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Silicon Carbide Components for Semiconductor Processing Global Market Insights 2026, Analysis and Forecast to 2031

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Abstracts

The semiconductor industry is currently undergoing a paradigm shift, characterized by the transition to smaller process nodes, the rise of wide-bandgap (WBG) power electronics, and the pursuit of extreme manufacturing efficiency. At the heart of this evolution are the high-performance consumables used within semiconductor fabrication environments. Silicon Carbide (SiC) components for semiconductor processing have emerged as a critical enabler for these advancements. Unlike traditional quartz or high-purity silicon parts, SiC components—specifically those produced via Chemical Vapor Deposition (CVD)—offer superior thermal conductivity, exceptional resistance to plasma erosion, and high mechanical strength at extreme temperatures.

These components are primarily utilized in the 'hot zones' of semiconductor manufacturing equipment, including plasma etching chambers, chemical vapor deposition (CVD) systems, and high-temperature diffusion furnaces. As foundries move toward 3nm and 2nm logic nodes and increasingly complex 3D NAND structures, the physical limits of traditional materials are being reached. Silicon Carbide's ability to maintain structural integrity and minimize particulate contamination makes it an indispensable material for high-yield, advanced-node semiconductor fabrication. The market is currently driven by a dual-track demand: the expansion of traditional silicon-based logic and memory capacity, and the explosive growth of the SiC power semiconductor industry itself.

Market Size and Growth Projections

The market for Silicon Carbide components used in semiconductor processing is positioned for robust growth over the next decade. The increasing intensity of etching

processes and the higher thermal budgets required for advanced materials are primary catalysts for this expansion.

2026 Market Valuation: The global market size is estimated to reach a range of 1.7 billion USD to 3.5 billion USD by 2026. This valuation accounts for both the 'first-fit' market driven by semiconductor equipment OEMs (Original Equipment Manufacturers) and the recurring 'aftermarket' demand from global fabrication facilities (fabs).

Long-term CAGR (2026–2031): Following 2026, the market is projected to expand at a Compound Annual Growth Rate (CAGR) of 7.0% to 10.0%. This growth reflects the deepening penetration of SiC components in mature foundries and the rapid scaling of 8-inch SiC wafer production facilities worldwide.

Regional Market Landscape and Trends

The demand and production of Silicon Carbide components are concentrated in regions with high semiconductor manufacturing density, though the supply chain for high-purity raw materials remains global.

Asia-Pacific: This region remains the largest and most dynamic market, holding an estimated share of 65% to 78%. The dominance is driven by the concentrated manufacturing hubs in South Korea, Taiwan, China, and Mainland China. South Korea is home to leading SiC component specialists such as HANA Materials and Solmics, which serve the massive memory fabrication needs of local giants. In China, players like Chongqing Zhenbao Technology are rapidly scaling to meet domestic localization targets. The region is also the epicenter for the 8-inch wafer transition, which requires a complete redesign of SiC-based furnace internals.

North America: With an estimated market share of 12% to 18%, North America is a critical hub for high-end material science and equipment design. The region is home to major equipment OEMs and leading SiC device manufacturers like Onsemi. Strategic moves in the US, such as the acquisition of Silicon Carbide Products (SCP) by international groups, highlight the region's importance in the specialized SiC material supply chain.

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Europe: Holding a market share estimated between 8% and 12%, Europe is a leader in power electronics and automotive semiconductors. Recent investments, such as the ?250 million injection into the Vishay Newport facility in South Wales, signal Europe's intent to build a vertically integrated SiC ecosystem. The European market is characterized by a high demand for SiC boats and specialized thermal process components.

Rest of the World: Other regions, including the Middle East and parts of Southeast Asia, account for approximately 2% to 5% of the market. Growth in these areas is often linked to localized assembly and testing or specific high-temperature industrial applications beyond standard semiconductor logic.

Product Type Analysis and Development Trends

The market is segmented by the specific functional roles these components play within the processing equipment:

SiC Ring (Focus Rings / Edge Rings): These are the most significant volume drivers in the market. In plasma etching, the SiC focus ring surrounds the wafer to ensure uniform plasma density across the entire surface. Because these rings are directly exposed to corrosive plasma, they are high-wear consumables. The trend is moving toward ultra-high-purity CVD SiC rings that can withstand the increasingly aggressive chemistries used in 3D NAND etching.

SiC Boat (Wafer Carriers): Used primarily in high-temperature diffusion and oxidation furnaces, SiC boats provide the necessary thermal stability and purity to carry multiple wafers through intense heat cycles. As the industry transitions from 6-inch to 8-inch SiC wafer processing, the design of these boats must evolve to handle larger loads without thermal warping.

Other Parts: This includes SiC showerheads, injectors, pedestals, and bellows. As thermal and chemical environments become more extreme, silicon carbide is replacing quartz and other ceramics in almost all critical path components within the reaction chamber to reduce downtime and contamination.

Value Chain and Industry Structure

The value chain for SiC components is technically demanding and capital-intensive, requiring specialized knowledge in both chemistry and precision machining.

Upstream (Raw Materials and Powder): This involves the production of high-purity Silicon Carbide powder or the sourcing of precursor gases for CVD processes. Maintaining 'semiconductor-grade' purity is the primary challenge at this stage.

Midstream (CVD and Sintering): There are two primary manufacturing paths. Sintered SiC is used for structural parts, while CVD SiC (Chemical Vapor Deposition) is preferred for high-purity, plasma-facing components. CVD SiC production involves a slow, high-temperature process where the material is grown on a substrate, requiring significant energy and specialized reactors.

Processing and Machining: Because SiC is one of the hardest known materials, machining it into complex geometries (like focus rings or boats) requires diamond-tooling and advanced CNC systems. This is often the most significant cost component in the final product.

Downstream (OEMs and Fabs): The components are sold to equipment makers like Lam Research, AMAT, and TEL, or directly to IDMs (Integrated Device Manufacturers) and foundries (TSMC, Samsung, SK Hynix, Intel) for replacement.

Key Market Players

The market features a mix of established material science companies and specialized semiconductor consumable providers.

HANA Materials: A leading South Korean player with deep ties to the global memory industry. They are recognized for their large-scale CVD SiC production capabilities and are a primary supplier of focus rings for high-volume etching platforms.

Worldex: Another key South Korean specialist, Worldex focuses on providing high-quality replacement parts for the semiconductor industry, leveraging their expertise in SiC and quartz to offer comprehensive consumable solutions.

CoorsTek GK: A global leader in technical ceramics. CoorsTek utilizes its extensive R&D capabilities to produce high-performance SiC components that meet the rigorous thermal and chemical standards of the latest equipment generations.

Solmics: Specializing in SiC and alumina components, Solmics is a critical part of the East Asian semiconductor supply chain, known for its precision manufacturing of focus rings and other chamber internals.

Chongqing Zhenbao Technology: An emerging leader in the Chinese domestic market. Their growth is fueled by the rapid expansion of the Chinese semiconductor fabrication ecosystem and the national drive for self-sufficiency in high-end consumables.

Strategic Mergers, Acquisitions, and Investments

The SiC component and device landscape is undergoing significant consolidation and investment, driven by the strategic importance of SiC in the EV and energy sectors.

Onsemi's Strategic Vertical Integration: In December 2024, Onsemi announced the acquisition of Qorvo's SiC JFET technology and United Silicon Carbide for $115 million. While this deal focuses on device technology, Onsemi estimates this will expand their market opportunity by $1.3 billion over five years. This vertical integration increases the internal demand for SiC processing components as Onsemi scales its own manufacturing capacity.

SK Group's Ecosystem Consolidation: In March 2025, SK Keyfoundry (a subsidiary of SK Hynix) moved to acquire 98.59% of SK Powertech for 25 billion won. This acquisition is part of a broader strategy to dominate the next generation of 'composite semiconductors.' By bringing SiC power device expertise under the same umbrella as their foundry operations, SK Hynix is creating a massive internal market for SiC processing consumables, including SiC rings and boats.

Vishay Newport Expansion: The March 2025 announcement of a ?250 million investment in the former Newport Wafer Fab (now Vishay Newport) in the UK marks a significant milestone for European SiC production. The facility is being retooled to produce SiC components for EVs and wind turbines. This represents a major new downstream customer for SiC component manufacturers in the European region.

Carborundum Universal (CUMI) US Acquisition: In late 2024, the Indian group CUMI acquired Silicon Carbide Products (SCP) in the USA. This acquisition gives CUMI a strategic foothold in the US market for specialized SiC materials, highlighting the global nature of the SiC component supply chain.

Market Opportunities

The 8-Inch SiC Transition: The semiconductor industry is currently transitioning from 150mm (6-inch) to 200mm (8-inch) SiC wafers to improve cost efficiency. This transition requires a complete overhaul of furnace internals and etching components. Manufacturers capable of producing large-diameter, high-purity SiC rings and carriers for 8-inch lines face a significant first-mover advantage.

Advanced 3D NAND Stacking: As 3D NAND reaches 232, 300, or even more layers, the aspect ratio of the holes that need to be etched becomes extreme. This requires longer, more powerful plasma pulses, which accelerates the wear on standard silicon rings. High-durability CVD SiC components are the only viable solution for these environments.

Vertical Integration Trends: Following the lead of Onsemi and SK Hynix, more IDMs are looking to control their supply of SiC consumables to avoid lead-time delays and ensure material purity. This creates an opportunity for specialized SiC component makers to form long-term, exclusive supply partnerships.

Sustainable Manufacturing: There is an increasing focus on the 'circular economy' for SiC components. Techniques for 'refurbishing' or recycling used SiC rings to extend their lifespan without compromising purity represent a growing niche opportunity as fabs look to reduce their environmental footprint and OpEx.

Market Challenges

Extreme Technical Barriers: Producing CVD SiC is a slow and energy-intensive process. Maintaining uniform thickness and high purity across a large batch of components requires sophisticated reactor control. The failure rate during the growth process can be high, impacting margins.

High Cost of Machining: SiC’s hardness makes it difficult to machine. The cost of diamond tools and the time required for precision grinding and polishing make SiC components significantly more expensive than their quartz counterparts. Fabs only switch to SiC when the performance benefits (uptime and yield) clearly outweigh the high unit cost.

Geopolitical Supply Chain Sensitivity: The high-purity polysilicon and precursor gases required for SiC production are subject to global supply chain disruptions. Furthermore, as semiconductor manufacturing becomes a matter of national security, export controls on high-end SiC manufacturing equipment and materials could restrict market access for certain players.

OLED and Emerging Tech Displacement: While SiC is dominant in power electronics, the overall demand for semiconductor processing components is tied to the health of the broader LCD/OLED and logic markets. Any slowdown in global consumer electronics demand can lead to reduced fab utilization, slowing the replacement cycle for SiC consumables.

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TABLES AND FIGURES

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