

Shear behavior of crushed mudstone and claystone under macrostructural and microstructural approaches

ABSTRACT

This article discussed the shear behavior of crushed mudstone and claystone in Malaysia when subjected to short- and long-term immersion while staged compression-immersion-direct shear tests were performed. The crushed mudrocks were subjected to 5 stages of loading (50 kPa, 100 kPa, 150 kPa, 300 kPa, and 600 kPa) with and without immersion, whereby immersions were done at 100 kPa and 600 kPa vertical loads were referred to as long- and short-term immersion tests, respectively. A variable pressure scanning electron microscope (VPSEM) and X-ray diffraction (XRD) were employed for microstructural investigation so as to give a microstructural description of crushed mudrock failure upon shearing. It is found that short-term immersion had caused the crushed mudrocks to be less brittle while long-term immersion resulted in fully plastic straining behavior for both crushed mudrocks. XRD results revealed that claystone contained higher swelling minerals compared to mudstone, which explains the clod-form of claystone seen in VPSEM images. Based on both macrostructural and microstructural investigation, it is found that the crushed mudrocks are more susceptible to failure under short-term immersion, while long-term immersion caused the crushed mudrocks to achieve a stable state and be less sensitive to further moisture changes.