2022

TECHCET
Electronics Materials Information

2022 TECHCET's CMR™

CERAMIC

FABRICATED PARTS, MATERIAL SEGMENT
FOR SEMI-CONDUCTOR APPLICATIONS

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RESEARCH METHODOLOGY

TECHCET employs subject matter experts having first-hand experience within the industries which they analyze. Most of TECHCET' s analysts have over 25 years of direct and relevant experience in their field. Our analysts survey the commercial and technical staff of IC manufacturers and their suppliers and conduct extensive research of literature and commerce statistics to ascertain the current and future market environment and global supply risks. Combining this data with TECHCET's proprietary, quantitative wafer forecast results in a viable long-term market forecast for a variety of process materials.

This report represents the interpretation and analysis of information generally available to the public or released by responsible agencies or individuals. Data was obtained from sources considered reliable. However, accuracy or completeness is not guaranteed.

ANALYST BIOGRAPHY

Kuang-Han Ke is TECHCET's Senior Market Analyst covering consumable equipment components including quartz, silicon, and SiC/ceramics parts. He has over 25 years of semiconductor industry experience, including systems engineering design of four generations of plasma etch chambers for Applied Materials, leading to an installed base of nearly 10,000 chambers worth more than US$3.5 billion. He troubleshot etch, CVD, PVD, and CMP process equipment, was in charge of the semiconductor equipment and precision machine tools industries in the Ministry of Economic Affairs in Taiwan and was an expert adviser for the Taiwan "Industry 4.0/Productivity 4.0" national initiative. At SEMI, he oversaw industry technology, standards, and market statistics in Taiwan. He taught semiconductor equipment courses at Yuan-Zi University. He has started 5 companies, mentored startup companies, participated in 3 IPOs in Taiwan, and is working on launching a satellite in 2022. He holds a M.S. in Aeronautics and Astronautics from Stanford University, a B.S. in Aerospace Engineering & Mechanics from the University of Minnesota, Twin Cities, and more than 10 patents.

Tim Dyer is also a TECHCET Senior Market Analyst covering consumable equipment components including alumina, beryllia, and aluminum nitride ceramic components and assemblies. Tim has both bachelor's and master's Degrees in Materials Science and Engineering from the University of California, Davis. He has worked for Elcon Precision in San Jose California for almost 8 years and assumed the role of President of Elcon Precision in January 2018. Tim has over 30 years of product development experience in technical ceramics, refractory metals, and semiconductor capital equipment. Prior to Elcon, Tim worked as a Director of Process Engineering at Enovix Inc. making compact 3-D Silicon-based Lithium batteries for wearable electronics. He was also Chief Technology Officer and Ceramist for Energy Recovery Inc, Director of Technology at Morgan Ceramics, and Manager of Laser Chamber Technology at ASML in San Diego. He currently holds 34 US patents and has published numerous technical papers that have helped shape best practices within the advanced ceramics, supply chain, and material sciences fields.

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2.1 SCOPE

This report is focused on technical ceramic materials market and supply-chain which includes SiC/ CVD SiC, AlN, Al2O3, Y2O3, and BN used in the production of components and assemblies for use in semiconductor process equipment. We gathered information from primary research (field interviews), commonly available industry information, patent and IP (intellectual property) based knowledge, and combined this with available data base information to form the basis of this report.

SiC is frequently used for both carriers (boats, gas injectors, and fabware) and components for OEMs where high temperature or specific thermal packages are required, while traditional Al_2O_3 and AlN ceramics are normally used for lower temperature / etch applications.

The machines/tools manufacturers that use these components are referred to as OEMs (Original Equipment Manufacturers). This report targets ceramics used in the manufacture of semiconductors, only. The report contains data and analysis from TECHCET's data base and Sr. Analyst experience, as well as that developed from primary and secondary market research. For more information on TECHCET Critical materials Reports™ please go to https://TECHCET.com

2.2 PURPOSE

This Critical Materials Report™ (CMR) provides focused information for supply-chain managers, process integration and R&D directors, as well as business development managers, and financial analysts. The report covers information about key suppliers, issues/trends in the material supply chain, estimates on supplier market share, and forecast for the material segments.

This report aims to provide an overview to the above scope ceramic material and parts supply chain, serving the semiconductor industry. This information about this critical material is essential in the running of the semiconductor wafer fabs across the world. The goal is to annually track the state of the industry; the health of the supply and demand; to pinpoint any shortcomings or issues faced by the industry; and to provide a guidance for purchasing and industry quality improvement decisions. We hope to provide a dialog and feedback opportunities for related stakeholders to fine-tune and better manage the supply ups and downs.

2.3 METHODOLOGY

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We track micro-economic and macro-economic trends pertaining to the semiconductor industry and track overall industry trend and needs, equipment supply and demand situation, deduction towards the quartz material requirement, and supplier/fabricators situation one by one. From this vantage point, we check the suppliers/fabricators and the base material company information, and then the raw materials market information. Included in our work is an analysis of public information, website information, supplier interviews, supplier surveys, supplier peer-data cross-checking, and reference comparison. In addition, we conduct a material base usage calculation with respect to a demand and supply micro-economic analysis. We then conduct a forward and backward sweep of the forecast until data is in sync. In the meantime, for the data points that are missing, we use past historic, forward-looking data, and peer data so to extrapolate from three different levels of cross-checking. This provides us an estimation based on judgment from industry experience. In this year's report, we especially added special industry situation reporting and analysis for exogenous factors affecting the industry, which can be big percentage influence factors than normal trend parameter contributors.

2.4 Overview of Other TECHCET CMR™ Reports

TECHCET produces electronic material supply chain reports each year as one of its functions for the Critical Materials Council. Reports to be published in 2019 can be found at www.techcet.com and are listed in the table below:

Table 2: 2021 TECHCET Critical Material Reports

2020 – 20	TECHCET REPORTS
	1. CMP Consumables (Slurry, Pads, Disks)
	2. Equipment Components- Quartz
	3. Gases + Xeon/Neon
	4. Photoresist
	5. Precursors –Dielectric Precursors
	6. Precursors –Hi K / ALD CVD Metal Precursors
	7. Silicon Wafers
	8. Specialty Chems / Wet Chems
	9. Equipment Components- Silicon, SiC, Ceramics
	10. Metal Chemical
	11. Targets
	12. Equipment Components – Silicon 2020 version with 2021 forecast