

PHASE FIELD FORMULATION FOR FRACTURE AND ITS APPLICATIONS

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ABSTRACT

The phase field method (PFM) for fracture originated in the late 1990s. Francfort and Marigo [1] proposed a linearly elastic variational principle for enhancing Griffith's energy theory, *i.e.*, the requirement of a well-defined crack path and previously existing crack. Bourdin et al. [2] proposed a regularization for enabling the numerical simulation of this theory, later called the PFM. As a continuous approach to fracture, instead of tracking crack surfaces, PFM represents crack using a scalar field (phase field). Fracture processes including crack nucleation, propagation, joining, and branching are naturally predicted as the result of the minimization of its energy functional without any extra fracture criteria.

PFM can incorporate various material properties including anisotropy, elastoplasticity, viscoelasticity, hyperelasticity, piezoelectricity, etc, thermodynamically consistent. Through enhancing the energy functional, PFM is successfully applied to not only classical mechanical problems, e.g., fatigue, composite delamination, functionally graded materials, rock fracture, large strain fracture of polymer, and interfacial fracture of concrete, but also many multi-physics problems, including hydrogen embrittlement, cement hydration, stress corrosion, Li insertion, coupled fluid–structure fracture, and polymer oxidative aging, etc.

We initiate this symposium to report and discuss recent progress in various aspects of PFM. Topics of interest include but not limit to:

- Multi-physics problems of phase field method for fracture
- High performance computing strategies in phase field method for fracture
- Multi-scale phase field modeling of fracture
- Complex fracture problems with phase field method for fracture
- Experimental validation and comparison for the phase field theory

REFERENCES

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