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A phase-field model for crack propagation in fibre-reinforced polymers

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The increased use of fibre-reinforced polymers (FRP) in industry demands for methods to predict damage and fracture throughout the life-cyle of a FRP structure. Modelling crack propagation in FRPs is a challenging task due to the combination of different material types and further the need to capture fracture behaviour as fibre and matrix breakage but also interface debonding.
One established approach in general to describe crack propagation is the phase-field method. We use a model for crack propagation in multiphase regions [1, 2], extend it and modify its heterogeneous crack resistance to incorporate an interfacial strength. Mechanical quantities at the solid-solid transition regions are calculated to satisfy Hadamard's compatibility condition and the force balance [3] and influence the driving force for crack growth. The model is applied to FRP structures of different complexity.

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