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Short Communication

Inclusion dating and phase differentiation in minerals. H. S. VIRK and SURINDER SINGH, *Department of Physics, Punjabi University, Patiala-147002, India.*

Fission track technique developed by Fleischer, Price and Walker (1975) has been used for dating of minerals and estimation of their uranium contents. The technique is being exploited by the authors for mineral phase differentiation and dating of uraninite inclusions in mica pegmatites of Rajasthan state (India).

The experimental details for preparation of pegmatite samples and their fission track ages have been reported in an earlier communication to Mineralogical Journal (Virk and Singh Surinder, 1977). It is observed on careful microscope scanning that mica matrix is impregnated with a number of uranium bearing inclusions. On further etching of samples with 48 per cent HF acid the number of fossil fission tracks revealed in these inclusions is found to be a few hundred thousand times more than the corresponding number in inclusion free areas of the mica matrix. This situation is clearly demonstrated in the microphotographs (Virk and Singh Surinder, 1977).

For dating the inclusions, mica samples are irradiated in the CIRUS Reactor, Trombay, Bombay with a total thermal neutron dose of 10^{16} (nvt). The induced fission tracks in the inclusion free area are counted in the mica matrix itself. But due to large density of induced fission tracks arising from uraninite inclusions, it is preferred to use an external detector for their counting. Lexan polycarbonate and cellulose nitrate are considered most suitable for their detection efficiency and low uranium contents.

The fission track age of three uranium bearing inclusions has been

calculated by using the age formula (Virk and Koul, 1975)

$$T=6.57\times10^{9}\log_e(1+9.25\times10^{-18}\times\frac{\rho_s}{\rho_i}\times\varphi)\,.$$

The f. t. ages are summarized in Table 1. It is evident that while mica pegmatite belongs to the Precambrian age the uranium bearing inclusions date later phase mineralization of uranium in mica. Hence, this method can be used for phase differentiation in minerals.

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Table 1. Fission track age of mica pegmatite and its inclusions.

Mineral (location)	S. No.	Ratio of fossil to induced tracks (ρ_s/ρ_i)		Fission track age (m. y.) T	
		Inclusions	Mica matrix	Inclusions	Mica
Muscovite (Bhunas mica mine, Rajasthan state, India)	1	0.19	1.57	133	1022
	2	0.19	1.58	133	1025
	3	0.19	1.57	133	1022

Total neutron dose (nvt) $\phi=1.16\times10^{16}$

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