Bulletin of the Geological Survey of Japan, vol. 31(5), p. 221–224, 1980 550.93: 552.44(521.82+521.84)

K-Ar Ages of Sericites from the Chugoku District, Japan

Shunso Ishihara*, Ken Shibata**,
Ryuji Kitagawa*** and Satoru Kakitani***

Ishihara, S., Shibata, K., Kitagawa, R. and Kakitani, S. (1980) K–Ar ages of sericites from the Chugoku District, Japan. *Bull. Geol. Surv. Japan*, vol. 31(5), p. 221–224

Abstract: Sericites occurring in Cretaceous-Paleogene granitoids were dated by K–Ar method at two localities in the Chugoku District. Pale green sericite ($2M_1$ poly-type) from the well known sericite deposit in the Mitoya area, San'in province, gives 51 Ma, whereas white sericite (1Md poly-type) from minute vein at Takaya, San'yo province, is dated at 86 Ma. Each age is identical with that of the surrounding granitoids within the analytical error. The concordancy in the age may suggest the genetic link between post-magmatic fluid activity of the Cretaceous to Paleogene granitoids and the sericite formation.

Introduction

In the Chugoku District, sericite deposits are known to occur in the Paleogene granitoids of the San'in province. These were mined since the early 20th century. The ore deposits were studied in detail by Iwao (1953). The pale green sericite orebodies having lenticular, pipe-like or vein form, were concluded to have phengitic composition, and were considered to have formed by hydrothermal replacement process with a wide range of temperature. Kinosaki (1953) stressed the sericite deposits as one of the characteristics of the San'in granitic province.

Recently, clay deposits and minute clay veins were studied particularly in the San'yo province (Kakitani and Kitagawa, 1977; Kitagawa and Kakitani, 1978a, b, c; 1979a). They revealed that mica minerals of the San'in granitoids consist of $2M_1$, 1M and 1Md polytypes (Fig. 1), whereas those in the Hiroshima granitoids are all identified to be 1Md polytype (Kitagawa and Kakitani, 1979b).

The mica minerals occur as narrow veins, less than a few tenth cm in width, filling various fractures in general, and as sizable orebodies at several places. In referring to the igneous history of the district, one can think of three stages of the mineralization; namely (i) post-magmatic activity of the host granitoids which are Cretaceous or Paleogene in age, (ii) hydrothermal solution provided by the Miocene igneous activity and (iii) Quaternary weathering. Thus age of the sericites is needed to be examined.

This short note describes the result of the age determination on two representative samples. The analytical method is essentially the same as that reported in Shibata (1968).

Results and Discussion

Sample from the San'in granitoids was collected from an abandoned adit along westward stretching valley (Hinotani) at 1 km west of Takuwa, Mitoya-cho, Iishi-gun, Shimane Prefecture. This mine corresponds possibly to the Hinotani No. 1 orebody of Iwao (1953). Although the orebody is located at boundary between hornblende-bearing biotite granite and biotite granite in his Figure 2, the immediate host rock seems to be originally aplitic granite. It is probably irregular lens with 10 m width elongated in N–S direction. Among various ores, coarse-grained one was selected for the age determination. Sericite is pale green coex-

*Mineral Deposit Department, **Geochemistry and Technical Service Department, ***Hiroshima University

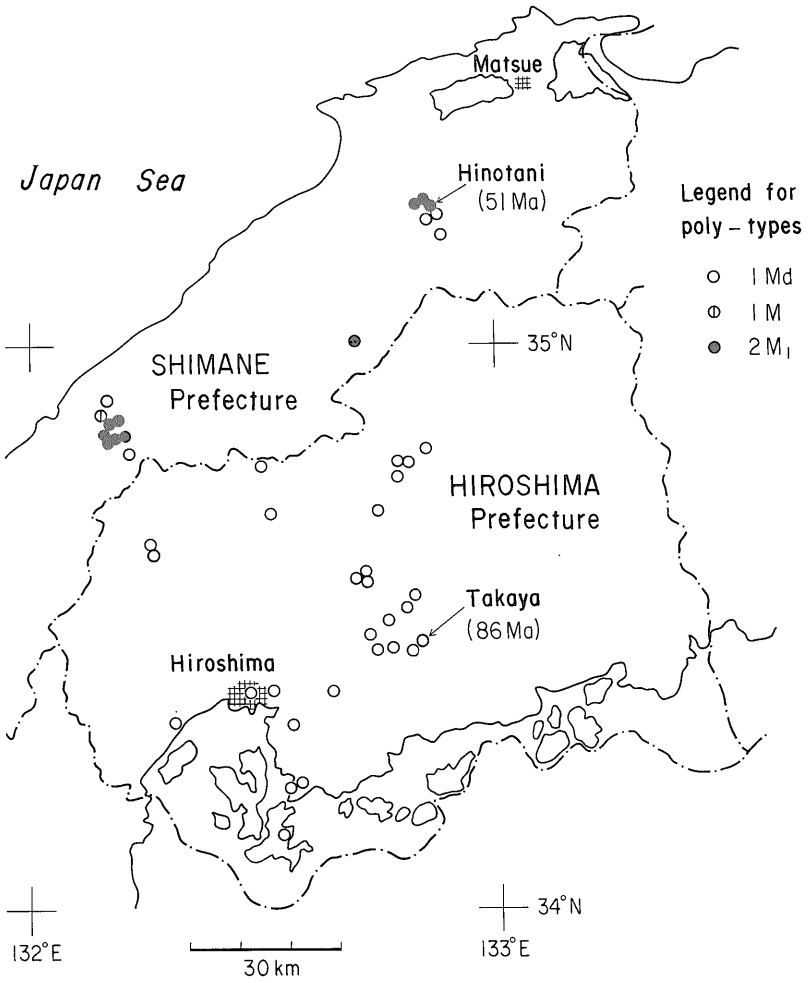

Fig. 1 Locality of the studied areas and distribution of the poly-types of mica clay minerals in the central part of the Chugoku District. The poly-types after KITAGAWA and KAKITANI (1979b).

Table 1 K–Ar ages of sericites from the Chugoku District

Locality	K_2O (%)	^{40}Ar rad (10^{-6} ml STP/g)	Atm ^{40}Ar (%)	Age (Ma)
Hinotani, Shimane	9.40	15.8	20.2	51.3±1.6 (50.1±1.6)
Takaya, Hiroshima	5.48	15.7	3.7	86.4±2.6 (84.5±2.5)

$\lambda_\beta = 4.962 \times 10^{-10}$/y, $\lambda_e + \lambda'_e = 0.581 \times 10^{-10}$/y, $^{40}K/K = 0.01167$ atom %
Age calculated with the old decay constants is given in parenthesis

isting with calcite. The sericite is of $2M_1$ poly-type. This mineral is dated at 51 Ma (Table 1).

Sample from the Hiroshima granitoids was taken at an artificial outcrop made available by road construction at Nishitani, Takaya-cho, Kamo-gun, Hiroshima Prefecture. Clay vein of 10 cm wide is present in the weathered biotite granite. The vein is identified to contain sericite and small amount of montmorillonite by x-ray study, differential thermal analysis and electron microscopic observation. The sericite is less greenish than the Hinotani sericite (here called white sericite) and belongs to 1Md poly-type. The age is dated at 86 Ma (Table 1).

The age of 51 Ma from the Hinotani sericite orebody is similar to 54* Ma (SHIBATA and ISHIHARA, 1974) of sericite from wall-rock alteration zone of molybdenite-quartz vein at Osa mine, which is located at about 7 km southwest of the Hinotani orebody, and also resembles to the age of granitoids in the general Mitoya area (KAWANO and UEDA, 1966).

In the Takaya area, the sericite age of 86 Ma is similar to that of nearby granitoids. KAWANO and UEDA (1966) reported 82 Ma on biotite granite at Kouchi station, which is about 9 km due east of the Takaya clay vein. The sericite age is also similar to one of the greisenization ages (ca. 87 Ma and 94 Ma) of tungsten deposits of the San'yo province (SHIBATA and ISHIHARA, 1974). In both areas, therefore, formation of the mica clay minerals seems to be contemporaneous with solidification of the host granitoids. This time concordancy may suggest genetic connection between the granitoids and the sericites examined.

The most clear difference observed on the granitoids of the two areas is higher Fe^{+3}/Fe^{+2} ratio (ISHIHARA, 1971) thus higher fO_2 (TSUSUE and ISHIHARA, 1974) in the San'in province than the San'yo province. This difference of magmatic stage may well be reflected on hydrothermal solution of the post-magmatic stage as exemplified on molybdenum and tungsten deposits. However, a large amount of meteoric water inflow may be expected in the formation of such mica clay deposits. In addition, the 1 Md sericite may have been converted from originally different mica minerals. More detailed studies are necessary to clarify the whole scheme of genetic connection.

Acknowledgement: Laboratory assistance of S. UCHIUMI is appreciated.

References

ISHIHARA, S. (1971) Modal and chemical composition of the granitic rocks related to the major molybdenum and tungsten deposits in the Inner Zone of Southwest Japan. *Jour. Geol. Soc. Japan*, vol. 77, p. 441–452.

IWAO, S. (1953) Pale green sericite deposits in Iishi district, Shimane Prefecture, with special reference to the wall rock alteration. *Bull. Geol. Surv. Japan*, vol. 4, p. 223–238 (text in Japanese).

KAKITANI, S. and KITAGAWA, R. (1977) Clay minerals in the veins and veinlets found in the granitic rocks of Hiroshima Prefecture. *Jour. Miner. Soc. Japan*, vol. 13, p. 187–196 (text in Japanese).

KAWANO, Y. and UEDA, Y. (1966) K–A dating on the igneous rocks in Japan—Granitic rocks in southwestern Japan—. *Jour. Japan. Assoc. Min. Petr. Econ. Geol.*, vol. 56, p. 191–211 (text in Japanese).

KINOSAKI, Y. (1953) On the granitic rocks in Chugoku, and the molybdenite and wolframite deposits in them. *Rept. Earth Sci., Hiroshima Univ.*, no. 3, p. 61–76 (text in Japanese).

KITAGAWA, R. and KAKITANI, S. (1978a) The pale-green clay vein in the granitic rock at the Ondo-cho district, Hiroshima Prefecture. *Jour. Clay Sci. Soc. Japan*, vol. 18, p. 1–10 (text in Japanese).

————and————(1978b) The white clay vein in the granitic rocks at the Hachihonmatsu district, Hiroshima Prefecture. *Jour. Clay Sci. Soc. Japan*, vol. 18, p. 31–39 (text in Japanese).

————and————(1978c) Mode of occurrence and mineralogy of clay vein in granitic rocks with special reference to the genesis of clay minerals in them. *Jour. Miner. Soc. Japan*, vol. 13, p. 357–379 (text in Japanese).

————and————(1979a) The mode of occurrence and mineralogy of Kodachi kaolin deposit and clay veins found in its host rocks. *Mining Geol.*, vol. 29, p. 217–226(text in Japanese).

————and————(1979b) Modes of occurrence and mineralogy of mica clay minerals in the Hiroshima and the San'in granitic complexes. *Jour. Miner. Soc. Japan*, vol. 14, p. 3–19 (text in Japanese).

SHIBATA, K. (1968) K–Ar age determinations on granitic rocks and metamorphic rocks in Japan. *Rept. Geol. Surv. Japan*, no. 227, 71 p.

————and ISHIHARA, S. (1974) K–Ar ages of

*All ages quoted in this paper are calculated by new decay constants.

the major tungsten and molybdenum deposits in Japan. *Econ. Geol.*, vol. 69, p. 1207–1214.

TSUSUE, A. and ISHIHARA, S. (1974) The iron-titanium oxides in the granitic rocks of Southwest Japan. *Mining Geol.*, vol. 24, p. 13–30 (text in Japanese).

中国地方産絹雲母の K-Ar 年代

石原舜三・柴田　賢・北川隆司・柿谷　悟

要　旨

中国地方の白亜紀-古第三紀花崗岩類中に産出する絹雲母の K–Ar 年代を 2 カ所で測定した．島根県，三刀屋地域産の著名な絹雲母鉱床産の淡緑色絹雲母（$2M_1$，ポリタイプ）は 51 Ma であり，広島花崗岩中の細脈状絹雲母（1Md ポリタイプ）は 86 Ma であった．これらの年代は個々の地域の花崗岩やそれと関連する高温型鉱床の年代と似ている．この年代が一致することは，絹雲母の生成が成因的にも花崗岩の固結と関係することを意味しており，少なくとも測定に使用した絹雲母はグリーンタフ活動期やより以後の熱水活動，また風化作用による生成に否定的である．

Hinotani……鏑の谷　　Mitoya ……三刀屋　　Iishi……飯　石
Takaya ……高　屋　　Kouchi ……河　内　　Takuwa…… 多久和

（受付：1980年 2 月 4 日；受理：1980年 2 月12日）