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 Diagnostics 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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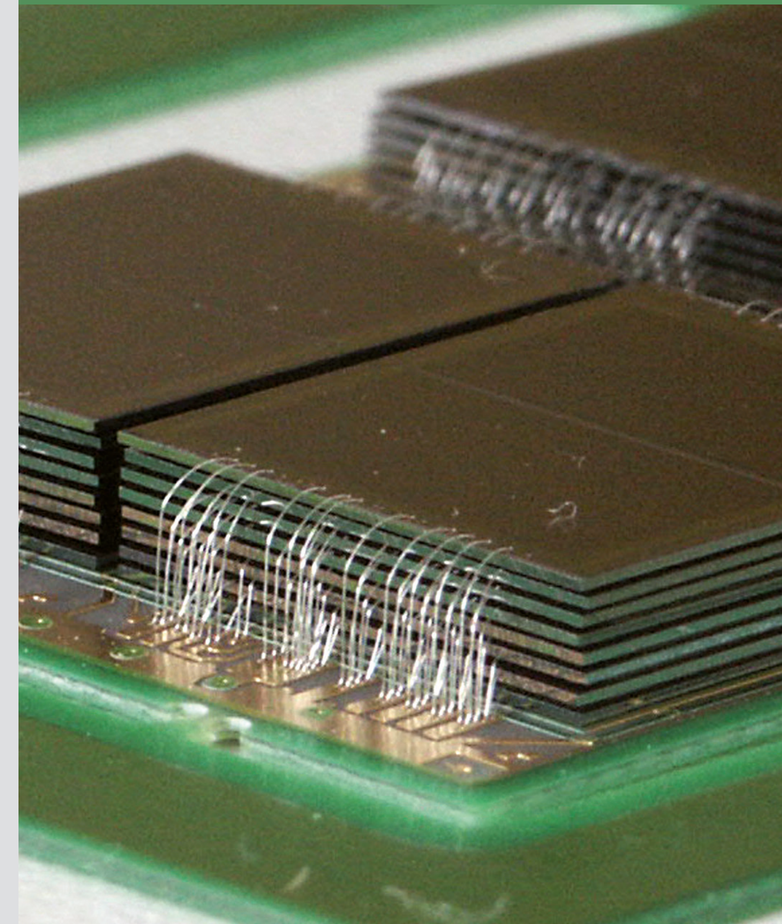
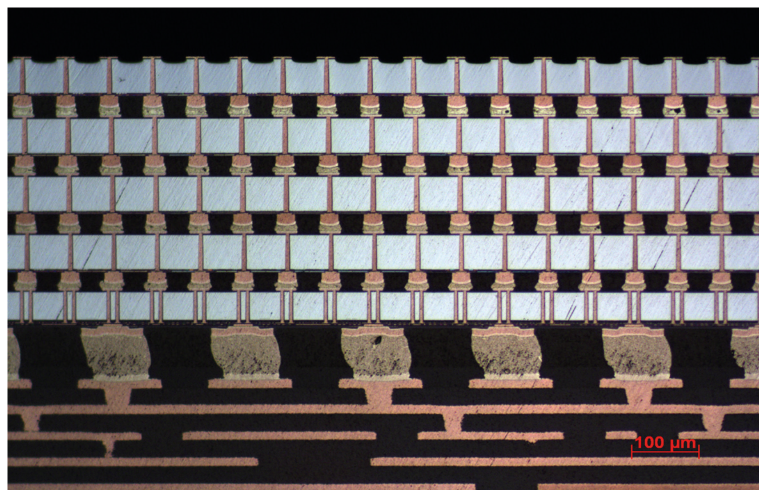
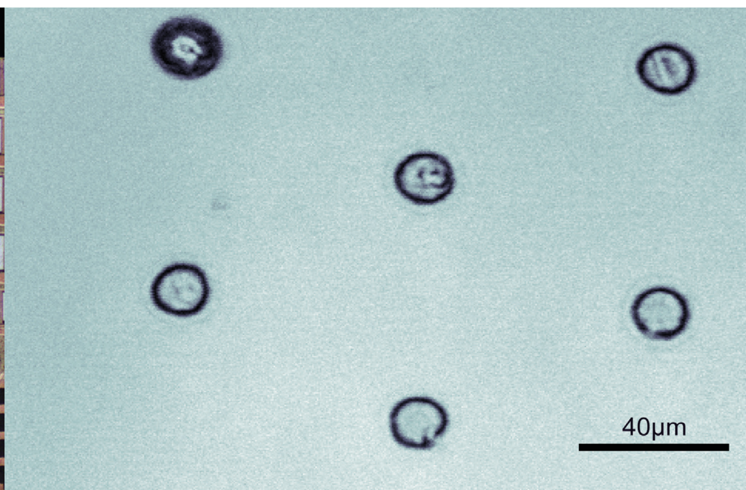
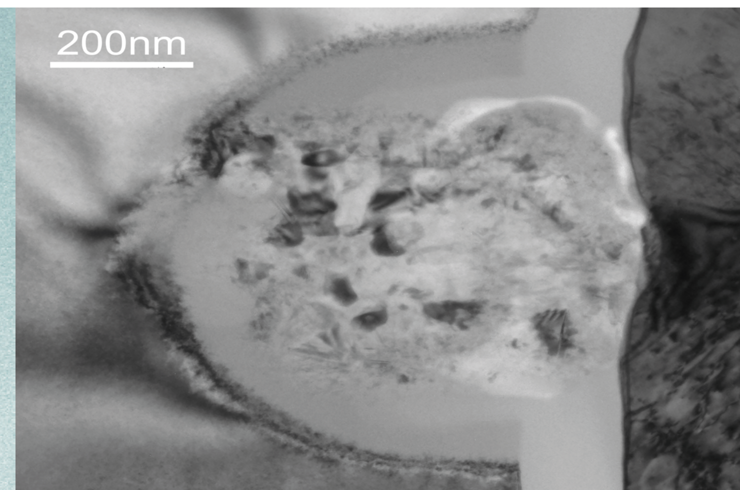
# 3D SYSTEM IN PACKAGE INTEGRATION










## 3D SYSTEM IN PACKAGE INTEGRATION

During the past years, continuously increasing demands for higher miniaturization, implementation of more functionality, superior signal performance and high innovation rates paved the way for the development of new electronics packaging platforms such as System in Package (SiP), Wafer Level Package (WLP) or 3D system integration. The high complexity of these systems regarding 3D design, combination of different technologies and multi-material approaches poses also new and severe challenges to failure analysis methodologies and instrumentation needed to support technology development, process and system qualification.

Together with leading diagnostic tool manufacturers, CAM develops techniques for fault isolation, site specific target preparation, physical microstructure and material characterization for failure analysis and quality control adapted to the specific requirements of SiP, WLP and 3D devices. In co-operation with manufacturers of microelectronics systems, these techniques are applied to secure the quality, yield and reliability of innovative devices.

## OUR SERVICES

- Acoustic microscopy methods for delamination detection in multi-layer devices
- GHZ- acoustic microscopy with 1 µm lateral resolution for defect analysis in small scaled interconnect structures like TSVs and microbumps
- Non-destructive 3D localization of electrical defects in 3D SiPs by advanced Lock-in-Thermography techniques
- High throughput site specific cross sectioning by high current FIB and laser based preparation, e.g. of 3D TSVs and microbump structures
- Physical analysis of local defects and interface problems by high resolution electron microscopy and time-of-flight secondary ion mass spectrometry in chip-to-wafer and wafer-to-wafer bonding
- Customized failure analysis flows and material characterization for WLP devices (fan in and fan out WLPs, e.g. eWLB)
- Diagnostic support for technology assessment and qualification including construction analysis

## EQUIPMENT

- Scanning Acoustic Microscopes (MHz, GHz)
- Lock-in-Thermography including phase shift analysis software for 3D localization
- 2D X-Ray inspection and 3D tomography
- Short and ultrashort plused laser milling
- Combined FIB and laser milling (Laser-FIB)
- High current Ga-FIB with integrated IR microscopy for navigation
- High current Plasma-FIB
- Large area Ar milling (cross section polisher)
- Combined FIB/SEM tools
- High resolution SEM with EBSD,EDX EBSD analytics
- High resolution TEM with EDX, EELS (FEI TitanG2, FEI TechnaiF20)
- Time of flight secondary mass spectrometry