New unspiked K-Ar ages of shield and postshield lavas from the West Maui volcano, Hawaii

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It is widely believed that the Hawaiian volcanoes have four growth stages: preshield, shield, postshield and rejuvenated stages. The quiescence of volcanism between postshield and rejuvenated stages is considered to be about 0.6 to 2 million years. (Tagami et al., 2002)

In this study, we measured K-Ar ages on nine Honolua postshield-stage lava samples and thirty Wailuku shield-stage lava samples from the West Maui volcano, island of Maui, Hawaii, in order to understand better the rate of shield building as well as timing and duration of postshield growth at the hot spot volcanoes. Magnetic polarities of these samples have also been measured to correlate these ages with geomagnetic polarity time scale.

1)The major volcanic activity took place at ~1.8-1.5 Ma for theupper part of the shield-stage Wailuku volcanics and ~1.4-1.3 Ma for postshield-stage Honolua volcanics. There is no evidence of quiescence longer than 0.1 m.y. between postshield and shield stages.

2)The period of quiescence between postshield and rejuvenated stages was estimated previously to be about 0.6 m.y. in West Maui (Tagami et al., 2002).

In this study, however, we find that the youngest age of postshield-stage rocks is 1.04+-0.04 Ma. Along with the age of rejuvenated-stage Lahaina volcanics (Tagami et al., 2002), this suggests that the quiescence was shorter as ~0.4 m.y.

References

Tagami et al., 2002: Rejuvenated-stage volcanism after 0.6-m.y. quiescence at West Maui volcano, Hawaii: new evidence from K-Ar ages and chemistry of Lahaina Volcaics, Journal of Volcanology and Geothermal Research 120(2003) 207-214

Potential indicator for the hydrothermally altered silicate rock - Application to exploration for Zn-Pb hydrothermal deposit -

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The Kamioka mine in central Japan is composed of a world-class Zn-Pb-Ag skarn deposit which replaced Hida metamorphic rocks: limestone, gneiss, and the so-called “Inishi rock” constituting mainly of andesine, diopsidic pyroxene, and titanite with variable amounts of K-feldspar and quartz. Previous studies have shown that limestones in the Sako-nishi area of Kamioka are subjected to alteration by hydrothermal fluids with a dominant meteoric water component, and show a halo with low $\delta^{18}O$ and $\delta^{13}C$ values and high Fe, Mn, Al contents around the orebody. Exploration based on this geochemical anomaly succeeded in identifying a new ore body. We performed the petrographical and geochemical study for silicate rocks (Inishi rock and gneiss) widely distributed in the Sako-nishi area in order to develop a new exploration tool.

The silicate rocks are hydrothermally-altered into minerals of chlorite, epidote, sericite, pyrite, prehnite, and calcite in the periphery of the skarn and/or ore deposit, indicating that alteration zone in the silicate rocks are affected by propyritic-like alteration in the later stage of a series of mineralization and skarnization. The hydrothermally-altered rocks decreased in Na and K reflecting the dominance of these low Na- and K-minerals. Leaching of them with aqua regia shows an increase of Al, Fe, and Mn due to the decomposition of chlorite, pyrite, and calcite. The aqua regia leachate for the Inishi rock is more enriched in Fe than that of limestone because the hydrothermal chlorite which replaced clinopyroxene becomes more dominant. The ratios of Mn/Mg, Fe/Al, Ca/Na, Mg/(Mg+Fe+Mn) along with these elements tend to change with the decrease of $\delta^{18}O$ and $\delta^{13}C$ values of associated limestone, and are effective for separating the hydrothermally-altered silicate rocks from the unaltered ones. We assume that the aqua regia extraction method is widely applicable as a tool for detecting the propyritic alteration which is common in Zn-Pb hydrothermal deposit.

References

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