

Evaluation of the influence of weathering on the K-Ar age

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The K-Ar dating method has been widely used as a useful method mainly for volcanic rocks. On the other hand, it is necessary to satisfy various conditions to get a reliable age, and loss of K and Ar by secondary alteration and weathering is one of the factors which we have to be careful of. Thus, it is particularly important how to choose samples for dating. In the K-Ar method, it is desirable to get fresh samples which surely have not been influenced by those secondary processes. However it is not always easy, depending on the state of an outcrop. Therefore We measured and compared the K-Ar ages for samples of different degrees of weathering in the same lava flow in order to define a range of freshness of samples which we can apply K-Ar method to.

In this study, We collected 29 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 thus 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. For the accurate measurement, We analyzed groundmass of samples to reduce the influence of excess ^{40}Ar 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. I will do Ar isotope analysis of more samples and measure $\text{K}_2\text{O}/\text{P}_2\text{O}_5$ ratio which is used as the indicator of loss of K in tholeiite basalt, and discuss secondary loss of K and Ar in more details.