Unspiked K-Ar dating of the rejuvenated volcanism and quiescence on Kaua’i, Hawai’i

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Many hotspot volcanoes undergo rejuvenated volcanism, following a period of volcanic quiescence and erosion after the main shield-building. The cause of this renewed volcanism has been enigmatic while numerous mechanisms have been proposed. The lack of age data has prevented further discussion on modeling of rejuvenated volcanism. Recently, new K-Ar ages have reevaluated accurately the length and timing of rejuvenation in Hawaiian volcanoes and activated arguments to the model construction. For this reason we have undertaken K-Ar dating in order to decide the detailed history of hiatus and rejuvenation on Kaua’i which is controversial.

We collected and dated 27 rock samples from Koloa Volcanics covering eastern and southern area of Kaua’i island, and 6 from underlying Waimea Canyon Basalt which had built most part of the island. All samples dated were judged to be fresh in thin section and XRF analysis, and phenocrysts, xenocrysts and xenoliths were carefully removed to minimize extraneous 40Ar. The mass fractionation correction procedure, which is essential when samples have high atmospheric contamination, was applied in argon isotopic analysis.

New K-Ar results show that the ages of Koloa Volcanics has a main quiescence between 3.58 and 2.44 Ma (˜1.1 m.y.) and had been active from 2.44 to 0.15 Ma (˜2.3m.y.). The youngest age of WCB was 3.92 Ma. This revealed age distribution on Kaua’i is consistent with a model of the secondary melting zone formed downstream of the plume center (Ribe and Christensen, 1999) for the origin of rejuvenated volcanism.