

Potassium - Argon ages of the Amritpur Granite, District Nainital, Kumaun Himalaya and its stratigraphic position

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Abstract

Potassium-Argon ages of muscovite and biotite, separated from the Amritpur Granite, District Nainital, Kumaun Himalaya, determined in the 'Geochronology Laboratory' of the IGM Institute of the USSR Academy of Sciences, Moscow, are 1880 ± 40 m.y. and 1330 ± 40 respectively. The granitic body apparently shows intrusive relationship with quartzite-metavolcanic association of the Bhimtal-Bhowali area of which the latter has given a whole rock K-Ar age of 228 ± 10 . These reveal that the Amritpur Granite is composite in nature intruded in Middle Proterozoic Period (1880 ± 40 m.y.) and later remobilised at different periods with the development of tourmaline granite in the peripheral parts, as the latest phase.

Introduction

The Amritpur Granite (Nautiyal, 1955), a lensoid granitic body, extends from Surajjala in the west to Barhoan in the east, in the Nainital District, Kumaun Himalaya. In the south, the main boundary fault along which the Gola River runs partly separates the Amritpur Granite from Lower Siwalik Formation. To the north occurs the quartzite-metabasite association of the Bhimtal-Bhowali region (Varadarajan and Rawat, 1976).

Controversy exists regarding the age and stratigraphic position of this granitic body. Nautiyal (1955) considered it as tectonically transported to the present position and not intrusive. Pande (1966, 1975, 1976) who called it as Ranibagh Granite after Middlemiss (1890) considered it as tectonically intruded into its present position in the period between Upper Cretaceous and Lower Tertiary. Saxena (1974) also assigned a Lower Tertiary age to it. Raina and Dungrakoti (1975) considered the Amritpur Granite and the 'Quartz Porphyry' of Heim and Gansser (1939) as the variants of one and the same body and intrusive into the 'Deoban Group'. Chatterjee (1976) opined that the granitic body was synkinematically intruded along structurally guided planes. Varadarajan and Rawat (1976) who gave a detailed petrographic classification of the Amritpur Granite considered it as intrusive into the quartzite-metavolcanic association of Bhimtal-Bhowali area and later thrust together against the Lower Siwalik Formation. Varadarajan (1976) on the basis of K-Ar dating of the metavolcanics of Bhimtal-Bhowali area assigned Permo-Carboniferous age to it and correlated it with Panjal Volcanics in Kashmir and Abor Volcanics in NE Himalaya.

The present paper deals with the K-Ar age of the micas from the Amritpur Granite and its stratigraphic position.

Selection of Samples and Age Determination

Two fresh samples of Amritpur Granite—one from the equigranular variety from the southern part and another porphyritic variety from the middle part of the granite massif were selected for K-Ar age determination. Age determinations were made on the minerals, muscovite and biotite, separated from the two samples respectively.

The age determination was carried out in the Geochronology Lab of the IGEM Institute of the USSR Academy of Sciences, Moscow. The ages were calculated by using the following decay constants, accepted by the USSR Geochronological Commission since 1964 and revised in 1977.

$$\lambda_k = 0.557 \times 10^{-10} \text{ Yr}^{-1} ; \lambda_\beta = 4.72 \times 10^{-10} \text{ Yr}^{-1} \text{ and} \\ K^{40} = 0.000122 \text{ K (per weight).}$$

The ages obtained for the two minerals by applying the above decay constants are given in Table I.

TABLE I

S. No.	Lab. No.	Sp. No.	Rock/Min.	Analytical results		40 Ar Rad 40 Ar Total %	Age m.y.
				Contents at K%	Rad Argon ng/g ^x		
1.	8755	44	Muscovite	826 ± 0 ^{xx} .06	1795 ± 30	91 : 96	1880 ± 40
2.	8756	46	Biotite	1.03 × 0.01	1340 ± 2	83 : 94	1330 ± 40

^x) 1 nanogram (ng) = 10⁻⁹ gm.

^{xx}) The errors given correspond to a 90% probability level (standard deviation × 1.6).

Discussion

On field relationship the Amritpur Granite appears to have an intrusive relationship with the quartzite-metavolcanic association of Bhimtal-Bhowali area. It is also interesting to note that the K-Ar age of massive metabasite from Bhimtal area is 228 ± 10 m.y. (Varadarajan, 1976). But K-Ar ages of muscovite and biotite from the Amritpur Granite are 1880 ± 40 and 1330 ± 40, respectively. These ages represent the middle and upper Proterozoic ages for the muscovite and biotite occurring in the equigranular and porphyritic varieties respectively of Amritpur Granite. The different ages given by the two minerals, indicate the periods of intrusion and remobilisation respectively of the Amritpur Granite. The present K-Ar age determination of muscovite and biotite from Amritpur Granite and its earlier study reveals that it is a composite granitic body intruded in Middle Proterozoic Period and later remobilised at different periods in the Upper Proterozoic Period, the Permo-Carboniferous Period and perhaps during the Upper Cretaceous Period also.

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References

- CHATTERJEE, B., (1976) A note on the occurrence of Microgranite along the Main Boundary Fault in Amritpur area, Nainital District, U.P. *Him. Geol. Seminar*, Delhi, Abstract, p. 48.
- HEIM, A. A. and GANSSER, A., (1939) Central Himalayas—Geological observation of the Swiss Expedition (1936): *Mem. Soc. Helv. Sci. Nat.*, v. 73 (1), p. 245.
- MIDDLEMISS, C. S., (1890) Geological sketch of Nainital with some remarks on the natural conditions governing mountain slopes; *Rec. Geol. Surv. India*, v. 23, pp. 213-234.
- NAUTIYAL, S. P., (1955) Director General's Report for 1944 on Nainital district; *Rec. Geol. Surv. India*, v. 79, pp. 590-598.

- PANDE, I. C., (1966) Contributions to the Geology of Kathgodam area; *Centre Adv. Study Geology*, pp. 79-114.
- (1975) Recent Advances in Himalayan Geology; *Pres. Adr. Geol. and Geogr. Section, 62nd Indian Science Congress*.
- (1976) The Geology of Ranibagh Area, District Nainital, India, *Him. Geol. Seminar*, Abstracts 35.
- RAINA, B. N. and DUNGRAKOTI, B. D., (1975) Geology of the Area between Nainital and Champawat, Kumaun Himalaya, U.P. *Him. Geol.*, v. 5, pp. 1-28.
- SAXENA, M. N., (1974) Some observations on Granitic Rocks occurring to the west of Nepal: Abstract, *61st Indian Science Congress*.
- VARADARAJAN, S. and RAWAT, R. S., (1976) Some Aspects of Amritpur Granite, Nainital District, Kumaun Himalaya; *Him. Geol.*, v. 6, pp. 467-484.
- VARADARAJAN, S., (1976) Potassium-Argon Age of the Metabasites from the Bhimtal-Bhowali Area, Nainital District, Kumaun Himalaya and its significance; *Recent Researches in Geology* (Vol. 3) Prof. I. C. Pande Commemoration Volume.

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ANNOUNCEMENTS

New Secretary for the Society

Sri Y. N. Rama Rao has been appointed as Secretary, Geological Society of India, in place of Prof. C. Naganna who has resigned.

Mysore Geologists' Association Gold Medal

The Council of the Geological Society of India have decided to award the Mysore Geologists' Association Gold Medal for the year 1977 to Dr. S. M. Naqvi of the National Geophysical Research Institute, Hyderabad.

CORRECTION

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PROGRAMME FOR COMPUTATION OF GRAIN-SIZE DATA ON PROGRAMMABLE DESK CALCULATORS

by G. C. Bhattacharya and N. H. Hashimi

1. TABLE II (contd.) p. 296 step. 150 please read 'Halt (Read m'₃) Run' in place of 'Halt (Read M'₃) Run'
2. TABLE III p. 298 step 091 please read '[' in place of 'I'
3. TABLE III pp. 298-299 Please read 'a*' in place of 'a*' in Step Nos. 031, 040, 049, 162, 189, 223, 250, 264, 281, 328.