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Zircon geochronology of Berach granite of Chittorgarh, Rajasthan

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Abstract

Discordant ages of zircons from Berach granite suggest that this granite crystallized around 2610 m.y. ago and lost lead during an episodic event around 710 m.y. The 710 m.y. date probably reflects a response to a regional thermal event also recorded in the 730 m.y. zircon age for the Mt. Abu 'Erinpura type' granite.

Introduction

One of the exposures of Berach granite is along the banks of Berach River at Chittorgarh. This granite is overlain by Vindhyan limestone.

Crawford (1970) established the stratigraphic position of Berach granite as pre-Aravalli and he estimated its whole rock Rb-Sr age to be 2585 m.y. or 2533 m.y., if the new decay constant of $1.42 \times 10^{-11} \times Y^{-1}$ is used (Steiger and Jäger, 1977). Henceforth in this paper all the references to Crawford (1970) data will be with respect to the new decay constant.

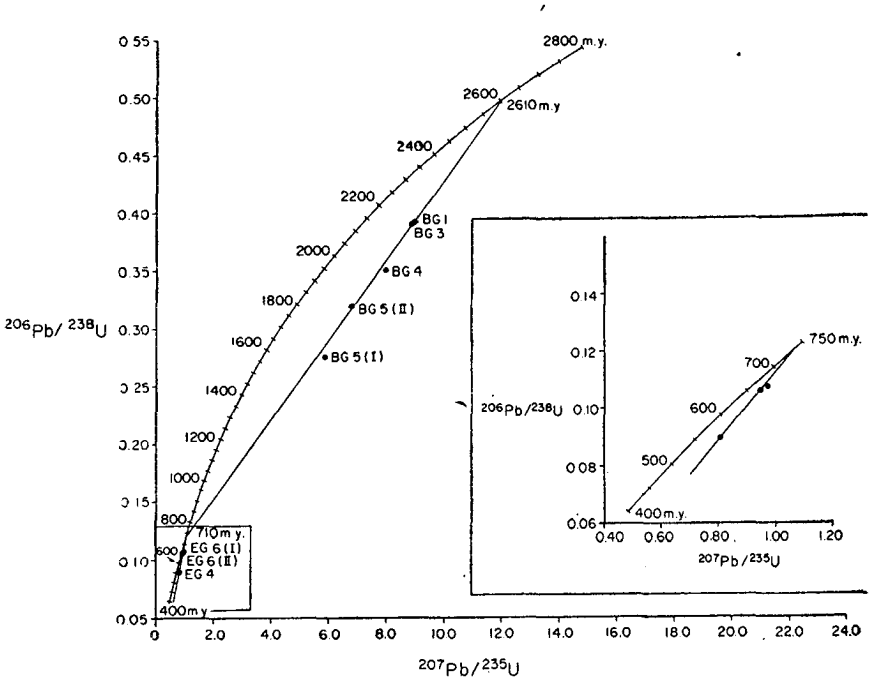

Figure 1. Concordia plot of zircon U-Pb data for Berach and Mt. Abu granites.

Result

Six samples each about 10 kg were collected by the senior author in 1976 and were processed to separate zircons for U-Pb age determination. Four samples yielded sufficient amounts of zircon for age analyses. All the four samples of zircon

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are magmatic and hyacinth in colour (transparent, orange-red colour). The analytical technique used is a modified version of Krogh (1973).

Table I shows the analytical result of these zircons. Table I also gives the result of zircons from granites of 'Erinpura type' from Mt. Abu. Figure 1 is a plot of the data in Table I on a concordia diagram (Wetherhill, 1956, 1963, and Tilton, 1960).

TABLE I. Zircon analyses for Berach and Mt. Abu Granites

Sample	ppm U	ppm Pb	Observed Atomic Ratios $\frac{208}{206}$	$\frac{207}{206}$	$\frac{204}{206}$	Ages (m.y.) $\frac{206}{238}$	$\frac{207}{235}$	$\frac{207}{206}$
Berach Granite								
BG1	234.1	105.3	0.1989 ±0.00023	0.1658 ±0.00014	0.00098 ±0.00002	2136	2335	2515
BG3	230.1	102.3	0.1679 ±0.00027	0.1644 ±0.00028	0.00035 ±0.00001	2129	2325	2501
BG4	219.3	87.5	0.1704 ±0.00135	0.1650 ±0.00091	0.00042 ±0.00000	1939	2229	2507
BG5 (I)	592.6	188.5	0.2531 ±0.00054	0.1542 ±0.00067	0.00196 ±0.00001	1571	1956	2392
BG5 (II)	591.2	218.1	0.2442 ±0.00045	0.1542 ±0.00014	0.00170 ±0.00001	1790	2086	2393
Mt. Abu Granite								
EG4 (74)	955.1	87.4	0.1339 ±0.0018	0.0653 ±0.00090	0.00036 ±0.00001	554	601	784
EG6 (I)	905.5	107.3	0.2453 ±0.0064	0.0652 ±0.00065	0.00099 ±0.00004	660	688	780
EG6 (II)	704.8	81.2	0.2402 ±0.00091	0.0646 ±0.00012	0.00128 ±0.00000	650	676	761

Note: (74) – 74 Micron
I – First run
II – Second run

Conclusion

It can be concluded from this investigation that: a) The crystallization age of Berach granite is 2610 m.y. which is comparable to whole rock Rb-Sr age of 2533 m.y. of Crawford (1970); b) These zircons underwent an episodic lead loss around 710 m.y., corresponding to 'Erinpura' post-Delhi event as shown by the crystallization age of Mt. Abu zircons. The lower intercept of Mt. Abu zircons gives an age of 184 m.y. which does not represent any known geologic event in the area and is probably due to continuous lead loss. It is apparent from this investigation that Berach granite intruded at least 2610 m.y. ago and was affected by the 710 m.y. 'Erinpura' post-Delhi regional thermal event.

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