K–Ar AGES OF MICA CLAY MINERALS IN CLAY VEINS FOUND IN GRANITIC AND RHYOLITIC ROCKS OF HIROSHIMA PREFECTURE, JAPAN

RYUJI KITAGAWA and SATORU KAKITANI

Department of Geology and Mineralogy, Hiroshima University, Sendamachi, 1-chome, Hiroshima 730

Two mica clay minerals in clay veins developed in Hiroshima granitic rock and Takada rhyolitic rock distributed in Hiroshima Prefecture were dated by K-Ar method. The age of both minerals are 68.4 m.y. and 79.5 m.y. respectively. The ages of mica clay minerals are similar to that of the Hiroshima granitic rocks (70–91 m.y.). This result may be suggested that the mica clay minerals found in both host rocks are formed by hydrothermal solution subsequent to the post granitic activity.

INTRODUCTION

Numerous clay veins which consist of mica clay mineral are found in granitic and rhyolitic rocks inferred to be Cretaceous age in Hiroshima Prefecture. Kitagawa and Kakitani (1977, 1978a, b, 1979) were reported their modes of occurrence and mineralogy of the constituent mica clay minerals. In referring to the igneous history of this district, one can think of three formation processes for these mica clay minerals as follows: 1. hydrothermal activities subsequent to the post granitic intrusive, 2. hydrothermal solution provided by igneous activity of the later stage, 3. recent weathering.

This short paper described the result of the age determination on two representative mica clay minerals collected from clay veins in granitic and rhyolitic rocks of Hiroshima Prefecture, and also discussed the genesis in their formation.

SAMPLING LOCALITIES AND SPECIMENS

Two specimens were collected from veins in Kure and Toyosaka districts respectively (Fig. 1). The clay vein of Kure district is found in Hiroshima granitic...
rock inferred to be late Cretaceous age. It is 15–20 cm in width and pale-green in colour. The clay vein of Toyosaka district is observed in Takada rhyolitic rock inferred to be late Cretaceous age. It is formed along N20°E in strike and nearly vertical fault. The vein is about 3 cm in width and pale-green in colour.

The X-ray powder patterns of two specimens are shown in Fig. 2. As shown in Fig. 2, the both specimens consist of pure mica clay mineral. The mica clay minerals are identified to be 1M (Kure district) and 2M (Toyosaka district) polytypes. The differential thermal diagram of the former one shows one endothermic peak in the range of 50–100°C, and double endothermic peaks in 500–650°C range, while the latter one exhibits a weak endothermic peak at about 500°C (Fig. 3). The electron micrographs of the both specimens are shown in Fig. 4. The bright-field images of both mica clay mineral appear to show thin irregularly platy and elongated tabular forms. Some of particles in Toyosaka district show hexagonal forms. The mineralogical habits of both specimens are summarized in Table 1.

Table 1. Mineralogical habits of specimens

<table>
<thead>
<tr>
<th></th>
<th>Mica clay mineral of Kure</th>
<th>Mica clay mineral of Toyosaka</th>
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<tbody>
<tr>
<td>(001) basal spacing</td>
<td>10.6Å</td>
<td>9.97Å</td>
</tr>
<tr>
<td>Polytype</td>
<td>1M</td>
<td>2M</td>
</tr>
<tr>
<td>DTA</td>
<td>double endothermic peaks (500–650°C)</td>
<td>one endothermic peak (about 600°C)</td>
</tr>
<tr>
<td>Morphology</td>
<td>Irregularly plate elongated tabular form</td>
<td>hexagonal plate hexagonal elongated tabular form irregularly plate elongated tabular form</td>
</tr>
</tbody>
</table>

Fig. 2. X-ray powder diffraction patterns for mica clay minerals
A: mica clay mineral in Kure
B: mica clay mineral in Toyosaka

Fig. 3. Differential thermal analysis curves of mica clay minerals
A: mica clay mineral in Kure, B: mica clay mineral in Toyosaka

Fig. 4. Electron micrographs for mica clay minerals
A: specimen of Kure district, B: specimen of Toyosaka district
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Table 2. K-Ar ages of mica clay minerals

<table>
<thead>
<tr>
<th>Locality</th>
<th>sec ( \Delta_{40^{\text{K}}} \times 10^{-5} )</th>
<th>sec ( \Delta_{40^{\text{Ar}}} \times 10^{-5} )</th>
<th>sec ( \Delta_K \times 10^{-5} )</th>
<th>Isotope age (m.y.)</th>
</tr>
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<tbody>
<tr>
<td>Kure</td>
<td>1.37</td>
<td>89.7</td>
<td>9.02</td>
<td>68.4 ± 3.4</td>
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<tr>
<td></td>
<td>1.38</td>
<td>90.2</td>
<td>8.97</td>
<td></td>
</tr>
<tr>
<td>Toyosaka</td>
<td>2.16</td>
<td>62.6</td>
<td>6.95</td>
<td>79.5 ± 4.0</td>
</tr>
<tr>
<td></td>
<td>2.17</td>
<td>94.3</td>
<td>6.85</td>
<td></td>
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</table>

The constants for age calculation: \( \lambda_{\text{K}} = 4.962 \times 10^{-10} \text{yr}^{-1} \), \( \lambda_{\text{Ar}} = 0.581 \times 10^{-10} \text{yr}^{-1} \), \( K_0 = 1.167 \times 10^{-4} \) atom per atom of national potassium (Convention on decay contents, Subcommission on Geocronology, 25th International Geological Congress, 1976.)

RESULT AND DISCUSSION

The mica clay minerals picked out from clay veins in Hiroshima granitic rock (Kure) and Takada rhyolitic rock (Toyosaka) of Hiroshima Prefecture were dated by K-Ar method. Two mica clay minerals in both host rocks are dated at 68.4 m.y. and 79.5 m.y. respectively (Table 2). Up to the present, the age of Hiroshima granitic rocks are believed to be in the range of 70-91 m.y. (Kawano and Ueda, 1966. Shibata and Ishihara, 1974), while the Takada rhyolitic rock seems to rage mainly from the Aritan to Miyakoan in Cretaceous age corresponding to older than 100 m.y. (Yoshida, 1961). Therefore, the ages of formation of both mica clay minerals are closely similar to that of Hiroshima granitic rocks.

Ishihara et al. (1980) reported that the age of mica clay mineral formed by hydrothermal activity occurring in the granitic rock of San'in province (51 m.y.) is 51 m.y., and the age of mica clay mineral in Sanyo province (82 m.y.) is 86 m.y.

In conclusion, ages of the mica clay minerals both in granitic and rhyolitic rocks in these districts are very close to that of the granitic rock suggesting genetic relations of the clay minerals to the post granitic activity, i.e. hydrothermal solution.

ACKNOWLEDGEMENT

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REFERENCES


広島県下に分布する花崗岩と流紋岩中に細脈として産する
雲母粘土鉱物の K-Ar 年代

北川 隆司 柿谷 悟

広島県下に分布する花崗岩類（広島花崗岩）と流紋岩類（高田流紋岩）中に細脈として産出する雲母粘土鉱物の K-Ar 年代を測定した。呉市（花崗岩）で採取した雲母粘土鉱物（1Md ポリタイプ）は 68.4 m.y. を示し、賀茂郡丹生町（流紋岩）での雲母粘土鉱物（2M ポリタイプ）は 79.5 m.y. であった。これらの年代は、広島花崗岩類の生成年代である 70-91 m.y. の年代と類似しているが、流紋岩の年代である宮古統一有田統（100 m.y. 以前）よりはかなり新しい。これら雲母粘土鉱物の時代が花崗岩生成時代とほぼ一致することは、雲母粘土鉱物が花崗岩貫入活動にひき続く熱水作用により生成されたと考えるのが妥当であろう。