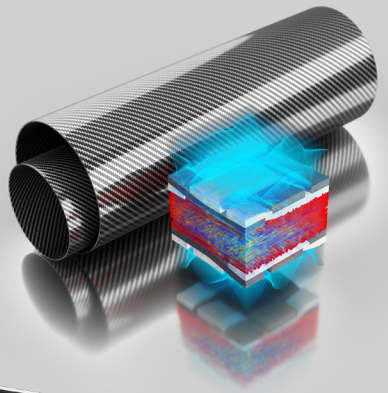
GeoDict

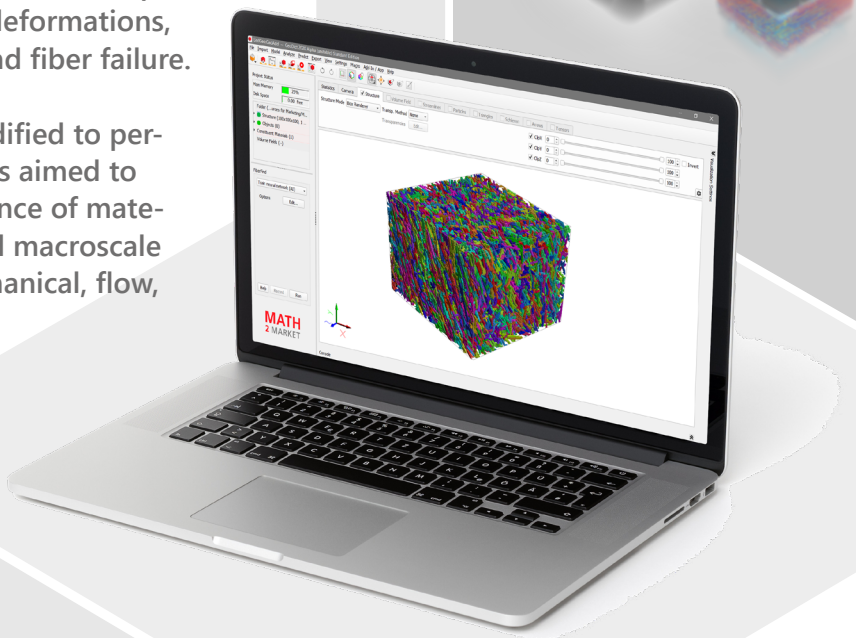
The Digital Material Laboratory

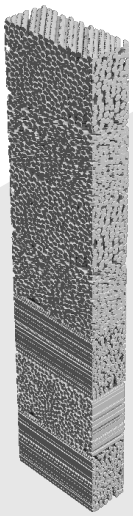
GeoDict Workflow for Composites

Generate a Composite and Simulate its Mechanical Behavior

- Microscale 3D models are generated easily with GeoDict based on parameter information collected from datasheets and micrographs. The 3D models include fibers as well as imperfections, such as voids.
- The generated 3D models are used to run simulations and assess their mechanical behavior, from determining the anisotropic stiffness tensor to nonlinear deformations, including polymer damage and fiber failure.
- The 3D models are easily modified to perform digital parameter studies aimed to understand the interdependence of material microstructure design and macroscale material properties, e.g. mechanical, flow, thermal, electrical, etc.







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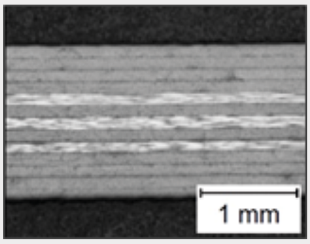
GeoDict® Workflow for Composites

1 Data Acquisition



Collect information on the composite from:

- Micrographs
  fiber volume fraction, fiber distribution, fiber diameter, void content
- Data sheets
  fiber volume fraction, twist, yarn density, yarn count, fiber diameter
- Other laboratory experiments

Result: Description of the composite

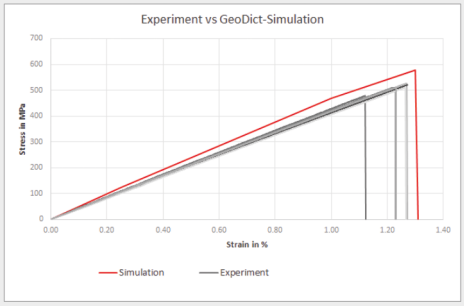
2 Structure Generation

Generate a fiber structure based on collected information, with:

- Endless fibers
- Short and long fibers
- Curved or straight fibers
- Voids
- Uneven fiber distributions
- Misalignment
- Multilayer laminates

Result: Digital model of the composite

3 Property Prediction



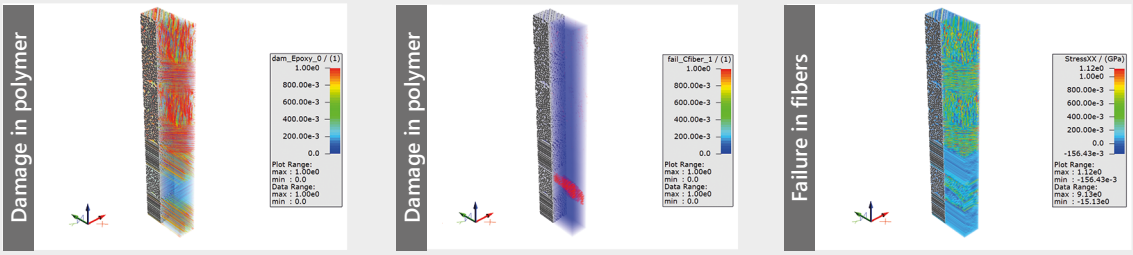
Simulate the mechanical behavior of the composite by:

- Determining the anisotropic stiffness tensor
- Investigating influence on mechanical properties of reinforcement, polymer type, imperfections (e. g. voids), etc.

Example: Run parameter study for influence of fiber content on stiffness

Result: Mechanical properties of the composite

4 Simulation



Simulate nonlinear deformation including

Result: Mechanical behavior of the composite

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