

Rubicon Technology, Inc.
Form 10-K
March 13, 2009
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UNITED STATES
SECURITIES AND EXCHANGE COMMISSION

WASHINGTON, DC 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, 2008 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
(State or Other Jurisdiction of

36-4419301
(I.R.S. Employer Identification No.)

Incorporation or Organization)

9931 Franklin Avenue

Franklin Park, Illinois
(Address of Principal Executive Offices)

60131
(Zip Code)

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

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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

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

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 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 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

As of June 30, 2008, there were 13,690,927 shares of common stock outstanding held by nonaffiliates of the registrant, and the aggregate market value of the common stock (based upon the closing price of these shares on the NASDAQ Global Market) was approximately \$278,199,637 million.

The number of shares of the registrant's common stock outstanding as of the close of business on March 6, 2009 was 21,289,200.

Documents incorporated by reference:

Portions of the Registrant's Proxy Statement for its Annual Meeting of Stockholders are incorporated by reference into Part III, 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 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 as defined in the 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, and the like, and/or future-tense or conditional constructions such as will, may, could, and 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 and 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 the publications and found it to be reasonable and believe the publications 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 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.

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ITEM 1. BUSINESS OVERVIEW

We are an advanced electronic materials provider that develops, manufactures and sells monocrystalline sapphire and other innovative crystalline products for light-emitting diodes (LEDs), radio frequency integrated circuits (RFICs), blue laser diodes, optoelectronics and other optical applications. The emergence of sapphire in commercial volumes at competitive prices has enabled the development of new technologies such as high brightness (HB) white, blue and green LEDs and highly-integrated RFICs. We apply our proprietary crystal growth technology to produce high-quality sapphire products efficiently to supply our end-markets, and we work closely with our customers to meet their quality and delivery needs. We believe we are the leading supplier of sapphire products to the LED industry.

We are a vertically integrated manufacturer of high-quality sapphire substrates and optical windows that are used in a variety of high-growth, high-volume end-market applications. Our largest product line is two to four inch sapphire wafers for use in LEDs and blue laser diodes for solid state lighting and electronic applications. In addition, we sell six inch sapphire wafers that are used for Silicon-on-Sapphire (SOS) RFICs, as well as products for military, aerospace, sensor and other applications. We have also extended our technology to manufacture six inch products to support next-generation LED, and eight inch products to support next generation RFIC and optical window applications and are developing the capacity to produce even larger products.

Our fully integrated in-house capabilities enable us to design, assemble and maintain proprietary crystal growth furnaces to grow high purity, low-stress, ultra low defect density sapphire crystals. In addition, we possess state-of-the-art capabilities in high precision core drilling, wafer slicing, surface lapping, edge bevel grinding and wafer cleaning processes. 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 rapidly capture market growth.

We plan to leverage our technological advantage in efficiently producing high-quality, large-diameter sapphire products to maintain our leadership position and 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.

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 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. Other sapphire applications include SOS integrated circuits, optical lenses and windows, and substrates for blue laser diodes.

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

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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, traffic signals, and general and specialty lighting. Applications using LEDs have unit volumes in the billions and are expected to grow significantly over the next several years. For instance, from 2007 to 2012, HB LED sales are expected to grow at a 21% compound annual growth rate (CAGR) according to Strategies Unlimited, an independent market research firm. The production volume of HB LEDs is expected to increase from 38.5 billion units in 2007 to 124 billion units in 2012. Further, the percentage of gallium nitride (GaN)-based LEDs, which predominantly use sapphire substrates, is expected to rise from 75% to 84% of the total HB LED production volume in the same time period. Therefore, as the HB LED market grows, we believe the sapphire substrate market will grow as well. However, the worsening recession has had a significantly negative impact on demand for products using LEDs in the second half of 2008 and will continue into 2009.

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. According to Strategies Unlimited, the full color display penetration in mobile phones is expected to approach 100% over the next several years. According to a March 2009 report published by Gartner, an independent market research firm, in 2008, the number of mobile phones sold was approximately 1.22 billion units worldwide. LEDs are well-suited for mobile devices due to their low current drain which extends battery life and durability while generating less heat. LEDs used in mobile devices outside of cell phones are expected to grow 30% CAGR from 2007 to 2012 according to Strategies Unlimited.

LED backlighting units for large displays. LED BLUs are beginning to replace conventional fluorescent BLUs in notebook computers, desktop monitors and LCD flat panel televisions. Benefits of LED BLUs in these applications are extended battery life, thinner displays, quicker response time and better color rendition. Displays made with LED BLUs also have no toxic materials, which help electronics manufacturers to comply with environmental regulations. DisplayBank, an independent market research firm, estimates an increase in LED penetration in larger (greater than 10 inch) BLUs from 1% in 2007 to 27% by 2012. The backlight market for large-size LCD screens is estimated to grow by greater than 20% per year, approaching 500 million units by 2010, as forecasted by DisplayBank. According to analyst firm DisplaySearch, 13.4% of notebooks shipped in the fourth quarter 2008 featured BLUs versus 6.3% in the third quarter 2008.

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. Uses for LEDs in all automotive applications (exterior and interior) are expected to grow at a CAGR of approximately 17% from 2007 to 2012, according to a report published in October 2008 by Strategies Unlimited. Increased LED usage in other transportation vehicles such as motorcycles and commercial jets offers additional growth potential.

Commercial signage/displays. LEDs are becoming more widely used as light sources on large signs, LED displays and outdoor displays, such as jumbo screens used in sporting arenas and electronic billboard displays. The LED commercial sign/display market will grow at an estimated CAGR of approximately 46% from 2007 to 2012, according to a report published in October 2008 by Strategies Unlimited.

Illumination. LEDs are increasingly being used for replacement lamps, architectural lighting, retail displays commercial and industrial lights, residential lighting, street lights and off grid lighting for developing countries and is expected to be one of the fastest growing applications for HB LEDs. The illumination market is forecasted to grow at an estimated CAGR of approximately 37% from 2007 to 2012 according to a report published in October 2008 by Strategies Unlimited.

SOS RFIC and optical applications

SOS integrated circuits consist of a thin layer of silicon grown on a sapphire substrate and are primarily used in advanced wireless and military applications, such as RFICs. In particular, SOS RFICs are currently used

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in high volumes for mobile phones, broadband television set-top boxes, satellites and radiation-hardened applications for the defense industry. We believe SOS devices also represent a large potential market opportunity for sapphire due to sapphire's outstanding properties as an insulating substrate material with outstanding thermal conductivity and crystal lattice compatibility with silicon, which, among other things, enables monolithic integration in RFICs.

Sapphire and various fluoride materials are utilized for windows and optics for aerospace, sensor, medical and laser applications. Sapphire is used in these 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 (FLIR) windows for commercial and business jets as well as unmanned air vehicles or drones, rocket domes and transparent armor for military vehicles. Sapphire substrates are also used in the production of blue laser diodes. Blue laser diode technology allows much higher data storage for HD-DVD applications. Blue laser diodes are just beginning to penetrate potentially high volume applications, such as the Blu-ray Disc DVD players and leading-edge video game systems.

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. A great emphasis is placed on continuously improving yields and increasing production capacity to drive costs lower to take advantage of emerging high-volume opportunities. Device manufacturers are seeking larger diameter sapphire wafers to allow them to develop higher performance applications and achieve economies of scale. Historical methods of sapphire crystal growth, which rely on lower-volume batch processes, are less able to meet the needs of leading end-market customers for high quality crystals, demanding dimensional tolerances, high production volumes, cost efficiency and on-time delivery. Sapphire is the base material that feeds the entire value chain.

THE RUBICON SOLUTION

We are an advanced electronic materials provider that develops, manufactures and sells monocrystalline sapphire and other innovative crystalline products for LEDs, RFICs, blue laser diodes, optoelectronics and other optical applications. As a leading producer of sapphire and provider of other crystals, we believe that the following are our principal competitive advantages:

Proprietary technology for crystal growth

We refer to the proprietary technology, equipment and processes we use in the production of our sapphire crystals as ES2, which stands for evolving science, evolving solutions. Due to our understanding of sapphire crystal growth seeding and crystal growth furnace operational parameters, we have developed a full in-house capability to design, build and maintain ES2 crystal growth furnaces with proprietary features. Our ES2 technology enables us to maintain a highly scalable, efficient operation and to produce large diameter sapphire wafers that we believe exceed the quality of any other sapphire producer today. Our competitors primarily employ the Kyropoulos, Czochralski (CZ) or Edge-defined Film-fed Growth (EFG) method to grow sapphire crystals. We believe that our ES2 technology, which employs an enhanced Kyropoulos methodology, significantly outperforms other methods of sapphire production with respect to capital costs, operating costs, throughput, quality and diameter size. Using our ES2 technology, we currently have the capability to produce sapphire products with diameters of up to eight inches in production volumes and we are developing the capability to produce larger diameter sapphire products.

High quality sapphire products

We believe our sapphire crystal wafers are best-in-class in terms of quality. Our quality advantage is exhibited by our ability to produce crystals with an etch pitch density (EPD) of fewer than 100 defects per square centimeter, which is significantly better than the industry standard range. According to Sapphire & Other

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Corundum Crystals by E. Dobrovinskaya, L. Lytvynov, and V. Pishchik (1994), for sapphire grown using other methods, the standard EPD is 5,000 to 100,000 defects per square centimeter. Our sapphire also has ultra high (99.999%) purity levels. Our high purity sapphire helps our customers realize high yields in their processing. In addition, because of the high purity of our products, our customers have the ability to utilize our sapphire for optical applications requiring high transmission in the ultraviolet through mid-infrared spectral ranges. Through our operational expertise in crystal growth, post-growth processing and in-process manufacturing controls of sapphire wafer production, we are able to meet or exceed our customers' key product specifications, such as crystalline quality, dimensional tolerances and crystal orientation, while maintaining high production yields.

Vertical integration

We possess critical know-how and proprietary processes and metrology for crystal growth and sapphire processing. We grow sapphire crystals and have extensive capabilities to process sapphire into products that meet our customers' needs from cores to wafers and window blanks to large diameter epi-polished wafers. In the areas of fabrication and slicing, we employ high volume manufacturing techniques and utilize customized tooling and metrology to hold very tight dimensional and orientation tolerances for sapphire cores and wafers. We also have high precision lapping, edge bevel grinding and annealing capabilities for as ground wafers and window blanks. We have proprietary six and eight inch polishing and ultra-cleaning equipment and processes for SOS RFIC and other applications that demand larger-diameter epi-polished wafers. By vertically integrating our processes, we are able to achieve significant operating efficiencies and produce high-quality, high-precision products that offer cost and quality benefits to our customers. This vertical integration also helps us expand our range of products and protect our technology and manufacturing trade secrets.

High volume and flexible manufacturing capability

We provide a high volume and stable US-based supply of products for our customers. We offer reliable, consistent on-time delivery to our customers through our flexible and scalable production operations. We have developed automated manufacturing and metrology platforms at each stage of our production process that allow us to increase capacity rapidly and to switch products in manufacturing easily so that we can meet our customers' specific product demands.

Lowest total cost for customers

We compete on the quality of our products and our service levels to supplement our competitive pricing. We believe our high sustained yields, our dedication to consistent production and performance and our commitment to lasting customer relationships help assure our customers of a reliable source of high-quality sapphire products at stable prices. Our in-process quality control practices lead to predictable customer process yields, reduced inspection costs and overall high customer satisfaction. In addition, we work closely with our customers to understand their product specifications and then align our operations to meet their needs. Through close collaboration with our customers, we help them develop new applications for our advanced sapphire products and establish ourselves as a preferred supplier. As such, we believe our solution offers the lowest total cost for our customers.

STRATEGY

Our goal is to be the leading global provider of advanced monocrystalline substrate and window materials to the solid state lighting, SOS RFIC, aerospace and optical markets. We currently occupy a leading position among sapphire producers worldwide in market volume for two through four inch sapphire products for LEDs. A key element of our strategy is to increase the proportion of our shipments of four and six inch diameter products. The time elapsed from our beginning product development to shipping commercial volumes in the six inch sapphire substrate market was less than one year. As a result, we now have significant market share in the six inch SOS RFIC sapphire substrate market. In 2008, we developed the capability to produce eight inch diameter products in

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commercial volumes. While there currently is little demand for eight inch substrates, we believe this product will play an important role in future generation LED and SOS products. We have provided eight inch wafers for research and development purposes to both the LED and SOS industry and believe we will begin shipping commercial volumes of eight inch diameter product in 2010.

Our strategy includes the following key elements:

Extend our technology and manufacturing leadership position

We believe our specialized manufacturing processes and proprietary technology and trade secrets provide us with significant competitive advantages. We have designed and developed product, equipment and process technology platforms from which we can rapidly increase capacity and stay flexible to meet our customers' needs. At each phase of our manufacturing process, we have developed and standardized automated equipment that employs similar processes to produce a full range of products. For example, most of our furnaces can grow sapphire crystals of the same size in various orientations to produce two through six inch wafers and cores. This reduces our operating costs and significantly improves our product development cycles. In 2008, we developed the capability to produce larger sapphire crystals from which we have the ability to produce eight inch cores and wafers as well as larger diameter optical material. We intend to continue to develop advanced technology platforms to further increase crystal boule size and offer market-leading product specifications, while maintaining product quality and manufacturing efficiencies.

Capitalize on opportunities in high-growth markets

Our sapphire products are used in multiple applications in the high-growth LED and SOS RFIC markets. We also participate in optical market segments where sapphire and fluoride materials are being adopted rapidly in new applications. We intend to continue to expand our opportunities by adding new categories and sizes of products with the goal of providing our customers in multiple high-growth end markets with a robust set of sapphire solutions. For example, one of the largest market segment opportunities is likely to come from the solid state lighting market, which will require higher brightness, lower-cost white LEDs that require larger-size LED chips. Larger LED chips are increasingly being manufactured in volume on four inch sapphire wafers. Our process to manufacture large diameter, high quality sapphire wafers is well-suited to this market and we believe our processes will help enable its growth. We already produce high volumes of four and six inch sapphire products and we continue to add large diameter sapphire production capacity in anticipation of market growth, as evidenced by the addition of eight inch diameter capabilities in 2008. We expect that next-generation LEDs and SOS RFICs will be produced on six inch and larger sapphire wafers to further drive cost efficiencies.

Enhance operational excellence

Our unique expertise in producing high-quality sapphire products in many sizes gives us a significant edge in process and product technology. We plan to further refine our proprietary ES2 crystal growth techniques, sapphire processing platforms and process controls to produce even higher quality crystals at greater yields. Our engineering efforts focus on the capability to design, build and maintain ES2 crystal growth furnaces with new proprietary features. We seek to continuously improve our sapphire processing and material inspection capabilities. We also promote operational excellence through lowering cycle times, raising yields, and reducing overhead costs. Our ability to understand our customers' design and manufacturing processes enhances our ability to reach these goals. We employ Six Sigma methodologies to continuously improve our operational platforms and we provide extensive training to current and new employees.

Expand our sales and marketing efforts

We plan to enhance our brand recognition worldwide by increasing our marketing and communications programs and resources. For example, we have sponsored several LED conferences and we plan to extend our sponsorships into other markets, such as SOS RFICs and aerospace. We plan to further enhance our website, extend our public relations campaigns and increase our brand visibility in trade publications and with technical organizations. We rely on direct sales for the majority of our business and we use multiple distribution channels to extend the reach of our sales and support teams. Although we have already entered multiple markets globally, we plan to increase the scale and geographical coverage of our sales efforts. In 2008, we added two new members to our sales team who give us added sales capability in the Asian LED market and the domestic optical market.

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Penetrate new market segments

We target high growth market segments where we believe we can gain a leadership position. Although production of sapphire cores and wafers is our focus today, we intend to leverage our crystal growth and processing know-how to develop high-quality crystal products for new substrate and window applications. Sapphire is becoming increasingly popular and is replacing quartz and glass in high-performance and harsh environment applications in the aerospace, petroleum and laser industries. For example, the US military uses sapphire optical windows to construct targeting mechanisms for its jet fighters and drones and transparent armor for land vehicles. We intend to use our proprietary manufacturing technology to produce additional single crystal materials that can be used in optical applications as well as alternative substrates for certain electronic materials applications. As the electronics and optical industries continue to develop new applications that take advantage of the unique properties of both sapphire and other single crystal products, our goal is to be the provider of choice for these applications.

TECHNOLOGY

Our proprietary ES2 crystal growth technique 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 higher 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 believe we can readily scale our ES2 technology in a production environment while maintaining high crystal quality even as crystal boule size is increased. As a result of our proprietary ES2 technology, we believe that we currently offer the most efficient method for manufacturing large form factor, high quality sapphire in the market today.

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 cost.

We believe our proprietary ES2 process provides significant advantages over other crystal growth methods such as CZ and 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. For 2008, 2007 and 2006, our R&D expenses totaled \$862,000, \$769,000 and \$679,000, respectively. Our R&D is focused on three key areas: large diameter sapphire growth and fabrication; higher precision sapphire processing; and new crystal development. Our technical staff possesses deep and broad expertise in materials science and engineering. We also develop and utilize sophisticated metrology equipment to perform material and process characterization.

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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 in four general categories: core, as-cut, as-ground and polished. We currently offer two inch, three inch, four inch, six inch and eight inch diameter wafers, in C, R, A, and M planar orientations. 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.

Product	Size	Orientation	Applications
Core	2, 3, 4, 6, 8	C, R, A, M	LED Optical windows Blue laser diode
As-Cut	2, 3, 4, 6, 8	C, R, A, M	Wafers for LED Wafers for blue laser diodes Wafers for SOS RFICs
As-Ground	2, 3, 4, 6, 8	C, R, A, M	Wafers for LED Wafers for SOS RFICs Blanks for optical windows Wafer carriers
Polished	6, 8	C, R, A	Epi-polished wafers for SOS RFICs Polished optical windows Double-side polished wafer carriers

Core

Our core product line consists of our sapphire cores drilled from sapphire boules with high-precision, and is available in two, three, four, six and eight inch diameters and in various lengths and orientations. During fiscal years 2008, 2007 and 2006, sales of core accounted for 37%, 39% and 35% of our revenue.

As-cut

Our as-cut product line consists of sapphire cores sliced using a wire saw machine. We believe we are able to offer our customers one of the highest-precision cut sapphire wafers in the market. This is especially important to customers who require precise orientation planes for applications such as LEDs, SOS, RFICs and blue laser diodes. During fiscal years 2008, 2007 and 2006, sales of as-cut wafers accounted for 24%, 26% and 26% of our revenue.

As-ground

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Our as-ground product line consists of cut sapphire wafers that undergo a double-sided lapping and edge grinding process. The lapping process ensures that the surface of the wafer is flat and smooth and has a high degree of parallelism. The grinding process bevels the edges of the wafers, making them more durable and less susceptible to chipping and cracking. During fiscal year 2006, sales of as-ground wafers accounted for 18% of our revenue. During fiscal years 2008 and 2007, sales of as-ground wafers accounted for less than 15% of our revenue.

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Polished

Our polished product line consists of finely polished, ultra-clean, 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 very few firms offering six and eight inch, high-quality R-plane polished wafers. During fiscal years 2008 and 2007, sales of polished wafers accounted for 24% and 15% of our revenue. During fiscal year 2006, sales of polished wafers accounted for less than 15% of our revenue.

Other

We also offer optically-polished windows and ground window blanks of sapphire and various fluoride compounds, such as calcium, barium and magnesium fluoride. We provide sapphire and other crystal products in many sizes, shapes and product formats for specialty applications.

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 cores using our custom high-precision crystal orientation equipment and proprietary processes. We use wire saws to slice each core to be 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 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.

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 US.

SALES AND MARKETING

We market and sell our products through our direct sales force to customers in Asia, 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, especially at the senior management level. We achieve this through 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 through 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 and provides us with a competitive advantage when selling our products.

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

CUSTOMERS

Our principal customers are wafer polishing companies and semiconductor device manufacturers. A significant portion of our sales have been to relatively few customers. In the year ended December 31, 2008, our top four customers accounted for 68% of our revenue. In 2007 and 2006, our top three customers accounted for approximately 62% and 57% of our revenue. 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 the year ended December 31, 2008, sales to Peregrine Semiconductor Corp., Shinkosha Co. Ltd., Crystalwise Technology, Inc., and a fourth customer represented approximately 29%, 17%, 12% and 10% of our revenues, respectively. In 2007, sales to Crystalwise, Shinkosha and Peregrine represented approximately 26%, 21% and 15% of our revenues, respectively. In recent months, Peregrine has begun to accumulate inventory of sapphire wafers. In November 2008, we entered into an agreement with Peregrine pursuant to which its obligation to purchase material from us in 2008 and the first half of 2009 was replaced by a multi-year agreement under which Peregrine has committed to source at least 50% of its sapphire purchases from us through 2010. The agreement may be extended through 2011 upon mutual agreement on pricing. No other customer accounted for 10% or more of our revenues during those periods.

In the year ended December 31, 2008, 53% of our sales were made to customers in Asia, 44% of our sales were made to customers in North America and 3% of sales were made to customers in Europe. In the year ended December 31, 2007, 72% of our sales were made to customers in Asia, 26% of our sales were made to customers in North America and 2% of sales were made to customers in Europe. In the year ended December 31, 2006, 87% of our sales were made to customers in Asia, 11% of our sales were made to customers in North America and 2% of our sales were made to customers in Europe. Our contracts with major customers provide for minimum levels of product sales for the duration of the contract (typically 12 to 24 months) with the potential for higher sales levels depending on such factors as the customer's needs, our available capacity and/or our ability to reach agreement on key terms. Delays in product orders or changes in the timing of shipments under our supply agreements could cause our quarterly revenue to vary significantly. Our standard arrangement with all customers includes 30 day payment terms.

INTELLECTUAL PROPERTY

Our ability to compete successfully depends upon our ability to protect our proprietary technologies and other confidential information. We rely primarily upon a combination of trade secret laws and non-disclosure agreements with employees, customers and potential customers to protect our intellectual property. We have four pending patent applications with the United States Patent and Trademark Office 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 United States and currently have seven registered trademarks and one trademark application pending.

COMPETITION

We participate in an innovative, specialized and competitive industry. The products we produce must meet certain demanding requirements to succeed in the marketplace. Although we account for a significant percentage of the total market volume today, we face significant competition from other established providers of similar products as well as from potential new entrants into our markets.

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We have a few competitors that compete directly with us that are of similar size or smaller than us. 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 us 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, as-cut and as-ground products.

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

consistently producing high-quality products in the desired size, orientation and finish;

driving innovation through focused research and development efforts;

possessing sufficient supply capacity to meet end-market customer demands;

offering solutions through collaborative efforts with customers;

pricing; and

providing a low total cost-of-ownership for customers.

Although we face significant competition, we believe that our proprietary ES2 crystal growth technology and business practices allow us to compete effectively on all of the above factors.

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, 2008, we had 99 full-time employees. Of these 99 employees, 84 work in technology and operations. None of our employees is represented by a labor union. We consider our employee relations to be good. We believe that our future success will depend on our continued ability to attract, hire and retain qualified personnel.

OTHER INFORMATION

We file annual and quarterly reports and other information with the United States Securities and Exchange Commission, or the SEC. You may read and copy any documents that we file at the SEC's public reference room at 100 F Street, N.E., Washington, D.C. 20549. Please call the SEC at 1-800-SEC-0330 for further information about the operation of the public reference room. In addition, the SEC maintains an Internet website (<http://www.sec.gov>) that contains reports, proxy statements, information statements and other information about issuers that file electronically with the SEC, including Rubicon. You may also access, free of charge, our reports filed with the SEC (for example, our Annual Report 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.rubicon-es2.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., 9931 Franklin Avenue, Franklin Park, Illinois 60131, and a copy of such requested

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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

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.

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

We have incurred significant losses in prior periods. In 2007 and 2006, we incurred net losses of \$2.9 million and \$7.6 million, respectively. While we had net income of \$4.4 million in 2008, we incurred a loss of \$1.7 million in the fourth quarter of 2008 and as of December 31, 2008, we had an accumulated deficit of \$149.3 million. There can be no assurance that we will have sufficient revenue growth to offset increased expenses or to achieve profitability in future periods.

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

The current economic crisis resulted in weak demand for LED and SOS products in late 2008, which has significantly reduced orders for our sapphire substrates. We anticipate that reduced demand for our products will continue at least through early 2009. As a result, our manufacturing facilities are currently underutilized, which negatively impacts our gross margins. There can be no assurance that such sudden market changes will not occur again in the future affecting our profitability.

We anticipate that growth in demand for our products will resume, which will require expansion of our capacity in the future. Our 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, qualification of our new equipment and demands on management's time. If our business does not grow fast enough to utilize this 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. There can be no assurance that we will be able to successfully reach our production, timing and cost goals for our expansion.

If LED lighting does not achieve greater market acceptance, or if alternative technologies are developed and gain market traction, prospects for our growth and profitability would be limited.

Our future success depends on increased market acceptance of LED lighting. Approximately 62% and 73% of our revenue during 2008 and 2007, respectively, was from sales of our products for use in the manufacture of LED products. Potential customers for LED lighting systems may be reluctant to adopt LED lighting as an alternative to traditional lighting technology because of its higher initial cost and relatively low light output per unit in comparison with the most powerful traditional lighting devices. In addition, our potential customers may have substantial investments and know-how related to their existing lighting technologies, and may perceive risks relating to the novelty, complexity, reliability, quality, usefulness and cost-effectiveness of LED products when compared to other lighting sources available in the market. If acceptance of LED lighting does not increase significantly, then opportunities to increase our revenues and operate profitably would be limited.

Moreover, if effective new sources of light other than LED devices are developed, our current products and technologies could become less competitive or obsolete. Any of these factors could have a material and adverse impact on our growth and profitability.

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

We do not design or manufacture LEDs. Our ability to expand into new applications in the LED market depends on continued advancement in the design and manufacture of LEDs 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 likely 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 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 assure you 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 aluminum nitride, zinc oxide and bulk gallium nitride. Research is also ongoing for the use of silicon substrates in LED applications. 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 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 possibility that sapphire may in the future be replaced as a preferred substrate in certain LED applications;

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

the possibility that the LED 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 or future competitors.

If the development and acceptance of our products for the SOS RFIC market do not meet our expectations, our future operating results may be harmed.

The level of market acceptance of our SOS RFIC products will impact our future operating results. Our success in the SOS RFIC market depends on a number of factors, including:

the success of our customers' products in current applications; and

the acceptance of SOS RFIC products for newly targeted applications.

In addition, it is possible that other solutions, such as silicon-on-insulator, may become preferred over SOS. We cannot assure you that the RFIC market will continue to require the performance attributes of SOS solutions. If our products are not accepted more broadly in the RFIC market, our results of operations and business may be harmed.

The average selling prices of sapphire products have historically decreased over their life-cycles and continuing price decreases could adversely affect our results of operations.

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Historically, our industry has experienced price decreases for a particular product over the life of that product. We anticipate that the average selling prices of our products may decrease in the future in response to competitive pricing pressures, increased sales discounts and new product introductions by our competitors. To

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lessen the effect of price decreases, we attempt to introduce new products as well as reduce manufacturing costs in order to maintain or improve our margins. However, if we are not able to successfully introduce new products or achieve these cost reductions in a timely manner, we could lose market share which could have a material adverse effect on our operating results.

We depend on a few customers for a major portion of our sales and our results of operations would be adversely impacted if they reduced 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 2008, four customers each accounted for 10% or more of our revenues. In the year ended December 31, 2007, three customers each accounted for 10% or more of our revenues. In 2008, sales to Peregrine Semiconductor Corp., Shinkosha Co. Ltd., Crystalwise Technology, Inc., and a fourth customer represented approximately 29%, 17%, 12% and 10% of our revenues, respectively. In the year ended December 31, 2007, sales to Crystalwise, Shinkosha and Peregrine represented approximately 26%, 21% and 15% of our revenues, respectively. In late 2008, Peregrine began to accumulate inventory of sapphire wafers. In November 2008, we entered into an agreement with Peregrine pursuant to which its obligation to purchase material from us in 2008 and the first half of 2009 was replaced by a multi-year agreement under which Peregrine has committed to source at least 50% of its sapphire purchases from us through 2010. The agreement may be extended through 2011 upon mutual agreement on pricing. 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. We have agreements for longer-term purchase commitments from a few of our major customers; with certain exceptions, these commitments range from 12 months to 24 months. Delays in product orders or changes in the timing of shipments under our supply agreements could cause our quarterly revenue to vary significantly. Those customers with whom we do not have longer-term purchase commitments could cease purchasing our products with little or no notice and without significant penalties. 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 manufacturing processes may be interrupted or our production may be delayed if we cannot maintain sufficient electrical supply, which could adversely affect our business, financial condition and operating results.

Our manufacturing process requires a stable source of electricity. From time to time, we have experienced limited disruptions in our supply of electricity. Such disruptions, depending upon their duration, could result in a significant drop in throughput and yield of in-process crystal boules and create delays in our production. Although we use generators and other back-up sources of electricity, these replacement sources of electricity are only capable of providing effective back-up for limited periods of time. We cannot assure you that we will be successful in avoiding future disruptions in power or in mitigating the effects of such disruptions. Any material disruption in electrical supply could delay our production and could adversely affect our business, financial condition and operating results.

Our gross margins and profitability may be adversely affected by rising energy costs.

The average cost of electricity increased significantly at the end of 2006 largely due to the deregulation of energy in the State of Illinois. Electricity prices could also increase due to overall changes to the price of energy due to conditions in the Middle East, natural gas shortages in the United States and other economic conditions

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and uncertainties regarding the outcome and implications of such events. If electricity prices increase significantly, we may not be able to pass these price increases through to our customers on a timely basis, if at all, which could adversely affect our gross margins and results of operations.

As a public company, we are now subject to Section 404 of the Sarbanes-Oxley Act of 2002. Investor confidence and our stock price could decline if we or our independent registered public accountants conclude that our internal control over financial reporting is ineffective.

As a public company, we are required to comply with the requirements of Section 404 of the Sarbanes-Oxley Act of 2002. In this regard, we are required on an annual basis to assess the effectiveness of our internal control over financial reporting and include a statement as to whether or not our internal control over financial reporting is effective and we are required to have our independent registered public accounting firm issue an attestation report on our internal control over financial reporting. In conducting our annual assessment, we will not be able to conclude that our internal control over financial reporting is effective if we have one or more material weaknesses. If we or our independent registered public accountants conclude that our internal control is not effective, our investors could lose confidence in our financial reports and our stock price could decline. An ineffective internal control environment could also adversely affect our ability to report our financial results in a timely manner and could materially adversely affect our business.

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 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 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 as we continue to grow;

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;

potential seasonal fluctuations in our customers' business activities; 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.

Our gross margins could decline 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, with our larger diameter sapphire products generally yielding higher gross margins than our smaller diameter products. If our sales mix shifts to lower margin products in future periods, our overall gross margin levels and operating results would 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.

Our proprietary intellectual property rights may not adequately protect our products and technologies, and the failure to protect such rights could harm our competitive position and adversely affect our operating results.

To protect our technology, we have chosen to rely primarily on trade secrets rather than seeking protection through publicly filed patents. Trade secrets are inherently difficult to protect. While we believe we use reasonable efforts to protect our trade secrets, our directors, employees, consultants or contractors may unintentionally or willfully disclose our information to competitors, whether during or after the termination of their services to our company. If we were to seek to enforce a claim that a third party had illegally obtained and was using our trade secrets, it would be expensive and time consuming, and the outcome would be unpredictable. In addition, courts outside the United States are sometimes less