Understanding the small scale to predict the large scale

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Light weight fibre reinforced composites are the material of choice for more energy efficient wind turbines, cars and airplanes. Their bulk behaviour is however very different from ordinary engineering materials and not fully understood yet. Our micromechanical analysis is focused on understanding the fundamental mechanisms that determine the composite’s bulk behaviour.

Composites are build up out of fibres and a matrix. Only a good interaction between them will lead to optimal composites.

The deformation behavior of epoxy is very different at microscale! Research indicates higher strengths and more ductility than expected from bulk testing.

During fracture a composite undergoes deformation, this requires energy. The more energy needed, the tougher the composite will be.

All these aspects need to be researched in detail to understand the behaviour at microscale.

Our results will lead to a better understanding of the composite’s microstructure and will allow for more accurate predictions by finite element modelling.

In our research, we study the individual constituent behaviour as well as their interactions. By combining scanning electron microscopy with in-situ mechanical testing, we uncover the microscale deformation mechanisms in composite materials.