MATH2MARKET AND GEODICT

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EDM-CAE Forum

Dr. Jürgen Becker
COO Math2Market GmbH

MATH2MARKET GMBH

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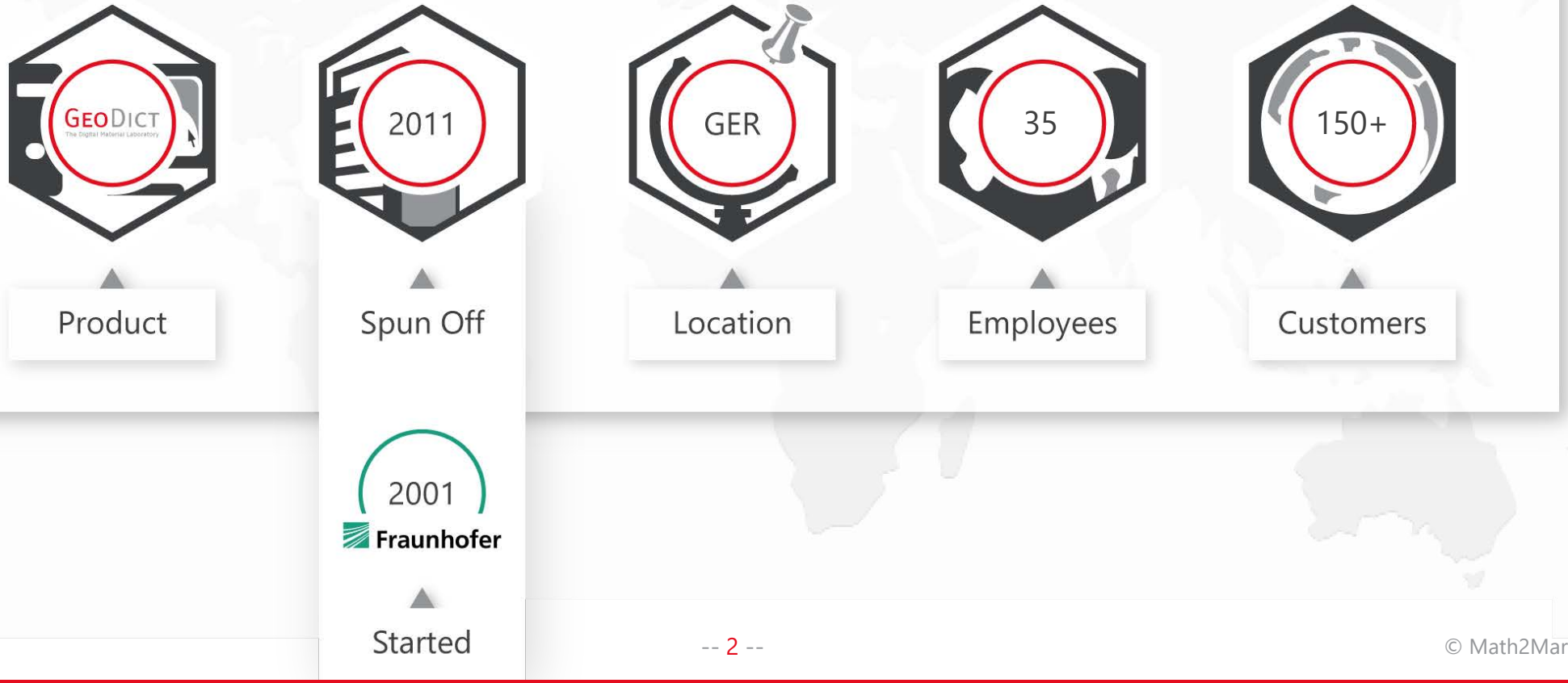

GeoDict – The Digital Material Laboratory

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The Digital Material Laboratory

We help our clients to profitably
engineer better materials and processes
through
digital solutions.

We believe that to understand is to improve.

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Selected Customers of Math2Market GmbH

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Digital Material Engineering on the Micro-Scale

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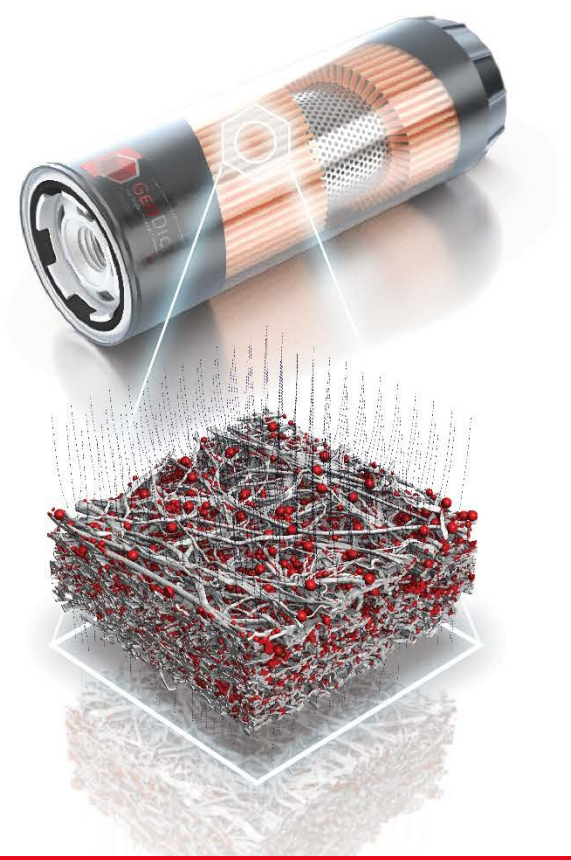
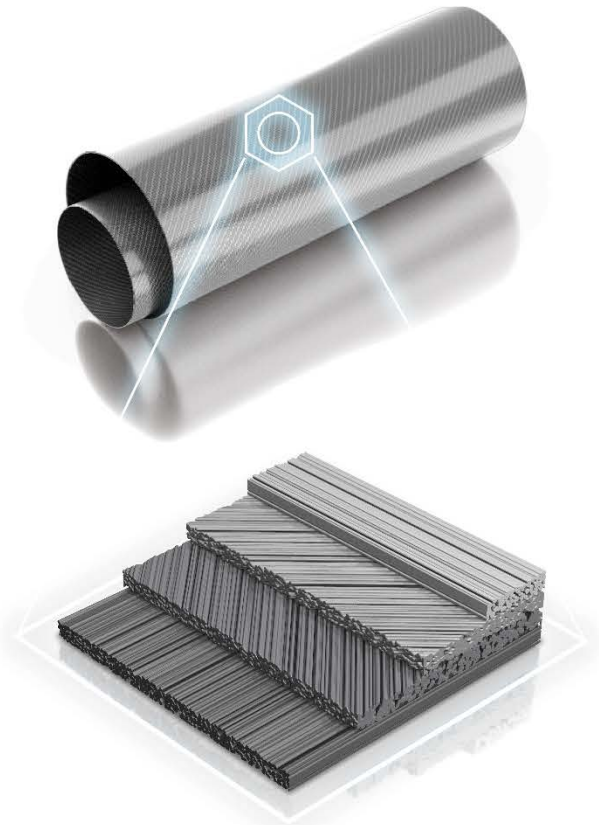
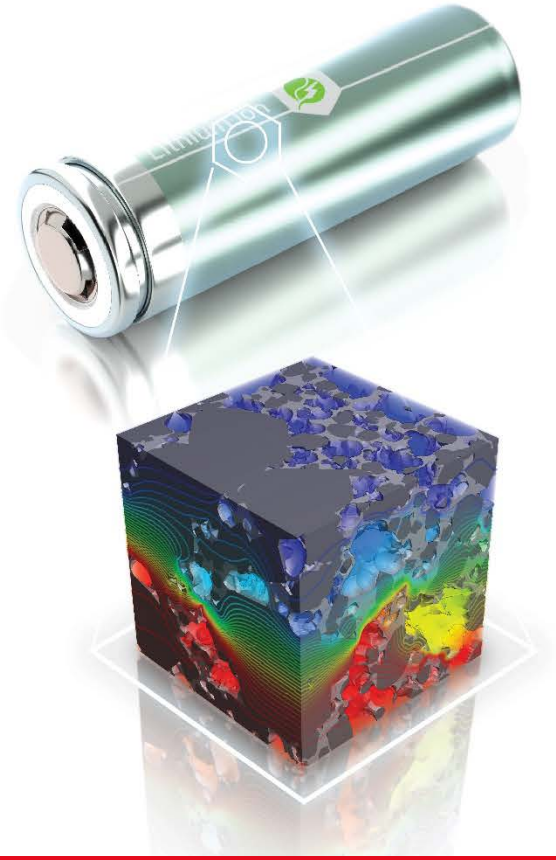


Filtration



Composites



Batteries

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GeoDict for Soot Filtration - Portfolio

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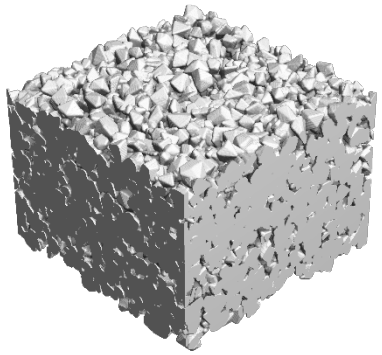

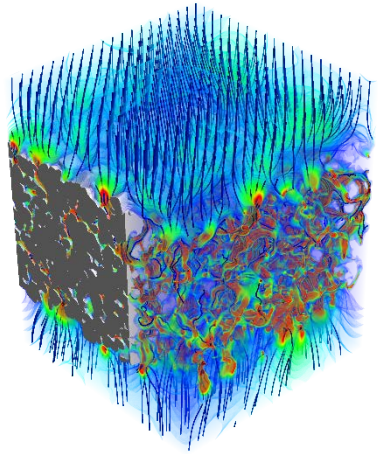

Filter Media	Clean Filter Parameters	Soot Filtration Experiments	Soot Filtration Results
■ Imported CT scans ■ Sintered ceramics 3D models	■ Pore size distribution ■ Initial pressure drop ■ Percolation path	■ Single pass tests ■ Diesel soot test dust	■ Pressure drop evolution ■ Initial filter efficiency ■ Fractional efficiencies ■ Filter capacity

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GeoDict for Batteries - Portfolio

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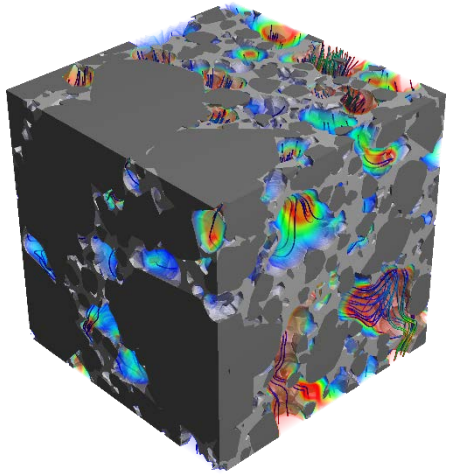
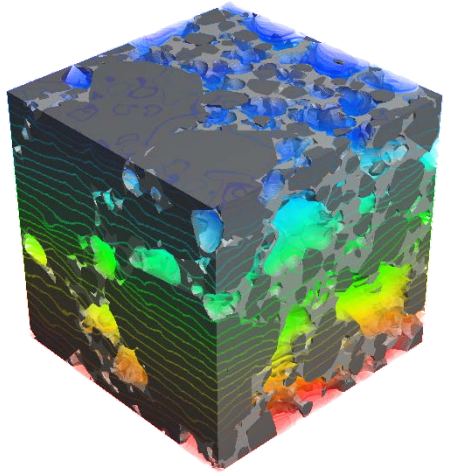
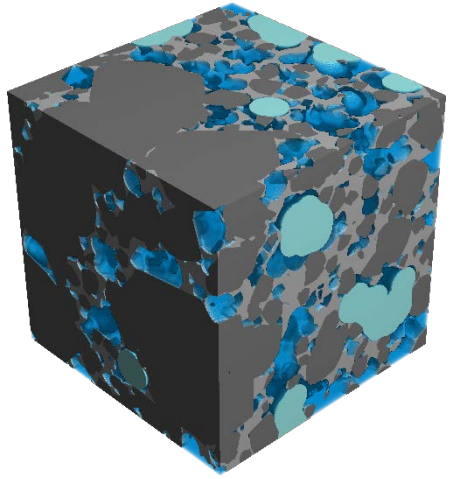
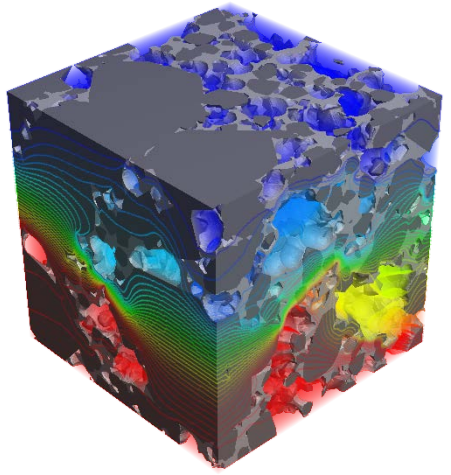

Geometric Parameters	Conduction Parameters	Saturation Parameters	Diffusion & Flow Parameters
■ Porosity	■ Thermal conductivity	■ Saturation exponent	■ Permeability
■ Pore size distribution	■ Thermal Flux	■ Variable contact angles	■ Diffusivity
■ Surface area	■ Temperature distribution	■ Cap. pressure curve	■ Particle concentration
■ Length of contact lines	■ Electrical conductivity		■ Path of single particle
■ Tortuosity/Gurley value	■ Electrical Flux		
	■ Electrostatic potential distribution		

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GeoDict for Composites - Portfolio

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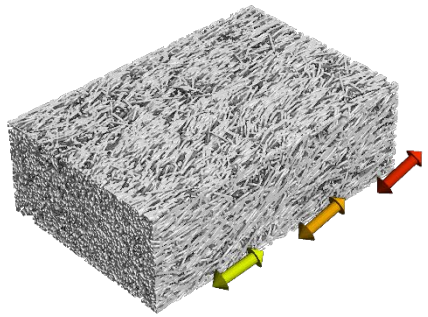

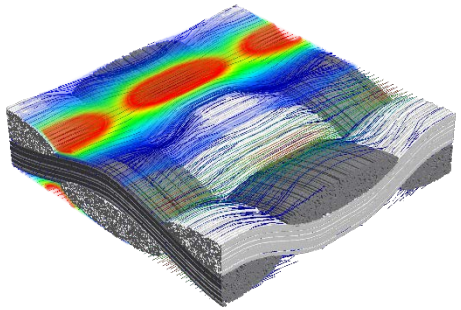

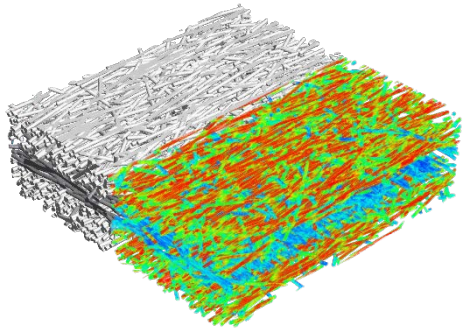

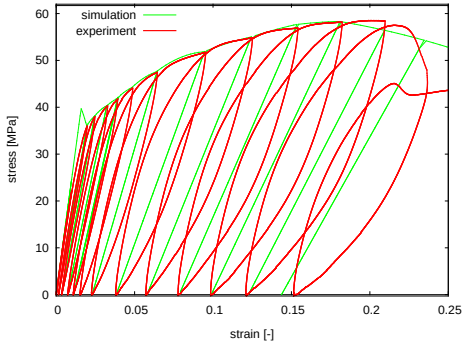

Geometric Parameters	Flow & Conduction Parameters	Mechanical Parameters	Large Deformation, Damage & Failure
■ Fiber volume fraction	■ Absolute permeability	■ Elastic moduli	■ Hyperelastic materials
■ Fiber diameters	■ Thermal conductivity	■ Stiffness tensor	■ Plastic deformations
■ Fiber orientation	■ Electrical conductivity	■ Full anisotropy	■ Viscous effects
■ 3d structure modelling	■ Tortuosity	■ Thermal expansion	■ Failure and damage
	■ Diffusivity	■ Stress-Strain curves	■ Structure change

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GeoDict Workflow – Material Analysis of an Engine Bearer

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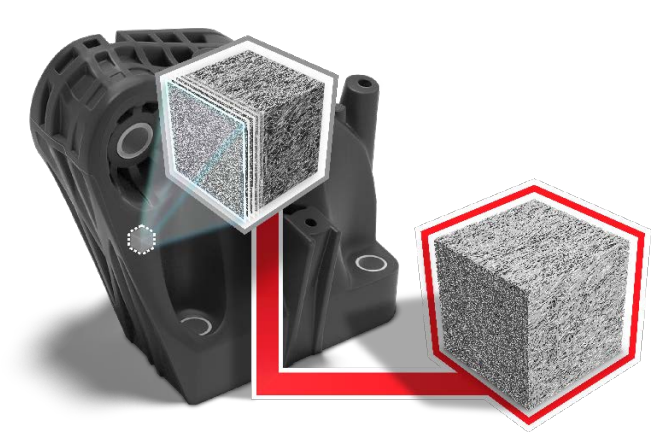
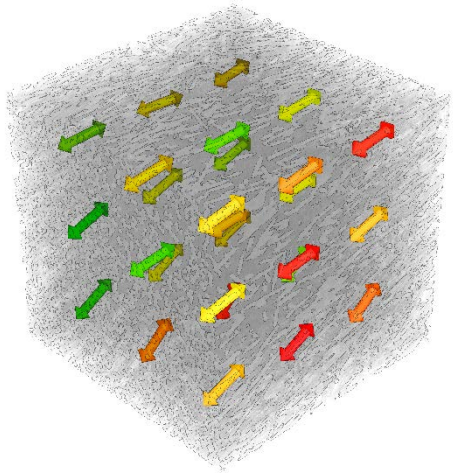
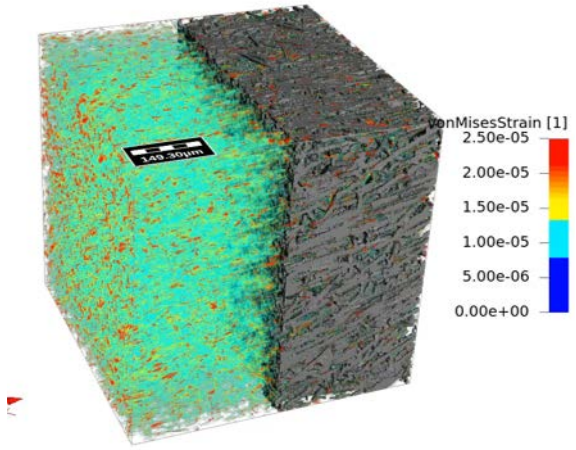
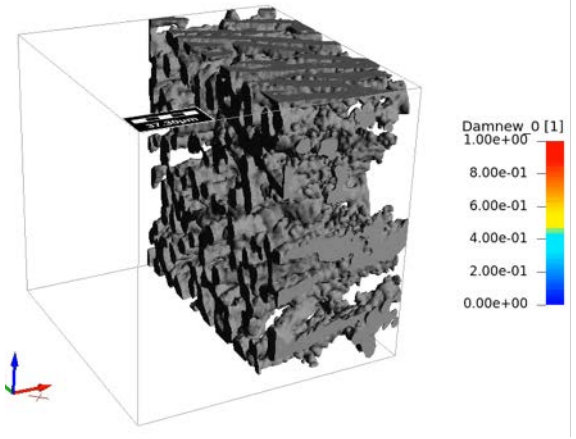
Digitalization	Geometric Analysis	Mechanical Behavior	Damage Simulation
			
■ CT scan of a material sample ■ Import & segment scan	■ Fiber weight percentage ■ Fiber diameters ■ Local fiber orientations	■ Stresses and strains ■ Local displacements	■ Large deformations, time series ■ Nonlinear materials ■ Damage models

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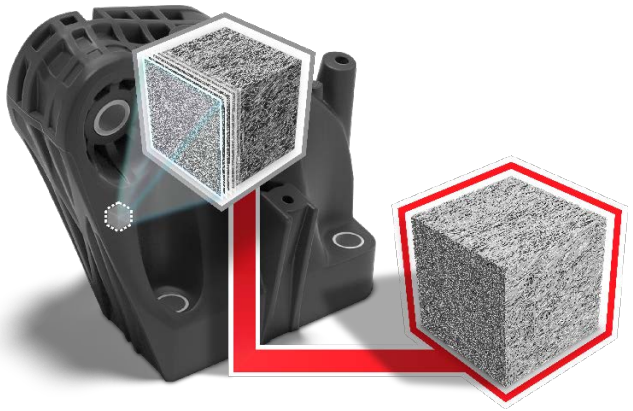	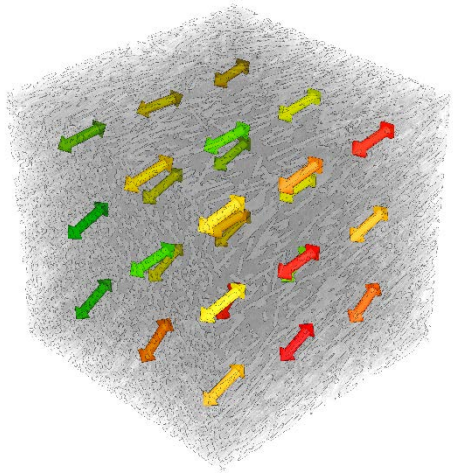	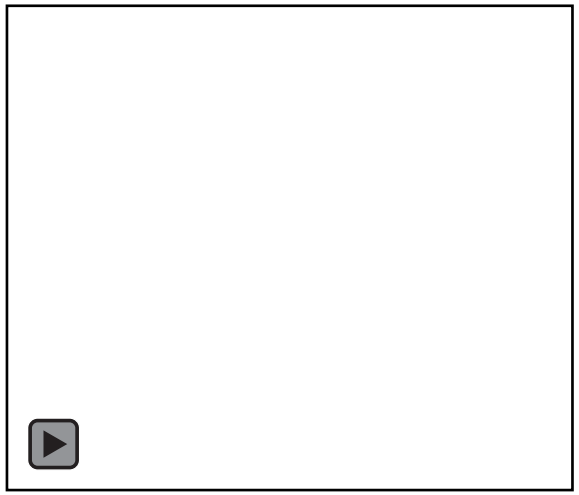	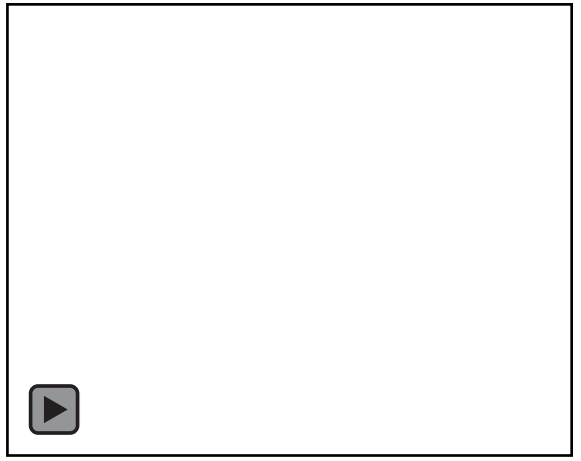
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Summary

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The basic idea: Microstructures define macroscopic properties!

- Permeability and pore shapes define the filtration properties and the pressure loss of a ceramic filter.
- Transport processes in the micro-structure define the behavior of a battery.
- Fiber orientation and fiber solid volume fraction define the strength and failure behavior of a FRP component.

GeoDict predicts macroscopic material properties based on the 3D microstructure and enables you to improve the materials.

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Thank You

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Visit us at our booth **E3.2**

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