Semiconductor will boom over the next three years – demand for autonomous cars and EVs to rise

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In the era of the 4th industrial revolution big data is collected via the Internet of Things (IoT) and artificial intelligence makes decisions based on the data, and it is changing how we live little by little. It's not difficult to imagine that companies that succeed in future data business will take up the reins of the 4th industrial revolution.

Entegris SVP Stuart Tison who was visiting Korea to expand business, explains the importance of materials and microcontamination control in semiconductor manufacturing processes.

All data is stored in memory. Expansion of the data center capacity of IT giants such as Google and Amazon is fueling the rapid growth of the world's semiconductor market. Last year, the global semiconductor industry grew by 21.5% YoY, reaching $411.8 billion.

Semiconductor manufacturing processes are roughly divided into pre-process and post-process. In pre-process, automation rate and necessary technology level are relatively high. The process involves cleaning, sputtering, ion injection, photoresist coating application (photolithography), etching, and photoresist removal. All the steps are repeated to draw circuit patterns on the silicon wafers. As the most critical process, photolithography takes about 60% of the semiconductor manufacturing process time and 35% of the costs. In the process, a scanner shoots light to the photoresist coated wafer to transfer specific patterns from the photomask (reticle) to the surface of the wafer.

Recently, Samsung Electronics broke ground on a new extreme ultraviolet (EUV) technology line in Hwaseong, Gyeonggyi-do. The company plans to use EUV technology with its 7 nm process starting from the second half of this year. Driving into the sub-10 nm regime, the industry is faced with slowing production which resulted from limitations in photoresist equipment and related materials.

For the EUV process to be in place, a high-level of quality management and inspection technology are required, but they can find defects that the existing SEM (Scanning Electron Microscope) may not be able to find. “For the 5-7 nm processes, it is getting more difficult for a chip manufacturer to find out if a specific problem occurred in a product and its cause,” said an official at leading semiconductor pre-process wafer inspection equipment manufacturer KLA-Tencor. As a result, solutions to fundamentally improve the quality and purity of materials that affect the yields of the process is getting more attention.

Headquartered in the U.S., Entegris is a global leader in contamination control, critical materials handling, and advanced process materials for the semiconductor and other high-tech industries. Established in 1966, the company’s 2017 annual revenue was $1.304 billion, 77% of which comes from the semiconductor segment. Entegris has entered the world’s Top 3 in the Atomic Layer Deposition (ALD), Chemical Vapor Deposition (CVD), Cu and Co plating, and Dopant specialty gas markets.

Maeil Economy Biz Times sat down with Stuart Tison who is Senior Vice President and General Manager of Specialty Chemicals and Engineered Materials at Entegris, Inc. to hear about game changers in the semiconductor industry. Tison predicted that the world semiconductor market would boom over the next three years, underscoring that a fast response would determine the success or failure of a business. He visited Korea to build an Advanced Deposition Material (ADM) R&D center and a manufacturing plant in Jangan, Suwon. The following are his answers to our questions.

Many Korean companies such as Samsung and SK Hynix are leading the global memory semiconductor market. Entegris plans to supply high-purity wafer carrier materials, specialty gases, and high-performance filters to the Korean market. What is your global strategy and how do you see the Korean market?

Our global strategy is “to be closer to our customers.” We operate an R&D center and a manufacturing facility here in Korea. If we want to provide a solution, we should be able to stay near our customers and provide a new solution right away. Samsung Electronics, for instance, launches several new products each year simultaneously. Our major Korean customers are global companies. Especially, as Korea is the leader of memory semiconductors. That's why Entegris built a manufacturing hub in Asia. The semiconductor industry is indeed a global business. To complete a product, intermediary materials probably make three round trips across the Pacific Ocean. An advanced, integrated supply chain is one of the characteristics of the semiconductor industry. To get closer to our customers in each region, Entegris pays special attention to local laws and safety regulations.

With the introduction of an EUV scanner, materials and inspection equipment previously not used can be used and the materials, design, and equipment will become more important than patterning skills. What can Entegris contribute to the EUV progress?

The most challenging part in the EUV process is photolithography. Among Entegris' solutions, filtering solutions used in the photoresist application process are the most competitive. We have been conducting R&D through technology collaboration with major customers. Entegris has a dominant position in the world's mask and pod market. Our EUV reticle pods and masks provide protection from contamination.

Also, W. L. Gore & Associates has been a strong player in gore-tex fabric over the last few decades. They have supplied gore-tex for clothing and outdoor products, but they also have a wide product portfolio of membrane filters. After the acquisition of a membrane filter business, Entegris has continued to work together with W. L. Gore & Associates in R&D for developing various semiconductor applications. We are going to develop Teflon® membrane filters. The semiconductor has been in a strong uptrend since it was used in PCs. Nobody can predict what is ahead, but we already have solutions for sub-10 nm processes. Whether it is 7 nm or 3 nm, we can quickly work together with customers in the semiconductor industry.

The traditional demand for PCs and smartphones are dwindling in the global semiconductor market. However, the market is expected to continue its growth thanks to the expansion of data business, connected cars, and IoT. What are your prospects in the semiconductor market?

I expect that semiconductor-related markets will keep growing over the next three years. The semiconductor equipment industry and the U.S. market research firm Gartner predict that the market will grow by about 6%. As a whole, there will be a wider variety of applications. This will accelerate the growth of the semiconductor industry.

Not only autonomous cars, but also electric vehicles will contribute to the boom. Even hybrid electric vehicles, not pure electric vehicles, are expected to use three times more electronic devices than gasoline-powered vehicles. Everything, not just artificial intelligence, is a driving force for the growth of the semiconductor market. Especially, as countries across the globe, including the U.S., Europe, and China are making efforts to reduce carbon emissions. Car manufacturers are currently preparing for these changes. Entegris will be able to help them grow.

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About Entegris

Entegris is a leader in specialty chemicals and advanced materials solutions for the microelectronics industry and other high-tech industries. Entegris is ISO 9001 certified and has manufacturing, customer service and/or research facilities in the United States, China, France, Germany, Israel, Japan, Malaysia, Singapore, South Korea and Taiwan. Additional information can be found at entegris.com.