How can we help you?

We offer our customers complex material diagnostics adapted to the individual requirements in industry, coupled with a profound scientific understanding of the respective material reactions.

Our Services

- Process characterization and optimization for packaging and assembly technologies and materials by microstructure analysis, mechanical testing, thermophysical and electrochemical material diagnostics
- One-stop and time-efficient comprehensive physical failure analysis workflows for packaged components and assembled subsystems Failure diagnostics and microstructure analysis of interconnection materials
- Material characterization and failure analyses of electronic packages (SiP, eWLB, PLP, MID, embedded components) and systems
- Analyses of material interaction for 2nd level reliability
- Material characterization of new high temperature-stable metallization and conducting systems as well as encapsulation materials
- Development of failure diagnostics and quality control methods adapted for microelectronics
- Modelling and simulation of mechanical, thermal and thermomechanical device properties

Further information can be found here:

www.imws.fraunhofer

Fraunhofer IMWS

Fraunhofer Institute for Microstructure of Materials and Systems IMWS

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We understand material reliability

Microelectronics Packaging

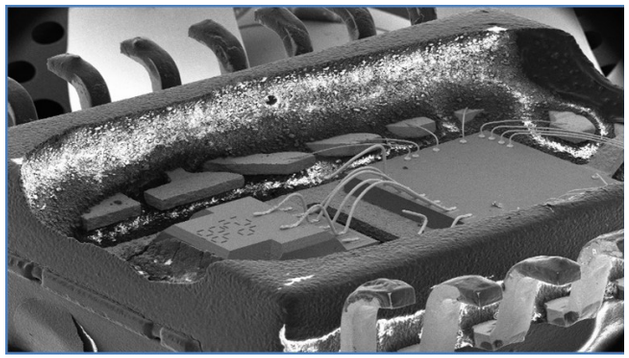
01/2022

Microelectronics Packaging

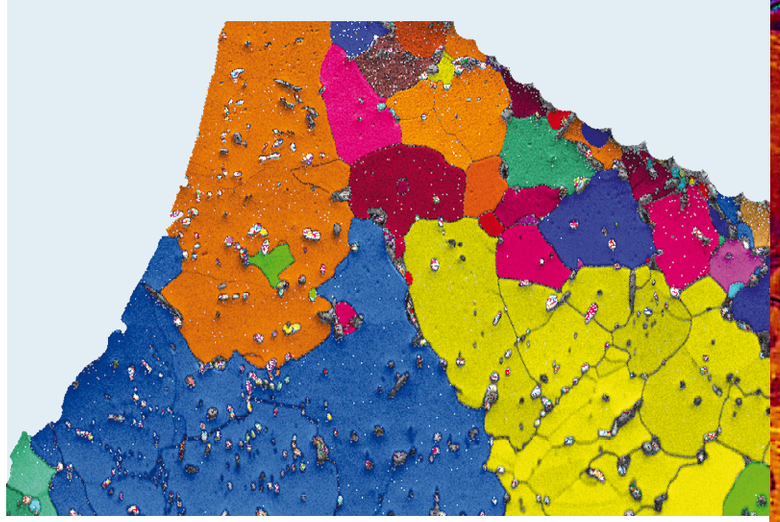
Within semiconductor packaging and system integration, semiconductor chips are electrically interconnected to their environment, encapsulated for protection and assembled onto sub-strates forming either electronic components, modules, board assemblies or even complex 3D integrated microsystems and subsystems.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

We support our partners with:

- **complex material diagnostics and failure analysis** in the field of packaging (both PCB- and leadframe-based assemblies, as well as ceramic-based) and thus the investigation of the underlying causes of defects and the prevention of failures
- **test development** and research into interaction mechanisms in the area of interconnection technology
- optimisation and **development of preparation methods**



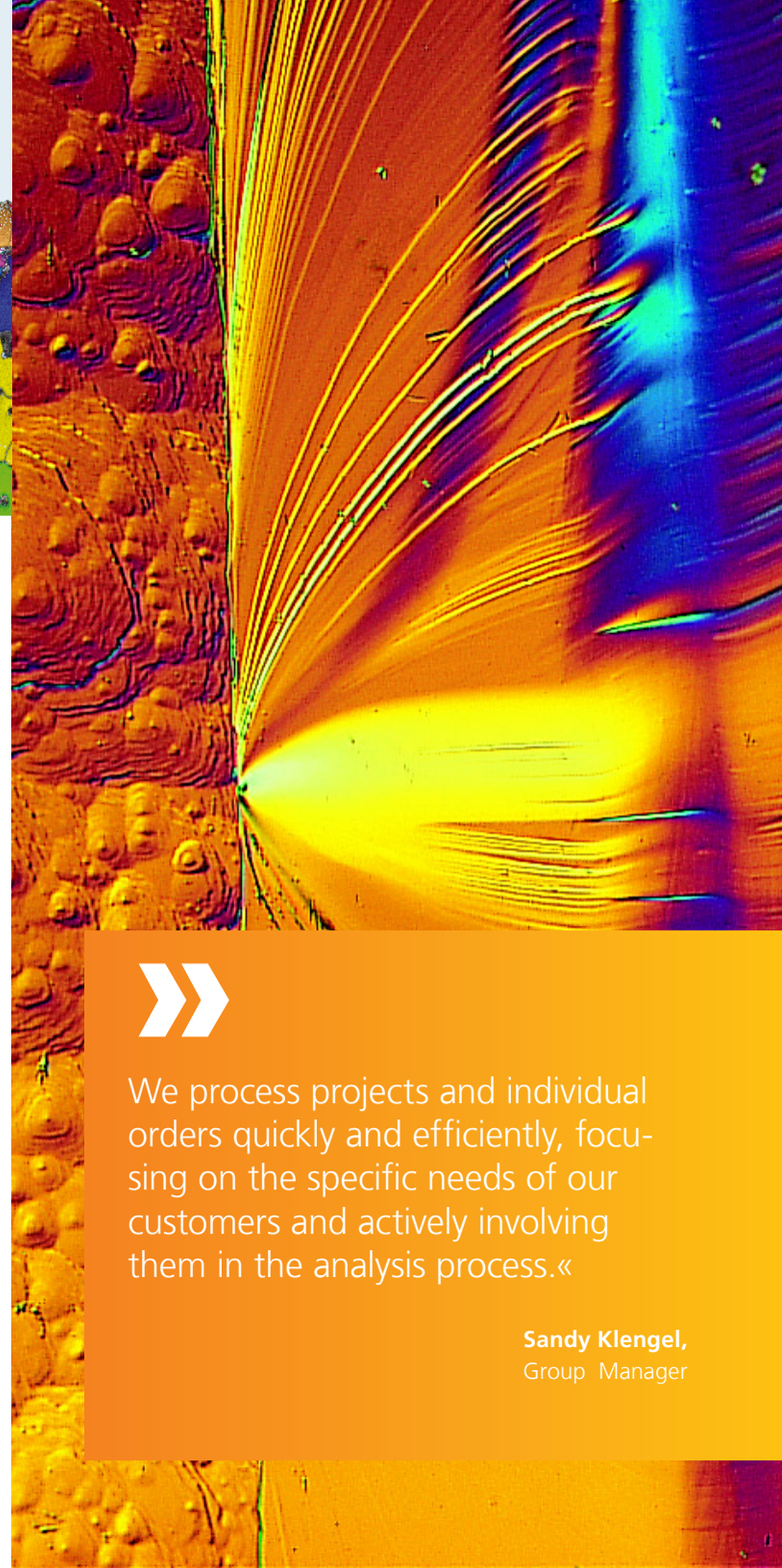
Electronic component with failed wire bond contact



Electron BackScattered Diffraction Image (ESBD) of a solder joint contact for investigation of crack formation and related root causes

Our Equipment:

- Non-destructive failure diagnostics at component level (SAM, 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 x-ray analysis)
- Crystallography (EBSD and XRD)
- Nanoanalytics (TEM/STEM microscopes (60-300kV) with image corrector, HAADF, EDS, EELS), AFM
- Surface/trace analysis systems (ToF-SIMS, XPS,…)
- Optical/IR spectroscopy (UV/VIS/FTIR and Raman)
- Mechanical characterization (nanoindentation and material testing at elevated temperatures)
- Thermophysical property characterization
- Residual stress analysis
- Reliability testing
- Modeling and simulation (FE-Analysis)



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We process projects and individual orders quickly and efficiently, focusing on the specific needs of our customers and actively involving them in the analysis process.«

Sandy Klengel,
Group Manager