Iodine-xenon studies of ordinary chondrites using RELAX

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Introduction

RELAX (Refrigerator Enhanced Laser Analyser for Xenon - Gilmour *et al.*, 1994*a*) is a resonance ionization, time-of-flight mass spectrometer designed for the analysis of xenon from extra-terrestrial samples. It combines a species-selective resonance ionization ion source with a cryogenic sample concentrator and a low-volume time-of-flight mass analyser to achieve sensitivites such that a sample of 500 atoms produces in excess of 1 cps.

We have previously reported results of iodine-xenon analyses chondrules from the Bjurböle (L6) and Parnallee (LL3) meteorites (Gilmour *et al.*, 1994b). Here we present a preliminary report on the extension of this work to a wider selection of samples.

Experimental

Exotic clasts were separated from five ordinary chondrites and a sub-sample taken for irradiation for dating purposes, the remainder being used for petrographic and chemical analysis. Two samples were taken from Parnallee (LL3) and one each from Quenggouk (H4) and Barwell (L6). Each sample was initially subjected to dating by the Ar-Ar method (Ash *et al.*, 1994) before being loaded into the laser port of the RELAX mass spectrometer. Extractions were made using laser powers between 0.2W and 4W in an attempt to mimic conventional stepped heating experiments - this technique has proved capable of resolving correlated and uncorrelated $^{128}Xe^{*}$ in our previous work (Gilmour *et al.*, 1994*b*). Each extraction consisted of a 1 minute exposure to the laser, during which time the evolved gas was exposed to a hot zirconium getter, followed by immediate inlet to the mass spectrometer.

Results and discussion

Barwell: The isochron for the Barwell inclusion is shown in $+0.08 \times 10^{-4}$(Kirschbaum, 1986), enabling its use as a standard in these analyses. This inclusion also exhibits a correlation between $^{131}Xe^{*}$ (possibly derived from tellurium) and iodine-derived $^{128}Xe^{*}$ similar to that we have reported in Bjurböle chondrules (*f*

Parnallee: One of the samples analysed here (Parnallee 9) contains no detectable radiogenic $^{129}Xe^{*}$ while the other (Parnallee 6) has a clearly defined isochron (fig. 3). This is consistent with previous Ar-Ar (Ash *et al.*, 1994) and I-Xe (Gilmour *et al.*, 1994) analyses of Parnallee, indicating that the complexity of its whole-rock Ar-Ar stepped heating signature can be attributed to a mixture of degassed and undegassed material. Comparison of sample Parnallee 6 with the

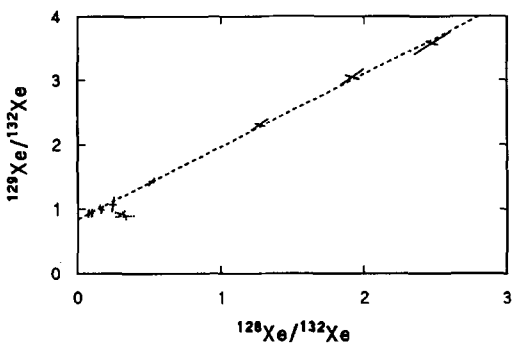

FIG. 1. Barwell 1 Isochron

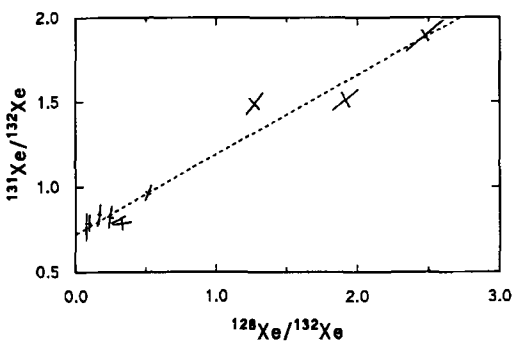

FIG. 2. Barwell 1 ^{131}Xe–^{128}Xe correlation.

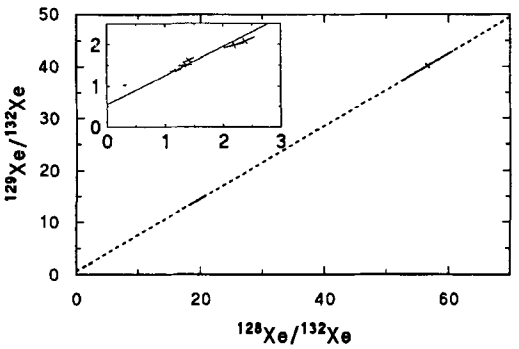

FIG. 3. Parnallee 6 Isochron.

Barwell inclusion suggests a formation age 5.0Ma after Bjurböle, compared to 4.62 (±0.44)Ma after Bjurböle for the cristobalite bearing inclusion CB1.

Quenggouk: In spite of the previously reported high Ar-Ar age (4.63±0.04 Ga, Ash *et al.*, 1994), this large porphyritic clast contains no $^{129}Xe^{*}$. Petrography suggests that the material in this inclusion may have been shock produced, which could also account for the anomalously old Ar-Ar ages (McConville *et al.*, 1988) as well as the absence of iodine-derived ^{129}Xe. This sample also contains small amounts of excess $^{131}Xe^{*}$, which exhibits correlation with excess $^{128}Xe^{*}$.

References

Ash R.D., Gilmour J.D. and Turner G. (1994) ICOG abstract (accepted).

Gilmour J. D., Lyon I.C., Johnston W.A. and Turner G. (1994*a*) *Rev. Sci. Inst.*, **65**, 617–25.

Gilmour J.D., Ash R.D., Hutchison R., Bridges J.C., Lyon I.C. and Turner G. (1994*b*) *Meteoritics* (submitted).

Kirschbaum C. (1986) *Meteoritics*, **21**, 414.