# Numerical Simulation of Crack Propagation in an anisotropic medium

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Phase-field methods have been proven to address the main challenges in fracture mechanics -- the identification of crack initiation and the simulation of the unknown crack paths -- in an elegant way. The approach has therefore become very popular recently. Our contribution sets the focus on different ways to capture anisotropy in the phase-field model.

In order to deal with the tension-compression anisotropy in fracture problems, a suitable operator split has to be deduced to take only the tensile deformations, which lead to crack growth, into account. In general, the strain energy function can be written in terms of principal stretches or principal invariants. A comparison of different anisotropic splits is demonstrated in the context of both, finite and linearized strains. Furthermore, energetic and stress based fracture criterions are considered and checked against each other in more detail.

Additionally, material anisotropy is examined within the phase-field approach. Basis of this ansatz is an operator-scaling anisotropic random field to consider the microstructure of the material implicitly, proposed by [1], which is applied here on the fracture phase-field method. The models are studied within a series of suitable numerical examples.

## References

[1] D. Anders, A. Hoffmann, H.-P. Scheffler and K. Weinberg. Application of operator-scaling anisotropic random fields to binary mixtures. *Philosophical Magazine*, 91, No. 29, 3766--3792, 2011.