

K-Ar Ages of Muscovite from the Muscovite-Quartz Schist of the Sangun Metamorphic Terrain in the Tari District, Tottori Prefecture, Japan

By

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Abstract

K-Ar ages of muscovite from the muscovite-quartz schist intercalated in the albite-spotted schist of the Sangun metamorphic terrain in the Tari district, Tottori prefecture, are 175 ± 9 and 169 ± 8 m.y., and they are correlated to the Middle Jurassic. The meaning of these results is discussed in the light of geological evidence and other isotopic age data on the Sangun metamorphism.

Geological setting

Geological map, with the index map, of the Tari district is given in Figure 1. The Sangun

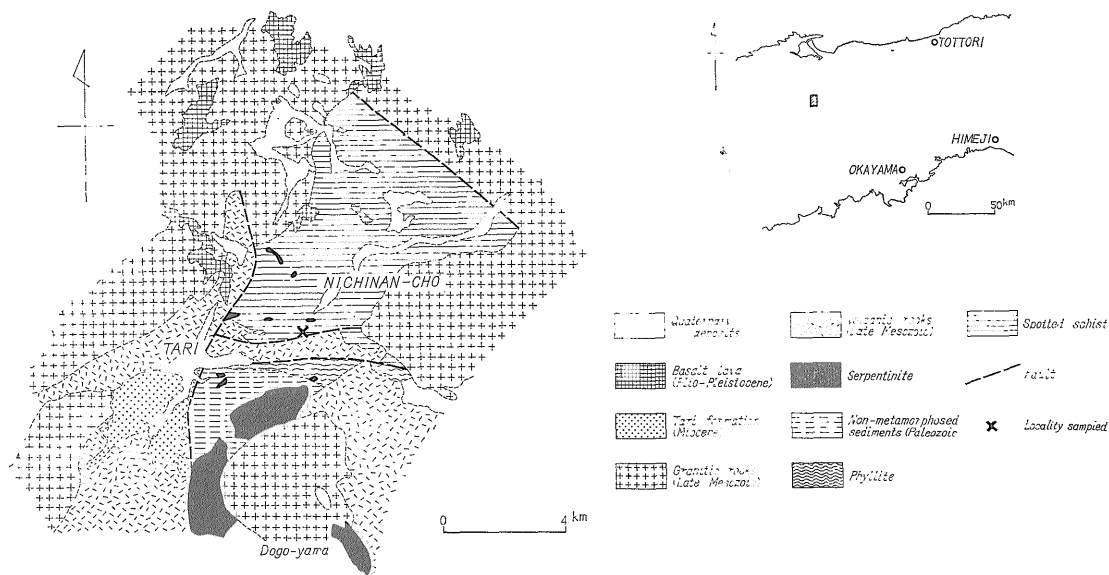


Fig. 1 Geological map of the Tari district, Tottori prefecture, after Tottori-ken (1966) and Igi (unpublished).

metamorphic rocks are divided into two types, namely albite-spotted schist in the northern part and phyllite in the southern part, which grades to the non-metamorphic Paleozoic sediments towards south.

Description of the determined sample

The rock-specimen sampled for the experiment is muscovite-quartz schist (TD66-2),

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intercalated in albite-spotted schist (TD66-1) as thin bed, about 10 cm in thickness, derived from the Paleozoic rock. The sample locality is Tari,¹ Nichinan-cho, Hino-gun, Tottori prefecture. The muscovite quartz schist is light grey in colour and rather fine-grained with the schistosity. Under the microscope, it is composed mainly of quartz, muscovite, garnet and small quantities of iron ore. Quartz is round, xenoblastic, and 0.1 ~ 0.2 mm across. Muscovite is flaky, colourless and 1 ~ 2 mm long. Garnet is granular or round, idioblastic and about 0.5 mm across.

Experimental procedure

Each of muscovites was isolated with an isodynamic separator after crushing and sieving the rock specimen. Argon was extracted and purified in a pyrex high vacuum system. The samples were fused in a molybdenum crucible at about 1,300°C for 30 minutes with a radio-frequency heater. The Ar³⁹ spike was added during fusion, and argon was purified from other gases with hot titanium sponge. Isotopic ratios of argon were measured by a static operation on the Mitsubishi MS-315G mass spectrometer, which is Reynolds-type with 15 cm radius 60°-sector analyser.

Potassium was determined by flame photometry. The samples were digested with hydrofluoric acid and hydrochloric acid, and then the residues were dissolved in hydrochloric acid, diluted to a standard volume, and the potassium content of the solution was measured with the Hitachi EPU-2 flame photometer.

The constants used in the calculations are:

$$\lambda\beta = 4.72 \times 10^{-10} \text{ Yr}^{-1}, \lambda_e = 0.584 \times 10^{-10} \text{ Yr}^{-1} \text{ and } K^{40}/K = 0.0119 \text{ atomic } \%$$

The results of the determination are given in Table 1.

Table 1 K-Ar ages of muscovites from muscovite quartz schist in the Tari district

Sample No.	Mineral	K ₂ O (wt %)	Vol. of Ar* wt. of sample (mm ³ /g)	Atmospheric contamination (%)	Age (m. y.)
TD 66-2-1	Muscovite	8.49	0.0514	16.1	175±9
TD 66-2-2	Muscovite	8.41	0.0491	12.2	169±8

* Radiogenic argon.

Discussion of the results

The ages of muscovites from muscovite-quartz schist in the Tari district, 175 and 169 m.y., and correlated to Middle Jurassic. Rb-Sr isotopic analyses of the same muscovite and whole rock as described in this paper (TD66-2) and those from the albite-spotted schist (TD66-1) yielded an isochron age of about 160 m.y. ($Rb = 1.47 \times 10^{-11} \text{ Yr}^{-1}$) and an initial Sr⁸⁷/Sr⁸⁶ ratio of 0.709 (SHIBATA, WANLESS and IGI, unpublished data), thereby confirming the Middle Jurassic event. These results are inconsistent with our knowledge on the Sangun metamorphism proper, whose age is not later than the Middle Triassic from any geological evidence.

We have other isotopic age determinations on the equivalents of the Sangun metamorphic rocks as given in Figure 2. However, they are inconsistent with each other; the oldest age of Omi schist is 320 m.y., and of the schist from Northern Kyushu, 270 m.y. Our results may represent the

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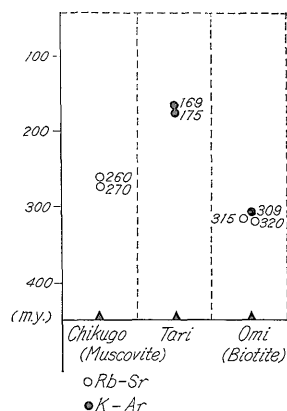


Fig. 2 Isotopic ages of the Sangun met morphic rocks in some districts, after SHIBATA & NOZAWA (1968), YANAGI (1967) and HAYASE et al. (1968)

latest stage of the Sangun metamorphism ended with the orogenic movement associated with the serpentinite intrusion in late Triassic or early Jurassic age. More determination is urgently hoped in the near future.

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References

HAYASE, I., ISHIZAKA, K. & NODA, S. (1968): Rb-Sr age of the so-called "Mitaki granitic rocks" (Abstract). *Jour. Geol. Soc. Japan*, vol. 74, p. 91 (In Japanese).

IGI, S. (unpublished): 1: 50,000 geological map of "Tari" and its explanatory text. Geol. Surv. Japan.

SHIBATA, K. & NOZAWA, T. (1968): K-Ar age of Omi-schist, Hida Mountains, Japan. *Bull. Geol. Surv. Japan*, vol. 19, p. 243-246.

TOTTORI-KEN (1966): 1: 100,000 geological map of Tottori prefecture and its explanatory text (in Japanese).

YANAGI, T. (1967): On the Chikugo metamorphic rocks (Abstract). *Jour. Geol. Soc. Japan*, vol. 73, p. 113 (in Japanese).

鳥取県多里地方における三郡変成岩中の白雲母の K-Ar 年代

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要 旨

鳥取県多里地方の三郡変成岩の白雲母石英片岩中に含まれる白雲母は K-Ar 法によると 175 ± 9 m.y. と 169 ± 8 m.y. を示した。これらはジュラ紀中期に相当するが、三郡変成作用の時代に対する一般概念とは相当かけはなれたものがある。

地 名

Hino-gun	日野郡	Tari	多里
Nichinan-cho	日南町	Tottori	鳥取
Omi	青海		