Extensions of the phase-field fracture modeling for different materials

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In computational mechanics the phase-field modeling gains more and more attention to predict the crack propagation and to identify the crack initialization. It has been established to be a reliable way to simulate complex fracture patterns. Typically, the phase-field methods for brittle fracture employ a variational framework which has been approved to converge to Griffith’ classical model. While this approach requires an appropriate tension-compression split, which is not physically meaningful in all cases, in this contribution ad-hoc crack driving forces will be presented which are motivated by established criteria of fracture mechanics. Because the formulation is based on failure criteria for brittle (or ductile) materials it is possible to analyze different types of fracture observed in engineering practice.

In this context we discuss the validity of the ad-hoc approach and present a series of numerical examples. In addition to investigations with respect to different influencing factors like the length-scale parameter or the degradation function, numerical simulations of a conchoidal fracture example, a foam structure and a Brazilian test show the accuracy of the phase-field model.

References