Phase-Field Modelling of Mixed Mode Crack Propagation in PMMA - Code 82 - CFRAC 2019

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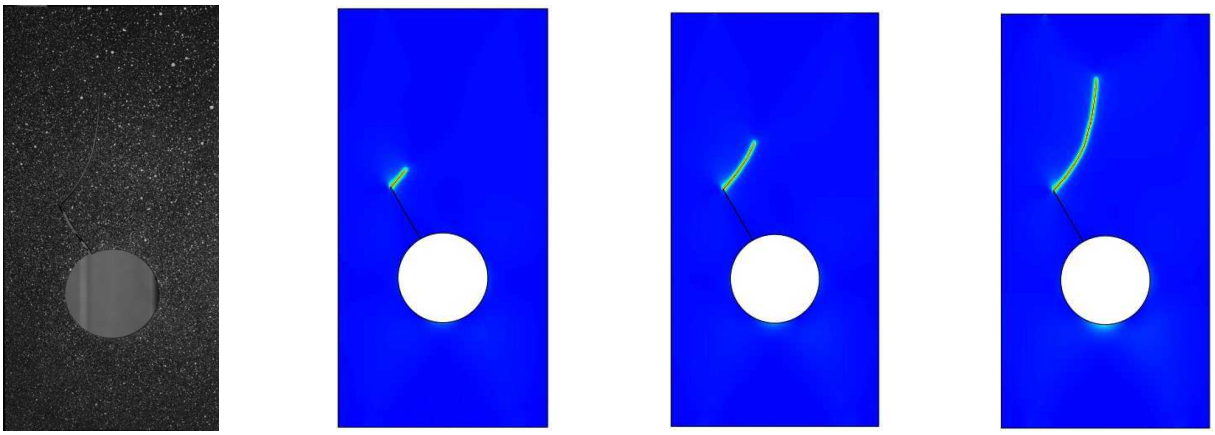
ABSTRACT

Since the beginning of this century, the variational theory represented by phase-field modelling of fracturing processes has attracted significant interest. What makes the phase field an attractive numerical approach can be attributed to its convenience on simulating complex fracture processes, including curved crack propagation, crack branching and merging of cracks in brittle materials. However, the attention on the numerical modelling of crack patterns under combined mixed compressive loading is relatively few. In this works, four commonly used phase-field models, the isotropic model, the volumetric-deviatoric split, the spectral split and the hybrid formulation, as well as their numerical performances are investigated for the simulation of crack propagation in PMMA materials under compressive loading, and the numerical results of each phase-field are compared with experimental tests (Rethore 2018). The numerical results show that the isotropic model is totally unable to prevent crack propagating under compression which obtains non-physically sound numerical results. Again, the volumetric/deviatoric split leads to unphysical crack propagation for some physical settings. The results by using the spectral split model are not fully in agreement with the experiment tests. In contrast, the hybrid model can reduce the simulation time and show good numerical results.



(a) Experiment (b) Setup 1 (c) Setup 2 (d) Setup 3

Figure 1: **Graphical Abstract: Fracturing Process in Compression.**

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