LETTER

^{40}K - ^{39}K ratio of cubic diamond from Zaire

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(Received April 18, 1988; Accepted May 30, 1988)

No anomaly was observed in the isotopic composition of potassium in the Zaire cubic diamonds, which show a K-Ar isochron-like relationship corresponding to 6.0 Gyr (Zashu *et al.*, 1986).

Zashu *et al.* (1986) reported K-Ar systematics on cubic diamonds from Zaire. They presented K- ^{40}Ar and K/ ^{36}Ar - $^{40}\text{Ar}/^{36}\text{Ar}$ plots for ten pieces of the diamond. If these plots are considered to be "isochron", the slope of the plots gives 6.0 Gyr, which is much greater than the age of the earth. One possible interpretation for this great K-Ar age is that $^{40}\text{K}/^{39}\text{K}$ in the diamond is much higher than that of normal potassium, resulting in a higher amount of the decay product ^{40}Ar (Zashu *et al.*, 1986). To examine this, we measured the isotopic ratio of potassium in the diamond.

Our Zaire cubic diamonds were obtained from the same marketing route as those of Zashu *et al.* (1986). The diamonds were cleaned well with boiling HF, HNO₃, HClO₄ and HCl acids. Each acid was highly purified by sub-boiling distillation. Potassium in the diamond was extracted by combustion with oxygen gas (purity; 99.99%) in a quartz apparatus as shown in Fig. 1. Cubic diamond (0.3–0.5 g) was placed at the bottom of the combustion tube without crushing. The potassium released from the diamond by combustion was collected on the wall of the combustion tube and in a condenser connected to the outlet of the combustion tube, and was then leached out with hydrochloric acid. The leaching solution was split into two parts, one for isotope ratio measurement and the other

for potassium abundance determination by the isotope dilution method. The total blank of the

Fig. 1. Schematic diagram of the diamond combustion apparatus. All parts are made of quartz. Cubic diamond sample was placed at the bottom of the combustion tube (20 mm i.d. $\times$ 130 mm), and burned in oxygen gas (purity; 99.99%).

Table 1. Isotopic ratio of potassium in Zaire cubic diamonds

Sample	$^{40}\text{K}/^{39}\text{K} (\times 10^4)^a$	Amount of K collected (μg)	Original weight (g)
1 ^b	1.249 ± 0.014	1.15	0.5420
2 ^b	1.197 ± 0.080	0.79	0.5156
3 ^b	1.241 ± 0.058	0.27	0.5132
4 ^b	1.248 ± 0.015	0.70	0.5540
5 ^b	1.238 ± 0.008	0.31	0.5303
6 ^c	1.276 ± 0.009	3.11	0.3403
Reagent ^d	1.267 ± 0.028		

^aError; 1σ .^bPotassium collected in the condenser of the combustion apparatus.^cPotassium collected in the tube and the condenser of the combustion apparatus.^dPotassium chloride (Merck, Suprapur).

whole procedure including combustion and leaching was lower than 31 ng. The isotope ratio of the potassium collected in the condenser was measured with a JEOL JMS-05RB. The $^{40}\text{K}/^{39}\text{K}$ ratios were normalized against $^{41}\text{K}/^{39}\text{K} = 0.07217$.

The measured isotopic ratios of potassium in the diamond are summarized in Table 1 along with that of a reagent. The amounts of potassium collected in the condenser were in the range of 270 to 1150 ng which was about one fifth of the amount of potassium collected in the combustion tube. Sample No. 6 (about 3.1 μg of potassium) was collected from both the tube and

the condenser. The isotopic ratio of potassium in the diamonds is identical to that of the reagent within the range of error. Our results for the $^{40}\text{K}/^{39}\text{K}$ ratios of the diamond and the reagent are close to the 1.255×10^{-4} adopted by the IUPAC (1984). As a consequence, the hypothetical interpretation advanced by Zashu *et al.* (1986) in terms of a "probable" isotope anomaly of potassium in the diamond is dismissed. At the same time, the data presented in Table 1 indicate that the radioactive decay constant of the potassium studied here has been substantially normal all the time. In any case the age presented by Zashu *et al.* (1986) should also be re-examined by other dating methods such as Rb-Sr systematics. Our interpretation of isochron-like relationship (Zashu *et al.*, 1986) from a chemical viewpoint will be presented separately.

Acknowledgments—We wish to acknowledge Prof. M. Ozima for the initial stimulus for this investigation.

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