

Evaluation of the influence of weathering on the K-Ar age; Unspiked K-Ar dating of submarine samples dredged from off Kauai, Hawaii

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This study has two purposes. One is to define a range of freshness of samples which we can apply K-Ar method to. The other is to reveal the volcanism of off Kauai.

For evaluation of the influence of weathering on the K-Ar age, we measured and compared the K-Ar ages for samples of different degrees of weathering in the same lava flow. We collected samples from Makapuu Head which is formed of tholeiite basalt in the shield stage of Koolau volcano on the island of Oahu, Hawaii. This locality is suitable for present purpose because there are outcrops throughout the section and the stratigraphy and the ages have been well studied. On the field we totally judged the degree of weathering by the degree of alteration of olivine, the presence of secondary mineral and the aggravation of oxidation with the naked eye and a loupe. Then in the laboratory we observed the degree of alteration of olivine, the presence of second mineral and the degree of crystallization of the groundmass with a microscope. We also measured K₂O/P₂O₅ ratio which is used as the indicator of loss of K in tholeiite basalt. For the accurate dating, we analyzed groundmass of samples to reduce the influence of excess ⁴⁰Ar and adopted the peak comparison method for mass fractionation correction of initial argon.

As a result, there is no significant difference of data between fresh samples and some of the samples which are too weathered at the conventional criterion. It suggests that we may be able to apply K-Ar dating method to rocks of the wider range of freshness than we expected. To study in more detail we analyzed by Scanning Electron Microscope. The result shows that it might be possible to make a better criterion by relating it with the alteration of glass.

In the study of off Kauai, we measured the ages of 5 dredged samples, because the volcanic topographies were found there in recent years. We got two reliable ages, ~1.80Ma and ~3.86Ma. It suggests that they are rejuvenated stage and before postshield stage volcanism.