# A STOCHASTIC DAMAGE ANALYSIS FOR BRITTLE MATERIALS AND ITS APPLICATION TO FRAGMENT-IMPACT MODELING OF CONCRETES

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**Abstract**

In this work, a micro-crack informed stochastic damage analysis is performed to consider the failures of material with stochastic microstructures. The derivation of the damage evolution law is based on the Helmholtz free energy equivalence between cracked microstructure and homogenized continuum. The damage model is constructed under the framework of stochastic representative volume element (SRVE). The characteristics of SRVE used in the construction of the stochastic damage model have been investigated based on the principle of the minimum potential energy. The mesh dependency issue has been addressed by introducing a scaling law into the derivation of damage evolution equation. The proposed methods are then applied to fragment-impact modeling of ultra-high strength concrete.