

## CONTACT

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FRAUNHOFER IMWS  
 CENTER FOR APPLIED MICROSTRUCTURE DIAGNOSTICS

## MAJOR APPLICATION AND MARKET FIELDS

### Electronics and microsystem technologies:

- Si-based semiconductor IC technologies (CMOS, BiCMOS, HV CMOS)
- GaN, SiC, Optoelectronics and HF electronics
- Power electronics
- Organic electronics
- Microelectronics packaging
- Advanced 3D System Integration
- MEMS and actuators, sensor materials

### Nanotechnologies:

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

### Market fields:

- Automotive and industry electronics
- Information and communication, consumer electronics
- Electronics and microsystems for security products
- Nanomaterials
- Diagnostics and testing equipment manufacturing
- Failure analysis, material testing and quality control

## EQUIPMENT AND METHODS

### Non-destructive defect localization

- Scanning Acoustic Microscopy, Lock-in/pulse thermography, 3D X-Ray, XRM

### FIB and electron microscopy

- Standard IC and package target preparation, laser and ion beam techniques, IC backside prep., Cryo-Ultramicrotomy
- Plasma FIB, Laser FIB, Circuit edit IR FIB, Dual Beam Cryo FIB, Cross Beam FIB, Ar Nanomill
- Analyt. SEMs with EBSD, EDS, WDS, EBIC, EBAC; ESEM
- TEM/STEM and EF-TEM (60-300 kV) with Cs image corrector, ns-EDS, EELS, HAADF, STEM, NBD and in situ testing

### Surface and trace analysis

- AFM, XPS/UPS, AES, TOF-SIMS, ICP-MS, OES, RGA

### Crystallography and optical spectrometry

- XRD, EBSD, FTIR,  $\mu$ -Raman, UV/VIS spectroscopy, EL/PL

### Surface topography and deformation

- LSM, Interferometry, ESPI, DIC systems, TTV, Bow

### Polymer characterization

- DSC, DMA, TGA, TMA, TCA (light flash), Rheometry

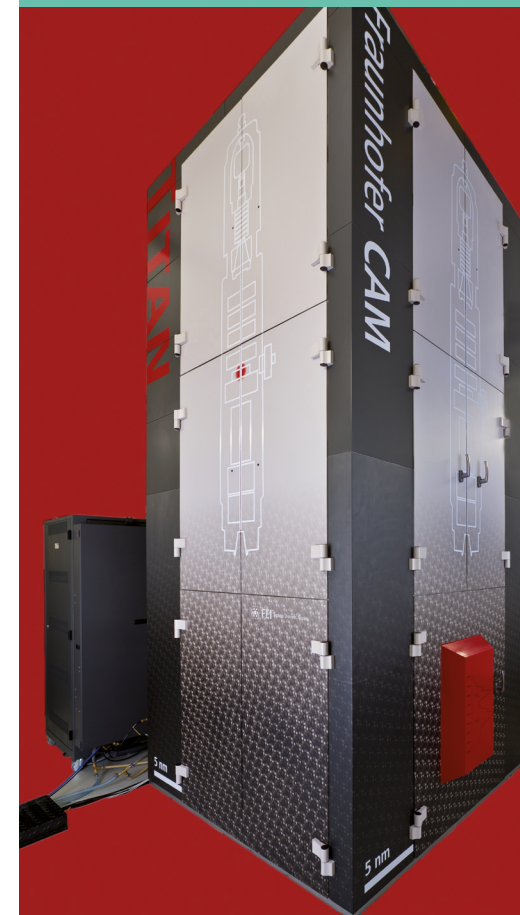
### Mechanical and reliability testing, Modeling

- Static and dynamic material testing, Nanoindentation
- MEMS analyzer; Customized microtesting for deformation, strength, fatigue and electrical properties,
- Finite Element (FE) simulation and material modeling

### Electrochemical characterization and corrosion testing

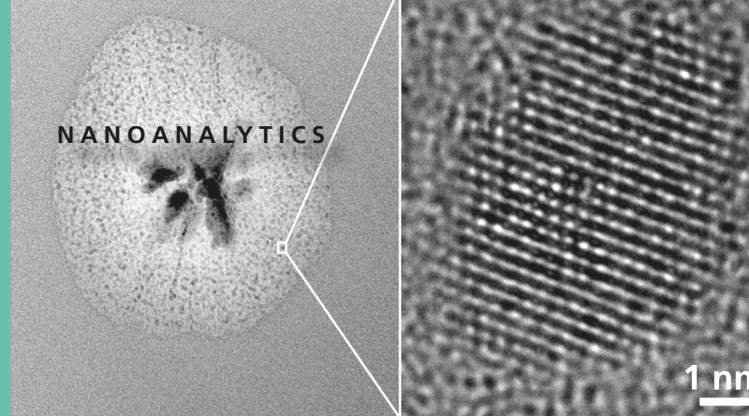
- Voltametry, potentiodynamic and potentiometry testing
- Gas permeativity, flow injection analysis

## FRAUNHOFER CENTER FOR APPLIED MICROSTRUCTURE DIAGNOSTICS CAM



TEM TITAN<sup>3</sup>  
 G2 60-300

## MICROSTRUCTURE DIAGNOSTICS AND FAILURE ANALYSIS



## METHOD AND EQUIPMENT DEVELOPMENT IN MICROSTRUCTURE DIAGNOSTICS AND MATERIAL TESTING

Based on twenty years of experience in microstructure diagnostics and material assessment for semiconductor technologies, micro-electronic components, microsystems and nano-structured materials, Fraunhofer CAM is tying the entire flow from non-destructive defect localization to high precision target preparation right up to cutting edge nanoanalytics supplemented by micro-mechanical testing, finite element modeling and numerical simulation.

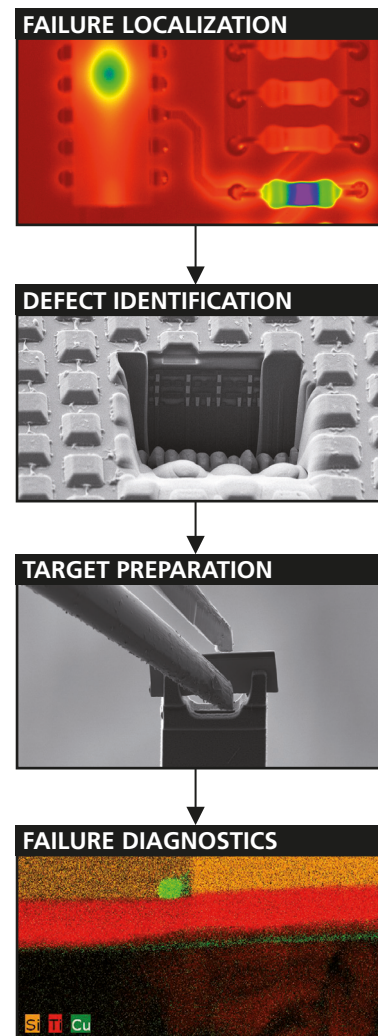
In addition to cooperation within public-funded research projects and scientific networks, Fraunhofer CAM is a major contractor to the microelectronics and nanotechnology industry focusing on physical failure analysis and material characterization. Using a certified DIN ISO 9001:2015 quality management system, we are providing services for leading international as well as for small and medium enterprises, many of them active in the very demanding automotive electronics market.

Our research results are aimed at supporting our cooperation partners introducing innovative materials and new technologies, improving manufacturing process steps, securing reliable field use of components, and consequently optimizing manufacturing yield, product quality, reliability, and cost efficiency.

Our major strength is the transfer of know-how from and close working collaboration with our colleagues in fields like photovoltaics, material research both in dental and personal care in the area of medical technology.

Please refer to our website to learn more about our capabilities and expertises, and check for the latest information on our annual CAM workshop and technology exhibition!

[www.cam.fraunhofer.de](http://www.cam.fraunhofer.de)



The soaring design and material complexity in current electronics systems, microtechnologies and nanomaterials also poses a rapidly increasing challenge on methodologies needed for microstructure diagnostics, failure analysis, parameter testing, mechanical characterization, industrial quality control and reliability surveillance.

Fraunhofer CAM addresses this challenge by collaborating with equipment manufacturers on the development of novel diagnostics and testing tools. We provide our partners with innovative hard- and software components, problem-adapted analysis work flows and industry-compatible application strategies. Progress in signal evaluation and hardware development is used to improve defect detection and material analysis by lock-in thermography, scanning acoustic microscopy, EBAC, nanoprobe, and electron microscopy.

Prospective research also includes preparation techniques based on focused ion- and laser beams that allow improving throughput and capability in industrial failure diagnostics and nanoanalytics. In addition, we are working on methods for residual stress measurement and phase identification, strength evaluation of microcontacts and interconnects, and local deformation properties, e.g. for wire and wafer bonding.

Our strength at Fraunhofer CAM is the unique, comprehensive and one-stop failure analysis and materials characterization chain operated by an experienced, service-oriented team.

Due to the close collaboration with leading microelectronics manufacturers, Fraunhofer CAM is able to support suppliers for test and diagnostics equipment. We can support you in exploring and evaluating upcoming markets, new customer segments and future application fields.