Phase field modeling of crack initiation and propagation under complex loading

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ABSTRACT

Phase field method is a versatile simulation framework for studying initiation and propagation of complex, multiple crack fronts without ad-hoc numerical treatments. In this study, a new technique has been developed to study the microcracking by prescribing the local displacements measured by digital image correlation (2D/3D) over the boundary of the sample during the numerical simulations [1, 2]. We have performed analyses on several samples of concrete and PMMA with different configurations. Qualitative and quantitative validations between numerical predictions and experimental observations are provided at various loading levels, and over various 2D cuts through the 3D structures. The comparisons show a remarkable quantitative agreement between the crack morphology obtained by the model and by the experiments, without any a priori knowledge about the location of the initiation of the cracks in the numerical model.

REFERENCES

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