INTERDISCIPLINARY CENTRE FOR
ADVANCED MATERIALS SIMULATION

The ICAMS "Montagsseminar" presents

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Monday, December 8, 4 p.m.
ICAMS Seminar room UHW 1102

Continuum Aspects of Fracture

The growth of cracks is a fascinating subject in materials science and physics, that still lacks a convincing understanding in many respects. It naturally links the small scale effects in the vicinity of the crack tip to a macroscopic behavior at larger distances. Whereas an often used perspective to tackle this multiscale problem starts from the description of crack propagation as the successive breaking of atomic bonds, I will present an alternative point of view that interprets fracture as a pattern formation process in the framework of continuum theories. The description is based on well established concepts from elasticity and nonequilibrium thermodynamics only and exhibits strong links to interfacial instabilities of stressed solids. Using this approach I will discuss generic questions concerning the growth velocity of cracks in brittle materials, their shape and branching instabilities at high driving forces. In contrast to purely brittle materials, where dissipation takes place mainly at the crack surfaces, in materials with a more viscous behavior an extended zone of bulk dissipation can form around the crack. This effect, and its consequences for the growth behavior will be investigated in the context of mixed mode loadings.