

OUR COMPETENCES AND SERVICES

Structural Mechanics for Textiles and Composites

FeelMath is the universal solver for micro-structured materials. The solver is especially useful for highly complex microstructures

- Several material models (viscoelasticity, plasticity, damage) for the nonlinear thermo-mechanical deformation
- Virtual test stands (unidirectional tensile tests, shear test) for the prediction of failure, fatigue and lifetime
- Full multiscale coupling of FeelMath using our FeelMath server with classical FE-Tools

TexMath is a modular software program, which enables simulations of multi-scale problems for textile applications.

- Periodic textile structures (Wovens, 3D-Spacer, knitted fabrics,) with complex bonds are created with MeshUp
- Effective mechanical properties (Bending, tension, compression) are calculated by FiberFEM
- Complex load scenarios on textiles or even while in textile production is simulated with FISFT

Benefit from FeelMath and TexMath

- Accelerates the development of composites, technical textiles and foams for light weight and insulation applications
- Gain a keen insight in structure-property-relation
- Virtual Design and optimization of application specific materials

Our expertise in modeling and simulation of flow and materials includes

- Simulation services using advanced software tools
- Multi-scale and multi-physics modeling
- Computation of effective properties of materials
- Tailor-made simulation solutions
- Consulting and support for establishing simulation toolchains and workflow in your enterprise

Experimental characterization of materials

- DMTA (Dynamic Mechanical Thermal Analysis)
- Measurement of air permeability of textiles (ISO 9237)

Contact

**Fraunhofer-Institut für Techno- und
Wirtschaftsmathematik ITWM**

Fraunhofer-Platz 1
67663 Kaiserslautern
Germany

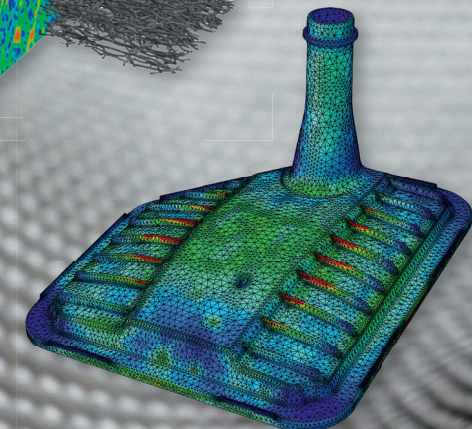
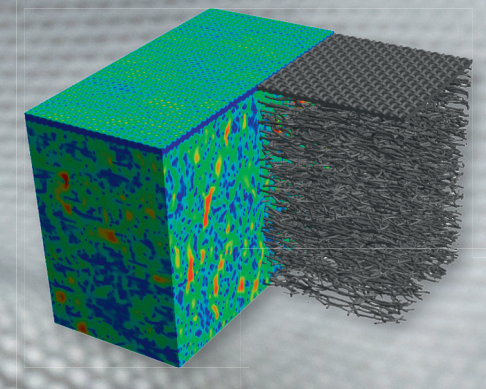
Dr. Konrad Steiner

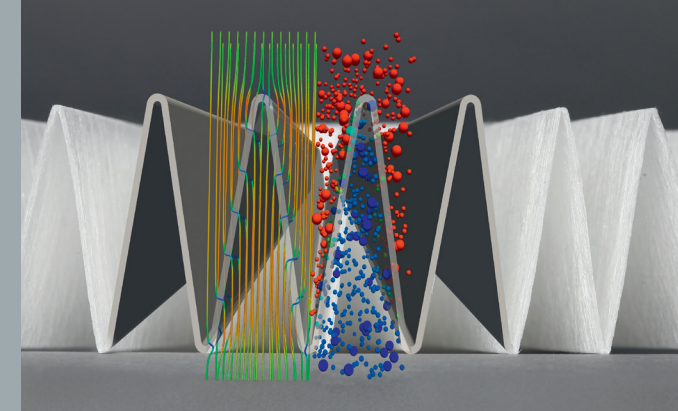
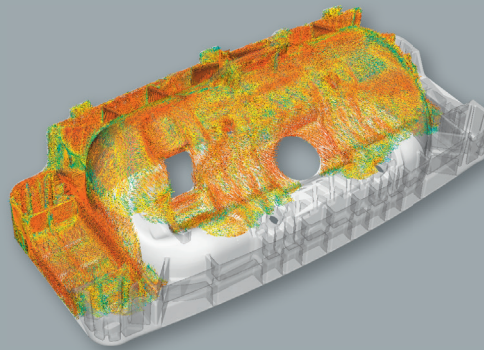
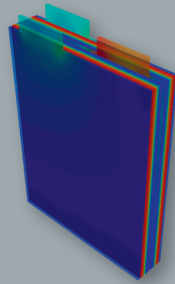
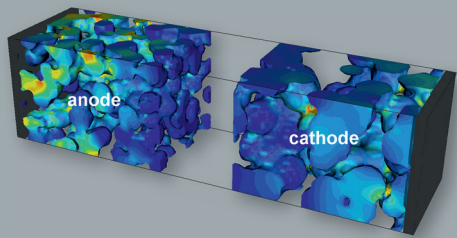
Phone +49 631 31600-4342

konrad.steiner@itwm.fraunhofer.de

[www.itwm.fraunhofer.de/en/departments/sms/
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FLOW AND MATERIAL SIMULATION





Electrochemistry: Battery Simulation

With the Battery and Electrochemistry Simulation Tool BEST, we provide a software for detailed three-dimensional battery simulations on different spatial scales.

BESTmicro – electrochemical transport simulation resolving the electrode microstructures

BESTmeso – upscaled electrochemical battery model for cell design simulations

Based on fundamental material properties, applications include cell layout optimization, thermal module design or the analysis of electrical characteristics.

Specific features and new developments are

- Bidirectional coupling to thermal model
- Arbitrary time-dependent CC/CV boundary conditions
- Coupling to GeoDict® for microstructure generation
- 3d solution fields allow detailed analysis of cell characteristics
- Coupling to structural mechanics (volume change)
- Degradation models (SEI formation, plating)
- Detailed electrochemical and thermal input data for Battery Management Systems



Complex Fluid Dynamics

Based on our software platform CoRheoS (Complex Rheology Solvers), we are able to model and simulate complex multiphase and multi-physics flow problems in a robust and efficient way.

FLUID is solving multi-phase, Non-Newtonian flow problems like polymer-based liquids, concrete, gypsum, ceramic pastes, honey, etc. including particle and fiber suspensions. Applications are the simulation of process engineering steps like

- Injection moulding of fiber reinforced plastics
- Calendaring of ceramic pastes
- Filling of concrete or honey like materials
- Infiltration simulation of battery cells

GRAIN is simulating granular and bulk flows in the full range of dilute granular flows up to bulk material transport. The surrounding fluid (air, water) is realized by coupling with FLUID. Typical applications are

- Optimal designing of silos and hoppers
- Quality of Mixers and mills including segregation
- Pneumatic transport

FOAM is simulating the expansion of PUR-Foam in arbitrary geometries, and offers the possibility to calculate the foam formation process as well as the resulting foam density in advance.



Filtration, Separation and Purification

FiltEST (Filter Element Simulation Toolbox) provides 3D simulation of flow and filtration in filter elements, pleats and multi-layered media

- Several models for the evolution of fractional efficiency and the pressure drop during filter loading
- Virtual test stands (single-pass, multi-pass) for the computer-aided prediction of efficiency, dust holding capacity and lifetime

PoreChem (Pore Chemistry Simulation) is able to simulate reactive mass transfer in porous media

- Flow, diffusion and reactive mass transport
- Bulk and surface reactions
- Adsorption and desorption
- Dissolution and precipitation

Our developments and services in this application area include

- Optimization of filter pleat shapes and filter elements
- Design of functionalized membranes
- Optimization of conversion efficiency of catalytic filter media
- Simulation services for flow and efficiency in filter media using GeoDict®
- Coupling to structural mechanics to study media deformation during operation (flow-induced) or due to manufacturing (e.g. embossing and pleating)

