

花崗岩の摩擦実験によるアルゴンの放出と年代の若返りの可能性

Experimental study for argon release and possibility of rejuvenated age after frictional heating granite

佐藤 佳子^{1*}, 廣瀬 丈洋², 熊谷 英憲¹, 田村 肇¹, 坂口 真澄³, 鈴木 勝彦¹

SATO, Keiko^{1*}, HIROSE, Takehiro², KUMAGAI, Hidenori¹, TAMURA, Hajimu¹, Masumi Sakaguchi³, SUZUKI, Katsuhiko¹

¹ 海洋研究開発機構, 地球内部ダイナミクス領域, ² 海洋研究開発機構, 高知コア研究所, ³ マリンワークジャパン

¹IFREE, JAMSTEC, ²KCC, JAMSTEC, ³Marine Works, JAPAN

Isotope ratios of noble gas in certain minerals are believed to be modified easily by their ambient reservoirs when the minerals reach higher temperatures than their closure temperature. The thermal history of a rock or a geologic event, even a fault movement, can therefore be determined quantitatively by applying radiometric dating methods to a set of different minerals. However, neither traditional K-Ar nor Ar-Ar dating methods can be applied easily to faulted rocks because, in the case of faulting, it is difficult to prove that the temperature of an event was greater than the closure temperatures of minerals.

Frictional heating experiments performed on fine grain homogeneous gabbros with high temperatures induced by frictional heating using a high-velocity friction apparatus were used to test whether rapid fault movement can rejuvenate the argon isotope ratio of fault rocks by the Argon released. The temperature on the artificial fault plane is flashing and above the closure temperature of the K-Ar system, as expected from the calculated cooling age. The anticipated rapid equilibration of volatiles during the frictional heating of rocks implies that the Argon isotope composition/ratio was released to an atmospheric value during this experiment.

Previous result of gabbroid analysis, we could observed that the reset was occurred only frictional plane, and we setted that second fuse enviroment (stable melted and pseudotachylyte was made) at the time. Rejuvenation and/or apparent increases in the K-Ar ages were only observed in a narrow, 3-mm-wide zone around the fault plane that appears thermally altered and mechanically fractured in thin sections.

In this study, for the granite friction experiment, the Argon gas released timing is faster, which called "first fuse" (Hirose et al., 2005) in the time. The granitoid, which is composed upper crust, include the potassium rather gabbroid, which composed lower crust, because the radiogenic Ar is more abundant in the nature. After granite friction experiment, Argon and other gases released by the sample were collected in a small aluminum tube in a nitrogen atmosphere before and after the frictional heating granite experiment, also. Therefore, we could not observe glass and glassy material after granite experiment, but the argon gas released at "first fuse" stage. We report that the measured noble gas isotopes in an Aji granite sample analysis, compared with gabbroid analysis.

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