PRESS RELEASE

New simulation possibilities for fluid and energy technology studies at Fraunhofer IFAM Dresden

The Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM in Dresden has expanded its simulation facilities at the site in order to be able to investigate flow and energy processes in materials even better.

In particular, the new competencies will also enable the investigation of systems and networks and the prediction of phase change materials (PCM) and their behavior and effects in components. For example, the open source tool OpenFOAM, which is used for flow simulations, is new in the portfolio. The software offers scientists significantly more possibilities for model development and implementation.

COMSOL Multiphysics software also provides new options. It is used for structural mechanical calculations by determining the stress distribution in solids under a defined mechanical load. In addition, COMSOL Multiphysics can now also be used for the design of thermal systems with phase change materials, such as those found in heat storage systems. This ideally complements the investigations of coupled flow and energy transport processes as an existing application area of the software at the Fraunhofer IFAM Dresden.

In addition, researchers have recently been able to use the open source tool OpenModelica to calculate systems from spatially zero and one-dimensional components. However, the simulation technology has not only been expanded for the own research. Thanks to the COMSOL Application Builder extension, customer-specific programs that are used directly by the client can now also be developed.

With the help of the new in-house solutions, data from imaging processes (microstructure tomography) can be converted into computable 3D models, both voxel-based and smoothed, and exported as STL files. Thus, flow and energy transport processes in microstructures can be calculated in more detail than before.

The new software extends the already existing software portfolio for the calculation of velocity and pressure distribution in flows (Computational Fluid Dynamics, CFD), stationary and unsteady temperature fields of solids (Heat Transfer) and the consideration of non-isothermal flows (Conjugate Heat Transfer, CHT) in an ideal way.

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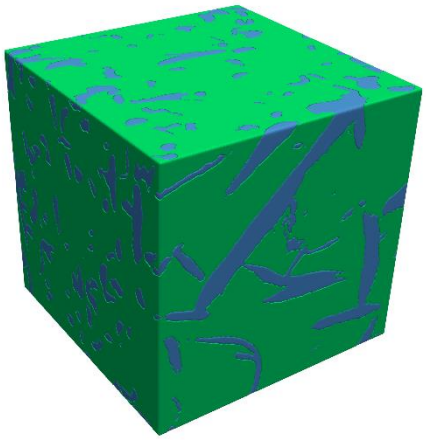
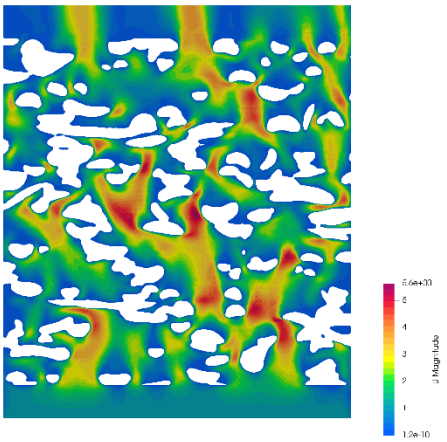
The modeling, numerical calculation and simulation of fluidic and energy-related processes in components and systems is used in the Energy and Thermal Management department of Fraunhofer IFAM Dresden for a variety of applications.

For example, for clarifying detailed questions in flow and energy systems, such as recalculation and analysis as well as prediction and estimation of parameters. Customer-specific test rigs can also be developed and designed. In addition, the scientists conduct research on the thermal and geometric optimization of components and perform strength analyses of thermally and mechanically stressed components.

Further information on the business field Energy and Thermal Management at Fraunhofer IFAM Dresden.



Reconstructed 3D model of a fiber cavity structure



Velocity distributions in sectional plane of a 3D microstructure

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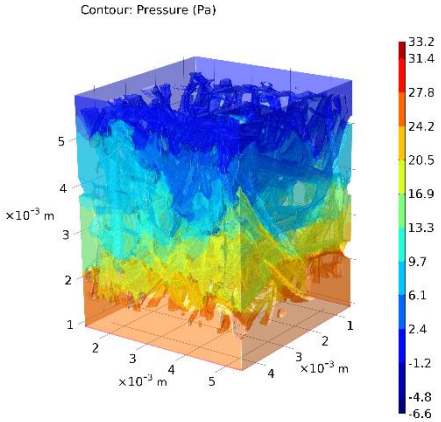
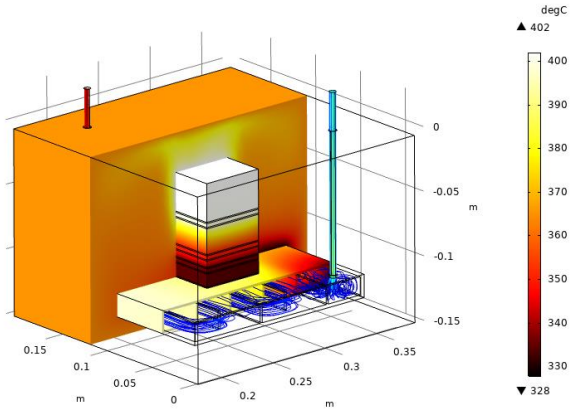


Pressure distribution in a flow-through 3D microstructure



Temperature distribution and streamlines in a high temperature plate apparatus for thermal conductivity measurement

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