

## Potassium-Argon Age of Ryoke Granite from Obatake, Yamaguchi Prefecture\*

by

John A. Miller\*\* & Ken Shibata\*\*\*

Recently, Miller, Shido, Banno and Uyeda<sup>1)</sup> determined the geological age of the Ryoke granite from the Dando district, using the potassium-argon method of geochronometry, and similar work has been done by Banno and Miller<sup>2)</sup> on granodiorite from the Abukuma metamorphic zone. In both areas the samples measured gave ages of about 95 million years, a figure considerably less than had previously been put forward on geological grounds, by some workers.

The significance of these measurements, together with other results, has been summarised and discussed by Kuno<sup>3)</sup>, and in this work further information on the Ryoke metamorphic belt is presented.

Samples of the Ryoke granite from Obatake, Yamaguchi prefecture were collected from a quarry 1.5 km north of Obatake railway station. In the area, the commonest rock type is a gneissose granodiorite, of migmatitic nature, referred to by Nureki<sup>4)</sup> in his work on the district as the "Obatake gneissose granodiorite". From these rocks, samples of biotite were isolated using a magnetic separator, and it was upon this mineral that the measurements were made.

Age determinations were carried out using the total volume method. In this technique, the total volume of argon obtained from the rock by fusion was measured using a McLeod gauge, then corrected for its atmospheric argon content, by measuring the  $A^{40}/A^{36}$  ratio of the gas. From a knowledge of the  $A^{40}/A^{36}$  ratio of the atmospheric argon, and assuming that the rock has not generated argon-36 by some radioactive process, it is possible to subtract the volume of argon-40 of atmospheric origin and to find the volume of argon-40 derived from the radioactive decay of potassium-40 present in the material.

Potassium is estimated using the 'EEL' flame photometer. The biotites are dissolved in hydrofluoric acid, and the resulting solution evaporated to dryness, then redissolved in 50% sulphuric acid. Excess ammonium carbonate and ammonium hydroxide are added to precipitate heavy metals as their carbonates, and to render the solution slightly alkaline. These are measured against standard potassium sulphate solutions.

Errors may arise from inaccuracies in the measurement of argon volumes, of the potassium content, and the uncertainty in the isotopic ratios. Results show that a one percent error in either the volume of the argon or the proportion of  $K_2O$  would introduce a one percent error in the final age. Using a McLeod gauge, the volumes of argon dealt with in this work are probably measured correctly to  $\pm 3\%$ .

\* J. A. Miller 氏により柴田賢が指導を受け、この研究は共同で行なった。

\*\* Department of Geodesy and Geophysics, Madingley Rise, Madingley Road, Cambridge, England

\*\*\* Technological Department

The results given in Table 1 indicate that the migmatization which produced this rock took place some 84 million years ago, in the Upper Cretaceous<sup>5</sup>. Ages of Ryoke rocks from the Dando district and Abukuma metamorphic zone are slightly greater than this (about 95 million years). The general age of metamorphism in the two areas where Ryoke type rocks exist is, however, similar, which further supports the new concepts of the geology of Japan which are emerging from this work.

Table 1  
Results of Potassium-Argon Dating

Sample Ref.	Mesh	Volume of argon (mm <sup>3</sup> ) Weight of sample (gm)	Atmospheric contamination (%)	K <sub>2</sub> O p.c.	$\delta_V$	$\delta_T$	Age (in million yr)
H/3	20-40	0.029	14.1	8.95	1.8	0.81	82
H/4	40-60	0.028	14.1	8.46	0.9	0.82	84

$\delta_V$  = percentage standard deviation in volume of radiogenic argon due to uncertainty in isotopic ratio of the specimen.

$\delta_T$  = error in age due to a one percent error in proportion of K<sub>2</sub>O or volume of radiogenic argon.

$\lambda\beta = 4.72 \times 10^{-10} \text{ yr}^{-1}$ ,  $\lambda_e = 0.584 \times 10^{-10} \text{ yr}^{-1}$ .

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