Compound semiconductor materials market growing at 14% CAGR to almost $5.2bn by 2031

Yole highlights a sustained structural growth phase as compound semiconductor materials are becoming core to power electronics, photonics and AI infrastructure.

Despite short-term pricing pressure in certain segments, the electrification, AI infrastructure expansion and next-generation connectivity trends are reinforcing long-term demand for compound semiconductor materials — including silicon carbide (SiC), gallium nitride (GaN), gallium arsenide (GaAs) and indium phosphide (InP) — according to Yole Group's latest annual market & technology report 'Status of the Compound Semiconductor Industry 2026 – Focus on Substrates and Epiwafers', which highlights sustained structural growth through 2031. The combined compound semiconductor substrate and open epiwafer markets are reckoned to be growing at a compound annual growth rate CAGR of about 14% from 2025 to more than $5bn in 2031.

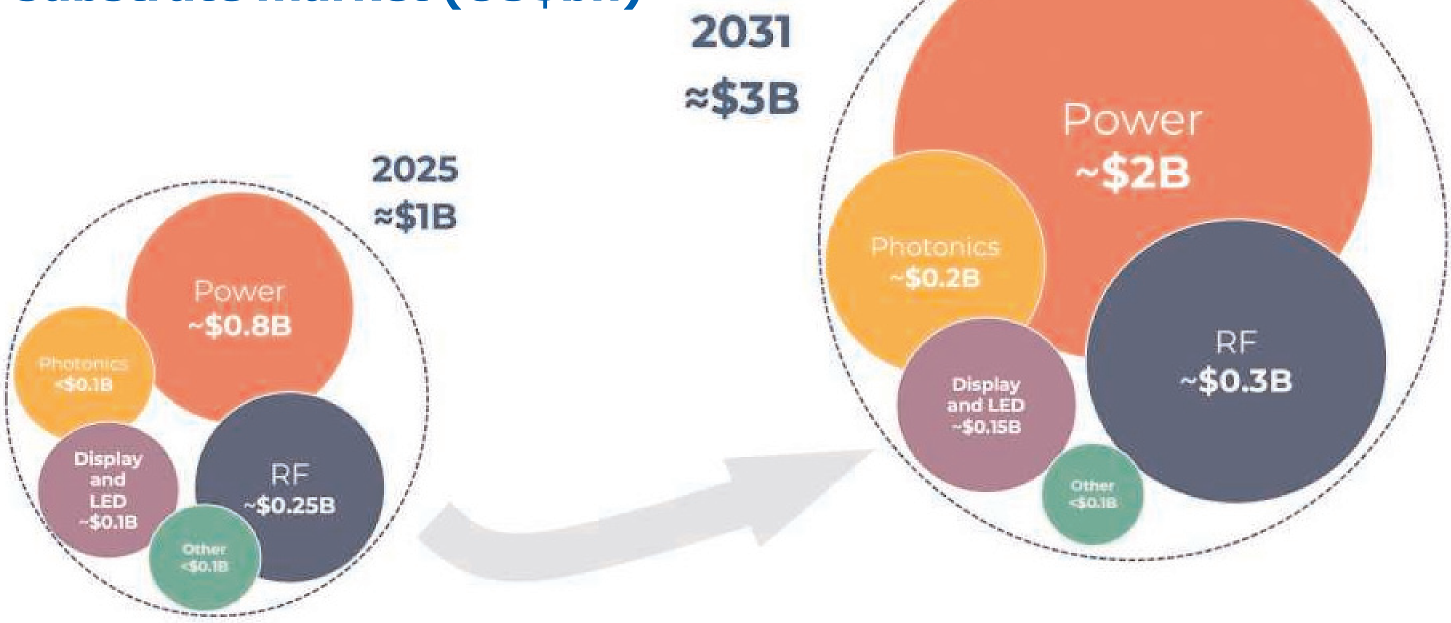
"Power SiC continues to anchor market expansion," notes Ahmad Abbas PhD, technology & market analyst, Compound Semiconductor. "What is particularly notable is the diversification of growth. In this new edition, we see this industry becoming structurally stronger and more balanced."

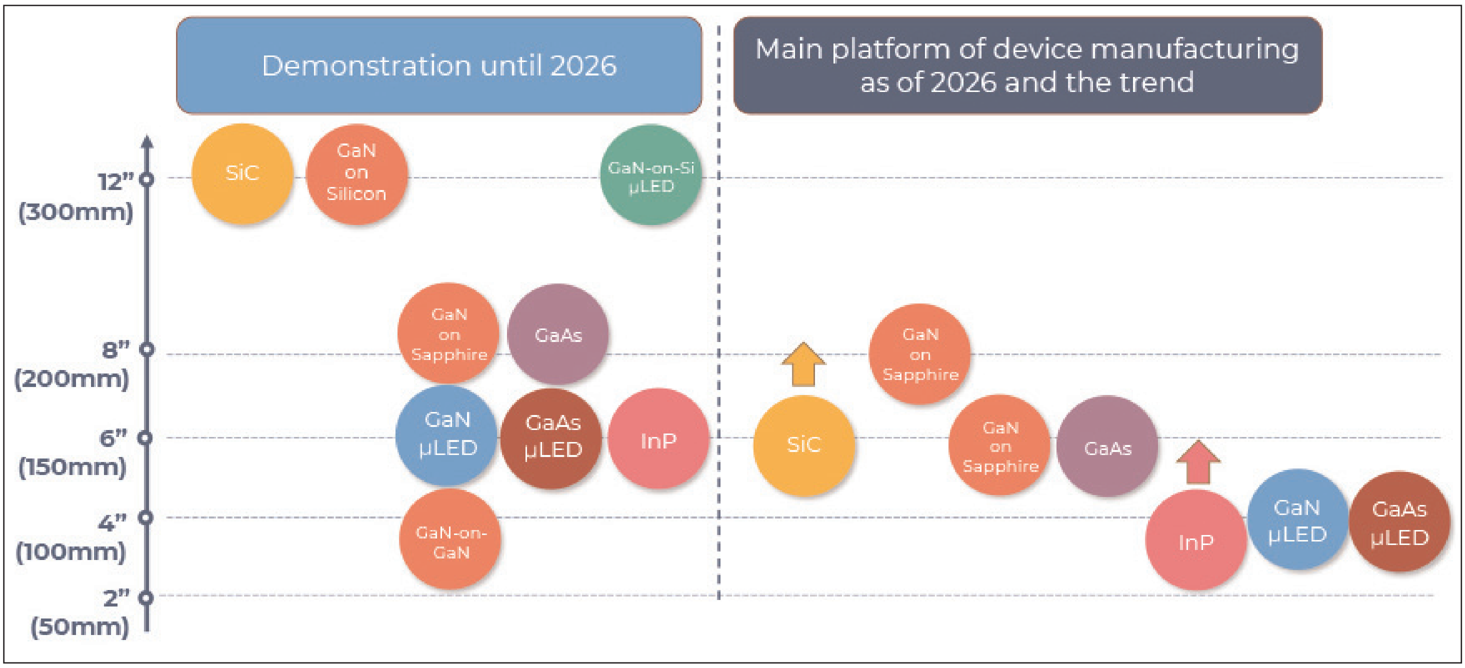
Market dynamics: power leads, photonics accelerates, RF stabilizes

"In this edition, we would also like to highlight the key role of AI," says Poshun Chiu, principal analyst, Compound Semiconductor. "Without doubt, AI is reshaping the overall compound semiconductor supply chain: from SiC enabling efficient power delivery in data centers to InP supporting high-speed optical interconnects, compound materials are becoming essential to scalable AI infrastructure."

The adoption of compound semiconductors is accelerating thanks to their clear performance advantages.

Compound semiconductor substrate market (US$bn)





Status of substrate diameter for different compound semiconductors.

Yole Group says that its analysts are closely monitoring this shift across diverse market segments:

Power electronics remains the dominant growth engine. N-type SiC substrates alone are expected to surpass $2bn by 2031, supported by electric vehicle (EV) adoption, 800V architectures, onboard chargers, renewable energy systems, and industrial electrification. The transition from 6-inch to 8-inch wafers is accelerating cost-reduction and scaling efforts, reinforcing SiC's long-term competitiveness despite recent pricing pressure linked to overcapacity and the normalization of automotive demand.

Power GaN continues expanding beyond consumer fast charging into automotive and data-center applications, strengthening its strategic position as a complementary power technology.

In RF markets, GaAs maintains leadership in handset front-end modules, while GaN progresses in telecom infrastructure and defense applications, with long-term prospects in 6G deployment.

Photonics represents the most dynamic segment. InP substrates are forecast to grow at more than 18% CAGR through 2031, driven by AI data centers, high-speed optical transceivers, and co-packaged optics (CPO) architectures. The transition to 6-inch InP platforms supports both performance scaling and manufacturing efficiency. Meanwhile, LED remains mature, and micro-LED adoption progresses gradually, beginning with high-end wearable and display applications.

AI is reshaping the overall compound semiconductor supply chain: from silicon carbide enabling efficient power delivery in data centers to indium phosphide supporting high-speed optical interconnects, compound materials are becoming essential to scalable AI infrastructure

To explore these market and technology dynamics, highlighting their role across photonics and AI-driven infrastructure, Yole Group is addressing compound semiconductor trends at upcoming industry events:

- At the Optical Fiber Communication Conference & Exposition (OFC 2026) at the Los Angeles Convention Center (15–19 March), compound semiconductors will be explored through the photonics lens during Yole Group's briefing 'Scaling Datacom Optical Technologies for Next-Generation Networks'. Yole Group's analysts Martin Vallo, Lakshman Srinivasan and Axel Clouet, in collaboration with leading photonic companies Coherent and Lightmatter, will discuss how rising demand for bandwidth, optical integration, and co-packaged optics are shaping the positioning of InP, GaAs and silicon photonics technologies in next-generation data-center networks.
- At SEMICON China 2026 in Shanghai New International Expo Centre (25–27 March), the perspective expands toward AI-driven infrastructure and semiconductor strategy. The conference features speaker Poshun Chiu addressing how compound materials are enabling scalable AI systems and reinforcing the link between materials innovation and manufacturing ecosystems. ■

www.yolegroup.com/product/report/status-of-the-compound-semiconductor-industry-2026---focus-on-substrates-and-epiwafers
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