Fraunhofer IMWS

CAM IS A COMPETENCE CENTER FOR MICROSTRUCTURE DIAGNOSTICS AND MATERIAL CHARACTERIZATION WITHIN FRAUNHOFER IMWS IN HALLE

CENTER FOR APPLIED MICRO-STRUCTURE DIAGNOSTICS

The Center for Applied Microstructure Diagnostis is a leading service provider for failure diagnostics and materials assessment. Contract R & D for industry, semiconductor technologies, microelectronic components, microsystems and nanostructured materials is our day-to-day business.

At CAM, we cover the entire work flow from non-destructive defect localization over high precision target preparation to cutting edge nanoanalytics supplemented by micro-mechanical testing, finite element modelling and numerical simulation. In preparation for future challenges, we do accomplish intense forefront research in cooperation with international partners.

CONTACT US

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MAJOR APPLICATIONS

Electronics and microsystem technologies:

- Si-based semiconductor IC technologies (CMOS, BiCMOS, HV CMOS)
- Optoelectronics and HF electronics
- Power electronics
- Organic electronics
- Microelectronics packaging
- Advanced 3D System Integration
- Interconnecting materials for photovoltaics (cooperation with Fraunhofer CSP)
- MEMS and actuators
- Sensor materials

Nanotechnologies:

- Pigments and nanoparticles
- Optical coatings
- Nanostructured glasses, ceramics and glass ceramics
- Selected health care materials

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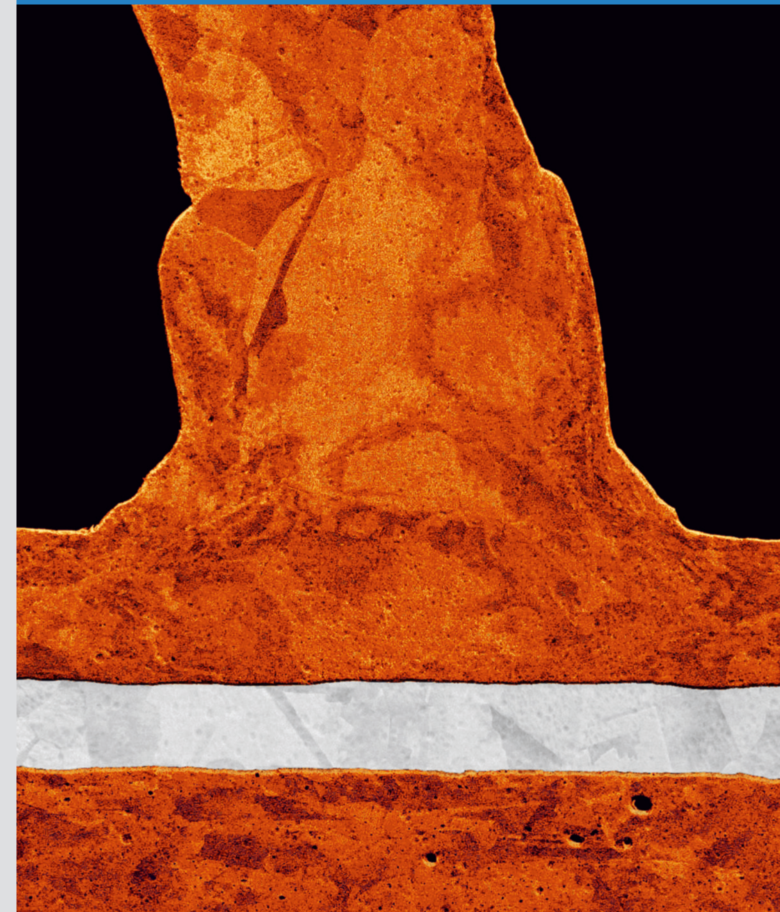
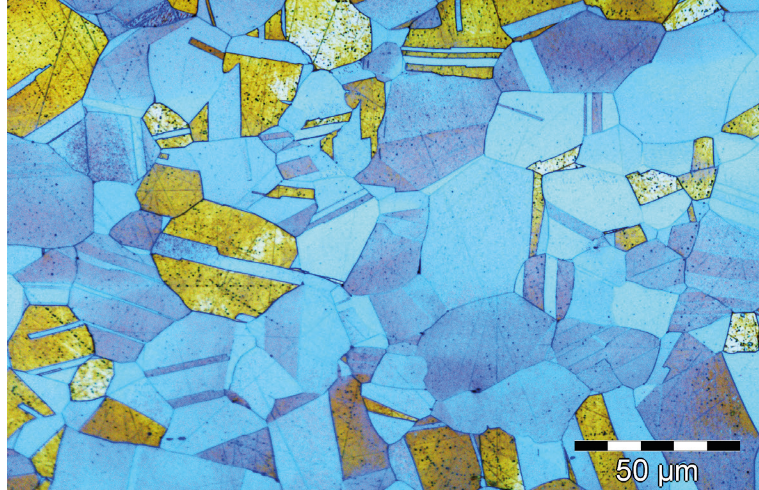
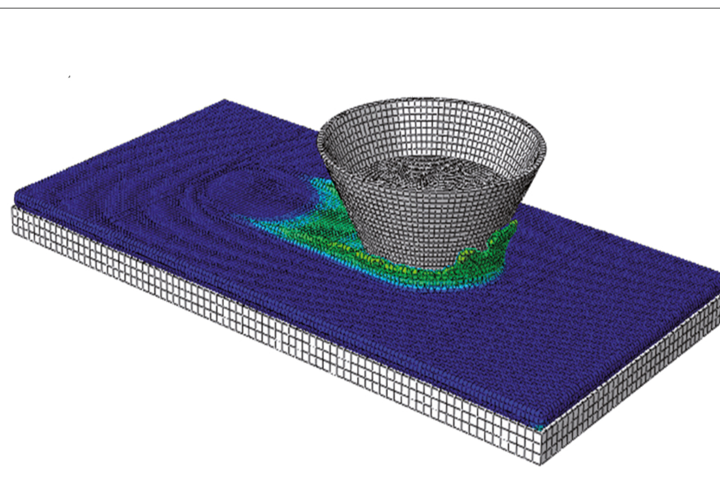
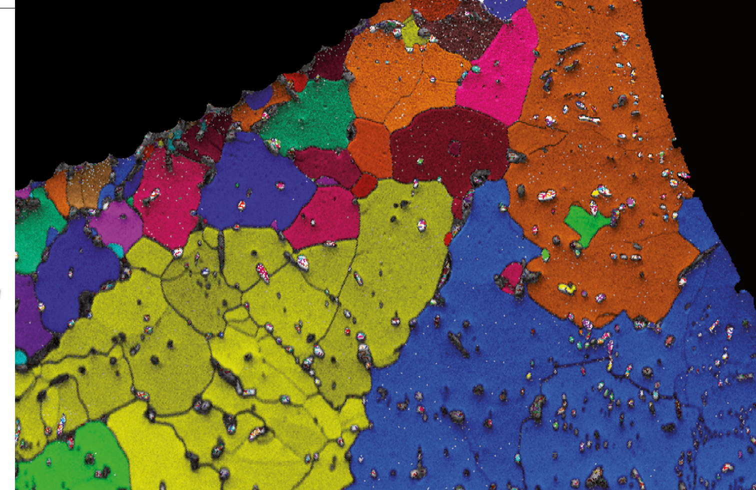
MICROELECTRONICS PACKAGING









MICROELECTRONICS PACKAGING

Within semiconductor packaging and system integration, semiconductor chips are electrically interconnected to their environment, encapsulated for protection and assembled onto sub-strates forming either electronic components, modules, board assemblies or even complex 3D integrated microsystems and subsystems. The designs, process steps and materials used in packaging significantly affect the reliability properties of the complete system.

CAM provides a comprehensive workflow of physical failure analysis and material diagnostics ranging from non-destructive testing, high-precision and efficient target preparation to cutting edge electron microscopy, surface and trace analysis, optical and IR spectroscopy as well as mechanical and thermophysical material characterization.

With these activities we assist our partners in detecting, analyzing and consequently preventing potential root causes of defects and failures. In close cooperation with equipment manufacturers we develop new failure analysis-, target preparation- and reliability testing routines and tools.

OUR SERVICES

- Failure diagnostics and microstructure analysis of interconnection materials (solder materials, sinter materials, epoxys)
- Material characterization of new high temperature-stable metallization and conducting systems
- Material characterization of encapsulation materials (e.g. mold compounds, silgels)
- Failure diagnostics and microstructure analysis of wire bond materials and contacts
- Characterization of heavy wire bonding contact/ materials, e.g. Al, Cu, Al/Cu compound wires/ribbons
- Simulation and modeling of the life time of wire bonding loops loaded by thermomechanical stress
- Development of failure diagnostics and quality control methods adapted for microelectronics
- Modelling and simulation of mechanical, thermal and thermomechanical device properties

EQUIPMENT

- Non-destructive failure diagnostics at component level (SAM, 3D-Xray, CT, Lock-In-Thermografie)
- Thermomechanical deformation characterization (IC-techniques, ESPI, LSCM, Laser scanning triangulation, mechanical profilometry)
- Package decapsulation and cross sectioning techniques
- Fast, high rate chip and package analysis by Laser-FIB and Plasma-FIB tools
- High resolution microstructure and interface analysis (combined FIB/SEM tools and SEM with element analytics)
- Crystallography (EBSD and XRD)
- Nanoanalytics (TEM/STEM microscopes (60-300kV) with image corrector, HAADF, EDS, EELS), AFM
- Surface/trace analysis systems (ToF-SIMS, XPS, ICPMS, XRF)
- Optical/IR spectroscopy (UV/VIS/FTIR and Raman)
- Mechanical characterization (nanoindentation and material testing at elevated temperatures)
- Thermophysical property characterization
- Reliability testing and test development
- Corrosion testing
- Modeling and simulation (FE-Analysis)