# How can we help you?

Our specially adapted characterisation methods enable an application-oriented and material-related determination of component-specific deformation and damage parameters. By using those in numerical simulation tools an improved prediction of possible reliability issues or ageing mechanisms is possible already during the design phase. Also an in-depth understanding of root causes from observed failure modes during qualification or field returns can be achieved.

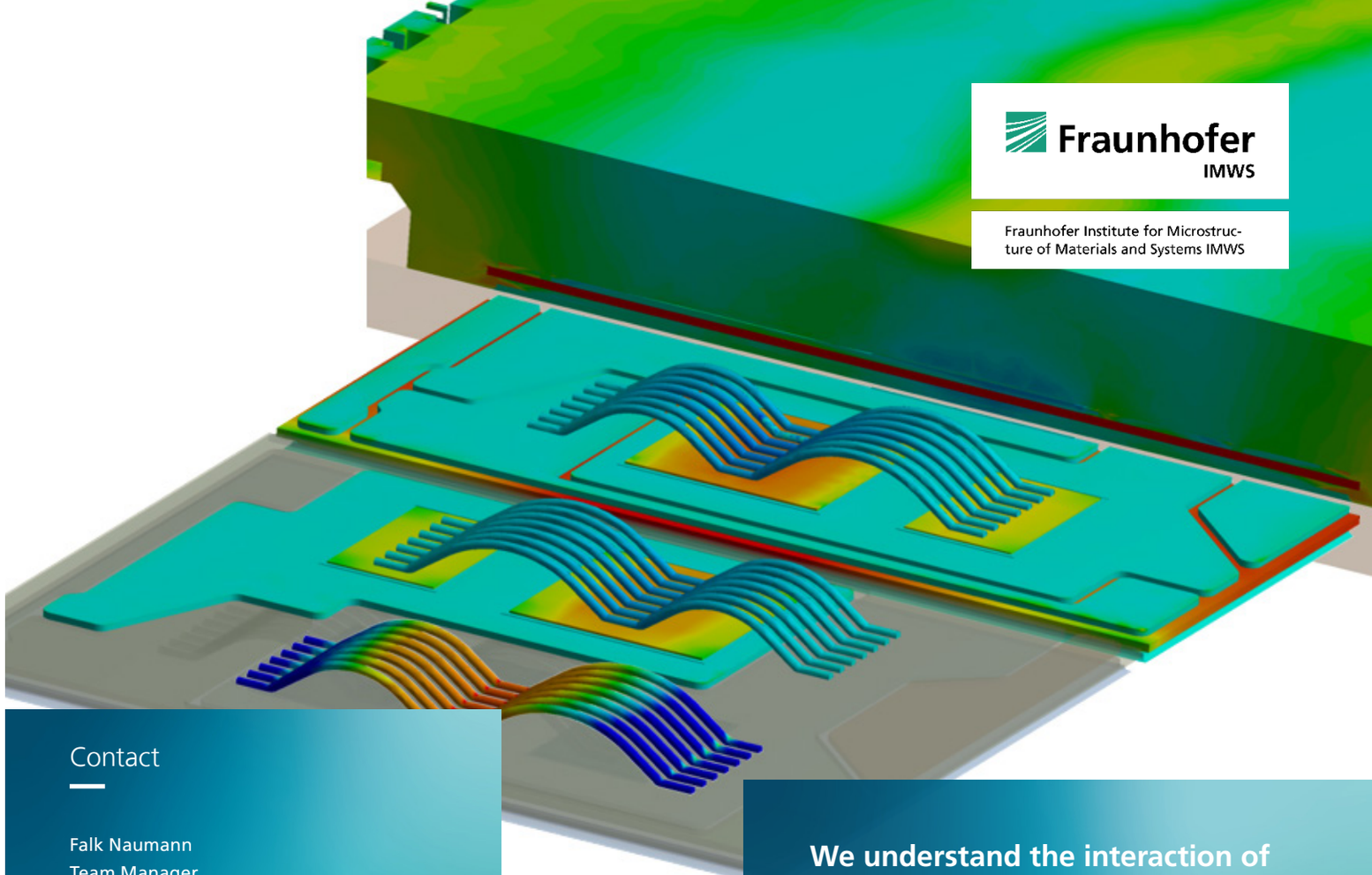
In addition, appropriate characterization methods are being further developed for the application of novel materials in order to identify possible reliability risks at an early stage and thus reduce development periods.

### We support our partners with

- **Characterisation** of materials for micro- and power electronics
- **Identification of potential failure mechanisms** and concepts for lifetime prediction
- **Parameter identification** for advanced finite element material models as well as for failure models / damage hypotheses
- **Sub-modelling** of specific failure modes (e.g. material fatigue, fracture mechanics)
- Validation of **FEA results** and degradation modes by high-resolution failure diagnostics

Further information can be found here:

www.imws.fraunhofer.de



Fraunhofer IMWS

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**We understand the interaction of material behaviour and failures.**

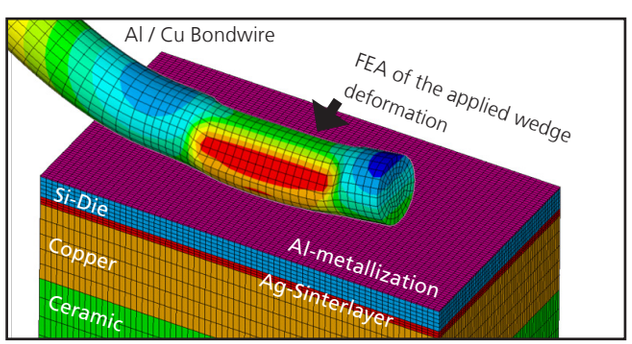
# Micromechanics and Simulation

# Micromechanics and Simulation

Increased demands in terms of reliability combined with difficult operating conditions of electronic components in the areas of regenerative energies, electromobility or automated industrial technology lead to broader questions regarding selection of suitable materials. This applies in particular to increased challenges for material characterization taking potential failure modes into account.

For such an evaluation, relevant and load-related material properties must be identified in order to enable a robust design. To this end, process- or application-related interaction of the microstructure can cause changes of the initial material behavior, which should be taken into account for comprehensive robustness validation.

Our specially adapted methods of material characterisation enable an application-oriented and material-specific determination of material and damage parameters relevant for FEA analysis of the components. By using these in numerical simulation tools, an improved prediction of possible reliability or ageing mechanisms is possible.




*FEA analysis of the applied semiconductor stress during wire bonding*

Our customers benefit from an enhanced reliability assesment. This results in an accelerated product development as well as an increased robustness.

## Simulation

- Services for mechanical, thermo-mechanical and multi-physical FEA simulations
- Submodelling approaches for specific failure mechanisms, based on fracture mechanics, probabilistic and fatigue related approaches

## Test development

- Development of customer-specific tests and characterization methods for components and materials
- Experimental replication of failure modes under customer-specific load scenarios including specific test development
- Standardisation of test methods

## Material characterisation

- Material characterization services based on standardized and customer-specific tests
- Parameter identification for extended material data for FEA modeling (non-linear temperature-dependent material behaviour, thermo-physical characterisation)

## Identification of critical failure modes

- Definition of suitable damage models related to observed failure modes
- Experimental characterization and parameter identification for complex numerical damage approaches

We provide our customers with a deeper understanding of potential failure modes under defined load conditions.«

**Falk Naumann,**
**Team Manager**