WHY WORK WITH US?

The Fraunhofer IWM uses the latest materials science and technology findings to increase material and component performance levels and create innovative functionalities and to improve manufacturing processes.

The institute uses its understanding of material behavior to assess materials and components under a wide range of environmental conditions and loads: this leads to increased durability, reliability and availability of components, systems and entire plants.

The well-established link between experimentation and simulation at the Fraunhofer IWM provides an excellent basis for solving materials technology issues, particularly where resource or energy savings during manufacture and in use are concerned.

For the virtual development and assessment of materials and components, the institute works with advanced multiscale simulations on the nano, micro and macro level or develops the appropriate models.

The development of and changes to material properties along a chain of different manufacturing stages can be predicted for entire manufacturing processes.

FRAUNHOFER INSTITUTE FOR MECHANICS OF MATERIALS IWM

As research partner for industry and public bodies, Fraunhofer IWM develops solutions that can improve energy and resource efficiency during manufacture and use of materials and components and can reduce losses involved in the production, conversion and storage of energy. The solutions lead to greater component durability, longer service life and improved reliability as well as more cost-efficient processes.

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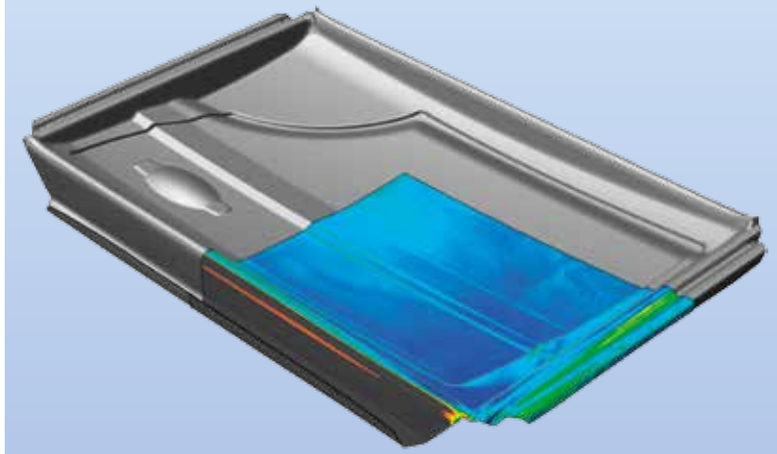
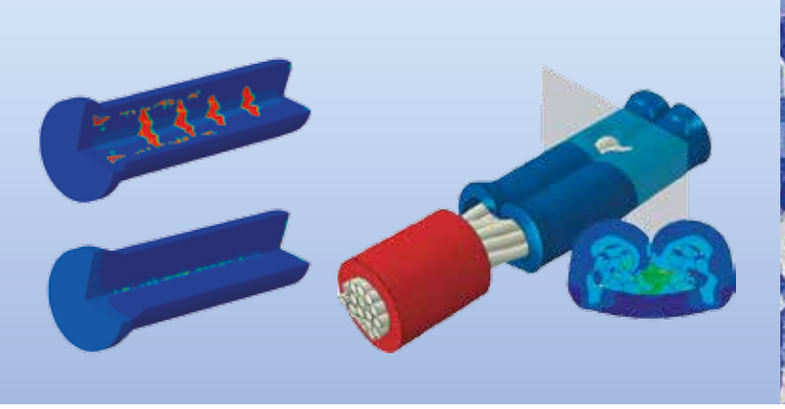
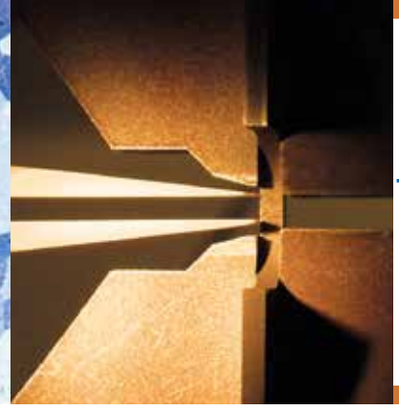
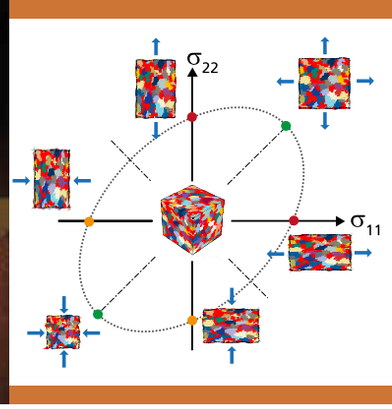
OPTIMIZATION OF SHAPING AND FORMING PROCESSES









Get more benefit out of materials in the production process

On the basis of material-related modeling concepts and advanced simulation methods we analyze, evaluate and optimize forming and shaping processes for connector elements including forming tools and according process steps. We look for weak spots in the forming process and evaluate their physical reasons. Thus, they can be eliminated already in the design phase, or their effects can be controlled.

For a better understanding of the material behavior we correlate the microstructure of materials with their engineering properties. For that we develop testing and modeling concepts and simulation tools.

We model the materials on different lengthscales and predict their properties via multiscale simulations. We simulate the evolution of material properties during the production process and work out suggestions for improving the production process.

In real and »virtual« labs we predict the operating behavior of the produced parts and suggest modifications in material selection and part design.

Our services

Simulation of forming processes

- Support in planning and design of forming processes for
  - Sheet and bulk metal forming
  - Cold and hot forming
- Simulation of process chains
- Evaluation of forming processes concerning shape accuracy, spring-back and forming limits

Predicting and controling the evolution of the microstructure

- Lengthscale overlapping modeling from atomic dimensions to real parts
- Calculation of deformation and recrystallization textures
- Virtual determination of material parameters based on microstructure
- Description of thermodynamics and kinetics of phase transformations

Development of material models and transfer to simulation tools

- Models to describe plastic deformation caused by dislocation movement, twin forming and martensitic transformation
- Models to describe deformation at elevated temperatures
- Extension of available models
- New modeling strategies

Determination of material properties and use for simulation

- Materials characterization from the analysis of the microstructure up to components testing
- Experimental investigations of the hot forming behavior
- Determination of thermophysical properties
- Use of suitable optimization techniques to fit model parameters to experimental data