

Influences of faulting and hydrothermal alteration on matrix diffusion in granitic rocks

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Matrix diffusion is an important process for controlling mass transport in crystalline rocks such as granitic rocks. The matrix diffusion rate is controlled by porosity. The influence of hydrothermal alteration on matrix diffusion is one of the important issues in Japan, because the porosity in plutons in an orogenic belt such as Japan has the potential to increase associated with faulting and / or hydrothermal alteration. Thus, this study focuses on the relationship between faulting, hydrothermal alteration and matrix diffusion.

Six granitic rock samples (three samples are altered rocks and others are non-altered rocks) are obtained from ground level -300m in Mizunami Underground Research Laboratory (MIU) located in Mizunami city Gifu prefecture, central Japan. Detailed observations and through-diffusion experiments to use uranine as a tracer material provide two results, 1) Porosities and effective diffusivities of samples located near faults show high values compared with samples from sites which are unaffected by faulting and 2) The decrease in porosities and effective diffusivities of samples located near faults is related to the increase in the percentage of secondary mineral. This result suggests that faulting and hydrothermal alteration has potentials of controlling the distribution of microscopic voids and having an effect on the matrix diffusion rates.

Keywords: matrix diffusion, fault, hydrothermal alteration, granitic rocks