Technische Universität Braunschweig

GRK 2075 MUSEN

On the modeling of a generalized interface in heterogeneous materials

Lecture of

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March 4, 2024, 4:45 PM

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access via Altgebäude, Pockelsstraße 4

Finite-thickness interphases between different constituents in heterogeneous materials are often replaced by a zero-thickness interface model. The interphase may be e.g. the transition zone between inclusion and matrix in composites or the grain boundaries in polycrystalline solids.

For geometrically equivalent samples, due to increasing area-to-volume ratio with decreasing size, interfaces demonstrate a more pronounced effect on the material response at smaller scales. A remarkable outcome therefore is that including interfaces introduces a length-scale into the effective response of microstructures.

The most commonly studied interface models are the cohesive interface model and the elastic interface model. The cohesive interface model allows for a displacement jump across the interface, while the stress normal to the interface is continuous. The elastic interface model, on the other hand, requires displacement continuity across the interface, while it allows for a general discontinuity of the stress.

The interface model in this presentation is “general” in the sense that it allows for both types of discontinuity. Numerical results will be shown that highlight the significance of the constitutive relations pertinent to a multiphase elastic solid.