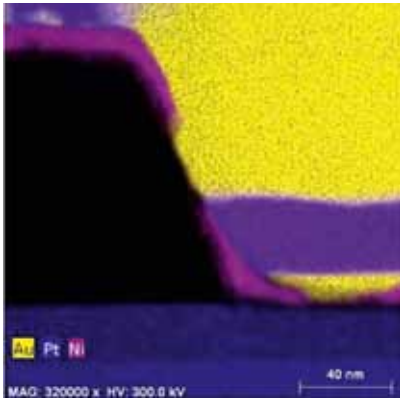
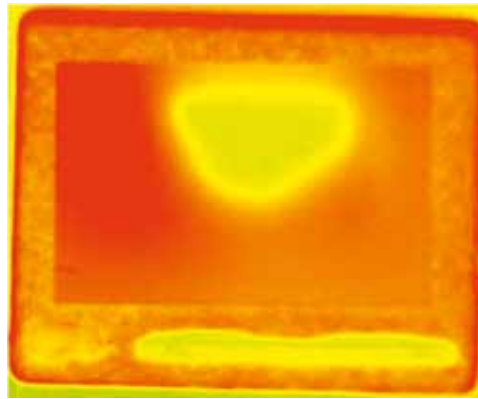


FRAUNHOFER INSTITUTE FOR MICROSTRUCTURE OF MATERIALS AND SYSTEMS IMWS/ CENTER FOR APPLIED MICROSTRUCTURE DIAGNOSTICS CAM



TEM EDS mapping of a GaN HEMT gate structure



Pulsed thermography of a defective Power MOSFET device with interface delamination

About Fraunhofer IMWS/CAM

Fraunhofer IMWS/CAM is a leading service provider for failure diagnostics and materials assessment. Contract R & D for industry in the area of semiconductor technologies, microelectronic components, microsystems and nanostructured materials is our day-to-day business. Fraunhofer CAM covers the entire work flow from non-destructive defect localization over high precision target preparation to cutting edge nanoanalytics, supplemented by micro-mechanical testing and numerical simulation. In preparation for future challenges, we do undertake intense forefront research in cooperation with international partners from academia and industry. See www.cam.fraunhofer.de for further information.

Failure Diagnostics in Power Electronics

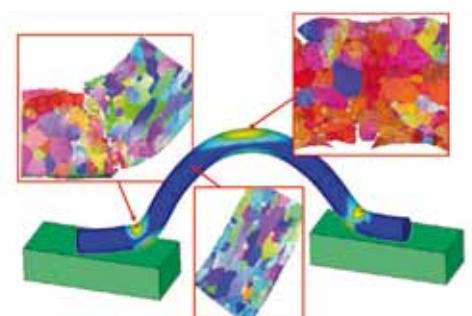
Fraunhofer IMWS/CAM provides failure analysis for power semiconductors,

including power ICs, MOS transistors, IGBTs, diodes and sensors developed for operation under standard and harsh environment. In addition to Si-based systems, we investigate and analyze the behavior and performance characteristics of novel SiC and GaN based devices including related dielectrics, metallization layers and contact systems.

Particular attention is paid to a fundamental understanding of interface material properties and mechanisms relevant for new interconnection and packaging approaches. Current activities cover the characterization of heavy wire bonding materials, Ag-sintering, diffusion soldering, new substrates and housing materials. Fraunhofer CAM closely collaborates with leading manufacturers of analysis and testing equipment with explicit focus on the development of innovative tools and test methods for quality assessment and failure analysis valuable for the electronics industry.

Portfolio

- Microstructure/failure analysis of power semiconductors on wafer and chip level (ICs, MOS transistors, IGBTs, diodes based on Si, SiC and GaN) and of packaged components and modules (including high temperature operation > 250°C)
- Material characterization of high temperature-stable metallization and conducting systems
- Characterization of interconnection materials like heavy wire bonding contacts/materials (e.g. Al, Cu, Al/Cu clad wires/ribbons)
- Characterization of encapsulation and housing materials
- Modeling and numerical simulation of mechanical, thermal and thermo-mechanical device and material properties
- Development of tools and methods for failure diagnostics and quality assessment specifically adapted to power electronics



Finite Element model and grain structure characterization by Electron Backscattered Diffraction (EBSD) for a low cycle fatigue analysis of heavy wire bonding interconnects