

## FISSION-TRACK DATING OF KIMBERLITIC ZIRCONS

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Zircons separated from the matrix of kimberlite pipes can be dated by the fission-track method. The zircon fission-track age represents the last time the zircon cooled below approximately 200°C. In the case of a rapidly cooling kimberlite, it should date the time of emplacement, provided it was emplaced high in the crust where the temperature was less than 200°C.

Zircons from six kimberlite pipes have been dated with the fission-track method. One sample is from the Schaffer 3 pipe in Wyoming, and the other five are from African kimberlites (table 1).

Six small (0.1-mm) zircons from the Schaffer-3 pipe have an average age of  $377 \pm 9$  m.y. ( $\pm \sigma$ ). This age is compatible with the post-Silurian and pre-Pennsylvanian age estimated on geologic grounds for the Colorado-Wyoming kimberlites.

The zircons from the five African localities are splits of large crystals that were dated by the U-Pb method (G. L. Davis, written commun., 1977). Zircons from these five pipes have the following fission-track ages: Bultfontein ( $57.7 \pm 7$  m.y.), Monastary ( $60.9 \pm 7$  m.y.), Platbakkies ( $59.0 \pm 2$  m.y.), and Finsch ( $71.1 \pm 4$  m.y.), all in South Africa, and Nzega ( $54.3 \pm 7$  m.y.), in Tanzania. Four of these fission-track ages are considerably younger (about 30%) than the U-Pb ages, whereas at Platbakkies the fission-track age is only 12% younger than the U-Pb age.

At the present this discordance is unexplained. It could be the result of thermal track fading, or possibly some pre-emplacement history recorded in the U-Pb system.

Table 1. Fission-Track Data for Six Kimberlitic Zircon Samples

Sample	$\rho_s \frac{1/}{\times 10^6}$ t/cm <sup>2</sup>	$\rho_i \frac{2/}{\times 10^6}$ t/cm <sup>2</sup>	$\frac{3/}{\emptyset}$ $\times 10^{15}$ n/cm <sup>2</sup>	T $\times 10^6$ yr	$\frac{+2\sigma}{\times 10^6}$ yr	U ppm
Schaffer 3 (Wyo.)	30.4	8.95	1.86	377	19	150
Bultfontein (S. Africa)	.271	1.094	3.82	57.7	11	8.7
Monastary (S. Africa)	.344	1.30	3.77	60.9	7.7	10
Finsch (S. Africa)	1.51	4.99	3.85	71.1	3.7	39
Platbakkies (S. Africa)	11.16	12.02	1.04	59.0	2.7	350
Nzega (Tanz.)	.149	.635	3.80	54.3	8.7	5.1

$$\lambda_F = 6.85 \times 10^{-17} \text{yr}^{-1}$$

$$\frac{1/}{P_s} = \text{number of fossil track per cm}^2$$

$$\frac{2/}{P_i} = \text{number of induced track per cm}^2$$

$$\frac{3/}{\emptyset} = \text{neutrons/cm}^2$$