INTERDISCIPLINARY CENTRE FOR ADVANCED MATERIALS SIMULATION

The ICAMS Seminar presents

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Normal Stress Cohesive Zone Models for Mixed-Mode Crack Simulation Based on Extended Finite Element Methods

In conventional cohesive zone models the traction-separation law starts from zero load, so that the model cannot be applied to predict mixed-mode cracking. In the work the cohesive zone model with a threshold is introduced and applied for simulating different mixed-mode cracks in combining with the extended finite element method. Computational results of cracked specimens show that the crack initiation and propagation under mixed-mode loading conditions can be characterized by the cohesive zone model for normal stress failure. The contribution of the shear stress is negligible. The maximum principal stress predicts crack direction accurately. Our computations based on XFEM agree with known experiments very well. The shear stress becomes, however, important for uncracked specimens to catch the correct crack initiation angle. How to include shear stress into the cohesive law needs separate detailed investigations. To study mixed-mode cracks one has to introduce a threshold into the cohesive law and to implement the new cohesive zone based on the fracture criterion. In monotonic loading cases it can be easily realized in the extended finite element formulation. For cyclic loading cases convergence of the inelastic computations can be critical.