

Research on fracture toughness of Inada granite and its composed minerals

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To extract supercritical geothermal resources and develop Hydraulic Fracturing technology, understanding mechanism of rock fracture is important. In the linear elastic fracture mechanics (LEFM), which has been used to explain fracture mechanism of brittle materials such as rock, “fracture toughness” has been used as mechanical property for describing fracture propagation.

Fracture toughness is known to be affected by microstructures of rocks such as mineral grains, so researching microscopic fracture toughness (MFT) focused on micro mineral grains of rocks is necessary. Moreover, in regard to fracture toughness, size effect, a trend that the fracture toughness is increased with increasing specimen size, is known.

In this study, MFT tests were performed to micro-sized specimens made within mineral grains of Inada granite; quartz, alkali feldspar, plagioclase, biotite, in order to compare the MFT value in terms of types of mineral grains, and clarify a relationship between size effect and MFT. As a result, the MFT values of quartz and alkali feldspar were determined, so that this MFT testing method will be conducted on other types of rocks or minerals. And these results illustrate the size effect: these were lower than the fracture toughness determined by larger sized specimens as SR test, CB test. And there's a possibility that these values indicate the lower limit of the size effect.