Mechanical behaviors of granite containing two flaws subjected to uniaxial increasing-amplitude fatigue loading conditions: An insight into fracture evolution analyses

yu wang[1], changhong li[2], jianqiang han[3], and huajian wang[2]

[1]University of Science and Technology Beijing
[2]Affiliation not available
[3]Institute of Acoustics Chinese Academy of Sciences

May 5, 2020

Abstract

This work aims to investigate the fracture evolution of granite containing two pre-existing flaws under uniaxial increasing-amplitude fatigue conditions using GCTS 2000 rock mechanical system and post-test 3D computed tomography (CT) technique. The impacts of flaw arrangement (i.e., approach angle of 20°, 50°, and 70°) on the stress strain responses, hysteresis loop shape, damage evolution and crack coalescence pattern at rock bridge segment were investigated. Results show that rock structure has obvious impact on macroscopic stress strain responses, volumetric strain, resilient modulus and damping ratio. The sparse-dense pattern of hysteresis loop is different at each loading stage caused by the differential accumulative damage. The resilient modulus decreases and damping ratio increases with increasing fatigue loading stage as damage grows. Post-test 3D CT visualization reveal a most striking finding that crack coalescence is easy for rock having low approach angle, and complex crack network forms for rock having high approach angle.

Hosted file

Mechanical behaviors of granite to fatigue loading-fatigue-.docx available at https://authorea.com/users/299009/articles/428492-mechanical-behaviors-of-granite-containing-two-flaws-subjected-to-uniaxial-increasing-amplitude-fatigue-loading-conditions-an-insight-into-fracture-evolution-analyses