Rubicon Technology, Inc.
Form 10-K
March 14, 2016
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UNITED STATES

SECURITIES AND EXCHANGE COMMISSION

WASHINGTON, DC 20549

FORM 10-K

(Mark one)

x **Annual report pursuant to section 13 or 15(d) of the Securities Exchange Act of 1934 for the fiscal year ended December 31, 2015**

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 001-33834

RUBICON TECHNOLOGY, INC.

(Exact Name of Registrant as Specified in Its Charter)

Delaware	**36-4419301**
(State or Other Jurisdiction of Incorporation or Organization)	**(I.R.S. Employer Identification No.)**
900 East Green Street	
Bensenville, Illinois	**60106**
(Address of Principal Executive Offices)	**(Zip Code)**

Registrant s Telephone Number, Including Area Code: (847) 295-7000

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

Title of each class	**Name of each exchange on which registered**
Common Stock, Par Value $0.001 per share	**The NASDAQ Global Market**

Securities registered pursuant to Section 12(g) of the 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 x

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

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 x No ¨

Indicate by check mark whether the registrant has submitted electronically and posted on its corporate Website, if any, every Interactive Data File required to be submitted and posted pursuant to Rule 405 of Regulation S-T (§ 232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit and post such files). Yes x 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. x

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 x
Non-accelerated filer ¨	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 x

As of June 30, 2015, there were 23,709,896 shares of common stock outstanding held by nonaffiliates of the registrant, with an aggregate market value of the common stock (based upon the closing price of these shares on the NASDAQ Global Market) of approximately $57,615,047.

The number of shares of the registrant s common stock outstanding as of the close of business on March 9, 2016 was 26,722,958.

Documents incorporated by reference:

Portions of the Registrant s Proxy Statement for its 2016 Annual Meeting of Stockholders are incorporated by reference into Part III of this Annual Report on Form 10-K provided, that if such Proxy Statement is not filed with the Commission within 120 days after the end of the fiscal year covered by this Form 10-K, an amendment to this Form 10-K shall be filed no later than the end of such 120-day period.

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PART I

All statements, other than statements of historical facts, included in this Annual Report on Form 10-K including statements regarding our estimates, expectations, beliefs, intentions, projections or strategies for the future, results of operations, financial position, net sales, projected costs, prospects and plans and objectives of management for future operations may be forward-looking statements within the meaning of the safe harbor provisions of the U.S. Private Securities Litigation Reform Act of 1995. We have based these forward-looking statements on our current expectations and projections about future events and financial trends that we believe may affect our financial condition, results of operations, business strategy, short-term and long-term business operations and objectives and financial needs. These forward-looking statements can be identified by the use of terms and phrases such as believe, plan, intend, anticipate, target, estimate, expect, forecast, prospects, goals, potential, likely, an future-tense or conditional constructions such as will, may, could, should, etc. (or the negative thereof). Items contemplating or making assumptions about actual or potential future sales, market size and trends or operating results also constitute forward-looking statements.

Moreover, we operate in a very competitive and rapidly changing environment. New risks emerge from time to time. It is not possible for our management to predict all risks, nor can we assess the impact of all factors on our business or the extent to which any factor, or combination of factors, may cause actual results to differ materially from those contained in any forward-looking statements we may make. Before investing in our common stock, investors should be aware that the occurrence of the risks, uncertainties and events described in the section entitled Risk Factors and elsewhere in this Annual Report could have a material adverse effect on our business, results of operations and financial condition.

Although we believe that the expectations reflected in the forward-looking statements are reasonable, forward-looking statements are inherently subject to known and unknown risks, including business, economic and other risks and uncertainties that may cause actual results to be materially different from those discussed in these forward-looking statements. Readers are urged not to place undue reliance on these forward-looking statements, which speak only as of the date of this Annual Report. We assume no obligation to update any forward-looking statements in order to reflect any event or circumstance that may arise after the date of this Annual Report, other than as may be required by applicable law or regulation. If one or more of these risks or uncertainties materialize, or if the underlying assumptions prove incorrect, our actual results may vary materially from those expected or projected.

This Annual Report also contains statistical data and estimates, including those relating to market size and growth rates of the markets in which we participate, that we obtained from industry publications and reports generated by market research firms. These publications typically indicate that they have obtained their information from sources they believe to be reliable, but do not guarantee the accuracy and completeness of their information. Although we have assessed the information in such publications and found it to be reasonable and believe the publications and reports are reliable, we have not independently verified their data.

You should read this Annual Report and the documents that we reference in this Annual Report and have filed with the Securities and Exchange Commission (the SEC) as exhibits with the understanding that our actual future results, levels of activity, performance and events and circumstances may be materially different from what we expect.

Unless otherwise indicated, the terms Rubicon, the Company, we, us, and our refer to Rubicon Technology, Inc our consolidated subsidiaries.

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ITEM 1. BUSINESS

OVERVIEW

We are a vertically integrated, advanced electronic materials provider specializing in monocrystalline sapphire for applications in light-emitting diodes (LEDs), optical systems and specialty electronic devices. Sapphire is also used as an exterior component in mobile devices, specifically camera lens covers, dual flashes and home buttons on certain newer model smartphones and as the crystal covering the faces of certain smart watches. Sapphire was adopted for use on the home button on certain smartphones because of the scratch resistance and increased touch capacitance it offers, which are important characteristics to ensure the effectiveness of the fingerprint recognition security built into the device. We believe that the use of fingerprint recognition security and other biometrics could become more prevalent in the future, which could become a strong growth driver for sapphire. In addition, some consumer electronics original equipment manufacturers (OEMs) are using full sapphire faceplates for smartphones, in limited volume. If sapphire smartphone faceplates were widely adopted, this would become the world s largest application for sapphire. We apply our proprietary crystal growth technology to produce high-quality sapphire products to supply both high-volume and niche end-markets, and we work closely with our customers to meet their quality and delivery needs.

Our largest product lines are:

- sapphire cores, two to six inches in diameter, which our customers further process into wafers for use in LED applications and into components such as lens covers for mobile devices;
- four and six-inch sapphire wafers that are used as substrates for the manufacture of LED chips and to a lesser extent for other semiconductor applications such as Silicon-on-Sapphire (SoS) Radio Frequency Integrated Circuits (RFICs);
- four, six, and eight-inch patterned sapphire substrate (PSS) wafers which are polished wafers that undergo additional processes of photolithography and dry plasma etching to produce a patterned surface which enhances LED light extraction efficiency (LEE); and
- optical sapphire components in various shapes and sizes, including round and rectangular windows and blanks, domes, tubes and rods. These optical sapphire products are used in equipment for a wide variety of end markets, including defense and aerospace, medical devices, oil and gas drilling, semiconductor manufacturing and other markets.

For the LED market, we currently sell two to six-inch material in core form and four, six and eight-inch material in polished and PSS wafer form. Eight-inch wafers are sold primarily for customers research and development efforts at this time. We have the ability to produce cores and wafers of up to twelve inches in diameter to support production of chips for next-generation LED and other electronic applications. Larger sapphire also has current applications in the optical markets. In other semiconductor markets, sapphire is used in certain RFIC products.

We believe that LED production is following a similar path to that of production of integrated circuits on silicon substrates, which gradually migrated to production on increasingly larger substrates in order to reduce manufacturing costs. We feel that this migration to larger substrates and the related efficiency gains will help reduce the prices of

LED devices and thereby facilitate greater adoption of LED technology in the backlighting and general lighting markets.

Our vertically-integrated manufacturing capabilities are designed to enable us to maintain our high quality standards while controlling costs. We start with powdered aluminum oxide and densify and purify the powder with our proprietary process into a form used in our crystal growth furnaces. We design, assemble and maintain our own proprietary crystal growth furnaces to grow high-purity, low-stress, ultra-low-defect-density sapphire crystals. In addition, we possess capabilities in high-precision core drilling, wafer slicing, surface lapping, edge bevel grinding, polishing, patterning and wafer cleaning processes. We also have the ability to etch patterns onto our polished wafers for use in the LED market. We foster a strong sense of innovation and agility in our product development teams in an attempt to develop new products more effectively and to differentiate our product offering.

We plan to leverage our technological advantage in efficiently producing high-quality, large-diameter sapphire products to capitalize on future growth opportunities. To attain this goal, we are investing in research and development activities, continuing to enhance our operational capabilities, increasing our brand recognition and diversifying into new market segments.

We are a Delaware corporation incorporated on February 7, 2001. Our common stock is listed on the NASDAQ Global Market under the symbol RBCN.

INDUSTRY OVERVIEW

Integrated circuits and other semiconductor devices have traditionally been fabricated on silicon substrates. However, for certain advanced applications, new electronic materials have emerged as the substrates of choice due to evolving integration and performance considerations. For example, sapphire is the preferred substrate material for High Brightness (HB) white, blue and green LED applications due to its crystal lattice compatibility with the aluminum gallium nitride (AlGaN) epitaxial layers, thermal expansion properties, commercial availability and cost efficiency. Because of its hardness, transparency and other physical properties, sapphire has long been used for windows and lenses in harsh environments and is now being used as a component in consumer electronic devices and other non-LED applications.

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LED applications

Advancements in solid state lighting utilizing HB white, blue and green LEDs over the past decade represent a disruptive technology in the lighting industry, providing significant performance, environmental and economic improvements compared to traditional incandescent or fluorescent lighting. For example, traditional incandescent lamps are inefficient and costly, emitting over 90% of consumed power as heat and lasting only 1,500 to 2,000 hours. Fluorescent lamps produce light by passing electricity through toxic mercury vapor, which creates an environmental disposal problem. LEDs do not contain mercury or lead and are 4.0 to 6.6 times as efficient as traditional incandescent lamps, while providing 35,000 to 50,000 hours of light. These factors, along with their durability, small form factor, excellent color performance and decreasing costs, have led to growing demand for LEDs in applications such as small displays for mobile devices, flashes for digital cameras, backlighting units (BLUs) for displays used in notebook computers, desktop monitors, LCD televisions, public display signs, automotive lights, street lights, traffic signals and general and specialty lighting. Applications using LEDs have unit volumes in the billions and we believe are expected to grow significantly over the next several years. More than 95 percent of HB LEDs are produced on sapphire substrates. Therefore, as the HB LED market grows, we believe the sapphire substrate market will grow as well.

General illumination. LEDs are increasingly being used for outdoor and indoor commercial and public lighting, architectural lighting, street lights, traffic signals, retail displays, residential lighting, replacement lamps and off-grid lighting for developing countries. General illumination has recently become the largest application for HB LEDs and is still growing rapidly.

Mobile devices. LEDs are used in color displays for mobile phones and other portable electronics such as GPS systems, MP3 players and digital camera flashes. LEDs are well suited for mobile devices due to their low current drain which extends battery life and durability while generating less heat. For these reasons, the vast majority of mobile devices utilize LED lighting.

LED backlighting units for large displays. LED BLUs now frequently replace conventional fluorescent BLUs in LCD flat panel televisions, notebook computers and desktop monitors. Benefits of LED BLUs in these applications are reduced power consumption/extended battery life, thinner displays, quicker response time and better color rendition. Displays made with LED BLUs also have no toxic materials, which helps electronics manufacturers to comply with environmental regulations.

Automotive lighting. Automobile manufacturers are increasingly using LEDs in car and truck headlights, turning and tail light functions as well as interior lighting. Benefits include near-instant response time, reduced power usage and more stylish and effective designs. Increased LED usage in other transportation vehicles such as motorcycles and commercial jets offers additional growth potential.

Commercial signage/displays. LEDs are widely used as light sources on large signs, LED displays and outdoor displays, such as jumbo screens used in sports arenas and electronic billboard displays.

Optical applications

Sapphire is utilized for windows and optics for aerospace, sensor, medical and laser applications due to its wide-band transmission, superior strength, scratch resistance and high strength-to-weight ratio. Sapphire s physical properties make it very well suited for jet fighter targeting pod windows, forward-looking infrared windows for commercial and business jets as well as unmanned air vehicles or drones, rocket domes and transparent armor for military vehicles. Recently, sapphire has been adopted for use in several new applications in mobile devices, specifically camera lens covers, dual flashes and home buttons on certain newer model smartphones. The switch to sapphire for these mobile

device applications is because sapphire is highly scratch resistant and offers improved touch capacitance, which are important characteristics to ensure the effectiveness of the fingerprint recognition security recently built into the home button functionality of one of the major brands of smartphones. Biometrics, such as fingerprint recognition, provides greater security than a password. Data security is becoming an increasing concern in society and we believe that the use of biometrics could increase in coming years, which could increase demand for sapphire.

Some consumer electronics OEMs have announced or introduced smart watches using sapphire crystals and a few OEMs have announced or introduced smart phones with the entire faceplate made of sapphire crystal. One factor delaying broader adoption is the relatively high fabrication costs to make a faceplate from bulk sapphire. We are working on developing alternative sapphire solutions for this market that could eliminate most of the customer s fabrication costs.

Other semiconductor applications

SoS integrated circuits consist of a thin layer of silicon grown on a sapphire substrate and are primarily used for RFICs in advanced wireless and military applications. In particular, SoS RFICs are currently used in mobile communication base stations, satellites and radiation-hardened applications for the defense industry.

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Sapphire substrate industry supply chain

The production process for sapphire substrates is substantially similar to that of silicon wafers. A typical process flow consists of crystal growth, fabrication, slicing, lapping and polishing steps. Output quality is measured in flatness, desired crystal planar orientation, etch pitch density and crystalline structure uniformity. We place a great emphasis on continuously improving yields and increasing production efficiency to drive costs lower to take advantage of emerging high-volume opportunities as they arise. Manufacturers are exploring the use of larger diameter sapphire wafers to allow them to gain efficiency in their production processes through higher throughput and reduced edge loss. In addition to high quality crystal, they require very precise dimensional tolerances, high production volumes, cost efficiency and on-time delivery. Sapphire is the material on which the entire HB LED value chain is built.

TECHNOLOGY

Rubicon, as a vertically integrated manufacturer, has developed proprietary advanced technology at every stage of production from raw material processing through crystal growth, fabrication, wafer finishing, patterning and cleaning.

Our proprietary crystal growth technique, which we refer to as ES2, produces high-quality sapphire crystals for use in our sapphire products. ES2 is derived from the standard Kyropoulos method of crystal growth. We developed this technique with the goal of establishing greater control over the crystal growth process while maintaining minimal temperature variations. Unlike other techniques, during the ES2 technique, the growing sapphire crystal exists in an unconstrained, low stress environment inside a closed growth chamber. The closed system allows for enhanced control of the melt, resulting in higher quality crystals. The temperature gradient between the melt and the crystal in the ES2 technique is significantly lower than in other crystal growth techniques. These aspects of the ES2 technique enable us to grow crystals that have a significantly lower dislocation density, higher crystal purity and greater uniformity than sapphire crystals grown using other techniques. The ES2 technique provides an inherent annealing process once the crystal is fully grown. This thermal annealing is an integral means of relieving stress in the crystal during the ES2 process. We have demonstrated the ability to readily scale our ES2 technology in a production environment while maintaining high crystal quality even as crystal boule size is increased.

We have automated the crystal growth process of our proprietary ES2 technique. Our furnace environments are controlled by closed-loop control systems and the overall crystal growth process is run with minimal operator intervention, which reduces the potential for human error. In addition, a single operator can supervise the control of multiple ES2 furnaces simultaneously, which reduces costs.

We believe our proprietary ES2 process provides significant advantages over other crystal growth methods such as Czochralski (CZ) and Edge-defined Film-fed Growth (EFG). Unlike the ES2 technique, the CZ and EFG methods grow crystals with much higher levels of stress. This stress can decrease the overall quality of the sapphire crystal and requires increased processing time to relieve this stress, which increases production costs and decreases throughput, especially in larger diameter crystals. During the EFG process, the crystal is grown in a sheet form by pulling it through a die directly from the melt; while in the CZ process, the crystal must be rotated and pulled as the aluminum oxide melt is consumed. These constrained growth environments with higher thermal gradients increase stress and decrease crystal quality.

Our research and development (R&D) activity plays a vital role in supporting our technology, product and revenue roadmaps. In 2015, 2014 and 2013, our R&D expenses totaled $2.2 million, $1.9 million and $2.3 million, respectively. These expenses do not include costs incurred in connection with our R&D activities under a government contract. Activities under the government contract are accounted for as revenue and cost of goods sold. Our R&D is focused on four key areas:

large area sapphire growth and fabrication;

higher precision sapphire processing;

cost-effective optical components for mobile devices and;

hard aluminum oxide coatings for diverse applications.

Our technical staff possesses deep and broad expertise in materials science and engineering. We also utilize sophisticated metrology equipment to perform material and process characterization.

PRODUCTS

We offer a wide variety of sapphire products designed to meet the stringent specifications of our customers. Using our proprietary ES2 technology, we grow high-quality sapphire boules. We fabricate our products from the boules and sell them as core, polished wafer, and patterned sapphire substrate (PSS) wafers. A sapphire crystal has multiple orientation planes resulting from its crystalline structure symmetry. Each orientation of the crystal structure is represented by a letter and differs in lattice structure. These variations result in different chemical, electrical and physical properties depending on the particular orientation plane. As a result, customers require different orientation planes depending on the intended application. For example, LED manufacturers typically request C plane crystals while SoS manufacturers typically request R plane crystals.

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Our current sales efforts are now focused on selling two through four-inch cores to our polishing customers and four and six-inch polished and PSS wafers to our semiconductor device manufacturing customers. Eight-inch wafers are sold primarily for customers research and development at this time.

Product	Size	Orientation	Applications
Core	2, 3, 4, 6	C, R, A, M	LED
			Optical windows
Polished	4, 6, 8	C, R, A	Epi-polished wafers for LEDs and SoS RFICs
			Polished optical windows
			Double-side polished wafer carriers
Patterned Sapphire Substrate	4, 6	C	Epi-polished patterned wafers for LEDs

Core

Our core product line consists of our sapphire cores drilled from sapphire boules with high-precision. In 2015, 2014, and 2013, sales of core accounted for 48%, 65%, and 56%, of our revenue, respectively. Major suppliers of sapphire and new entrants have added capacity, resulting in excess supply which caused lower product prices. Core prices have trended lower over the last three years.

Polished

Our polished product line primarily consists of finely polished, ultra-clean, four, six and eight-inch sapphire wafers. Our polished wafers undergo two polishing phases, including both a mechanical and a chemical mechanical planarization phase. We believe we are currently one of a small number of fully vertically integrated firms offering six and eight-inch, high-quality C-plane and R-plane polished wafers. In 2015, 2014, and 2013 sales of polished wafers accounted for 15%, 18%, and 29% of our revenue, respectively. The proportion of revenue from polished wafers in the future will depend on a number of factors, including customer adoption of large-diameter sapphire wafers in the LED market, customer decisions to purchase patterned versus polished wafers and pricing for our various products, including cores.

Patterned sapphire substrates

Our patterned sapphire substrates (PSS) product line was introduced in 2013 and consists of finely polished, ultra-clean, four and six-inch patterned sapphire wafers. LED chip manufacturers etch a pattern onto the surface of the sapphire wafer in the early stages of their production process in order to improve light output. We have leveraged our capability in producing larger diameter sapphire wafers to offer pre-patterned, larger diameter (four-inch and six-inch)

wafers to the LED market. We offer fully customizable, sub-micron patterning capability with dimensional tolerances within one tenth of a micron. We also offer the industry s smallest edge exclusion zone maximizing the usable wafer surface area yielding more chips per wafer. We believe we are the first vertically integrated sapphire producer to offer high volume four and six-inch patterned substrates. In 2015, sales of PSS wafers accounted for 13% of our revenue and in 2014 sales of PSS wafers accounted for less than 10% of our revenue.

Optical

We offer optically-polished windows and ground window blanks of sapphire. We provide sapphire and other crystal products in many sizes, shapes and product formats for specialty applications. We are focusing in 2016 on increasing our business and technological development efforts in optical markets for aerospace, defense and industrial applications, as well as in the consumer electronics market. For the years ended December 31, 2015, 2014 and 2013, sales of optical products accounted for 21%, 15% and 11%, respectively.

Research and Development

We record R&D revenue associated with a government contract as costs are incurred plus a fixed fee. We are focusing in 2016 on completing our R&D efforts which have resulted in successfully growing large rectangular slabs of sapphire for use in defense applications. For the years ended December 31, 2015, 2014 and 2013 revenue from R&D accounted for less than 10% of our revenue, respectively.

MANUFACTURING

The process of growing the crystal begins by heating the raw material, aluminum oxide, until it reaches an ideal temperature above its melting point. This ideal temperature is essential for our process because it allows us to produce high-purity crystals with very low defect rates. Following the heating, a seed rod is inserted in the melted material as the material is being cooled to crystallize into a boule. Following the growth process, each boule is rigorously inspected by using polarized lighting and magnification to find imperfections, such as bubbles, dislocations and granular deposits within the crystal.

We then drill the resulting boules into cylindrical cores using our custom high-precision crystal orientation equipment and proprietary processes. We use wire saws to slice each core into wafers of precise size and shape. These wafers are then pre-polished using precision lapping and edge-grinding equipment and then are ready to be polished into epitaxial wafers. All of these processes are

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performed in clean environments to reduce the chance of crystal contamination. Epi-polishing and wafer cleaning are performed in Class 10,000 and Class 100 clean-room environments, respectively. For PSS, we use photolithography and dry plasma etching to create customer determined micropatterns on polished wafers.

We are dedicated to quality assurance throughout our entire operation. We employ detailed material traceability from raw material to finished product. Our quality system is certified as ISO9001:2000, and we have in-house expertise at the Six Sigma Black Belt level.

All of our long-lived assets are located in the U.S. and Malaysia. For more information see Note 3- Segment Information to our Consolidated Financial Statements included in this Annual Report on Form 10-K.

SALES AND MARKETING

We market and sell our products through our direct sales force to customers in Asia, Australia, North America and Europe. Our direct sales force includes experienced and technically sophisticated sales professionals and engineers who are knowledgeable in the development, manufacturing and use of sapphire substrates, windows and other optical materials. Our sales staff works with customers during all stages of the substrate manufacturing process, from developing the precise composition of the substrate through manufacturing and processing the substrate to the customer s specifications.

A key component of our marketing strategy is developing and maintaining strong relationships with our customers. We achieve this by working closely with our customers to optimize our products for their production processes. In addition, we are able to develop long-term relationships with key customers by offering product specification assistance, providing direct access to enable them to evaluate and audit our operations, delivering high-quality products and providing superior customer service. We believe that maintaining close relationships with senior management and providing technical support improves customer satisfaction.

In order to increase brand recognition of our products and of Rubicon in general, we publish technical articles, distribute promotional materials and participate in industry trade shows and conferences.

CUSTOMERS

Our principal customers are semiconductor device manufacturers and wafer polishing companies. A substantial portion of our sales have been to a small number of customers. In 2015, 2014 and 2013, our top two customers accounted for approximately 31%, 36% and 44% of our revenue, respectively. Although we are attempting to diversify and expand our customer base, we expect our sales to continue to be concentrated among a small number of customers. However, we also expect that our significant customers may change from time to time. In 2015, sales to Zhejiang Crystal Optech Co. Ltd. and Osram Opto Semiconductors represented approximately 16% and 15% of our revenues, respectively. In 2014, sales to Zhejiang Crystal Optech Co. Ltd. and Tera Xtal Technology Corp. represented approximately 24% and 12% of our revenues, respectively. In 2013, sales to Peregrine Semiconductor Corporation and Nanjing J-crystal Photoelectric Technology Co. represented approximately 27% and 17% of our revenues, respectively. No other customer accounted for 10% or more of our revenues during 2015, 2014, or 2013.

In 2015, 54% of our sales were made to customers in Asia, 23% of our sales were made to customers in North America, 19% of our sales were made to customers in Europe and 4% of our sales were made to customers in Australia. In 2014, 79% of our sales were made to customers in Asia, 14% of our sales were made to customers in North America, 5% of our sales were made to customers in Europe and 2% of our sales were made to customers in Australia. In 2013, 60% of our sales were made to customers in Asia, 25% of our sales were made to customers in

Australia, 11% of our sales were made to customers in North America and 4% of our sales were made to customers in Europe. Our customer supply agreements tend to be for short periods of time, typically 90 days. Therefore, fluctuations in demand could cause our quarterly revenue to vary significantly. Our standard arrangement with most customers includes payment terms, which is customary in the industry.

INTELLECTUAL PROPERTY

Our ability to protect our proprietary technologies and other confidential information is a key factor in our ability to compete successfully. We rely primarily upon a combination of patent, trade secret laws and non-disclosure agreements with employees, customers and potential customers to protect our intellectual property. We have seven patents issued by the U.S. Patent and Trademark office and fifteen pending patent applications with the U.S. Patent and Trademark Office and various other foreign countries, mostly covering aspects of our core production, wafer grinding and lapping technologies. However, we believe that factors such as the technological and innovative abilities of our personnel, the success of our ongoing product development efforts and our efforts to maintain trade secret protection are more important than patents in maintaining our competitive position. We pursue the registration of certain of our trademarks in the U.S. and currently have three registered trademarks.

COMPETITION

The markets for high-quality sapphire products are very competitive and have been characterized by rapid technological change. The products we produce must meet certain demanding requirements to succeed in the marketplace. Although we are a well-established sapphire producer, we face significant competition from other established providers of similar products as well as from new and potential entrants into our markets.

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We have several competitors that compete directly with us. In recent years, certain companies that formerly competed with us only in sapphire cores have entered into wafer polishing and are trying to establish positions in the large-diameter wafer market. These companies tend to focus on providing core and as-cut products rather than offering polished products. There are a limited number of companies that are substantially larger than we are that compete with us in a relatively small segment of their overall business. These larger companies tend to focus on providing polished products to customers rather than providing core products.

We believe that the key competitive factors in our markets are:

- consistently producing high-quality products in the desired size, orientation and finish;
- pricing;
- providing a low total cost-of-ownership for customers;
- driving innovation through focused research and development efforts;
- offering solutions through collaborative efforts with customers; and
- possessing sufficient supply capacity to meet end-market customer demands.

ENVIRONMENTAL REGULATION

In our manufacturing process, we use water, oils, slurries, acids, adhesives and other industrial chemicals. We are subject to a variety of federal, state and local laws regulating the discharge of these materials into the environment or otherwise relating to the protection of the environment. These include statutory and regulatory provisions under which we are responsible for the management of hazardous materials we use and the disposition of hazardous wastes resulting from our manufacturing processes. Failure to comply with such provisions, whether intentional or inadvertent, could result in fines and other liabilities to the government or third parties, injunctions requiring us to suspend or curtail operations or other remedies, which could have a material adverse effect on our business.

EMPLOYEES

As of December 31, 2015, we had 244 full-time employees, of which 214 worked in technology and operations. None of our employees are represented by a labor union. We consider our employee relations to be good.

OTHER INFORMATION

You may access, free of charge, our reports filed with the SEC (for example, our Annual Reports on Form 10-K, our Quarterly Reports on Form 10-Q and our Current Reports on Form 8-K and any amendments to those forms) indirectly through our Internet website (www.rubicontechnology.com). Reports filed with or furnished to the SEC will be available as soon as reasonably practicable after they are filed with or furnished to the SEC. Alternatively, if you

would like a paper copy of any such SEC report (without exhibits) or document, write to Investor Relations, Rubicon Technology, Inc., 900 East Green Street, Bensenville, Illinois 60106, and a copy of such requested document will be provided to you, free of charge. The information found on our website is not part of this or any other report filed with or furnished to the SEC.

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ITEM 1A. RISK FACTORS

You should carefully read the risk factors set forth below, together with the financial statements, related notes and other information contained in this Annual Report on Form 10-K. Our business is subject to a number of important risks and uncertainties, some of which are described below. The risks described below, however, are not the only risks that we face. Additional risks and uncertainties not currently known to us or that we currently deem to be immaterial may also impair our business operations. Any of these risks may have a material adverse effect on our business, financial condition, results of operations and cash flows. Please refer to the discussion of forward-looking statements on page one of this Annual Report on Form 10-K in connection with your consideration of the risk factors and other important factors that may affect future results described below.

We have incurred significant losses in prior periods and may incur losses in the future.

We have incurred significant losses in prior periods and may continue to incur significant losses for the foreseeable future. These losses may have an adverse effect on our ability to attract new customers or retain existing customers. As of December 31, 2015, we had an accumulated deficit of $249.4 million. While we had net income of $38.1 million in 2011 and $29.1 million in 2010, we incurred net losses of $77.8 million, $44.0 million, $30.4 million and $5.5 million in 2015, 2014, 2013 and 2012, respectively. There can be no assurance that we will have sufficient revenue growth to achieve profitability in future periods.

The average selling prices of products in the LED supply chain have historically been volatile and in recent years sapphire product prices have been increasingly depressed.

Historically, our industry has experienced volatility in product demand and pricing. However, in the last three years, the sales prices for our sapphire products have trended downward. We experienced a significant drop in pricing in 2015 and continuing into 2016 largely due to an over-supply of products in the market. This has had a significant adverse impact on our profitability and our results of operations. Moreover, changes in average selling prices of our products as a result of competitive pricing pressures increased sales discounts and new product introductions by our competitors could have a significant impact on our profitability. In addition, our customers have experienced periods of excess inventory levels and seasonality which has impacted sales volume and pricing. Although we attempt to optimize our product mix, introduce new products, reduce manufacturing costs and pass along certain increases in costs to our customers in order to lessen the effect of decreases in selling prices, we may not be able to successfully do so in a timely manner or at all, and our results of operations and business may be harmed.

An excess of supply over demand for sapphire depresses the price and could have a material adverse effect on our operating results.

We experienced a significant drop in product pricing in 2015 due to an over-supply of sapphire products in the market, which has continued into 2016. Prices remain depressed as a result of excess supply and limited demand. Excess supply can be caused by various factors, including new competitors that emerge in the sapphire industry or existing competitors that lose a key customer or go out of business. In some countries, government programs support sapphire producers who would otherwise be unprofitable; in such circumstances, sapphire may be sold at prices below cost for an extended period of time, depressing market prices, to the detriment of our gross margins. In addition, there are a large number of sapphire furnaces, owned by various companies, which are currently idle. To the extent these furnaces are capable of producing sapphire of sufficient quality to satisfy the needs of customers in the LED industry and the consumer electronics market, and are brought on line, the supply of sapphire would be further increased. In the absence of a sufficient increase in demand for sapphire, this would likely be detrimental to sapphire pricing and to our gross margins. Any of these competitive threats resulting in lower prices could have a material adverse effect on our business, operating results or financial condition.

Our gross margins could fluctuate as a result of changes in our product mix and other factors, which may adversely impact our operating results.

We anticipate that our gross margins will fluctuate from period to period as a result of the mix of products that we sell in any given period. We have sold many of our products at prices below cost in 2014 and 2015. We are working to increase sales of higher margin products, introduce new differentiated products and lower our costs. There can be no assurance that we will be successful in improving our gross margin mix. If we are not successful, our overall gross margin levels and operating results in future periods would continue to be adversely impacted. Increased competition and the adoption of alternatives to our products, more complex engineering requirements, lower demand and other factors may lead to a further downward shift in our product margins, leading to price erosion and lower revenues for us in the future.

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We may require additional capital to fund operations, capital expenditures, additional product research and development efforts, and the introduction of new products. If we are unable to raise additional capital when needed, we may not be able to execute our business plan and may be forced to delay, reduce or eliminate our product research and development programs or delay the introduction of new products.

Our cash needs include cash required to fund our operations and the capital needed to fund any expansions in the U.S. and Asia and investments in new product development. We may finance future cash needs through public or private equity offerings, debt financings or corporate collaborations and licensing arrangements. Additional funds may not be available when we need them on terms that are acceptable to us, or at all. If adequate funds are not available, we may be required to delay, reduce the scope of or eliminate one or more of our product research and development programs. To the extent that we raise additional funds by issuing equity securities, our stockholders may experience dilution, and debt financing, if available, may involve restrictive covenants. To the extent that we raise additional funds through corporate collaborations and licensing arrangements, it may be necessary to relinquish some rights to our technologies or our new products or grant licenses on terms that may not be favorable to us. We may seek to access the public or private capital markets whenever conditions are favorable, even if we do not have an immediate need for additional capital at that time.

Developing advanced electronic materials and related products and introducing new products to the market can be expensive. We expect our research and development expenses to increase in connection with our ongoing product research and development plans. If we are required to conduct additional studies beyond those that we currently expect, our expenses could increase beyond what we currently anticipate and the timing of the release of any new products may be delayed. In addition, introducing newly developed products to the market often requires investment before revenue is generated from those products. We currently have no commitments or arrangements for any additional financing to fund our product research and development programs other than through our loan facility. However, we may need to raise substantial additional capital in the future to complete the development and commercialization of our new products.

We believe our existing cash, cash equivalents and short-term investments and interest thereon, will be sufficient to fund our projected operating requirements for at least the next twelve months. However, if we are not able to reduce our use of cash in the next twelve months, we may not have enough funds available to continue operating at our current level in future periods. A limitation of funds available may raise concerns about our ability to continue to operate. Such concerns may limit our ability to obtain financing and some customers may not be willing to do business with us.

Our future funding requirements, both near and long-term, will depend on many factors, including, but not limited to:

- the amount and growth rate of our revenues and ability to be operational cash flow positive;
- the level of capital expenditures required to maintain or expand our operations;
- the initiation, progress, timing, costs and results of studies and trials required for our new products;
- the number and characteristics of new products that we pursue;

the terms and timing of any future collaboration, licensing or other arrangements that we may establish;

the cost of filing, prosecuting, defending and enforcing any patent claims and other intellectual property rights;

the effect of competing technological and market developments;

the cost of establishing sales, marketing and distribution capabilities for any new products; and

the extent to which we acquire or invest in businesses, products or technologies.

If the market acceptance of newly developed products does not meet our expectations, or our efforts to enhance existing products are not successful, our future operating results may be harmed.

The development of new products may require substantial investment in development efforts and equipment. If our newly developed products do not achieve market acceptance, we may be unable to generate anticipated revenue and our operating results could be harmed.

Our continuing efforts to enhance our current products and to develop new products involve several risks, including:

our ability to anticipate and respond in a timely manner to changes in customer requirements;

the significant research and development and equipment investment that we may be required to make before market acceptance of a particular new or enhanced product;

the possibility that the industry may not accept our new or enhanced products after we have invested a significant amount of resources in development; and

competition from new technologies, processes and products introduced by our current and/or future competitors.

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We depend on a few customers for a major portion of our sales and our results of operations would be adversely impacted if they reduce their order volumes.

Historically, we have earned, and believe that in the future we will continue to earn, a substantial portion of our revenue from a small number of customers. In 2015 and 2014, our top two customers accounted for approximately 31% and 36% of our revenue, respectively. If we were to lose one of our major customers or have a major customer significantly reduce its volume of business with us, our revenues and profitability would be materially reduced unless we are able to replace such demand with other orders promptly. We expect to continue to be dependent on our significant customers, the number and identity of which may change from period to period.

We generally sell our products on the basis of purchase orders. Thus, most of our customers could cease purchasing our products with little or no notice and without significant penalties. In addition, delays in product orders could cause our quarterly revenue to vary significantly. A number of factors could cause our customers to cancel or defer orders, including interruptions to their operations due to a downturn in their industries, natural disasters, delays in manufacturing their own product offerings into which our products are incorporated, securing other sources for the products that we manufacture or developing such products internally.

Our results of operations, financial condition and business will be harmed if we are underutilizing our manufacturing facilities or if we are otherwise unable to effectively match our capacity with customer demand.

The markets we serve are emerging markets. As a result, there can be significant fluctuations in demand for our products, which may result in our manufacturing facilities being underutilized from time to time, which can negatively impact our gross margins and overall business. Currently, there is limited demand for sapphire cores and wafers. As a result, we currently are not fully utilizing our manufacturing facilities. We expect this underutilization of some of our manufacturing facilities to continue at least into the first half of 2016. There can be no assurance that such market changes will not occur again in the future adversely affecting our profitability.

From time to time we have expanded our production capacity as demand for our products strengthened. Capacity expansion involves significant risks, including the availability of capital equipment and the timing of its installation, availability and timing of required electric power, management of expansion costs, timing of production ramp-up, qualification of new equipment and demands on management s time. If our business does not grow fast enough to utilize the new capacity effectively, our business and financial results could be adversely affected. Conversely, delays in expanding our manufacturing capacity could impact our ability to meet future demand for our products. As a result, we might not be able to fulfill customer orders in a timely manner, which could adversely affect our customer relationships and operating results. Moreover, our efforts to increase our production capacity may not succeed in enabling us to manufacture the required quantities of our products in a timely manner or at the gross margins that we achieved in the past.

Our future operating results may fluctuate significantly, which makes our future results difficult to predict and could cause our operating results for particular periods to fall below expectations.

Our revenues and operating results have fluctuated in the past and are likely to fluctuate in the future. These fluctuations are due to a number of factors, many of which are beyond our control. These factors may include, among others:

- timing of orders from and shipments to major customers;

the gain or loss of significant customers;

fluctuations in gross margins as a result of changes in capacity utilization, product mix or other factors;

market acceptance of our products and our customers products;

our ability to develop, introduce and market new products and technologies on a timely basis;

the need to pay higher labor costs;

announcements of technological innovations, new products or upgrades to existing products by us or our competitors;

competitive market conditions, including pricing actions by our competitors and our customers competitors;

developments in trade secrets, patent or other proprietary rights by us or our competitors;

announcements by us or our competitors of significant acquisitions, strategic partnerships or divestitures;

interruption of operations at our manufacturing facilities or the facilities of our suppliers;

the level and timing of capital spending of our customers;

additions or departures of key personnel;

rapid changes in market conditions that result in financial hardship for some or all of our customers, resulting in reduced orders and/or additional accounts receivable write-offs in the future;

potential seasonal fluctuations in our customers business activities;

general economic conditions in the markets we serve; and

natural disasters, such as floods, hurricanes and earthquakes, as well as interruptions in power supply resulting from such events or due to other causes.

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The foregoing factors are difficult to forecast, and these, as well as other factors, could materially adversely affect our quarterly or annual operating results. If our revenues or operating results fall below the expectations of investors or any securities analysts that may publish research on our company, the price of our common stock would likely decline.

The technology used in the LED and SoS industries changes rapidly, and if we are unable to modify our products to adapt to future changes in these industries, we will be unable to attract or retain customers.

We do not design or manufacture LEDs or SOS chips. Our ability to increase our revenue into these markets depends on continued advancement in the design and manufacture of LEDs and SoS chips by others.

The LED industry has been characterized by a rapid rate of development of new technologies and manufacturing processes, rapid changes in customer requirements, frequent product introductions and ongoing demands for greater functionality. Our future success will depend on our ability to develop new products for use in LED applications and to adjust our product specifications, such as our previous development of larger diameter wafers, in response to these developments in a timely manner. If our development efforts are not successful or are delayed, or if our newly developed products, such as PSS, do not achieve market acceptance, we may be unable to attract or retain customers and our operating results could be harmed.

In addition, although sapphire is currently the preferred substrate material for HB white, blue and green LED applications, we cannot provide assurance that the LED market will continue to demand the performance attributes of sapphire. Silicon carbide is another substrate material currently used for certain LED applications, including some that also use sapphire substrates. Other substrates being investigated and used in research and development for certain LED applications are silicon, aluminum nitride, zinc oxide and bulk gallium nitride. If sapphire is displaced as the substrate of choice for certain LED applications, our financial condition and results of operations would be materially and adversely affected unless we were able to successfully offer the competing substrate material.

Our products must meet exacting specifications and undetected defects may cause customers to return or stop buying our products.

Our customers establish demanding specifications for quality, performance and reliability that our products must meet. While we inspect our products before shipment, they still may contain undetected defects. If defects occur in our products, we could experience lost revenue, increased costs, delays in, or cancellations or rescheduling of orders or shipments, product returns or discounts, or damage to our reputation, any of which would harm our operating results and our business.

The markets in which we operate are very competitive, and many of our competitors and potential competitors are larger, more established and better capitalized than we are.

The markets for selling high-quality sapphire products are very competitive and have been characterized by rapid technological change. This competition could result in increased pricing pressure, reduced profit margins, increased sales and marketing expenses, and failure to increase, or the loss of, market share or expected market share, any of which would likely seriously harm our business, operating results and financial condition.

Some of our competitors and potential competitors are substantially larger and have greater financial, technical, marketing and other resources than we do. Given their capital resources, the large companies with which we compete, or may compete in the future, are in a better position to substantially increase their manufacturing capacity and research and development efforts or to withstand any significant reduction in orders by customers in our markets.

Such larger companies typically have broader product lines and market focus and thus are not as susceptible to downturns in a particular market. In addition, some of our competitors have been in operation much longer than we have and therefore may have more long-standing and established relationships with our current and potential domestic and foreign customers.

We would be at a competitive disadvantage if our competitors bring their products to market earlier, if their products are more technologically capable than ours, or if any of our competitors products or technologies becomes preferred in the industry. Moreover, we cannot assure you that existing or potential customers will not develop their own products, or acquire companies with products that are competitive with our products. Any of these competitive threats could have a material adverse effect on our business, operating results or financial condition.

We are subject to risks from international sales that may harm our operating results.

In 2015 and 2014, revenue from international sales was approximately 77% and 86%, respectively, of our total revenue. We expect that revenue from international sales will continue to constitute a significant portion of our total revenue for the foreseeable future. Our international sales are subject to a variety of additional risks, including risks arising from:

- sales variability as a result of transacting our foreign sales in U.S. dollars as prices for our products become less competitive in countries with currencies that are low or are declining in value against the U.S. dollar and more competitive in countries with currencies that are high or increasing in value against the U.S. dollar;

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trading restrictions, tariffs, trade barriers and taxes;

differing intellectual property laws;

economic and political risks, wars, acts of terrorism, political unrest, pandemics, boycotts, curtailments of trade and other business restrictions;

the difficulty of enforcing contracts and collecting receivables through some foreign legal systems;

unexpected changes in regulatory requirements and other governmental approvals, permits and licenses; and

periodic foreign economic downturns.

Our future success will depend on our ability to anticipate and effectively manage these and other risks associated with our international sales. Our failure to manage any of these risks could harm our operating results.

We may acquire other business