $408,000 during the first year of the lease, and increase by approximately 3% annually for the term of the lease. The lease also provides for the payment by the Company of its pro rata share of real estate taxes and certain other expenses. Prior to the expiration of the lease term, the Company will have the right to extend the lease for an additional term of three years.

Under the terms of the new lease, the landlord will provide the Company with an allowance of up to $1.2 million to be utilized for improvements to the leased premises. These amounts are recorded as a component of deferred rent in determining the minimum lease payments for the property. As of December 31, 2016, the Company had capitalized $0.7 million in leasehold improvement costs.

The Company also leases facilities and equipment under operating leases expiring at various dates through 2021. Under these agreements, the Company is obligated to pay annual rentals, as noted below, plus real estate taxes, and certain operating expenses.

Future minimum lease payments under operating leases at December 31, 2016 are as follows:

Year	Operating Leases
	(In thousands)
2017	$ 1,222
2018	1,239
2019	813
2020	640
2021	505
Thereafter	2,512
Total minimum lease payments	$ 6,931

The Company incurred rent expense under all operating leases of approximately $1.5 million, $1.6 million and $1.2 million in the years ended December 31, 2016, 2015 and 2014, respectively.

Letters of Credit

The Company has been required to provide certain customers with letters of credit securing obligations under commercial contracts. The Company had letters of credit outstanding for $2.7 million at both December 31, 2016 and 2015, respectively. These letters of credit are secured by the Company's revolving credit facility (see note 6).

Customer Supply Agreement

During 2016, the Company entered into a supply agreement (the Supply Agreement) and a joint development agreement (the JDA) with BASF SE (BASF). Pursuant to the Supply Agreement, the Company will sell exclusively to BASF the Company's Spaceloft ® A2 product at annual volumes to be specified by BASF, subject to certain volume limits. The Supply Agreement will terminate on December 31, 2027. Upon expiration of the Supply Agreement, the Company will be subject to a post-termination supply commitment for an additional two years. The JDA is designed to facilitate the collaboration between the parties on the development and commercialization of new products.

In addition, BASF will make a non-interest bearing prepayment to the Company in the aggregate amount of $22 million during the construction of the Company's planned manufacturing facility in Statesboro, Georgia (Plant Two), subject to the Company's prior satisfaction of certain preconditions, including securing a debt commitment from a third party lender for at least $30 million. BASF is obligated to pay the prepayment to the Company in eight equal consecutive quarterly installments commencing on the first day of the calendar quarter following the date on which the preconditions are met. Once commenced, BASF's obligation to make such quarterly payments shall be subject to postponement in the event of delays of three months or more in the projected date of completion of Plant Two by a commensurate number of months.

After October 1, 2018, the Company will, at BASF's instruction, credit up to 25.3% of any amounts invoiced by the Company for Spaceloft ® A2 product sold to BASF against the prepayment balance. However, BASF has no obligation to purchase products under the Supply Agreement. If any of the prepayment remains uncredited against amounts invoiced by the Company as of September 30, 2023, BASF may request that the Company repay the uncredited amount to BASF in four equal quarterly installments beginning on December 31, 2023. The repayment obligation will be secured by a security interest in real estate, plant and equipment at the Company's Rhode Island and Georgia manufacturing facilities.

As of December 31, 2016, the Company anticipates that the impact of constrained capital investment and low activity levels in the global energy markets will continue into 2017. With this view of the market, the Company has elected to temporarily delay the board approved Plant Two project and its related financing to better align the capacity expansion with the Company's assessment of demand for the 2018 to 2020 period. As a result, the Company has yet to fulfill the prepayment preconditions and commencement of the quarterly prepayments from BASF will be delayed until the preconditions are satisfied.

Litigation

The Company is, from time to time, a party to litigation that arises in the normal course of its business operations. See Part I, Item 3 ("Legal Proceedings") of this Annual Report on Form 10-K for a description of certain of the Company's current legal proceedings. The Company is not presently a party to any litigation for which it believes a loss is probable requiring an amount to be accrued or a possible loss contingency requiring disclosure.

(10) Conversion of Redeemable Convertible Preferred Stock

Upon the closing of the Company's IPO discussed in note 1, the outstanding shares of Series A, Series B and Series C convertible preferred stock converted into 115,982 shares of common stock.

(11) Stockholders' Equity

On June 18, 2014, the Company completed an IPO of 7,500,000 shares of its common stock at a public offering price of $11.00 per share. The Company received net proceeds of $74.7 million after deducting underwriting discounts and commissions of $4.3 million and other offering expenses of approximately $3.5 million. Upon the closing of the offering, all of the Company's then-outstanding (i) Series C warrants to purchase Series C preferred stock were subject to an automatic net cashless exercise, (ii) convertible preferred stock (including the shares of Series C preferred stock issued upon the automatic net cashless exercise of Series C warrants) automatically converted into 115,982 shares of common stock, and (iii) Convertible Notes and Senior Convertible Notes automatically converted into 15,319,034 shares of common stock.

At December 31, 2016 and 2015, the Company was authorized to issue 130,000,000 shares of stock, of which 125,000,000 shares were designated as common stock and 5,000,000 shares were designated as preferred stock.

(12) Employee Benefit Plan

The Company sponsors the Aspen Aerogels, Inc. 401(k) Plan. Under the terms of the plan, the Company's employees may contribute a percentage of their pretax earnings. During the years ended December 31, 2016 and 2015, the Company provided matching contributions of $0.2 million and $0.1 million, respectively . During the year ended December 31, 2014 , the Company did not provided matc hing contributions nor did it make any contributions to the plan.

(13) Employee Stock Ownership Plans

Effective June 12, 2014, upon the pricing of the IPO, the Company adopted the 2014 Employee, Director and Consultant Equity Incentive Plan (the 2014 Equity Plan). Under the 2014 Equity Plan, the Company may grant incentive stock options, non-qualified stock options, restricted stock, RSUs and other stock-based awards. Stock options under the plan are to be granted with an exercise price not less than the fair market value of the Company's common stock at the date of grant. Equity awards granted to employees generally vest over a service period of three to four years. Restricted stock granted to nonemployee directors vests over a one year service period.

During 2016, the Company issued 75,152 shares of restricted common stock and 103,593 non-qualified stock options (NSOs) to its nonemployee directors with a fair value of $0.4 million and $0.2 million, respectively, vesting over a one year period. The Company also issued 429,803 RSUs and NSOs to purchase 278,440 shares of common stock to employees. The RSUs and NSOs granted to employees during 2016 will vest over a three year period. All awards to nonemployee directors and employees during 2016 were granted under the 2014 Equity Plan.

On December 11, 2015, the Company issued certain equity grants to its chief executive officer which included 78,125 shares of restricted stock, NSOs to purchase 84,745 shares of common stock vesting solely over three years and NSOs to purchase 370,181 shares of common stock vesting subject to certain common stock price target achievements, as defined, over a three to five year period (the CEO Options). Collectively, these equity grants had an aggregate fair value of $2.0 million at the time of grant. The restricted stock award will vest based on achievement of a Company financial performance target for fiscal year 2020.

Stock-based compensation is included in cost of sales or operating expenses, as applicable, and consists of the following:

	Year Ended December 31,		
	2016	2015	2014
	(In thousands)		
Cost of product revenue	$ 796	$ 824	$ 1,121
Research and development expenses	594	666	1,046
Sales and marketing expenses	1,066	1,012	1,390
General and administrative expenses	2,857	2,911	5,224
Total stock-based compensation	$ 5,313	$ 5,413	$ 8,781

At December 31, 2016, 2,652,658 shares of common stock were reserved for outstanding stock-based awards granted under the 2014 Equity Plan. In addition, at December 31, 2016, 92,987 shares of common stock were reserved for stock-based awards granted under the Company's 2001 Equity Incentive Plan, which was replaced by the 2014 Equity Plan. Any cancellations or forfeitures of these awards will become available for future grant under the 2014 Equity Plan. At December 31, 2016, there were 2,817,106 shares available for future grant under the 2014 Equity Plan.

Stock Options Valuation and Amortization Method

Prior to the IPO, the Board of Directors had historically determined the fair value of the Company's common stock based on the market approach and the income approach to estimate the enterprise value of the business under various liquidity event scenarios, including an IPO by the Company and the sale of the Company. To support the valuations, the Company utilized a probability-weighted expected return under those various liquidity scenarios, public guideline companies, management cash flow projections and other assumptions to derive the enterprise value of the business. The Company then derived the estimated fair value of each class of stock, taking into consideration the rights and preferences of each instrument based on a probability-weighted expected return.

The fair value of each stock option is estimated as of the date of grant using the Black-Scholes option pricing model. Key inputs into this formula included expected term, expected volatility, expected dividend yield and the risk-free rate. Each assumption is set forth and discussed below.

For the performance-based stock options issued during the year ended December 31, 2013, the Company used a Monte Carlo simulation model to estimate the number of options expected to remain outstanding and eligible for vesting upon completion of the Company's IPO. The simulation model was based on a number of complex assumptions including the terms of the performance condition, the value of our common stock at the time of the Company's IPO, the expected time from the date of grant to the Company's IPO and expected volatility. The number of options expected to remain outstanding and eligible for vesting upon completion of the Company's IPO was estimated to be 96.8% and 97.4% of the options granted at August 7, 2013 and December 20, 2013, respectively. The fair value of each performance-based stock option was determined by multiplying the Black-Sc holes estimate of grant date fair value by the percentage of options expected to remain outstanding and eligible for vesting upon completion of the Company's IPO.

In December 2015, the Company issued NSOs to its chief executive officer to purchase 370,181 shares of common stock which are subject to the achievement of certain common stock price targets and may become exercisable on the third, fourth and fifth anniversary of the grant date. The Company used a Monte Carlo Simulation model to estimate the grant date fair value of awards expected to vest. The simulation model was based on a number of complex assumptions including (i) if the vesting condition is satisfied within the time-vesting periods, and (ii) the date the common stock price target is met per the terms of the agreement.

For stock options with a service condition, the fair value is amortized on a straight-line basis over the requisite service period of the options, which is generally a three- to four-year vesting period from the date of grant. For the performance-based stock options issued during the year ended December 31, 2013, a portion of the fair value was recognized as expense when the IPO performance condition was achieved and the remainder over the requisite service period, which is generally a three- to four-year vesting period from the date of grant.

Expected Term

The expected term represents the period that the Company's stock-based awards are expected to be outstanding. The Company uses the simplified method as prescribed by FASB ASC 718 to calculate the expected term for options granted, as it does not have sufficient historical exercise data to provide a reasonable basis upon which to estimate the expected term.

Expected Volatility

Due to the Company's limited historical data, the estimated volatility reflects the incorporation of the historical volatility of comparable companies with publicly available share prices. In 2016, 2015 and 2014, the expected volatility is based on the weighted average volatility of up to 15 companies with business, financial and market attributes that the Company believes are similar to its own.

Expected Dividend

The Company uses an expected dividend yield of zero. The Company does not intend to pay cash dividends on its common stock in the foreseeable future, nor has it paid dividends on its common stock in the past.

Risk-free Interest Rate

The risk-free interest rate is based on U.S. Treasury zero-coupon issues with a remaining term equal to the expected life assumed at the date of grant.

Estimated Forfeitures

Forfeitures are required to be estimated at the time of grant and revised, if necessary, in subsequent periods, if actual forfeitures differ from those estimates. Forfeitures are estimated based on voluntary termination behavior as well as analysis of actual option forfeitures. Accordingly, share-based compensation expense has been reduced by an estimated annual forfeiture rate for the years ended December 31, 2016, 2015 and 2014.

Assumptions Utilized

The following information relates to the fair value of the option awards estimated by use of the Black-Scholes option pricing model:

	Year Ended December 31, 2016	2015	2014
		(In thousands)	
Weighted average assumptions:			
Expected term (in years)	5.86	6.02	6.17
Expected volatility	53.56%	57.95%	50.09%
Risk free rate	1.36%	1.79%	1.94%
Expected dividend yield	0.00%	0.00%	0.00%
Weighted average fair value:			
Grant-date fair value of options granted	$ 2.16	$ 3.82	$ 5.37
Grant-date fair value of options vested	$ 7.58	$ 11.89	$ 97.33
Aggregate intrinsic value of options exercised	$ —	$ —	$ 4,816.50

Outstanding Options

The following table summarizes information about stock options outstanding:

	Number of Shares	Weighted Average Grant Date Fair Value Per Share	Weighted Average Exercise Price Per Share	Weighted Average Remaining Contractual Term (Years)	Aggregate Intrinsic Value
	($ in thousands, except share and per share data)				
Options outstanding at December 31, 2015	1,702,337	$ 9.60	$ 13.47	9.08	$ 6,152
Granted	382,033	$ 2.16	$ 4.30		
Forfeited	(20,796)	$ 6.62	$ 10.58		
Exercised	—	$ —	$ —		$ —
Options outstanding at December 31, 2016	2,063,574	$ 8.26	$ 11.80	8.30	$ 36,326
Exercisable at December 31, 2016	707,260	$ 17.10	$ 19.81	7.68	$ —
Expected to vest at December 31, 2016	1,190,710	$ 3.58	$ 6.99	8.67	$ 31,473

As of December 31, 2016, total unrecognized compensation cost related to nonvested options granted under the 2014 Equity Plan was $3.0 million. The unrecognized compensation cost consisted of $3.0 million relating to service-based awards and less than $0.1 million to performance-based awards. The unrecognized compensation cost for the service-based options and performance-based awards is expected to be recognized over a weighted average period of 1.97 and 0.97 years, respectively.

Restricted Stock Awards and Restricted Stock Units

The Company values restricted stock awards and RSUs based on the closing trading value of our shares on the date of grant. RSUs have time-based vesting conditions and typically vest pro rata over three or four years. Restricted stock awards issued to nonemployee directors generally vest in full one year from the date of grant.

Information related to grants of RSUs during 2016 is as follows:

	Restricted Stock Units	Weighted Average Grant Date Fair Value
Balance at December 31, 2015	417,126	$ 9.01
Granted	429,803	4.04
Vested	(155,707)	9.20
Forfeited	(9,137)	9.37
Balance at December 31, 2016	682,085	$ 5.83

Restricted stock awards granted during 2016 are considered issued and outstanding common stock and are excluded from the table above. As of December 31, 2016 there were 153,277 shares of restricted stock outstanding.

The total intrinsic values of restricted stock and RSUs that vested in 2016 and 2015 was $0.6 million and $0.5 million, respectively. No restricted stock or RSUs vested in 2014. As of December 31, 2016, of the total shares of restricted stock and RSUs outstanding, 757,147 will vest upon the fulfillment of service conditions. In addition, 78,125 shares of restricted stock will vest only if certain performance conditions are achieved. As of December 31, 2016, the Company has determined that the performance-based condition was not probable, and no compensation has been recorded to date in conjunction with the award.

As of December 31, 2016, total unrecognized compensation cost related to restricted stock awards and RSUs granted under the 2014 Equity Plan was $0.2 million and $2.3 million, respectively, and is expected to be recognized over a weighted average period of 0.48 and 1.67 years, respectively.

(14) Net Loss Per Share

The computation of basic and diluted net income (loss) per share consists of the following:

	Year ended December 31,		
	2016	2015	2014
	(In thousands, except share and per share data)		
Numerator:			
Net loss	$ (12,023)	$ (6,417)	$ (66,324)
Denominator:			
Weighted average shares outstanding, basic and diluted	23,139,807	22,986,931	12,349,456
Net loss per share, basic and diluted	$ (0.52)	$ (0.28)	$ (5.37)

Potential dilutive common shares that were excluded from the computation of diluted net loss per share because they were anti-dilutive consist of the following:

	Year ended December 31,		
	2016	2015	2014
Common stock options	2,063,574	1,702,337	1,026,510
Restricted common stock units	682,085	417,126	314,640
Common stock warrants	115	131	131
Restricted common stock awards	153,277	132,130	—
Total	2,899,051	2,251,724	1,341,281

As of December 31, 2016 and 2015, there was no dilutive impact of the common stock options, RSUs, common stock warrants and restricted stock awards. All other potentially dilutive instruments were converted into shares of common stock upon the closing of the Company's IPO on June 18, 2014.

(15) Income Taxes

The Company incurred net operating losses and recorded a full valuation allowance against net deferred assets for all periods presented. Accordingly, the Company has not recorded a provision for federal or state income taxes.

The reconciliation between the U.S. statutory income tax rate and the Company's effective rate consists of the following:

	Year Ended December 31,		
	2016	2015	2014
U.S. federal income tax statutory rate	35%	35%	35%
Permanent differences	(4)%	(11)%	—%
State tax, net of federal benefit	(1)%	(6)%	—%
Changes in valuation allowance for deferred tax assets	(30)%	(11)%	1%
Stock-based compensation	(1)%	(8)%	—%
Debt and warrant fair value adjustments	—%	—%	(26)%
Write down of losses not previously benefitted	—%	—%	(11)%
Other	1%	1%	(1)%
Effective tax rate	—	—	—

The tax effects of temporary differences between financial statement and tax accounting that gave rise to significant portions of the Company's deferred tax assets and deferred tax liabilities at December 31, 2016 and 2015 are presented below:

	December 31,	
	2016	2015
	(In thousands)	
Deferred tax assets:		
Net operating loss carryforwards	$ 66,276	$ 62,671
Stock-based compensation	6,140	4,938
Tax credit carryforwards	312	323
Reserves and accruals	398	140
Intangible assets and amortization	95	150
Total gross deferred tax assets	73,221	68,222
Deferred tax liabilities:		
Depreciation	(5,295)	(3,841)
Total deferred tax liabilities	(5,295)	(3,841)
Total deferred tax assets and liabilities	67,926	64,381
Valuation allowance	(67,926)	(64,381)
Net deferred tax asset	$ —	$ —

The net change in the valuation allowance for the year ended December 31, 2016, was an increase of $3.5 million. The Company has recorded a full valuation allowance against its deferred tax assets due to the uncertainty associated with the utilization of the net operating loss carryforwards and other future deductible items. In assessing the realizability of deferred tax assets, the Company considers all available evidence, historical and prospective, with greater weight given to historical evidence, in determining whether it is more likely than not that some portion or all of the deferred tax assets will not be realized. The ultimate realization of the Company's deferred tax assets generally is dependent upon generation of future taxable income.

At December 31, 2016, the Company has $176.3 million of net operating losses available to offset future federal income, if any, and which expire on various dates through December 31, 2036.

For the year ended December 31, 2014, the Company performed an analysis pursuant to Internal Revenue Code Section 382, as well as similar state provisions, in order to determine whether any limitations might exist on the utilization of net operating losses and other tax attributes. Based on this analysis, the Company has determined that an ownership change occurred as a result of the June 2014 IPO, resulting in an annual limitation on the use of its net operating losses and other tax attributes as of such date. Net operating losses of $113.2 million were determined to be available. The Company also determined that built-in gains of $42.0 million existed at the date of the ownership change. Built-in gains increase the limitation under the Internal Revenue Code to the extent triggered during the five-year period subsequent to the date of change. Absent the disposition of certain built-in gain assets within the five-year period subsequent to the change in ownership, the entire $42.0 million of net operating losses will expire in June 2019.

At December 31, 2016, the Company has $97.1 million of apportioned net operating losses available to offset future state taxable income, if any, and which begin to expire at various dates between 2017 and 2036.

For each of the years ended December 31, 2016, 2015 and 2014, the Company did not have any material unrecognized tax benef its and thus no interest and penalties related to unrecognized tax benefits were recorded. In addition, the Company does not expect that the amount of unrecognized tax benefits will change significantly within the next twelve months.

The Company files a federal income tax return in the United States and income tax returns in various state and foreign jurisdictions. All tax years are open for examination by the taxing authorities for both federal and state purposes.

(16) Subsequent Events

The Company has evaluated subsequent events through March 2, 2017, the date of issuance of the consolidated financial statements for the year ended December 31, 2016.

QUARTERLY RESULTS OF OPERATIONS
(in thousands, except per share data)

(unaudited)

	Three Months Ended			
	March 31,	June 30,	Sept 30,	Dec 31,
2016				
Total revenue	$ 32,821	$ 27,718	$ 29,560	$ 27,639
Gross profit	6,527	6,653	6,402	3,729
Loss from operations	(1,758)	(1,348)	(2,404)	(5,710)
Net loss	(1,797)	(1,387)	(3,097)	(5,742)
Net loss per share basic and diluted common share - basic	$ (0.08)	$ (0.06)	$ (0.13)	$ (0.25)
2015				
Total revenue	$ 23,500	$ 30,096	$ 31,539	$ 37,384
Gross profit	4,514	5,109	5,172	9,852
Income (loss) from operations	(2,745)	(2,689)	(2,476)	1,684
Net income (loss)	(2,790)	(2,743)	(2,522)	1,638
Net income (loss) per share basic and diluted common share - basic	$ (0.12)	$ (0.12)	$ (0.11)	$ 0.07

Report of Independent Registered Public Accounting Firm

The Board of Directors and Stockholders
Aspen Aerogels, Inc.:

Under date of March 2, 2017, we reported on the consolidated balance sheets of Aspen Aerogels, Inc. and subsidiaries as of December 31, 2016 and 2015, and the related consolidated statements of operations, stockholders' equity, and cash flows for each of the years in the three-year period ended December 31, 2016, which are included in the annual report on Form 10-K. In connection with our audits of the aforementioned consolidated financial statements, we also audited the related consolidated financial statement schedule of Valuation and Qualifying Accounts included in the Form 10-K. This financial statement schedule is the responsibility of the Company's management. Our responsibility is to express an opinion on this financial statement schedule based on our audits.

In our opinion, the financial statement schedule, when considered in relation to the basic consolidated financial statements taken as a whole, presents fairly, in all material respects, the information set forth therein.

/s/ KPMG LLP

Boston, Massachusetts
March 2, 2017

Schedule II
VALUATION AND QUALIFYING ACCOUNTS
(in millions)

Description	Balance at Beginning of Year	Charges to Costs and Expenses (a)	Deductions to Allowances for Uncollectible Accounts (b)	Charges to (Deductions from) Other Accounts (c)	Balance at End of Year
Year Ended December 31, 2016:					
Allowances for uncollectible accounts and sales returns and allowances	$ 89	—	—	4	$ 93
Year Ended December 31, 2015:					
Allowances for uncollectible accounts and sales returns and allowances	$ 120	—	—	(31)	$ 89
Year Ended December 31, 2014:					
Allowances for uncollectible accounts and sales returns and allowances	$ 209	—	—	(89)	$ 120

(a) Represents allowances for uncollectible accounts established through selling, general and administrative expenses.

(b) Represents actual write-offs of uncollectible accounts.

(c) Represents net change in allowances for sales returns, recorded as contra-revenue.

Item 9. CHANGES IN AND DISAGREEMENTS WITH ACCO UNTANTS ON ACCOUNTING AND FINANCIAL DISCLOSURE

Not applicable.

Item 9A. CONTROLS AND PROCEDURES

(a) *Evaluation of Disclosure Controls and Procedures* . We maintain disclosure controls and procedures that are designed to ensure that information required to be disclosed in the reports that we file or submit under the Securities Exchange Act of 1934, as amended, or the Exchange Act, is recorded, processed, summarized and reported within the time periods specified in the SEC's rules and forms and is accumulated and communicated to our management, including our principal executive officer and principal financial officer, or persons performing similar functions, as appropriate to allow timely decisions regarding required disclosure.

As of December 31, 2016, our management, with the participation of our principal executive officer and principal financial officer, evaluated the effectiveness of our disclosure controls and procedures (as defined in Rules 13a-15(e) and 15d-15(e) under the Exchange Act). Our management recognizes that any controls and procedures, no matter how well designed and operated, can provide only reasonable assurance of achieving their objectives, and management necessarily applies its judgment in evaluating the cost-benefit relationship of possible controls and procedures. Based on such evaluation, our principal executive officer and principal financial officer have concluded, that, as of December 31, 2016, our disclosure controls and procedures were effective to ensure that information required to be disclosed by us in the reports that we file or submit under the Exchange Act is recorded, processed, summarized and reported within the time periods specified in the SEC's rules and forms, and is accumulated and communicated to our management, including our principal executive officer and principal financial officer, or persons performing similar functions, as appropriate to allow timely decisions regarding required disclosure.

(b) *Management's Report on Internal Control over Financial Reporting* . The Company's management is responsible for establishing and maintaining adequate internal control over financial reporting. Internal control over financial reporting is defined in Rules 13a-15(f) and 15d-15(f) under the Exchange Act, as a process designed by, or under the supervision of, the Company's principal executive and principal financial officers and effected by the Company's board of directors, management and other personnel to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. The Company's internal control over financial reporting includes those policies and procedures that:

- pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the Company;
- provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the Company are being made only in accordance with authorizations of management and directors of the Company; and
- provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use or disposition of the Company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

The Company's management assessed the effectiveness of the Company's internal control over financial reporting as of December 31, 2016. In making this assessment, management used the criteria set forth by the

Committee of Sponsoring Organizations of the Treadway Commission (COSO) in Internal Control-Integrated Framework (2013).

Based on our assessment, management believes that, as of December 31, 2016, the Company's internal control over financial reporting is effective based on those criteria.

(c) *Changes in* Internal *Controls* . There were no changes in our internal control over financial reporting, as such term is defined in Rules 13a-15(f) and 15(d)-15(f) promulgated under the Exchange Act, identified in connection with the evaluation of such internal control that occurred during the fourth quarter of the last fiscal year that have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

Item 9B. OTHER INFORMATION

Not applicable.

PART III

Item 10. DIRECTORS, EXECUTIVE OFFICERS AND CORPORATE GOVERNANCE

The response to this item is incorporated by reference from the discussion responsive thereto under the captions "Management and Corporate Governance," "Section 16(a) Beneficial Ownership Reporting Compliance," and "Code of Business Conduct and Ethics" in the Company's Proxy Statement for the 2017 Annual Meeting of Stockholders.

Item 11. EXECUTIVE COMPENSATION

The response to this item is incorporated by reference from the discussion responsive thereto under the caption "Executive Officer and Director Compensation" in the Company's Proxy Statement for the 2017 Annual Meeting of Stockholders.

Item 12. SECURITY OWNERSHIP OF CERTAIN BENEFICIAL OWNERS AND MANAGEMENT AND RELATED STOCKHOLDER MATTERS

The response to this item is incorporated by reference from the discussion responsive thereto under the captions "Security Ownership of Certain Beneficial Owners and Management," and "Equity Compensation Plan Information" in the Company's Proxy Statement for the 2017 Annual Meeting of Stockholders.

Item 13. CERTAIN RELATIONSHIPS AND RELATED TRANSACTIONS, AND DIRECTOR INDEPENDENCE

The response to this item is incorporated by reference from the discussion responsive thereto under the captions "Certain Relationships and Related Person Transactions" and "Management and Corporate Governance" in the Company's Proxy Statement for the 2017 Annual Meeting of Stockholders.

Item 14. PRINCIPAL ACCOUNTING FEES AND SERVICES

The response to this item is incorporated by reference from the discussion responsive thereto under the caption "Independent Registered Public Accounting Firm" in the Company's Proxy Statement for the 2017 Annual Meeting of Stockholders.

PART IV

Item 15. **EXHIBITS, FINAN CIAL STATEMENT SCHEDULES**

Item 15(a). The following documents are filed as part of this Annual Report on Form 10-K:

Item 15(a)(1) The following consolidated financial statements of the Company are included in Part II, Item 8 of this Annual Report on Form 10-K:

Report of Independent Registered Public Accounting Firm
Consolidated Balance Sheets as of December 31, 2016 and 2015
Consolidated Statements of Operations for the Years Ended December 31, 2016, 2015, and 2014
Consolidated Statements of Stockholders' Equity for the Years Ended December 31, 2016, 2015 and 2014
Consolidated Statements of Cash Flows for the Years Ended December 31, 2016, 2015 and 2014
Notes to Consolidated Financial Statements

Item 15(a)(2) The following financial statements schedule is included in Part II, Item 8:

Schedule II – Valuation and Qualifying Accounts

All other financial statement schedules have not been included because they are not applicable or the information is included in the financial statements or notes thereto.

Item 15(a)(3) Exhibits

The following is a list of exhibits filed as part of this Annual Report on Form 10-K.

Exhibit Number	Exhibit Description	Filed with this Report	Incorporated by Reference herein from Form or Schedule	Filing Date	SEC File/Reg. Number
3.1	Restated Certificate of Incorporation of the Registrant, as filed with the Secretary of State of the State of Delaware on June 18, 2014.		Form 8-K (Exhibit 3.2)	6/19/14	001-36481
3.2	Restated Bylaws of Aspen Aerogels, Inc.		Form 8-K (Exhibit 3.3)	6/19/14	001-36481
4.1	Form of common stock certificate.		Amendment No. 1 to Form S-1 (Exhibit 4.1)	5/14/14	333-195523
4.2	Form of warrant to purchase common stock issued by the Registrant in connection with 2004 and 2005 financing arrangements, as amended and restated.		Form S-1 (Exhibit 4.2)	4/28/14	333-195523
4.3	Form of warrant to purchase common stock issued by the Registrant in connection with the 2005 equity financing, as amended and restated.		Form S-1 (Exhibit 4.3)	4/28/14	333-195523
4.4	Form of warrant to purchase common stock issued by the Registrant in connection with the 2008 reorganization.		Form S-1 (Exhibit 4.4)	4/28/14	333-195523
4.5	Form of warrant to purchase common stock issued by the Registrant in connection with the 2008 financing.		Form S-1 (Exhibit 4.5)	4/28/14	333-195523
4.6	Form of warrant to purchase common stock issued by the Registrant in connection with the 2010 subordinated note and warrant financing.		Form S-1 (Exhibit 4.6)	4/28/14	333-195523

Exhibit Number	Exhibit Description	Filed with this Report	Incorporated by Reference herein from Form or Schedule	Filing Date	SEC File/Reg. Number
4.7	Sixth amended and restated registration rights agreement, dated as of June 11, 2012, by and among the Registrant and the investors named therein, as amended.		Form S-1 (Exhibit 4.8)	4/28/14	333-195523
9.1	Letter agreement, dated as of June 11, 2014, by and between the Registrant and the Fidelity Funds.		Amendment No. 5 to Form S-1 (Exhibit 9.1)	6/12/14	333-195523
10.1	2001 equity incentive plan, as amended. +		Form S-1 (Exhibit 10.1.1)	4/28/14	333-195523
10.2	Form of incentive stock option agreement granted under 2001 equity incentive plan, as amended.+		Form S-1 (Exhibit 10.1.2)	4/28/14	333-195523
10.3	Form of 2013 incentive stock option agreement for options issued in exchange for the forfeiture of options granted under 2001 equity incentive plan, as amended.+		Form S-1 (Exhibit 10.1.3)	4/28/14	333-195523
10.4	Form of 2013 performance-based incentive stock option agreement granted under 2001 equity incentive plan, as amended.+		Form S-1 (Exhibit 10.1.4)	4/28/14	333-195523
10.5	Form of non-qualified stock option agreement granted under 2001 equity incentive plan, as amended.+		Form S-1 (Exhibit 10.1.5)	4/28/14	333-195523
10.6	Form of 2013 non-qualified stock option agreement for options issued in exchange for the forfeiture of options granted under 2001 equity incentive plan, as amended.+		Form S-1 (Exhibit 10.1.6)	4/28/14	333-195523
10.7	Form of 2013 performance-based non-qualified stock option agreement granted under 2001 equity incentive plan, as amended.+		Form S-1 (Exhibit 10.1.7)	4/28/14	333-195523
10.8	Form of 2013 independent director stock option agreement for options issued in exchange for the forfeiture of options granted under 2001 equity incentive plan, as amended.+		Form S-1 (Exhibit 10.1.8)	4/28/14	333-195523
10.9	Form of 2013 performance-based independent director stock option agreement granted under 2001 equity incentive plan, as amended.+		Form S-1 (Exhibit 10.1.9)	4/28/14	333-195523
10.10	2014 employee, director and consultant equity incentive plan. +		Form S-8 (Exhibit 99.10)	8/13/14	333-198124
10.11	Form of stock option agreement granted under 2014 employee, director and consultant equity incentive plan.+		Amendment No. 1 to Form S-1 (Exhibit 10.2.2)	5/14/14	333-195523
10.12	Form of restricted stock unit agreement for executive officers under 2014 employee, director and consultant equity incentive plan. +		Form 10-Q (Exhibit 10.3)	11/7/14	001-36481
10.13	Form of restricted stock agreement for directors under 2014 employee, director and consultant equity incentive plan. +		Amendment No. 1 to Form S-1 (Exhibit 10.2.3)	5/14/14	333-195523
10.14	Multi-tenant industrial net lease, dated August 20, 2001, by and between the Registrant and Cabot II — MA1M03, LLC (as successor landlord to TMT290 Industrial Park, Inc.), as amended.		Form S-1 (Exhibit 10.3)	4/28/14	333-195523

Exhibit Number	Exhibit Description	Filed with this Report	Incorporated by Reference herein from Form or Schedule	Filing Date	SEC File/Reg. Number
10.15.1	Amended and Restated Loan and Security Agreement dated September 3, 2014 and effective as of August 31, 2014, by and between the Company and Silicon Valley Bank.		Form 8-K (Exhibit 10.1)	9/9/14	001-36481
10.15.2	Consent and First Amendment to the Amended and Restated Loan and Security Agreement, dated August 19, 2016, by and between the Registrant and Silicon Valley Bank.		Form 10-Q (Exhibit 10.1)	11/3/16	001-36481
10.15.3	Second Amendment to the Amended and Restated Loan and Security Agreement, dated November 23, 2016, by and between the registrant and Silicon Valley Bank.	X			
10.15.4	Third Amendment to the Amended and Restated Loan and Security Agreement, dated December 27, 2016, by and between the Registrant and Silicon Valley Bank.	X			
10.16	Executive agreement, dated as of December 16, 2015, by and between the Registrant and Donald R. Young. +		Form 10-K (Exhibit 10.16)	3/4/16	001-36481
10.17	Executive agreement, dated as of December 16, 2015, by and between the Registrant and John F. Fairbanks. +		Form 10-K (Exhibit 10.17)	3/4/16	001-36481
10.18	Executive agreement, dated as of December 16, 2015, by and between the Registrant and George L. Gould, Ph.D.+		Form 10-K (Exhibit 10.18)	3/4/16	001-36481
10.19	Executive agreement, dated as of December 16, 2015, by and between the Registrant and Jeffrey A. Ball. +		Form 10-K (Exhibit 10.19)	3/4/16	001-36481
10.20	Executive agreement, dated as of December 16, 2015, by and between the Registrant and Corby C. Whitaker. +		Form 10-K (Exhibit 10.20)	3/4/16	001-36481
10.21	Executive agreement, dated as of December 16, 2015, by and between the Registrant and Kelley W. Conte. +		Form 10-K (Exhibit 10.21)	3/4/16	001-36481
10.22	Bonus plan. +		Amendment No. 2 to Form S-1 (Exhibit 10.15)	5/22/14	333-195523
10.23	Form of participation letter of executive officers under bonus plan. +	X			
10.24	Non-Employee Director Compensation Policy. +		Form 10-Q (Exhibit 10.5)	8/5/16	001-36481
10.25	Cross license agreement dated as of April 1, 2006 by and between Cabot Corporation and the Registrant, as amended.*		Form S-1 (Exhibit 10.15)	4/28/14	333-195523

Exhibit Number	Exhibit Description	Filed with this Report	Incorporated by Reference herein from Form or Schedule	Filing Date	SEC File/Reg. Number
10.2 6	Form of indemnification agreement with directors and certain officers. +		Amendment No. 1 to Form S-1 (Exhibit 10.18)	5/14/14	333-195523
10.27	Inducement Agreement, dated February 15, 2016, by and between the Registrant and the Development Authority of Bulloch County, the City of Statesboro, Georgia and Bulloch County, Georgia.		Form 10-Q (Exhibit 10.1)	5/6/16	001-36481
10.28	PILOT Agreement, dated February 15, 2016, by and between the Registrant and the Development Authority of Bulloch County, the City of Statesboro, Georgia and Bulloch County, Georgia.		Form 10-Q (Exhibit 10.2)	5/6/16	001-36481
10.29	Performance and Accountability Agreement, dated February 15, 2016, by and between the Registrant and the Development Authority of Bulloch County, the Georgia Department of Community Affairs and the administering agency for the OneGeorgia Authority.		Form 10-Q (Exhibit 10.3)	5/6/16	001-36481
10.30	Supply Agreement, dated June 21, 2016, by and between the Registrant and BASF SE.*		Form 10-Q (Exhibit 10.1)	8/5/16	001-36481
10.31	Side Agreement, dated June 21, 2016, by and between the Registrant and BASF SE.*		Form 10-Q (Exhibit 10.2)	8/5/16	001-36481
10.32	Joint Development Agreement, dated June 21, 2016, by and between the Registrant and BASF SE.*		Form 10-Q (Exhibit 10.3)	8/5/16	001-36481
14.1	Code of business conduct and ethics.		Form 8-K (Exhibit 14.1)	6/22/15	001-36481
21.1	Subsidiaries of the Registrant.	X			
23.1	Consent of KPMG LLP.	X			
31.1	Certification of principal executive officer under Section 302(a) of the Sarbanes-Oxley Act of 2002.	X			
31.2	Certification of principal financial officer under Section 302(a) of the Sarbanes-Oxley Act of 2002.	X			
32	Certifications of the principal executive officer and the principal financial officer under Section 906 of the Sarbanes-Oxley Act of 2002.	X			

Exhibit Number	Exhibit Description	Filed with this Report	Incorporated by Reference herein from Form or Schedule	Filing Date	SEC File/Reg. Number
101	The following materials from the Registrant's Annual Report on Form 10-K for the fiscal year ended December 31, 2016, formatted in XBRL (eXtensible Business Reporting Language): (i) Consolidated Balance Sheets as of December 31, 2016 and 2015, (ii) Consolidated Statements of Operations for the Years Ended December 31, 2016, 2015 and 2014, (iii) Consolidated Statements Stockholders' Equity for the Years Ended December 31, 2016, 2015 and 2014, (iv) Consolidated Statements of Cash Flows for the Years Ended December 31, 2016, 2015, and 2014, and (v) Notes to Consolidated Financial Statements.	X			

\+ Management contract or compensatory plan or arrangement.

* Confidential treatment has been granted with respect to certain portions of this Exhibit, which portions have been omitted and filed separately with the Securities and Exchange Commission as part of an application for confidential treatment pursuant to the Securities Act of 1933, as amended.

SIGNAT URES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized.

ASPEN AEROGELS, INC.

Date: March 2, 2017

By: /s/ Donald R. Young
Donald R. Young
President and Chief Executive Officer
(principal executive officer)

Pursuant to the requirements of the Securities Exchange Act of 1934, this report has been signed below by the following persons on behalf of the registrant and in the capacities indicated below and on the dates indicated.

Signature	Title	Date
/s/ Donald R. Young Donald R. Young	President, Chief Executive Officer and Director (principal executive officer)	March 2, 2017
/s/ John F. Fairbanks John F. Fairbanks	Vice President, Chief Financial Officer and Treasurer (principal financial officer and principal accounting officer)	March 2, 2017
/s/ Mark L. Noetzel Mark L. Noetzel	Chairman of the Board	March 2, 2017
/s/ Rebecca Blalock Rebecca Blalock	Director	March 2, 2017
/s/ Robert M. Gervis Robert M. Gervis	Director	March 2, 2017
/s/ Craig A. Huff Craig A. Huff	Director	March 2, 2017
/s/ Steven R. Mitchell Steven R. Mitchell	Director	March 2, 2017
/s/ William P. Noglows William P. Noglows	Director	March 2, 2017
/s/ Richard F. Reilly Richard F. Reilly	Director	March 2, 2017

Exhibit 10.15.3

SECOND A MENDMENT
TO
AMENDED AND RESTATED LOAN AND SECURITY AGREEMENT

This Second Amendment to Amended and Restated Loan and Security Agreement (this " **Amendment** ") is entered into this 23rd day of November, 2016 by and between **SILICON VALLEY BANK** (" **Bank** ") and **ASPEN AEROGELS, INC.** , a Delaware corporation (" **Borrower** ") whose address is 30 Forbes Road, Building B, Northborough, Massachusetts 01532.

Recitals

A. Bank and Borrower have entered into that certain Amended and Restated Loan and Security Agreement dated as of September 3, 2014, as amended by that certain Consent and First Amendment to Amended and Restated Loan and Security Agreement dated as of August 19, 2016 (as amended, and as the same may from time to time be further amended, modified, supplemented or restated, the " **Loan Agreement** ").

B. Bank has extended credit to Borrower for the purposes permitted in the Loan Agreement.

C. Borrower has requested that Ba nk amend the Loan Agreement to (i) extend the maturity date, and (ii) make certain other revisions to the Loan Agreement as more fully set forth herein.

D. Bank has agreed to so amend certain provisions of the Loan Agreement, but only to the extent, in accordance with the terms, subject to the conditions and in reliance upon the representations and warranties set forth below.

Agreement

Now, Therefore, in consideration of the foregoing recitals and other good and valuable consideration, the receipt and adequacy of which is hereby acknowledged, and intending to be legally bound, the parties hereto agree as follows:

1. Definitions. Capitalized terms used but not defined in this Amendment shall have the meanings given to them in the Loan Agreement.

2. Amendment to Loan Agreement.

2.1 Section 13 (**Definitions**). The following term and its definition set forth in Section 13.1 is amended in its entirety and replaced with the following:

" **Revolving Line Maturity Date** " is December 29, 2016.

3. Limitation of Amendments.

3.1 The amendments set forth in Section 2 above are effective for the purposes set forth herein and shall be limited precisely as written and shall not be deemed to (a) be a consent to any amendment, waiver or modification of any other term or condition of any Loan Document, or (b) otherwise prejudice any right or remedy which Bank may now have or may have in the future under or in connection with any Loan Document.

3.2 This Amendment shall be construed in connection with and as part of the Loan Documents and all terms, conditions, representations, warranties, covenants and agreements set forth in the Loan Documents, except as herein amended, are hereby ratified and confirmed and shall remain in full force and effect.

4. Representations and Warranties. To induce Bank to enter into this Amendment, Borrower hereby represents and warrants to Bank as follows:

4.1 Immediately after giving effect to this Amendment (a) the representations and warranties contained in the Loan Documents are true, accurate and complete in all material respects as of the date hereof (except to the extent such representations and warranties relate to an earlier date, in which case they are true and correct as of such date), and (b) no Event of Default has occurred and is continuing;

4.2 Borrower has the power and authority to execute and deliver this Amendment and to perform its obligations under the Loan Agreement, as amended by this Amendment;

4.3 The organizational documents of Borrower delivered to Bank on the Effective Date remain true, accurate and complete and have not been amended, supplemented or restated and are and continue to be in full force and effect;

4.4 The execution and delivery by Borrower of this Amendment and the performance by Borrower of its obligations under the Loan Agreement, as amended by this Amendment, have been duly authorized;

4.5 The execution and delivery by Borrower of this Amendment and the performance by Borrower of its obligations under the Loan Agreement, as amended by this Amendment, do not and will not contravene (a) any law or regulation binding on or affecting Borrower, (b) any contractual restriction with a Person binding on Borrower, (c) any order, judgment or decree of any court or other governmental or public body or authority, or subdivision thereof, binding on Borrower, or (d) the organizational documents of Borrower;

4.6 The execution and delivery by Borrower of this Amendment and the performance by Borrower of its obligations under the Loan Agreement, as amended by this Amendment, do not require any order, consent, approval, license, authorization or validation of, or filing, recording or registration with, or exemption by any governmental or public body or authority, or subdivision thereof, binding on Borrower, except as already has been obtained or made; and

4.7 This Amendment has been duly executed and delivered by Borrower and is the binding obligation of Borrower, enforceable against Borrower in accordance with its terms, except as such enforceability may be limited by bankruptcy, insolvency, reorganization, liquidation, moratorium or other similar laws of general application and equitable principles relating to or affecting creditors' rights.

5. Ratification of Perfection Certificate . Borrower hereby ratifies, confirms and reaffirms, all and singular, the terms and disclosures contained in a certain Perfection Certificate dated as of August 31, 2014 delivered by Borrower to Bank, and acknowledges, confirms and agrees the disclosures and information Borrower provided to Bank in said Perfection Certificate have not changed, as of the date hereof.

6. No Defenses of Borrower. Borrower hereby acknowledges and agrees that Borrower has no offsets, defenses, claims, or counterclaims against Bank with respect to the Obligations, or otherwise, and that if Borrower now has, or ever did have, any offsets, defenses, claims, or counterclaims against Bank, whether known or unknown, at law or in equity, all of them are hereby expressly WAIVED and Borrower hereby RELEASES Bank from any liability thereunder.

7. Integration . This Amendment and the Loan Documents represent the entire agreement about this subject matter and supersede prior negotiations or agreements. All prior agreements, understandings, representations, warranties, and negotiations between the parties about the subject matter of this Amendment and the Loan Documents merge into this Amendment and the Loan Documents.

8. Counterparts. This Amendment may be executed in any number of counterparts and all of such counterparts taken together shall be deemed to constitute one and the same instrument.

9. Fees and Expenses . Borrower agrees to promptly pay Bank (i) a fully earned, non-refundable amendment fee in an amount equal to Four Thousand Dollars ($4,000) on the date of this Amendment, and (ii) upon receipt of an invoice, Bank's legal fees and expenses incurred in connection with this Amendment. Borrower agrees to execute such other documents and instruments as Bank may reasonably request.

10. Effectiveness . This Amendment shall be deemed effective upon (a) the due execution and delivery to Bank of this Amendment by each party hereto, and (b) Bank's receipt of the Acknowledgement of Amendment and Reaffirmation of Guaranty substantially in the form attached hereto as Schedule 1, duly executed and delivered by the Guarantor.

[Signature page follows.]

In Witness Whereof, the parties hereto have caused this Amendment to be duly executed and delivered as of the date first written above.

BANK	**BORROWER**
SILICON VALLEY BANK	ASPEN AEROGELS, INC.
By: /s/ Christopher Leary	By: /s/ John F. Fairbanks
Name: Christopher Leary	Name: John F. Fairbanks
Title: Director	Title: Chief Financial Officer

Schedule 1

ACKNOWELDGMENT OF AMENDMENT
AND REAFFIRMATION OF GUARANTY

Section 1. Guarantor hereby acknowledges and confirms that it has reviewed and approved the terms and conditions of the Second Amendment to Amended and Restated Loan and Security Agreement dated as of even date herewith ("the " **Amendment** ").

Section 2. Guarantor hereby consents to the Amendment and agrees that the Guaranty relating to the Obligations of Borrower under the Loan Agreement shall continue in full force and effect, shall be valid and enforceable and shall not be impaired or otherwise affected by the execution of the Amendment or any other document or instruction delivered in connection herewith.

Section 3. Guarantor represents and warrants that, after giving effect to the Amendment, all representations and warranties contained in the Guaranty are true, accurate and complete as if made the date hereof.

Dated as of November 23, 2016.

GUARANTOR : ASPEN AEROGELS RHODE ISLAND LLC

By: /s/ John F. Fairbanks

Name: John F. Fairbanks

Title: Chief Financial Officer

Exhibit 10.15.4

THIRD A MENDMENT
TO
AMENDED AND RESTATED LOAN AND SECURITY AGREEMENT

This Third Amendment to Amended and Restated Loan and Security Agreement (this " **Amendment** ") is entered into this 27 day of December, 2016 by and between **SILICON VALLEY BANK** (" **Bank** ") and **ASPEN AEROGELS, INC.** , a Delaware corporation (" **Borrower** ") whose address is 30 Forbes Road, Building B, Northborough, Massachusetts 01532.

Recitals

A. Bank and Borrower have entered into that certain Amended and Restated Loan and Security Agreement dated as of September 3, 2014, as amended by that certain Consent and First Amendment to Amended and Restated Loan and Security Agreement dated as of August 19, 2016, and as further amended by that certain Second Amendment to Amended and Restated Loan and Security Agreement dated as of November 23, 2016 (as amended, and as the same may from time to time be further amended, modified, supplemented or restated, the " **Loan Agreement** ").

B. Bank has extended credit to Borrower for the purposes permitted in the Loan Agreement.

C. Borrower has requested that Ba nk amend the Loan Agreement to (i) extend the maturity date, and (ii) make certain other revisions to the Loan Agreement as more fully set forth herein.

D. Bank has agreed to so amend certain provisions of the Loan Agreement, but only to the extent, in accordance with the terms, subject to the conditions and in reliance upon the representations and warranties set forth below.

Agreement

Now, Therefore, in consideration of the foregoing recitals and other good and valuable consideration, the receipt and adequacy of which is hereby acknowledged, and intending to be legally bound, the parties hereto agree as follows:

1. Definitions. Capitalized terms used but not defined in this Amendment shall have the meanings given to them in the Loan Agreement.

2. Amendment to Loan Agreement.

2.1 Section 6.9(a) (Financial Covenants) . Section 6.9(a) is amended in its entirety and replaced with the following:

"(a) EBITDA . Borrower shall achieve, measured as of the end of each fiscal quarter during the following periods, EBITDA of at least (loss not worse than) the following for the following periods:

Period	Minimum EBITDA (maximum loss)
Trailing three (3) month period ending December 31, 2016	($3,000,000)"

2.2 Section 13 (**Definitions**). The following term and its definition set forth in Section 13.1 is amended in its entirety and replaced with the following:

" **Revolving Line Maturity Date** " is January 29, 2017.

2.3 Exhibit B (Compliance Certificate) . The Compliance Certificate attached to the Loan Agreement as Exhibit B is amended in its entirety and replaced with the Compliance Certificate in the form of Exhibit B attached hereto.

3. Limitation of Amendments.

3.1 The amendments set forth in Section 2 above are effective for the purposes set forth herein and shall be limited precisely as written and shall not be deemed to (a) be a consent to any amendment, waiver or modification of any other term or condition of any Loan Document, or (b) otherwise prejudice any right or remedy which Bank may now have or may have in the future under or in connection with any Loan Document.

3.2 This Amendment shall be construed in connection with and as part of the Loan Documents and all terms, conditions, representations, warranties, covenants and agreements set forth in the Loan Documents, except as herein amended, are hereby ratified and confirmed and shall remain in full force and effect.

4. Representations and Warranties. To induce Bank to enter into this Amendment, Borrower hereby represents and warrants to Bank as follows:

4.1 Immediately after giving effect to this Amendment (a) the representations and warranties contained in the Loan Documents are true, accurate and complete in all material respects as of the date hereof (except to the extent such representations and warranties relate to an earlier date, in which case they are true and correct as of such date), and (b) no Event of Default has occurred and is continuing;

4.2 Borrower has the power and authority to execute and deliver this Amendment and to perform its obligations under the Loan Agreement, as amended by this Amendment;

4.3 The organizational documents of Borrower delivered to Bank on the Effective Date remain true, accurate and complete and have not been amended, supplemented or restated and are and continue to be in full force and effect;

4.4 The execution and delivery by Borrower of this Amendment and the performance by Borrower of its obligations under the Loan Agreement, as amended by this Amendment, have been duly authorized;

4.5 The execution and delivery by Borrower of this Amendment and the performance by Borrower of its obligations under the Loan Agreement, as amended by this Amendment, do not and will not contravene (a) any law or regulation binding on or affecting Borrower, (b) any contractual restriction with a Person binding on Borrower, (c) any order, judgment or decree of any court or other governmental or public body or authority, or subdivision thereof, binding on Borrower, or (d) the organizational documents of Borrower;

4.6 The execution and delivery by Borrower of this Amendment and the performance by Borrower of its obligations under the Loan Agreement, as amended by this Amendment, do not require any order, consent, approval, license, authorization or validation of, or filing, recording or registration with, or exemption by any governmental or public body or authority, or subdivision thereof, binding on Borrower, except as already has been obtained or made; and

4.7 This Amendment has been duly executed and delivered by Borrower and is the binding obligation of Borrower, enforceable against Borrower in accordance with its terms, except as such enforceability may be limited by bankruptcy, insolvency, reorganization, liquidation, moratorium or other similar laws of general application and equitable principles relating to or affecting creditors' rights.

5. Ratification of Perfection Certificate . Borrower hereby ratifies, confirms and reaffirms, all and singular, the terms and disclosures contained in a certain Perfection Certificate dated as of August 31, 2014 delivered by Borrower to Bank, and acknowledges, confirms and agrees the disclosures and information Borrower provided to Bank in said Perfection Certificate have not changed, as of the date hereof.

6. No Defenses of Borrower. Borrower hereby acknowledges and agrees that Borrower has no offsets, defenses, claims, or counterclaims against Bank with respect to the Obligations, or otherwise, and that if Borrower now has, or ever did have, any offsets, defenses, claims, or counterclaims against Bank, whether known or unknown, at law or in equity, all of them are hereby expressly WAIVED and Borrower hereby RELEASES Bank from any liability thereunder.

7. Integration . This Amendment and the Loan Documents represent the entire agreement about this subject matter and supersede prior negotiations or agreements. All prior agreements, understandings, representations, warranties, and negotiations between the parties about the subject matter of this Amendment and the Loan Documents merge into this Amendment and the Loan Documents.

8. Counterparts. This Amendment may be executed in any number of counterparts and all of such counterparts taken together shall be deemed to constitute one and the same instrument.

9. Fees and Expenses . Borrower agrees to promptly pay Bank, upon receipt of an invoice, Bank's legal fees and expenses incurred in connection with this Amendment. Borrower agrees to execute such other documents and instruments as Bank may reasonably request.

10. Effectiveness . This Amendment shall be deemed effective upon (a) the due execution and delivery to Bank of this Amendment by each party hereto, and (b) Bank's receipt of the Acknowledgement of Amendment and Reaffirmation of Guaranty substantially in the form attached hereto as Schedule 1, duly executed and delivered by the Guarantor.

[Signature page follows.]

In Witness Whereof, the parties hereto have caused this Amendment to be duly executed and delivered as of the date first written above.

BANK	**BORROWER**
SILICON VALLEY BANK	ASPEN AEROGELS, INC.
By: /s/ Christopher Leary	By: /s/ John F. Fairbanks
Name: Christopher Leary	Name: John F. Fairbanks
Title: Director	Title: Chief Financial Officer

Schedule 1

**ACKNOWELDGMENT OF AMENDMENT
AND REAFFIRMATION OF GUARANTY**

Section 1. Guarantor hereby acknowledges and confirms that it has reviewed and approved the terms and conditions of the Second Amendment to Amended and Restated Loan and Security Agreement dated as of even date herewith ("the " **Amendment** ").

Section 2. Guarantor hereby consents to the Amendment and agrees that the Guaranty relating to the Obligations of Borrower under the Loan Agreement shall continue in full force and effect, shall be valid and enforceable and shall not be impaired or otherwise affected by the execution of the Amendment or any other document or instruction delivered in connection herewith.

Section 3. Guarantor represents and warrants that, after giving effect to the Amendment, all representations and warranties contained in the Guaranty are true, accurate and complete as if made the date hereof.

Dated as of December 27 , 2016.

GUARANTOR : ASPEN AEROGELS RHODE ISLAND LLC

By: /s/ John F. Fairbanks

Name: John F. Fairbanks

Title: Chief Financial Officer

EXHIBIT B

COMPLIANCE CERTIFICATE

TO: SILICON VALLEY BANK Date:
FROM: ASPEN AEROGELS, INC.

The undersigned authorized officer of Aspen Aerogels, Inc. (" **Borrower** ") certifies that under the terms and conditions of the Amended and Restated Loan and Security Agreement between Borrower and Bank (as amended and in effect, the " **Agreement** "), (1) Borrower is in complete compliance for the period ending _______________ with all required covenants except as noted below, (2) there are no Events of Default, (3) all representations and warranties in the Agreement are true and correct in all material respects on this date except as noted below; provided , however , that such materiality qualifier shall not be applicable to any representations and warranties that already are qualified or modified by materiality in the text thereof; and provided , further that those representations and warranties expressly referring to a specific date shall be true, accurate and complete in all material respects as of such date , (4) Borrower, and each of its Subsidiaries, has timely filed all required tax returns and reports, and Borrower has timely paid all foreign, federal, state and local taxes, assessments, deposits and contributions owed by Borrower except as otherwise permitted pursuant to the terms of Section 5.9 of the Agreement, and (5) no Liens have been levied or claims made against Borrower or any of its Subsidiaries, if any, relating to unpaid employee payroll or benefits of which Borrower has not previously provided written notification to Bank. Attached are the required documents supporting the certification. The undersigned certifies that these are prepared in accordance with GAAP consistently applied from one period to the next except as explained in an accompanying letter or footnotes. The undersigned acknowledges that no borrowings may be requested at any time or date of determination that Borrower is not in compliance with any of the terms of the Agreement, and that compliance is determined not just at the date this certificate is delivered. Capitalized terms used but not otherwise defined herein shall have the meanings given them in the Agreement.

Please indicate compliance status by circling Yes/No under "Complies" column.

Reporting Covenant	Required	Complies
Monthly financial statements with Compliance Certificate	Monthly within 30 days	Yes No
Quarterly financial statements	Quarterly within 45 days	Yes No
Annual financial statement (CPA Audited) + CC	FYE within 150 days	Yes No
10-Q, 10-K and 8-K	Within 5 days after filing with SEC	Yes No
A/R & A/P Agings, inventory reports and Deferred Revenue reports	Monthly within 20 days	Yes No
Transaction Reports	15 th and last Business Day of each month (monthly within 20 days when a Streamline Period is in effect) and with each request for a Credit Extension;	Yes No
Projections	FYE within 30 days	Yes No
The following Intellectual Property was registered after the Effective Date (if no registrations, state "None")____		

Financial Covenant	Required	Actual	Complies
Maintain as indicated:			
Minimum EBITDA	*	$	Yes No
Maximum Unfinanced Capital Expenditures	**	$	Yes No

*See Section 6.9(a); ** See Section 6.9(b)

Performance Pricing		Applies
Adjusted Quick Ratio at least 1.50:1.00	Prime + 0.75% (Eligible Accounts) or Prime + 1.25% (Eligible Foreign Accounts and Eligible Inventory); LIBOR + 3.75% (Eligible Accounts) or LIBOR +4.25% (Eligible Foreign Accounts and Eligible Inventory)	Yes No
Adjusted Quick Ratio less than 1.50:1.00	Prime + 1.25% (Eligible Accounts); Prime + 1.75% (Eligible Foreign Accounts and Eligible Inventory)	Yes No

The following financial covenant analyses and information set forth in Schedule 1 attached hereto are true and accurate as of the date of this Certificate.

The following are the exceptions with respect to the certification above: (If no exceptions exist, state “No exceptions to note.”)

ASPEN AEROGELS, INC.

By:
Name:
Title:

BANK USE ONLY

Received by: _____________________
AUTHORIZED SIGNER
Date: _________________________
Verified: ________________________
AUTHORIZED SIGNER
Date: _________________________
Compliance Status:Yes No

Schedule 1 to Compliance Certificate

Financial Covenants of Borrower

In the event of a conflict between this Schedule and the Loan Agreement, the terms of the Loan Agreement shall govern.

I. **EBITDA** (Section 6.9(a))

Required: Borrower shall achieve, measured as of the end of each fiscal quarter during the following periods, EBITDA of at least (loss not worse than) the following for the following periods:

Period	**Minimum EBITDA (maximum loss)**
Trailing three (3) month period ending December 31, 2016	($3,000,000)

Actual:

A.	Net Income	$
B.	To the extent included in the determination of Net Income	
	1.The provision for income taxes	$
	2.Depreciation expense	$
	3.Amortization expense	$
	4.Net Interest Expense	$
	5.Non-cash stock compensation expense	$
	6.The sum of lines 1 through 5	$
C.	EBITDA (line A plus line B.6)	

Is line C equal to or greater than $___________?

No, not in compliance   Yes, in compliance

II. **Maximum Unfinanced Capital Expenditures** (Section 6.9(b))

Required:	Commencing on July 1, 2014 through each of the following periods, Borrower shall not incur Unfinanced Capital Expenditures (on a cumulative basis beginning on July 1, 2014) in excess of (i) Fifteen Million Dollars ($15,000,000) through September 30, 2014, (ii) Thirty Million Dollars ($30,000,000) through December 31, 2014, (iii) Forty Million Dollars ($40,000,000) through March 31, 2015, (iv) Forty Five Million Dollars ($45,000,000) through June 30, 2015, and (v) Fifty Million Dollars ($50,000,000) at all times thereafter.

Actual:

A.	Unfinanced Capital Expenditures	$

Are the Unfinanced Capital Expenditures for the period in question less than $_____________?

No, not in compliance Yes, in compliance

Exhibit 10.23

2017 Participation Letter
Corporate Personnel

Aspen Aerogels, Inc. Bonus Plan

Name: [ ]

Date: [ ], 2017

This Participation Letter describes the terms of your participation in the Aspen Aerogels, Inc. Bonus Plan (the "Plan") during fiscal year 2017. This Participation Letter is subject to the terms and conditions of the Plan, a copy of which has been provided to you. References to "EBITDA" in this Participation Letter shall be deemed to refer to "Adjusted EBITDA" as such term is used in and defined in the Plan.

1. **Designation:** Corporate Participant

2. **Target Award:** [ ]% of base salary or $[ ]

3. **Performance Period:** 2017 Fiscal Year

4. **Performance Metrics**
   - **Company Revenue Goal:** $[ ] million
   - **EBITDA Goal:** $[ ] million

5. **Allocation of Target Award to Goals**
   - [ ]% or $[ ] based on Company Revenue Goal
   - [ ]% or $[ ] based on EBITDA Goal

6. **Thresholds, Floors and Caps**
   - Revenue ≥ $[ ] for the Company Revenue Goal ("Revenue Goal Threshold")
   - EBITDA ≥ $[ ] for the EBITDA Goal ("EBITDA Goal Threshold")
   - If the Revenue or EBITDA Threshold is achieved, you will earn a bonus equal to a pro rata portion of such goal's target award based on a straight line interpolation between the applicable threshold and related goal.
   - THERE WILL BE NO PAYOUT UNDER EITHER GOAL UNLESS EBITDA GOAL THRESHOLD IS ACHIEVED.
   - Payments under this Participation Letter shall not exceed an amount equal to [ ]% of the Target Award amount.

7. MBO Goals

- [ ]

8. **Payouts above Threshold**
   - You will earn a bonus for actual Company Revenue and EBITDA above Threshold equal to:

     Company Revenue Goal:$[ ] per $[ ]M
     EBITDA Goal:$[ ] per $[ ]M

9. **Examples**

   [ ]

All amounts shown are based on current base salary. However, actual bonus will be calculated and paid based on actual base salary in effect at [ ].

Accepted: I hereby accept my designation as a Participant in the Plan. I agree to keep the terms and conditions of my participation in the Plan confidential and not to divulge such terms and conditions.

Signature: ______________________________ Dated: [__]

Exhibit 21.1

SUBSIDIARIES OF ASPEN AEROGELS, INC.

Aspen Aerogels Germany GmbH, a German entity

Aspen Aerogels Rhode Island, LLC, a Rhode Island limited liability company

Aspen Aerogels Georgia, LLC, a Georgia limited liability company

Exhibit 23.1

Consent of Independent Registered Public Accounting Firm

The Board of Directors
Aspen Aerogels, Inc.:

We consent to the incorporation by reference in the registration statements (Nos. 333-198124 and 333-209995) on Form S-8 of Aspen Aerogels, Inc. of our reports dated March 2, 2017, with respect to the consolidated balance sheets of Aspen Aerogels, Inc. as of December 31, 2016 and 2015, and the related consolidated statements of operations, stockholders' equity, and cash flows for each of the years in the three-year period ended December 31, 2016, and the related financial statement schedule, which reports appear in the December 31, 2016 annual report on Form 10-K of Aspen Aerogels, Inc.

/s/ KPMG LLP

Boston, Massachusetts
March 2, 2017

Exhibit 31.1

CERTIFICATIONS UNDER SECTION 302

I, Donald R. Young, certify that:

1. I have reviewed this annual report on Form 10-K of Aspen Aerogels, Inc.;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant’s other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

a) designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

b) designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

c) evaluated the effectiveness of the registrant’s disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

d) disclosed in this report any change in the registrant’s internal control over financial reporting that occurred during the registrant’s most recent fiscal quarter (the registrant’s fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant’s internal control over financial reporting; and

5. The registrant’s other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant’s auditors and the audit committee of the registrant’s board of directors (or persons performing the equivalent functions):

a) all significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant’s ability to record, process, summarize and report financial information; and

b) any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant’s internal control over financial reporting.

Date: March 2, 2017

/s/ Donald R. Young

Donald R. Young
President and Chief Executive Officer
(principal executive officer)

Exhibit 31.2

CERTIFICATIONS UNDER SECTION 302

I, John F. Fairbanks, certify that:

1. I have reviewed this annual report on Form 10-K of Aspen Aerogels, Inc.;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

a) designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

b) designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

c) evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

d) disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

a) all significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

b) any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: March 2, 2017

/s/ John F. Fairbanks
John F. Fairbanks
Vice President, Chief Financial Officer and Treasurer
(principal financial officer and principal accounting officer)

Exhibit 32

CERTIFICATIONS UNDER SECTION 906

Pursuant to section 906 of the Sarbanes-Oxley Act of 2002 (subsections (a) and (b) of section 1350, chapter 63 of title 18, United States Code), each of the undersigned officers of Aspen Aerogels, Inc., a Delaware corporation (the "Company"), does hereby certify, to such officer's knowledge, that:

The Annual Report for the year ended December 31, 2016 (the "Form 10-K") of the Company fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934, and the information contained in the Form 10-K fairly presents, in all material respects, the financial condition and results of operations of the Company.

Dated: March 2, 2017	/s/ Donald R. Young Donald R. Young President and Chief Executive Officer (principal executive officer)
Dated: March 2, 2017	/s/ John F. Fairbanks John F. Fairbanks Vice President, Chief Financial Officer and Treasurer (principal financial officer and principal accounting officer)