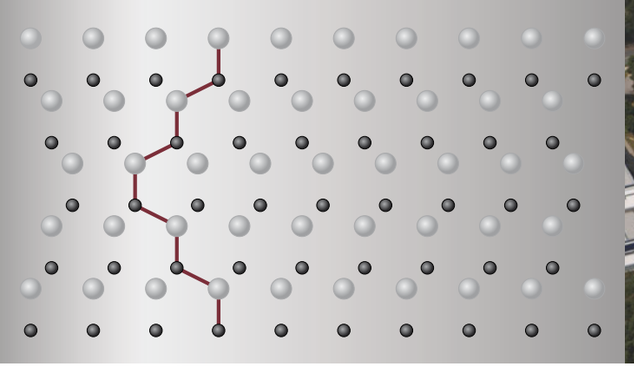

π-FAB @ IISB

Fraunhofer IISB operates the π-Fab, which comprises a continuous silicon CMOS and silicon carbide process line in an industry-compatible environment. π-Fab supports its customers with specific process steps as well as with the fabrication of customized electron devices. Customer satisfaction and the manufacture of production ready prototypes are our main priority.

SiC @ IISB

On the π-Fab platform, Fraunhofer IISB fabricates 4H-SiC prototype devices and supports customers with its expertise in electron device and materials development in order to promote the commercialization of SiC material and devices.

We provide R&D services in the following areas:

- Materials development
- Prototype devices
- Module assembly
- Mechatronic systems

π-Fab

FRAUNHOFER IISB

The Fraunhofer Institute for Integrated Systems and Device Technology IISB conducts applied research and development in the fields of Power Electronics, Nanoelectronics, Materials for Electronics, Electric Mobility, and Energy Electronics.

With its headquarters located in Erlangen, Germany's hotspot for silicon carbide, Fraunhofer IISB has been cooperating with partners from SiC industry and research for more than 20 years.

We are confident that 4H-SiC is the ideal semiconductor for the realization of high-voltage and high-power electron devices due to its outstanding material properties.

Fraunhofer IISB offers R&D services on SiC from materials development and prototype devices to module assembly and mechatronic systems.

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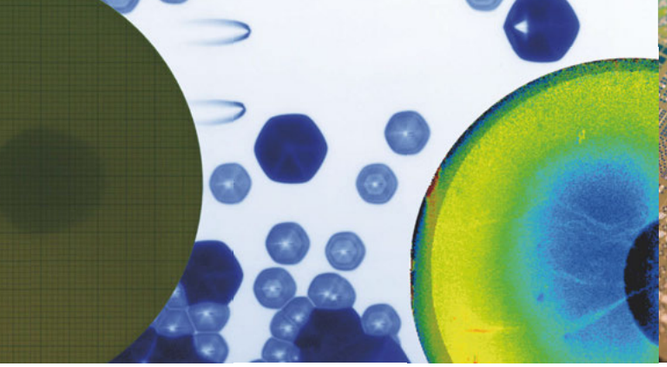
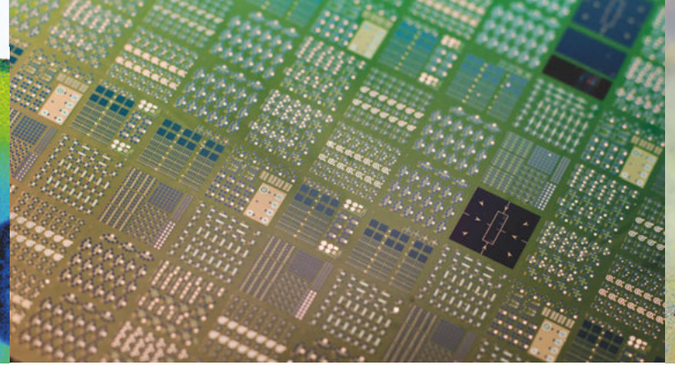
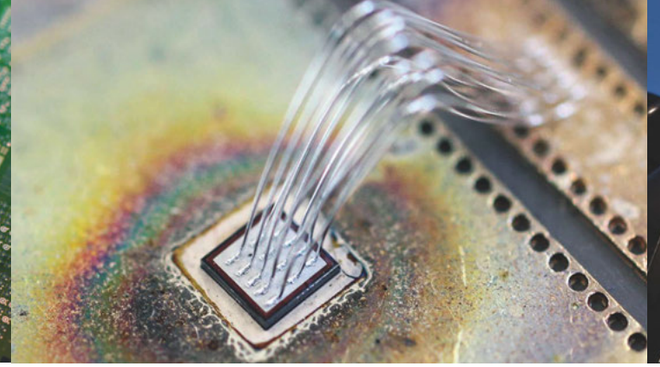
Fraunhofer IISB

FRAUNHOFER INSTITUTE FOR INTEGRATED SYSTEMS AND DEVICE TECHNOLOGY

CUSTOM-TAILORED SiC SERVICES


MATERIALS

Objectives
- Correlation of growth parameters and material quality based on experiments and simulation
- Growth of n- and p-type high quality epilayers
- Support of customers' process and material development

Characterization
- Structural defects in substrates and high-quality epilayers
- Electrical analysis of epilayers
- Defect evolution in epilayers

Simulation
- Tailored CFD software solutions
- Fluid dynamics and heat transfer for bulk and epitaxial growth processes
- Species transport with chemical reactions in CVD processes

Prototype
- Basal plane dislocation-free epilayers
- PiN diodes fabricated on IISB's epilayers

DEVICES

Objectives
- Prototype fabrication of power devices on a continuous CMOS process line
- Development and realization of novel device concepts
- Optimization of specific process steps

Characterization
- Static and dynamic electrical analysis of power devices up to 500 °C
- Ruggedness and reliability

Simulation
- TCAD simulation of SiC devices
- Development of compact models for electrical and thermal circuit simulations
- Junction termination for kV devices

Prototype
- Power semiconductor devices according to customer specifications
- High channel mobility-MOSFETs
- UV / X-ray detectors

MODULES

Objectives
- Different die attach technologies
- Diverse die attach concepts
- High speed switching designs
- Accelerated aging and lifetime modeling

Characterization
- Dynamic switching performance
- Active and passive temperature cycles
- Shear tests as die attach quality indicator
- Analysis of lifetime and failure mechanisms

Simulation
- Thermal management from die to coolant
- Plastic deformation during active and passive cycling
- Intermetallic diffusion for high temperature chip metallization
- Electric field distributions

Prototype
- Customized multi-chip power modules
- Manufacturing and packaging
- Design for electrical, thermal, mechanical, and lifetime constraints

SYSTEMS

Objectives
- Evaluation of novel devices in highly efficient power electronic systems
- Cost reduction by system integration
- Innovative solutions for automotive and energy transfer applications

Characterization
- Dynamic switching behavior of devices
- Burst ruggedness of gate control circuits
- EMC characterization and optimization

Simulation
- Analytic evaluation of converter topologies
- Optimum operating points for power semiconductors and passive devices
- Determination of boundary conditions by electro-thermal co-simulation

Prototype
- Bidirectional DC / DC and AC / DC converters for automotive and energy management
- Inductive charging systems for electric cars
- Ultra-high power densities up to 100 kW / l and switching frequencies up to 1 MHz
- Multiport concepts with lowest profile