

## **Re-Os geochronology of sub-micrometre meteoritic alloys through atom probe microscopy**

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Refractory metal nuggets (RMNs) are a sub-micrometre metal alloy composed of the highly siderophile elements, including Re and Os, found in primitive meteorites [1]. RMNs are thought to be among the earliest phases to form in the protoplanetary disk [2] and some may have a pre-solar origin [3]. Previous isotopic analyses of RMNs could not distinguish pre-solar RMNs from those formed in our Solar System for individual RMNs [2].

Atom probe microscopy (APM) can extract isotopic information from small sample volumes (<0.01  $\mu\text{m}^3$ ). It has been shown to robustly measure the isotopic ratios of Re and Os from complex synthetic alloys, comparable to RMNs, that are consistent with measurements from thermal ionisation mass spectrometry [4]. This approach was applied to RMNs.

Seven RMNs were extracted from ultra-refractory inclusions in the ALH 77307, Allende and Murchison meteorites. APM analysis of these RMNs reveals solar isotopic abundances for several elements, and Re-Os ratios that plot on a regression line consistent with that of the Solar System, as would be expected for RMNs that formed within a well-mixed solar nebula.

[1] Palme H. & Wlotzka F., (1976) *EPSL*. [2] Berg T., et al., (2009) *Astropys J*. [3] Daly L., et al., (in press), *Geochim. Cosmochim. Acta*. [4] Tessalina S., et al., (this meeting) *Goldschmidt 2017*.