Insight into the effect of dynamic frequency on fracture behaviors of pre-flawed granite subjected to increasing-amplitude fatigue loading conditions

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Abstract

Real-time acoustic emission (AE) monitoring combined with post-test 3D computed tomography (CT) technique was employed to reveal the fracture evolution behaviors of pre-flawed granite. Results show that the dynamic loading frequency impacts the strength, deformation, AE pattern, rock bridge fracturing and fatigue life of the granite samples. The accumulative AE count/energy increases with increasing loading frequency. In addition, AE spectral frequency analysis reveals six kinds of crack type, and the proportion of high frequency-high amplitude signal decreases indicating that large-scaled cracks are prone to form under high loading frequency. By post-test CT scanning visualization of the rock bridge segment, the most striking finding is that complex crack network forms under high loading frequency. The flaws are easy to be communicated for rock that subjected to low dynamic loading frequency conditions. It is suggested that deterioration of the rock bridge is strongly impacted by the dynamic loading frequency.

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