

Energy based DEM investigation of microcrack property effects on Brazilian test

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The microstructural properties of natural rock such as microcrack distribution and orientation have strong influence on crack growth and propagation. This paper takes advantage of bonded-particle model (BPM) and smooth-joint model (SJM) to numerically simulate the cracking progress in rock-like material with different microcrack characteristics. A series of 2D Brazilian tests with different kinds of initial crack distribution were performed using discrete element method (DEM). Energy based analysis such as energy distribution and energy dissipation was implemented to further investigate the microcrack effects through the cracking propagating procedure. Energy distribution shows the stress concentration around the tip of microcrack. The initial-crack related energy dissipation ratio (ICREDR) which is the ratio between the energy dissipated by new crack originated from the initial-crack and total boundary work at peak force has a negative linear relationship with the value of peak force.

Keywords: Brazilian test, microcracks, Bonded-particle model (BPM), Smooth-joint model (SJM)