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MODELLING DAMAGE AND FRACTURE IN GRADIENT-EXTENDED ANISOTROPIC BRITTLE SOLIDS USING A SECOND-ORDER DAMAGE TENSOR

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The talk investigates the modeling of irreversible anisotropic brittle damage and fracture based on a second-order damage tensor and its connection to micromechanical material models. The theoretical framework is the micromorpic theory by Forest (2009). The theory includes isotropic phase-field models of fracture as special case.
Furthermore, the principle of maximum dissipation is used to motivate damage evolution laws. In particular, the conditions for strictly increasing damage are discussed. Restrictions on the form of the free energy function and the damage evolution law are proposed. These are motivated by energetical, scale-bridging considerations for growing cracks and pores.
The special case of generalized standard materials is discussed including its special numerical treatment exploiting the underlying incremental potential structure of the model. Several numerical simulation examples illustrate the behavior of the model and show the transition from diffuse anisotropic damage to the onset and propagation of macroscopic cracks.

REFERENCES

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