RUTHENIUM ISOTOPE COMPOSITION OF ALLENDE REFRACTORY METAL NUGGETS

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Refractory metal nuggets (RMNs) contain high abundances of refractory siderophile elements (W, Re, Os, Ir, Mo, Ru, Pt, and Rh) which are the first elements to condense from a gas of solar composition [1]. As some of the first solids formed in the solar nebula RMNs provide important information on the initial isotopic composition of the solar system at a very early stage. Ruthenium is a promising element to study in this regard, because bulk meteorites exhibit nucleosynthetic Ru isotope anomalies [2].

The Ru isotope composition of RMNs extracted from a ~30g piece of the Allende CV3 meteorite has been measured by MC-ICPMS. The RMN sample reveals large, mass-independent isotope anomalies of nucleosynthetic origin. For internal normalization to $^{99}Ru/^{101}Ru$, apparent excesses in all other Ru isotopes are consistent with a deficit in *r*-process nuclides as calculated using the *r*-process residuals inferred from the stellar model for *s*-process nucleosynthesis of [3].

Since Ru is among the first elements to condense from a solar gas, the most straightforward interpretation of the Ru isotope data is that they reflect an early isotope heterogeneity of the solar nebula. In comparison to the RMNs bulk CAIs exhibit much smaller Ru isotope anomalies and are characterized by a deficit in *s*- rather than *r*-process nuclides [2]. To account for these contrasting isotope signatures in RMNs and bulk CAIs, *r*- and *p*-process Ru nuclides must have been added to the CAI after formation of the RMNs.

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