IODINE AND XENON SYSTEMATICS OF GRA 06129.

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Introduction: GRA 06129 (GRA 9) is an ancient ungrouped achondrite that has experienced a series of processes on its parent asteroid [1]. Our previous analyses of unirradiated GRA 9 [1] showed excess ^{129}Xe from decay of ^{129}I, either *in situ* or inherited, and $^{131-136}$Xe from fission of ^{244}Pu. Excess ^{129}Xe was thought to be hosted in a minor phase. An I-Xe age of ~75 Ma after Shallowater and an evolved trapped component have been reported [2] .

Experimental: Whole rock fragments (~1 mg) of GRA 9 were neutron irradiated (~10^{19} n cm^{-2}) converting the stable isotope ^{127}I to ^{128}Xe. Following irradiation the samples were laser step-heated at high resolution and Xe isotopes analysed using RELAX [3, 4]. ^{131}Xe is produced in the irradiation from Ba or Te and $^{131-136}$Xe are produced by neutron-induced fission of ^{235}U, allowing some mineralogical information about phases releasing gas at any temperature to be determined. A correlation between ^{129}Xe and ^{127}I during step-heating of a sample would indicate that some of the ^{129}Xe had been derived from *in situ* decay of ^{129}I. When this is the case, the ratio of excess ^{129}Xe and ^{127}I corresponds to the closure age of the material [5, 6].

Results: Three samples of GRA 9 have been analysed producing 116, 64 and 60 individual releases respectively. High concentrations of excess ^{128}Xe (corresponding to 10-30 ppm of I) released at low temperatures are attributed to Antarctic contamination [7]. Excess ^{131}Xe released at higher temperatures corresponds to Ba concentrations of 10-50 ppm, consistent with an origin in plagioclase [1].

A series of distinct high temperature releases were observed; each with contributions from Ba- and I-derived Xe alongside fission xenon and a trapped component. The systematics suggest an "original" phase with a consistent I/Ba ratio overprinted by contributions from a later phase containing iodine alongside U/Pu. Given the mineralogy of GRA 9, this may be attributed to the addition of (U/Pu-bearing) apatite to (Ba rich) plagioclase.

Small ^{129}Xe excesses were observed alongside these releases, but no overall correlation with I-derived ^{128}Xe was observed. This discordant behaviour suggests endmember models involving either inheritance of excess ^{129}Xe during secondary phase formation after complete decay of ^{129}I, or production of distinct secondary phases in a series of separate events distributed through time. In neither case can a closure age be reliably determined.

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