

SPUTTERING TARGETS

SUPPLY-CHAIN & MARKET ANALYSIS
A CRITICAL MATERIALS REPORT™

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RESEARCH METHODOLOGY

TEHCET employs subject matter experts having first-hand experience within the industries which they analyze. Most of TEHCET'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 TEHCET's proprietary, quantitative wafer forecast results in a viable long-term market forecast for a variety of process materials.

READER'S NOTE

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

- Sr. Director of Market Research, TECHCET
- Expertise in materials supply-chains including wafers, sputtering targets and packaging materials,
- Has over 25 years of experience in the electronics industry covering semiconductor markets including semiconductor packaging, thin films, semiconductor process equipment, and front-end semiconductor materials.
- Previous experience includes Sr. Director of Industry Research & Statistics group at SEMI, Sr. Research Analysts at Rose Associates, and Packaging Engineer at National Semiconductor.
- Holds a Ph.D. in Materials Engineering from Rensselaer Polytechnic Institute.



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2 SCOPE, PURPOSE AND METHODOLOGY

2.1

SCOPE

- This report covers the sputtering targets and supply-chain for key metals used in semiconductor device fabrication. 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://TEHCET.com>
- Sputtering targets are a critical in semiconductor manufacturing as sputtering allows the deposition of as most semiconductor devices are fabricated on silicon, thus silicon wafers are also the largest material spend of the semiconductor manufacturers. One of the challenges that the silicon wafer manufacturers encounter is profitability due to the timing of investments and industry downturns. Wafer pricing declined sharply from 2007 through 2016. The resulting rise and fall of profitability has led to a considerable consolidation in the market over the years, such that six manufacturers account for most of the wafer revenue and shipments. Despite this trend, new suppliers are emerging in the China market to support the “Made in China” program backed by the government. When these suppliers gain in capability and capacity, their influence could dramatically impact the silicon supply chain in the next 3+ years.

2.1

SCOPE, CONTINUED

- Target demand forecast is reported in terms of revenue growth, segmented and modeled by 200mm and 300mm target sizes.
- An absolute count of the number of sputtering targets is not included in this analysis for the following reasons:
 - The variety of sputtering target configurations employed by the semiconductor industry (i.e. “standard” planar targets, extended use targets, monolithic targets, and HCM’s)
 - The target utilization (i.e. fraction of materials sputtered from a target) varies based on target configuration and process conditions)
 - The introduction of alloys to improve RC Delay problems , reduce defects and improve electro-migration.

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.

2.3

METHODOLOGY

TEHCET employs subject matter experts having first-hand experience within the industries which they analyze. Most of TEHCET'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 TEHCET's proprietary, quantitative wafer forecast results in a viable long-term market forecast for a variety of process materials.

2.4

OVERVIEW OF OTHER TECHCET CMR™ REPORTS

- TEHCET produces electronic material supply chain reports each year as one of its functions for the Critical Materials Council. Reports to be published in 2020 can be found at www.techcet.com and are listed in the table below:

Table 1: CMR Report Schedule

2021	CMR Report Schedule
1	CMP Pads and Slurry
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 Cleaning Chems / Wet Chems
9	Equipment Components – Ceramics/SiC
10	Metal Chemicals
11	Targets
12	Equipment Components- Silicon 2020 version with 2021 forecast