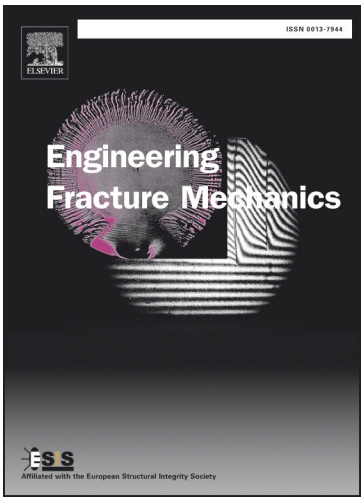

An energy based analytical method to predict the influence of natural fractures on hydraulic fracture propagation

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An energy based analytical method to predict the influence of natural fractures on hydraulic fracture propagation

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Abstract

Hydraulic fracturing is a widely applied stimulation method to enhance the productivity of unconventional resources. The hydraulic fracturing operation in naturally fractured reservoirs is complex, and the fractures can intersect a natural interface such as a bedding plane. The hydraulic fracture may either cross or be arrested by slippage without dilation, and the fracture plane can be opened upon arriving the interface. In the current study, a theoretical approach to predict the fracture extension encountering a natural fracture under far field stresses is developed, based on the Griffith stability criterion. The critical fluid pressure required to cross the interface, open the natural fracture, or make slippage take place is obtained. New criteria to separate opening zone, arrest and crossing zone are proposed based on stress field difference. The theoretical predictions are compared with experimental data and show reasonable accuracy.

Key Words: hydraulic fracture; analytical method; natural fracture; energy