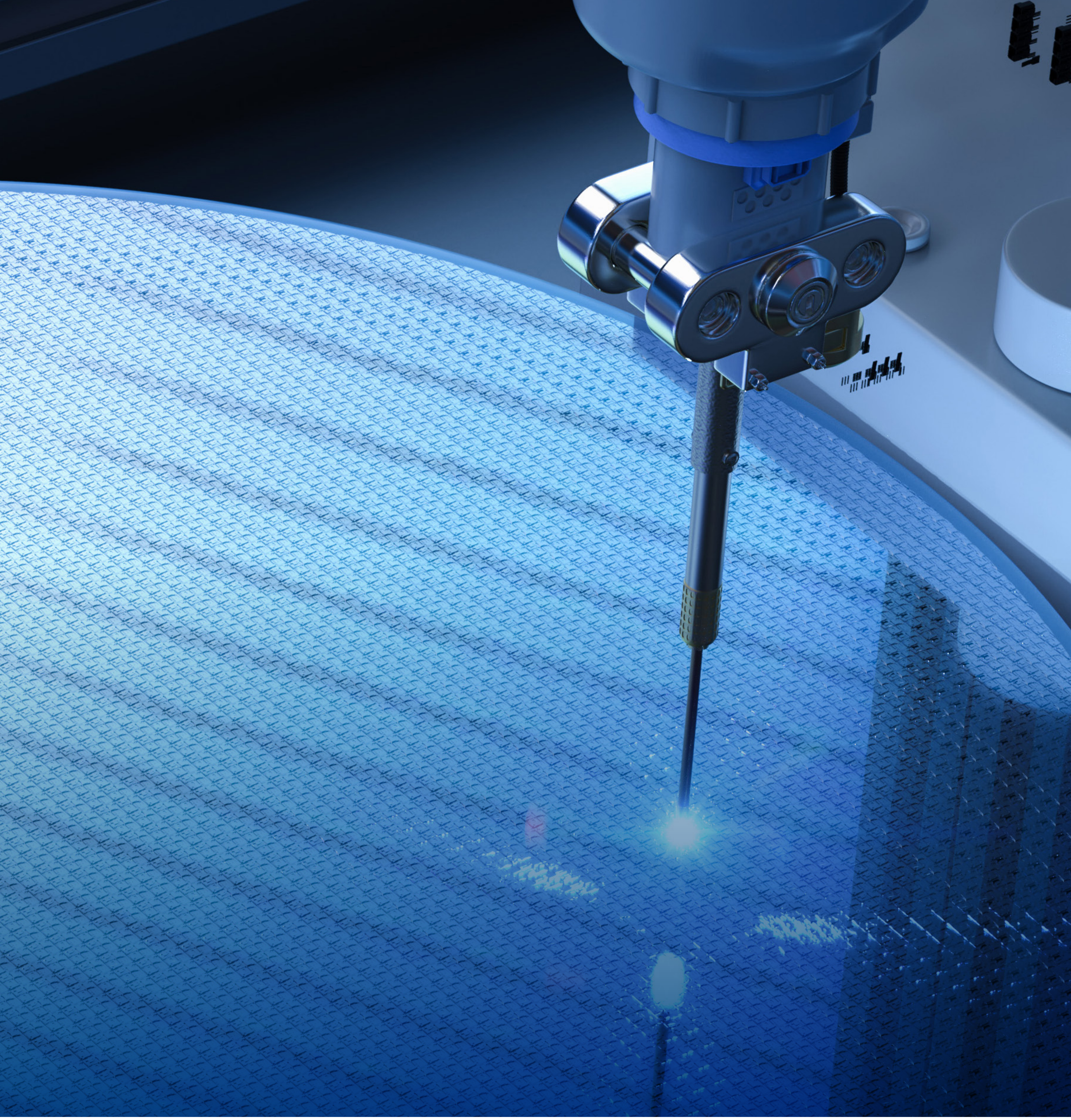


Quantacrystals

Client Brochure 2025

TFLN and TF-SiC represent a new class of materials that are expanding the frontiers of integrated photonics and considered as a cornerstone of next generation photonic circuits.

TFLN

Often hailed as the "silicon of photonics," it combines ultralow optical loss with an exceptionally fast electro-optic response via the Pockels effect—setting the gold standard for high-speed optical modulation.

TFLN leverages advanced semiconductor fabrication techniques to realize tightly confined waveguides and high integration density. This enables PICs with unprecedented bandwidth, low driving voltage, compact form factors, and exceptional long-term reliability.

VERIFIED MARKET REPORTS

10.5% CAGR from 2026 to 2033

Global Lithium Niobate on Insulator (LNOI) Wafer Market Size and Scope

Wafer Market size was valued at USD 500 million in 2024 and is projected to reach USD 1.2 billion by 2033

TF-SiC

Thin-film silicon carbide is redefining the landscape of integrated photonics with its rare combination of broadband transparency, strong third-order nonlinearity, and exceptional thermal and mechanical resilience.

Unlocking powerful new capabilities in non linear signal processing, mid-infrared aplications, and quantum photonics designed for extreme-environment operation.

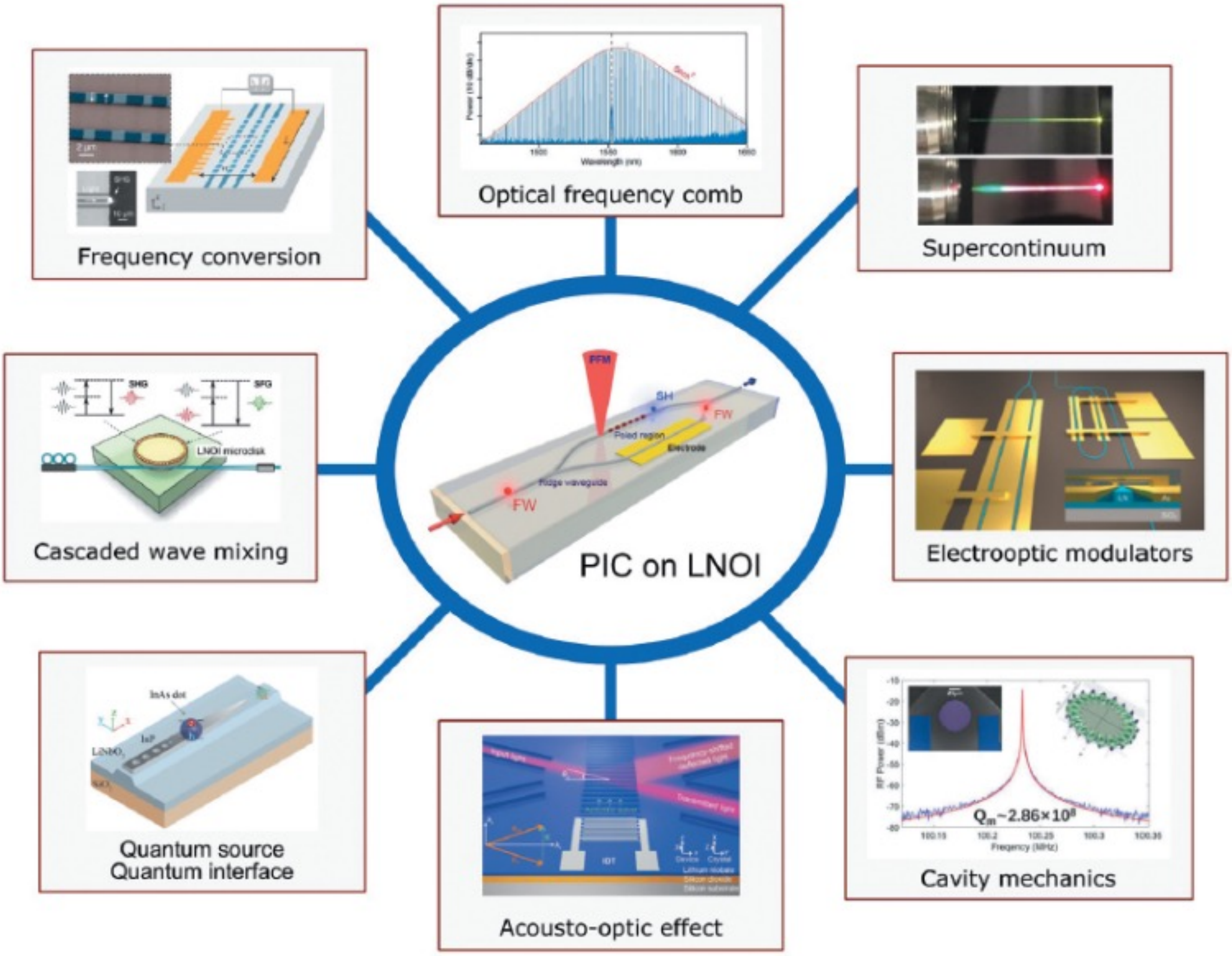
VERIFIED MARKET REPORTS

18.4% CAGR from 2026 to 2033

Global Silicon Carbide (SiC) Semiconductor Market Size and Scope

Wafer Market size was valued at USD 1.2 billion in 2024 and is projected to reach USD 5.6 billion by 2033

PIC Functionalities Enabled by LNOI Platform



Zheng, Y., & Chen, X. (2021). Nonlinear wave mixing in lithium niobate thin film. Advances in Physics: X, 6(1).

https://doi.org/10.1080/23746149.2021.1889402

Key Features of TFLN

High-Speed Electro-Optic Modulation

- Leverages the strowng Pockels (X^2) effect
- Supports modulation bandwidths >100 GHz
- Enables energy-efficient modulators with low V_π (< 1 V·cm)

Low-Loss, High-Confinement Waveguides

- Optical loss <0.1 dB/cm
- Tight mode confinement for compact PICs
- Compatible with dense integration and small bending radii (~30 μm)

Wide Optical Transparency Window

- Transmits from ~350 nm to 5.5 μm
- Covers visible, telecom, and mid-IR bands
- Ideal for multi-wavelength integrated systems

Strong Nonlinear Optical Properties

- Large X^2 and X^3 nonlinearities
- Enables second-harmonic generation (SHG), DFG, and supercontinuum generation
- Photon pair generation for quantum photonics

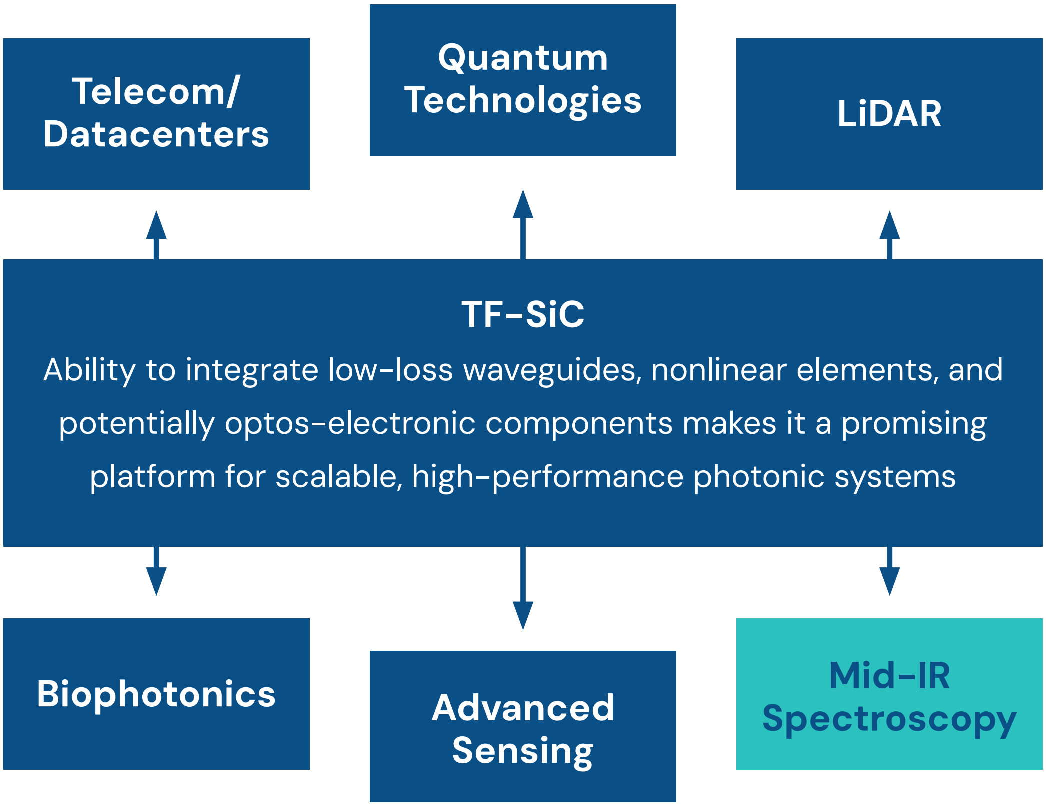
CMOS-Compatible Fabrication

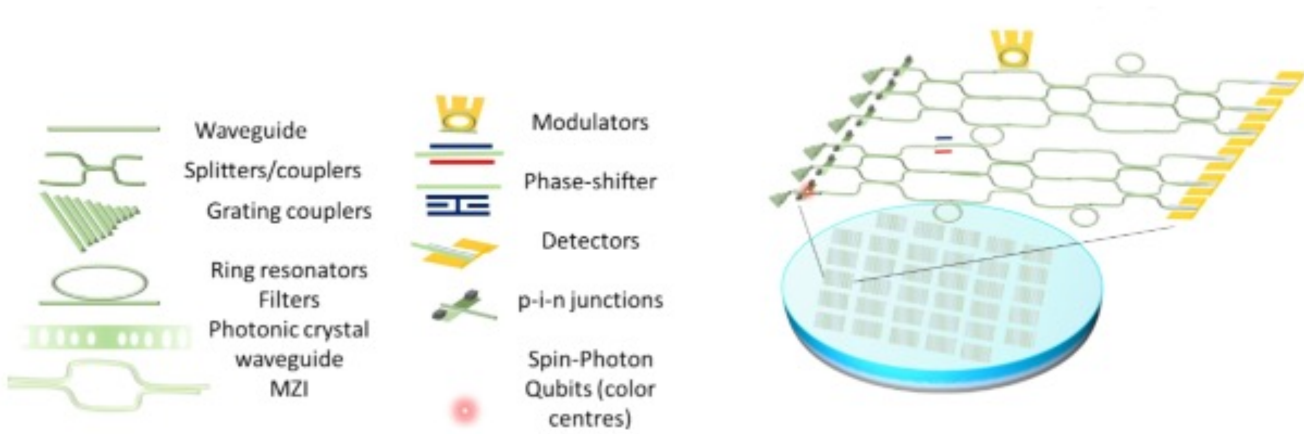
- Integrates with standard silicon foundry processes
- Thin-film bonding onto Si or SiO_2 substrates
- Scalable to wafer-level PIC manufacturing

Versatile for Multi-Domain Applications

- Telecom/datacenter: high-speed modulators
- Quantum: entangled photon sources
- LiDAR: low-loss routing and frequency shifting
- RF/optical hybrid systems: high-speed EO conversion

PIC Functionalities Enabled by SiCOI Platform

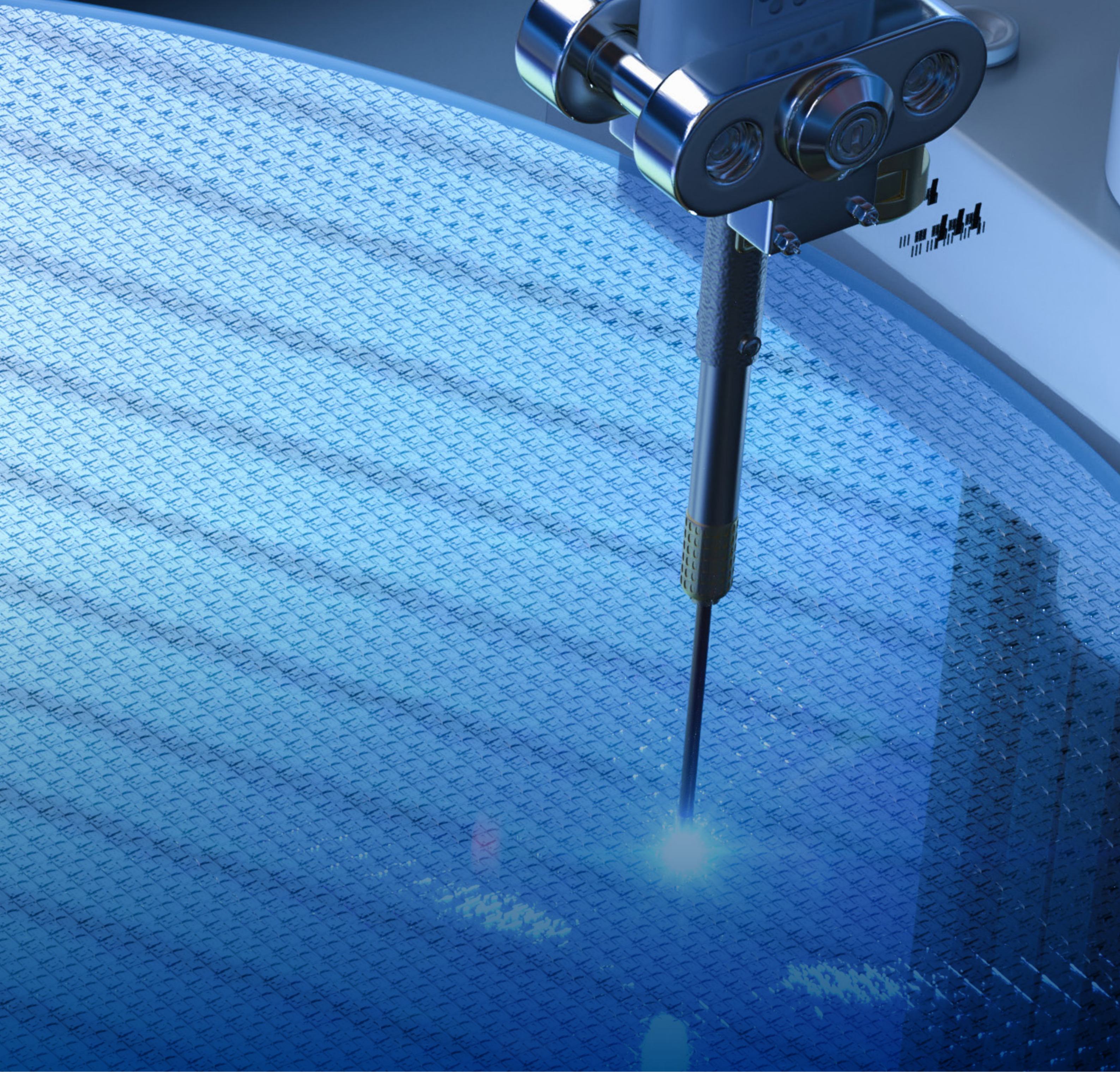




A. Boretti, Q. Li, S. Castelletto, Pioneering the future with silicon carbide integrated photonics, Optics & Laser Technology, Volume 181, Part B, 2025

Key Features of SiCOI (Silicon Carbide on Insulator)

Property	Typical Value / Feature
Core Layer	Thin-film 3C SiC, 4H SiC, 6H SiC, or amorphous SiC (a SiC)
Insulator (BOX)	SiO_2 (1–3 μm), sometimes sapphire or AlN
Substrate	Typically silicon (Si), quartz, or sapphire
Refractive Index	~2.55–2.7 at 1550 nm (high contrast with SiO_2)
Transparency Range	300 nm to >7–8 μm (visible to mid-IR)
Waveguide Loss	0.5–1 dB/cm (amorphous SiC), <0.2 dB/cm (crystalline SiC)
Thermal Conductivity	120–490 W/m·K (depending on polytype)
X^2 / X^3 Nonlinearities	Strong X^3 (all types); X^2 present in non-centrosymmetric SiC
Compatibility	CMOS-compatible; deposited or bonded using IC processes



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