

We support you by

...investigating components, systems and materials of electronics and microsystem engineering, for example integrated integrated circuits, MEMS sensors, packaged devices and PCBs. These are analyzed and tested comprehensively in order to understand the relationship between technological process and application conditions with microstructure and material properties as well as with the affected functional performance in detail especially for harsh environments.

- Non-destructive and high resolution defect localization
- Physical Failure analysis on IC, packaging and system level
- Cutting edge microstructural characterization and process assessment
- Micro-mechanical testing and numerical simulation
- Physics of Failure modelling and lifetime prediction

Cooperation Models

- Direct industrial contract research and service
- Applied basic research in national and EU funded projects
- Know-how transfer and application studies for diagnostic equipment
- Education and consulting service



Major areas of our work are the process characterization on a microstructural level complementing the introduction of innovative technologies as well as the fast and client-focused root cause analysis of faults and of defect formation. The results are incorporated into the clients' manufacturing processes and thus help to increase the quality and reliability of these systems.«

Frank Altmann,
Head of Business Unit

 **Fraunhofer**
IMWS

Fraunhofer Institute for Microstructure of Materials and Systems IMWS

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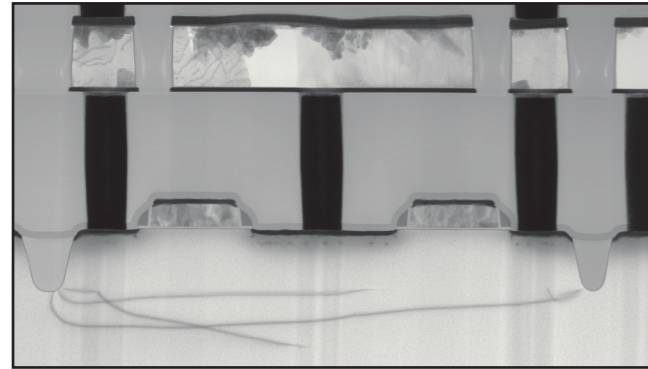
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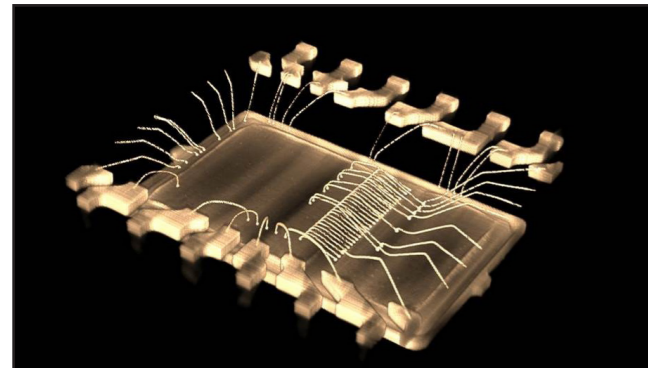
Electronic Materials and Components

We are Failure Analysis
Experts.

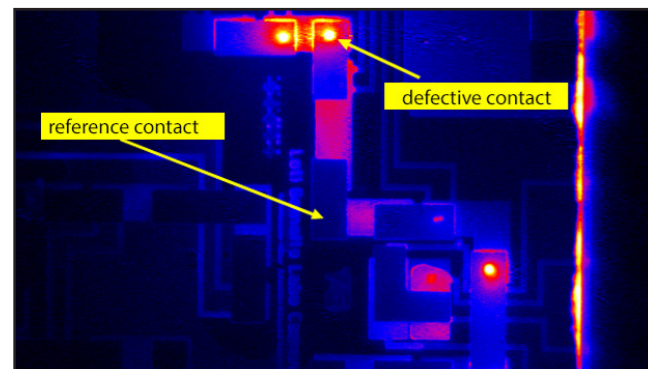
We are Failure Analysis Experts



Transmission electron microscopy (TEM) image showing electrical shorts caused by dislocations in a transistor structure



X-ray tomography of the interior of a microelectronic component with bonding wire contacts



Localization of high-ohmic flip chip contacts from chip backside

We analyse and test electronic components, systems and materials in order to understand the relationship between technological manufacturing processes, operating conditions, microstructure and material properties and the functional properties that depend on them. We thus increase and secure quality, reliability and safety of electronic components and systems.

Microstructure and material diagnostics

- Process evaluation (development, qualification, output)
- Prototyping (FIB layout modification)
- Reverse engineering
- Physical failure analysis
- Mechanical characterisation and functional tests
- Complex analysis for a deeper understanding of degradation mechanisms

Theoretical modelling and simulation

- Mechanical, thermomechanical application behaviour (service life)
- Thermal, acoustic signal behaviour for development of diagnostic methods

Methods developments

- Electrical, thermal, acoustic and magnetic defect localisation techniques
- Target preparation techniques for physical defect analysis
- Mechanical characterisation techniques
- Electrochemical test methods

Project examples

- [Ultimate GaN](#) - Evaluation of GaN-technologies with respect to reliability and new failure modes
- [ESAMKA](#) - Development of an electrochemical rapid test for highly reliable electronics applications
- [iRel 4.0](#) - Development of advanced methods for intelligent reliability along the value chain

Portfolio

In our research projects we investigate electronic components along the entire production chain from wafer to the assembled component in application:

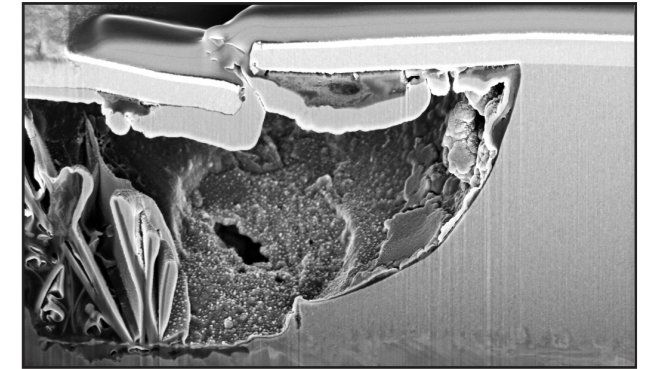
- Semiconductor wafers and chips (IC, sensors, power electronics, optoelectronics) of Si technologies, GaN & SiC
- Materials and components of packaging and interconnection technologies, power electronics modules
- Electronic assemblies and systems, e.g. in automobiles

International CAM-Workshop

Our annual industrial workshop combines

- oral presentations by experienced failure analysis experts from semiconductor industry and research institutes
- direct exchange between electronics failure analysis experts and diagnostics equipment manufacturers (through our an industrial exhibition)

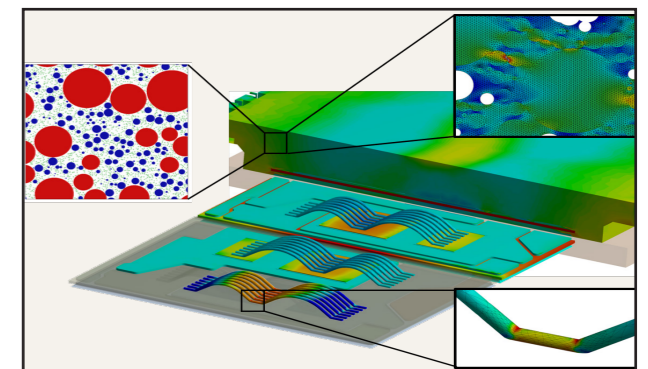
www.cam-workshop.de



SEM analysis of defect formation in the cross-section of a corroded layered bronze-Ni-NiPd-Au system



Defective power electronic packaging module



FEM-packaging simulation