A Model of Fracture Propagation Considering Fluid Pressure in Cracks Using SBFEM

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Abstract

A numerical model using the cohesive interface elements and considering hydraulic pressure in cracks is proposed based on scaled boundaty finite element method. Distribution of water pressure along the crack is simulated according to the experiment results, which reflects the coupling relationship between the pressure and crack width. The stress intensity factors casued by different effects can be described separately in a semi-analytical way. The crack propagation is determined by the $K_I \geqslant 0$ criterion and the propagation direction by the linear elastic fracture mechanics criteria. The modeling results agree well with both the experiments results and another simulation results to a great extent with coarser mesh and fewer nodes. This method provides a new way to simulate coupling hydraulic fracture propagation problems in some easy conditions.

Keywords: Scaled boundary finite element method; Hydraulic fracture; Cohesive crack model; crack propagation; Local arc-length method.