Variational Phase-field Fracture with Controlled Nucleation

C. J. Larsen[1*]

[1] Department of Mathematical Sciences, Worcester Polytechnic Institute, Worcester, MA, 01609 USA, cjlarsen@wpi.edu

We describe recent work [1] on controlling nucleation in phase-field fracture. First we review the Γ-convergence of phase-field fracture to Griffith fracture, and describe how softening and nucleation occur when implementing phase-field models. An example is given of how this softening and nucleation can be completely stopped, while preserving crack growth and Γ–convergence. We then show how nucleation can locally be turned back on, based on any criterion, such as a stress threshold. Again, these modifications preserve Γ–convergence, and they can be applied to static, quasi-static, and dynamic models. Additionally, we describe why these modifications can be expected to improve the convergence of phase-field models.

References

[1] C. J. Larsen, Variational phase-field fracture with controlled nucleation, Mech. Res. Commun. (2023) 104059.