World Academy of Science, Engineering and Technology
International Journal of Geotechnical and Geological Engineering
Vol:18, No:11, 2024

Mechanical Properties and Crack Extension Mechanism of Rock Contained Blocks Under Uniaxial Compression

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Abstract : Natural rock masses are cut into rock blocks of different shapes and sizes by intersecting joints. These rock blocks often determine the mechanical properties of the rock mass. In this study, fine sandstone cube specimens were produced, and three intersecting joint cracks were cut inside the specimen. Uniaxial compression tests were conducted using mechanical tests and numerical simulation methods to study the mechanical properties and crack propagation mechanism of triangular blocks within the rock. During the test, the mechanical strength, acoustic emission characteristics and strain field evolution of the specimen were analyzed. Discrete element software was used to study the expansion of microcracks during the specimen failure process, and the crack types were divided. The simulation results show that as the inclination angles of the three joints increase simultaneously, the mechanical strength of the specimen first decreases and then increases, and the crack type is mainly shear. As the inclination angle of a single joint increases, the strength of the specimen gradually decreases. When the inclination angles of the two joints increase at the same time, the strength of the specimen gradually decreases. The research results show that the stability of the rock mass is affected by the joint inclination angle and the size of the cut blocks. The greater the joint dip and block size, the more significant the development of micro-cracks in the rock mass, and the worse the stability.

Keywords : rock joints, uniaxial compression, crack extension, discrete element simulation
Conference Title : ICME 2024 : International Conference on Mining Engineering
Conference Location : New York, United States
Conference Dates : November 07-08, 2024