K-Ar dating of a subduction thrust in the Mugi Mélange of the Shimanto accretionary complex, southwest Japan

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Accretionary complexes are major orogenic systems that form at plate subduction zones and are sometimes exposed on land. An improved understanding of the temporal evolution of accretionary complexes is important for geometric studies of their deformation. Then, we used illite K-Ar dating to the Mugi Mélange of the Shimanto accretionary complex, southwest Japan. The Mugi Mélange represents repeated ocean floor stratigraphy and is regarded as an underplated mélange. In this study, a mélange matrix shale and a cataclasite of a subduction thrust were collected for illite K-Ar dating.

Complications arise when dating authigenic clay minerals in sedimentary rocks because of contamination by detrital potassium-bearing minerals. We attempt to evaluate the amount of detrital material in the samples using X-ray diffraction pattern. For this purpose, samples were separated four grain-size fractions of 1.0-2.0 μm, 0.5-1.0 μm, 0.2-0.5 μm, and less than 0.2 μm.

K-Ar dating analyses were conducted at the Okayama University of Science. Ages of the mélange matrix shale decrease with decreasing the detrital mica component. A lower intercept age at 100% authigenic illite of the shale is 32.8 ±1.0 Ma and younger than the zircon U-Pb age of the Mugi Mélange by previous study. The authigenic illite probably formed by diagenetic alternation from smectite. Ages of the cataclasite of the thrust also decrease with decreasing the detrital mica component. A lower intercept age at 100% authigenic illite of the cataclasite is 56.2 ±0.8 Ma and overlapped to the youngest zircon U-Pb age of the Mugi Mélange (57.9 ±2.9 Ma) by a previous study. It shows that the thrust activity has few temporal differences with sedimentation of the Mugi Mélange.

These results are consistent with geological interpretation that the thrust was due to underplating. This thrusting had no complete ^{40}Ar diffusion. And no reactivation was occurred after the underplating. On the other hand, K-Ar ages of a northernmost boundary fault of the mélange shows complete ^{40}Ar resetting between 29 and 23 Ma (Tonai et al., in revision). These different K-Ar ages of faults in the Mugi Mélange may reflect the temporal evolution and variety of fault activities of the mélange.

Keywords: fault, accretionary complex, Shimanto Belt, K-Ar age

