

In-situ XCT Image Based Meso-Scale Modelling of Concrete

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Meso-scale 2D finite element (FE) models are transformed directly from high resolution X-ray Computed Tomography (XCT) images of concrete specimens to simulate complex crack propagation. The material heterogeneity is modelled by real internal multi-phases, namely, aggregates, cement and voids. Zero-thickness cohesive interface elements (CIEs) with normal/shear traction-separation constitutive laws are pre-inserted to model potential cracks. Different fracture energy and damage initiation strength are assigned to CIEs on the aggregate-cement interfaces and inside the cement. Several 2D FE simulations are conducted. The results show good qualitative agreement with experimental observations and simulations from literatures.

Keywords: Concrete, Fracture, Finite Element Method, X-ray Computed Tomography, Image based modelling, Cohesive interface element