6.1.P04

^{176}Lu-^{176}Hf and Mg isotope systematics of the Juvinas eucrite

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^{176}Lu-^{176}Hf and Mg isotope measurements are reported for whole-rock samples and mineral separates of the eucrite Juvinas. Five whole-rocks have a limited spread in $^{176}Lu/^{177}Hf$ (0.0265–0.0285) and define an isochron (MSWD = 2.0) with slope of 0.092±0.015, within error of the chondrite isochron defined by [1]. Four pyroxene and plagioclase separates ($^{176}Lu/^{177}Hf$: 0.01513–0.08876; $^{176}Hf/^{177}Hf$: 0.28122–0.28776) define an isochron (MSWD = 1.1) with initial $^{176}Hf/^{177}Hf$ of 0.279873±0.000012 and slope of 0.08881±0.00052 (all 2sd).

Mg-isotopes were measured on one plagioclase and two pyroxene separates. The measurements were corrected for instrumental mass bias by the sample-standard bracketing technique, using the DSM3 standard. $\delta^{25}Mg$ values vary between +0.03 and +0.21‰. Excess ^{26}Mg ($\delta^{26}Mg^*$) was measured by correcting $^{26}Mg/^{24}Mg$ for mass bias using the exponential mass fractionation law ($^{25}Mg/^{24}Mg$ = 0.12663) and comparison with the terrestrial standard. Pyroxene and feldspar separates yield $\delta^{26}Mg^*$ = +0.037 to +0.058. Given our long-term reproducibility of ±0.020 ‰ on $\delta^{26}Mg^*$, the measured excess is statistically significant and thus contrasts with previous results [2].

These new data provide the following constraints on the evolution of the Juvinas eucrite and the HED parent body. (a) The presence of a $\delta^{26}Mg^*$ excess in Juvinas either implies that ^{26}Al was heterogeneously distributed in the early solar system or that basalts were produced in the parent body while ^{26}Al was present. The latter implies that ^{26}Al contributed to the heat production in the parent body and that the similar $\delta^{26}Mg^*$ in plagioclase and pyroxene means the Al-Mg isotope system was homogenised after extinction of ^{26}Al. (b) Intense bombardment of the HED surface that reset mineral Pb-Pb systematics producing a Pb-Pb age of 4320.7±1.7 Ma for Juvinas [3] is in excellent agreement with our ^{176}Lu-^{176}Hf mineral isochron age of 4291 ± 25 Ma ($\lambda^{176}Lu$ of 1.983±0.033 x 10^{-11} yr^{-1} [1]) and (?)homogenisation of the Al-Mg isotope system at this time.

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6.1.P05

Ni isotopes and early Solar System processes – A new chemical separation technique

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Ni isotopes in meteorite samples may provide important insights into the early history and processes occurring in the Solar System. The short-lived isotope ^{60}Fe is produced in stellar nucleosynthetic processes and decays to the stable isotope ^{60}Ni. The short half-life of ^{60}Fe (1.49 Myr) makes it potentially suitable as a chronometer to date early processes. Thus far, ^{60}Ni excesses have been found in achondrite meteorites [1], Allende CAIs and chondrules [2] and sulphides in unequilibrated ordinary chondrites [3,4]. Stable isotope measurements of nickel have not yet been reported but could potentially provide information about early solar system redox conditions, evaporation events, etc., in an analogous way to other transition metal isotopes such as iron [5].

We are carrying out a pathfinder study to search for ^{60}Ni excesses and investigate the Ni isotope systematics of olivine and metal from the main-group pallasites Imilac, Brenham and Krasnojarsk. Initial experiments on multi-element solutions and terrestrial rock samples show Ni can be successfully separated from matrix elements, including Fe and Mg, using two-stage ion exchange column chemistry. The first column uses AG1-X8 resin and is designed to separate Ni from Fe; Fe has an isobaric interference with Ni and also the presence of Fe hinders Ni separation in the second column stage. Ni is separated from matrix elements using Eichrom Ni resin, which is based on traditional dimethylglyoxime precipitation chemistry for Ni analysis. Results indicate nearly 100% recovery of Ni, which is imperative to eliminate possible mass fractionation effects [5]. Ni isotopes will be measured on the NHM/IC GV Instruments *IsoProbe* MC-ICP-MS. Preliminary measurements of Ni standards indicate that for 0.5ppm Ni, 2σ errors are <~0.3 ‰.

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