AIRline analysis for shocked chondorites

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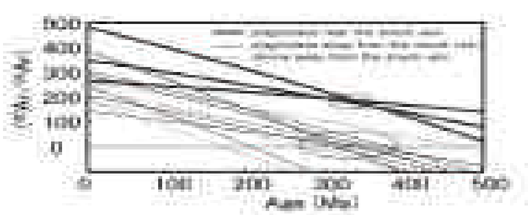
$^{40}Ar/^{39}Ar$ age studies of shocked meteorites require initial (or reset) $^{40}Ar/^{36}Ar$ ratios. Conventionally, isochron plots and/or inverse isochron plots have been used to obtain the ratios. We propose a new type of analysis called Age-Initial Ratio (AIR) line when isochrons cannot be well-defined (Figure). The $^{40}Ar/^{39}Ar$ age equation can be modified as

$$\left(\frac{^{40}Ar}{^{36}Ar}\right)_i = \frac{J\,^{40}Ar_m - {}^{39}Ar}{J\,^{36}Ar}\left(\exp(\lambda t)-1\right)$$

where $^{40}Ar/^{36}Ar$ ratio is expressed as a function of possible age. One AIRline corresponds to one data point in an isochron diagram. If data points have the same ages and initial ratios (i.e. having the same origin), they must go through the same single coordinate in the AIRline diagram. Normally, a group of crossing point is formed since data includes some errors.

We carried out laser probe $^{40}Ar/^{39}Ar$ analyses on a 5 x 5 mm^2 thin section of L6 chondorite, Y75097. Inverse isochron analysis yielded an impact age and $^{40}Ar/^{36}Ar$ initial ratio of 330 Ma and 185, respectively. However, it was difficult to define an isochron for the data away from the shock vein because of small amounts of ^{36}Ar with large errors.

We applied AIRline analysis on the data set, and obtained two groups of crossing points as shown in the figure. The three lines from plagioclase near shock vein gave the same results as the inverse isochron analysis. Data from plagioclases and olivines more than 1.5 mm away from the vein made a loose group of the same age but different $^{40}Ar/^{36}Ar$ ratios of nearly zero. This illustrates that the chondrite has two different $^{40}Ar/^{36}Ar$ ratios within a small area of a few millimeters. AIRline analysis provides a new approach to visualize the group of data with different $^{40}Ar/^{36}Ar$ ratios when isochron analyses are difficult.



Noble Gases Trapped in SiC Coated Diamond

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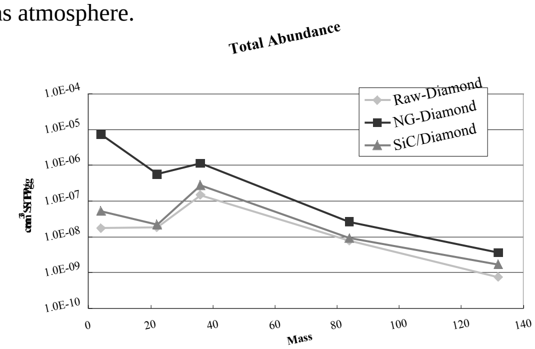
Matsuda et al. (1999) observed a strong relation of phase-Q with presolar diamonds. It seems mysterious that the release temperatures of Q-gases during pyrolysis lie between 1000-1200ºC which is about 200ºC higher than those of presolar diamonds. We think of the possibility that the coated material is completely different from diamonds. The plausible candidate is SiC.

Recently, Miyamoto et al. (2000) have succeeded in coating a β-SiC layer, several tens of nanometers in thickness, onto a diamond particle.

In this study, we have synthesized coated diamonds with SiC thin film at 1350ºC for 30 min in noble gases atmosphere at about 0.2atm. The particle size is 8-16μm. The components of the ambient noble gases were He 1%, Ne 1%, Ar 97.8%, Kr 0.1% and Xe 0.1%, respectively. We have measured the elemental abundances and isotopic compositions of noble gases trapped in the SiC/Dia (SiC coated diamond), the raw diamond powders and the diamond heated at 1350 ºC in noble gas atmosphere.



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