عنوان مقاله:

Effects of temperature and confining pressure on mode II fracture toughness of rocks (Case study: Lushan (Sandstone

محل انتشار:

مجله معدن و محیط زیست, دوره 9, شماره 2 (سال: 1397)

تعداد صفحات اصل مقاله: 13

نویسندگان:

M. Hosseini - *Department of Mining Engineering, College of Engineering, Imam Khomeini International University, Qazvin, Iran*

A. R. Khodayari - *Department of Mining Engineering, College of Engineering, Imam Khomeini International University, Qazvin, Iran*

خلاصه مقاله:

The fracture mechanics examines the development and expansion of cracks in solids and how they affect the deformation of materials. The stress intensity factors at the tip of the crack and the critical stress intensity factors or fracture toughness of materials are considered in the relevant criteria. There are three main modes of applying forces to a crack including the tensile mode, shear mode, and mixed mode. Mode II fracture toughness, which is also called the shear mode, is an important parameter for investigating the rock behaviors. This parameter is used in many different areas such as mining and tunneling. Several methods have been proposed for determining the mode II fracture toughness. In this work, the Punch-True-Shear (PTS) test, standardized by the International Society for Rock Mechanics, was used to determine the fracture toughness while the confining pressure is present. The studied sample was the Lushan sandstone. In this work, notchd cylindrical specimens were prepared for PTS testing. In order to investigate the effect of confining pressure, some tests were conducted in the presence of the confining pressures of 0, 3, 5, 7, and 10 MPa, and to check the effect of temperature, some tests were conducted under 1, 5, and 10 heating and cooling cycles at 60, 100, and 150 ˚C as well as at the ambient temperature (25 °C). The confining pressure of 3 MPa was used in all the tests to examine the effect of temperature. The analyses results showed that with increase in the confining pressure, the mode II fracture toughness and the fracture energy would increase as well. By increasing the number of heating-cooling cycles, the mode II fracture toughness as well as the fracture energy would decrease leading to a reduced fracture toughness and energy for all the three modes of heating specimens up to 60, 100, and 150 ˚C. The effect of the number of heating-cooling cycles on reducing the fracture toughness and fracture energy was greater than the effect of temperature.

کلمات کلیدی:

Fracture toughness, Mode II, Confining pressure, Temperature, Sandstone