

Contributions to the APECS Pilot Line: Fraunhofer IMWS

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Fraunhofer IMWS is one of 14 German research institutes involved in the implementation of the APECS pilot line. Fraunhofer IMWS focuses on microstructural characterization and failure analysis as a key to enabling innovative electronic devices, improve device performance and reliability. The institute helps to introduce new materials and manufacturing processes onto the market, to support ramping up and series production and to achieve high reliability under operational conditions.

The role of Fraunhofer IMWS in the APECS pilot line

Quality assurance is a key element of the APECS pilot line. It encompasses functional testing of components, analysis of process-related defects, evaluation of application-specific failure risks, and clarification of application specific failure mechanisms. At Fraunhofer IMWS, this expertise is a core competence and plays a central role in ensuring the reliability of electronic components used in critical applications such as automotive electronics.

Enhancing yield through high-resolution microscopy and trace analysis to identify process related defects.

Ensuring reliability by developing tailored physical analyses, micromechanical testing and numerical simulation to understand reliability risks and degradation mechanisms.

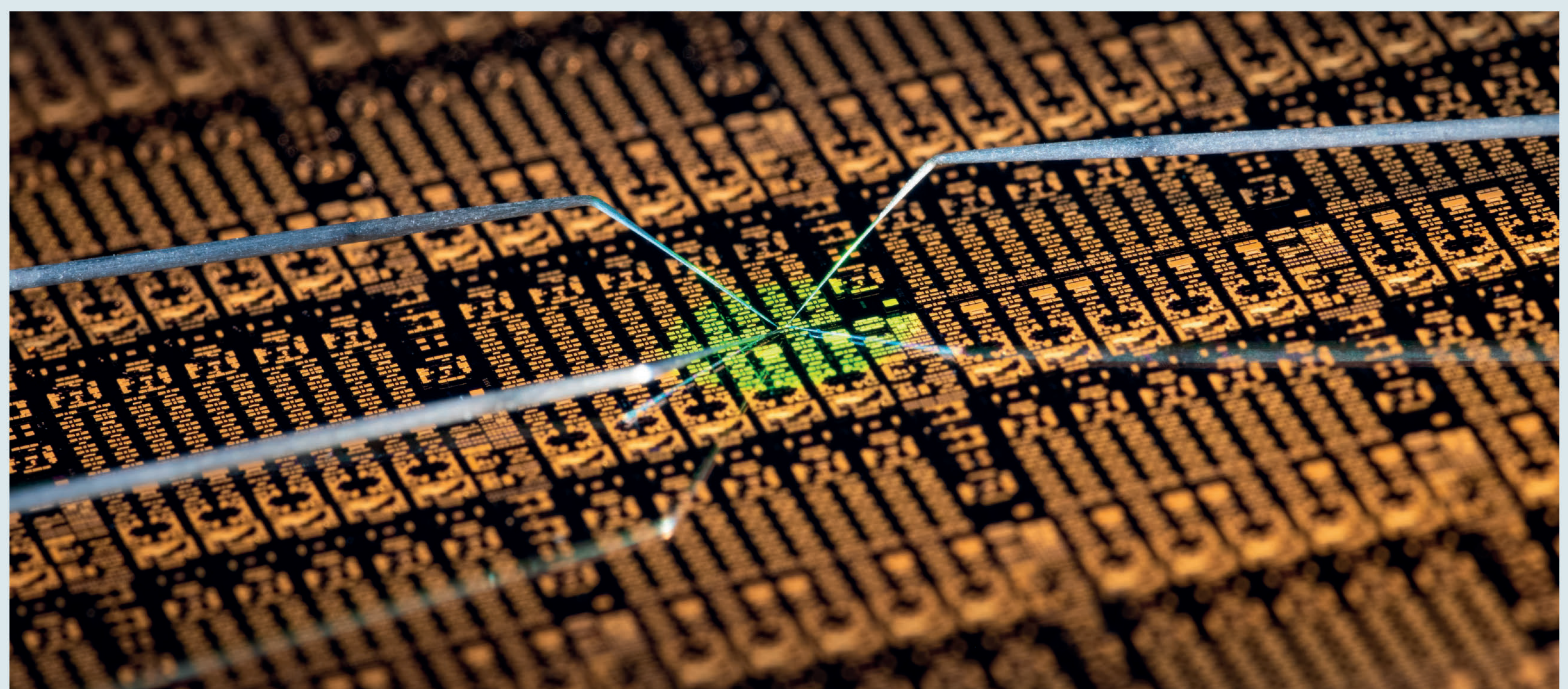
Providing novel solutions for local material parameter determination and lifetime modelling.

Developing new methodologies and hardware solutions for defect localization, efficient sample preparation and microstructural analysis.

Investigating novel failure mechanisms in functionally complex 3D and heterogeneous microelectronic components

Local electrical probing for optical and thermal defect localization in integrated circuits

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GHz-acoustic microscopy for defect screening in hybrid bonding interfaces

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What is APECS?

APECS (Advanced Packaging and Heterogeneous Integration for Electronic Components and Systems) is one of 5 European pilot lines established under the EU Chips Act. APECS is the foundation for Europe's competitive position in heterogeneous system integration and advanced packaging. It plays a vital role in enhancing Europe's strategic autonomy by reducing dependence on foreign suppliers and strengthening Europe's capabilities in critical technology areas.

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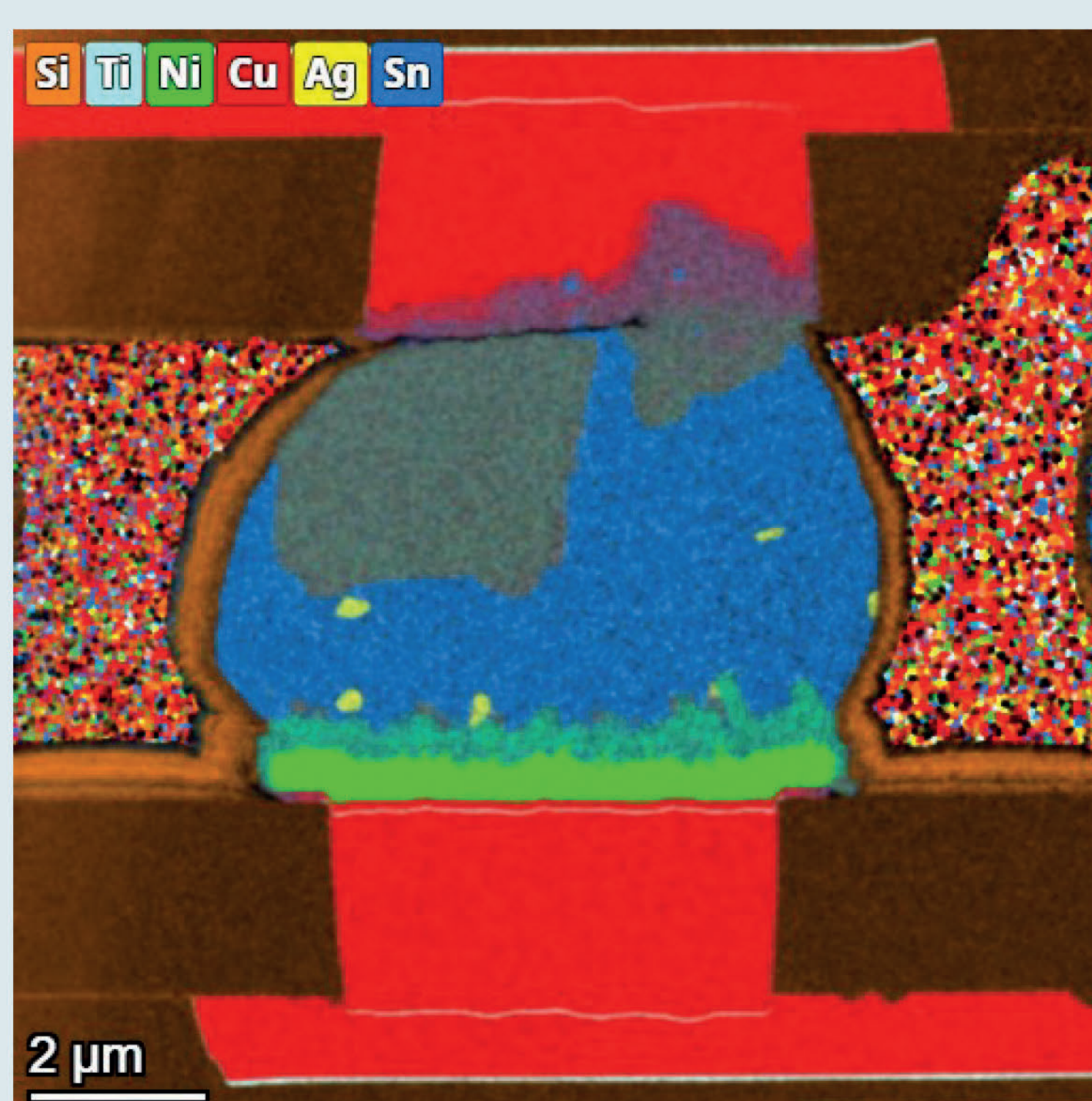
Additional information

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Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the Chips Joint Undertaking. Neither the European Union nor the granting authority can be held responsible for them.

High resolution elemental map of a die to wafer micro-bump interconnect by transmission electron microscopy

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Contributions to the APECS pilot line

Researchers at Fraunhofer IMWS investigate the optimization of functional properties of materials and systems, identify new failure modes and provide input to improve the performance and quality of materials, components, and systems contributing to several industrial applications in microelectronics. Within APECS, the institute leads the Work Package "Characterization, Test & Reliability (CTR)", jointly with Fraunhofer ENAS and further partners.

- Advanced non-destructive defect screening and localization of electrical malfunctions in complex 3D packages
- Efficient site-specific defect characterization and identification of failure root causes for key enabling technologies such as hybrid wafer bonding
- Advanced local material parameter detection and reliability simulation for 3D and heterointegrated packages