



Main Focus

- Technical Textiles and Nonwovens
- Microstructure Simulation and Virtual Material Design
- Lightweight Construction and Insulating Materials
- Filtration and Separation
- Complex Fluids and Multiphase Flow
- Electrochemistry and Batteries

Flow and Material Simulation

What does your department deal with and what constitutes its research work?

We design and implement method and software solutions for the development, production and improvement of innovative, sustainable materials, including so-called programmable materials. In doing so, we develop industrially suitable multiscale and multiphysics methods and customer-specific software solutions. Our simulation tools use latest research results such as model reduction methods, automatic parameter identification and machine learning to increase efficiency.

What potential does your department's research have for a better future?

The digitalization of material development – from manufacturing to life cycle assessment and recycling – is accelerating the development of innovative, sustainable materials. This is demonstrated by our new projects on material substitution through biobased and biohybrid textiles, foams and composites in lightweight construction, efficient and alternative battery concepts for electromobility, and self-cleaning particle filters.

Where do you see your department in five years?

The aim of our method and software development is to enable our customers to digitally accompany the design of their sustainable products and the associated process development from start to finish in five years' time, i.e. to have so-called digital twins down to the material level. These enable rapid testing of variants and innovations, without having to produce real prototypes. Digital twins can also be used for the quantitative evaluation of raw material and energy balances. In this way, we support sustainability and conserve resources.

Which three keywords best describe your department?

- Multiscale – efficient – robust

Department topics in this report:

- ALMA: Lightweighting and Ecological Design in Electric Vehicles S. 26
- Battery Cells for E-mobility S. 26
- Virtual Testing of Filter Nonwovens S. 27
- Rhineland-Palatinate Promotes Competence Center for Quantum Computing . . S. 31
- Programmable Materials Revolutionize Product Design S. 64
- ViDestoP S. 66

Contact

Dr. Konrad Steiner
Head of Department "Flow and
Material Simulation"
Phone +49 631 31600-4342
konrad.steiner@itwm.fraunhofer.de

