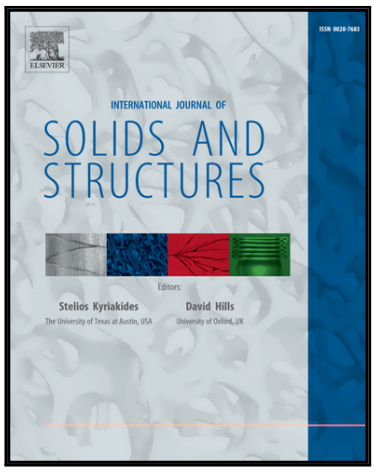

Progressive damage through interface microcracking in cementitious composites: A micromechanics based approach

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Progressive damage through interface microcracking in cementitious composites: A micromechanics based approach

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Abstract

A multiscale model in the framework of micromechanics is developed to study the effect of microcracks present at the interface between coarse aggregates and mortar matrix in cementitious composites. The different stages of damage induced by the propagation of microcracks are analyzed at the mesoscale with the aid of solutions based on interface fracture mechanics. Using the solution of the interaction between an edge dislocation and a circular inclusion with an interface crack, the stress intensity factor of a kinked arc crack is derived numerically by the method of distributed dislocations. The macroscopic response under uniaxial tensile loading is seen to be affected considerably by the presence of microcracks. Various factors such as the inclusion size, inclusion volume fraction, initial size of microcrack and elastic properties of the individual phases are found to influence the overall constitutive behaviour of the composite. The findings of the study can be utilized to provide guidelines to tailor the material properties and enhance the performance of such composites.