NUCLEOSYNTHETIC MO ISOTOPIC ANOMALIES IN BULK CHONDRITES, CAIS AND IRON METEORITES.

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Introduction: Nucleosynthetic anomalies in planetary materials are very useful indicators of mixing and fractionation processes in the solar nebula as well as of genetic relationships between planetary bodies. Non-mass dependent isotopic variations among bulk planetary objects have been reported for Ti, Cr, Ni, Mo, Ru and W, whereas for other elements (Zn, Zr, Hf, Os) no resolvable anomalies have yet been found [e.g., 1-4]. Extent and significance of this isotope variability, however, are unclear because for some elements discordant results were reported. In the case of Mo, some found widespread isotopic anomalies among bulk planetary objects, whereas others reported a uniform Mo isotopic composition for all solar system materials. These discrepant results may reflect incomplete digestion of refractory phases in chondrites and/or analytical artifacts. Here we present new Mo isotopic data that was acquired using improved digestion and mass spectrometric techniques.

Samples and analytical techniques: We processed samples from the CI, CM, CO, CV, CR, CB, H and L chondrite groups, samples of all major iron meteorite groups and Allende CAIs A-ZH-1 to A-ZH-5 [5]. To investigate the effect of different digestion methods on the measured isotopic composition, chondrite samples were (i) fused with a CO_2 Laser prior to digestion in HF-HNO_3-$HClO_4$, or (ii) dissolved in acid without previous fusion. Iron meteorites were dissolved in HCl. After separation by ion exchange chromatography, the Mo isotopic composition was measured using the Nu Plasma 1700 MC-ICP-MS at ETH.

Results: - *Chondrites:* Except for CI and ordinary chondrites all investigated chondrite groups exhibit Mo isotopic compositions distinct from that of the Earth. Murchison exhibits the largest anomalies. The results are indistinguishable for both digestion methods, indicating that the Mo isotope anomalies are not due to incompletely dissolved refractory components. -*CAIs:* All CAIs have clearly resolved anomalies. -*Irons:* All groups except for the IAB and IIICD irons exhibit anomalies, the largest are found in the IVB irons.

Discussion: The anomalies are internally consistent for various internal normalization schemes and within a given meteorite group samples show the same anomalies. All observed anomalies can be successfully modeled with a 3-component mixture between terrestrial Mo, a s-deficit and a r-excess component, and can only be explained in terms of a nucleosynthetic origin. The presence of nucleosynthetic anomalies in meteorite parent bodies requires that the solar nebula was isotopically heterogeneous on a large-scale. Whether this feature of the nebula is inherited from a heterogeneous molecular cloud and thus would reflect incomplete mixing of presolar components, or was established during thermal processing of an initially homogeneous nebula, might be revealed by the correlation of nucleosynthetic effects for different elements [1]. Our data conforms a well-defined Mo-Ru isotopic correlation [6] but only poor correlations are found between Mo and Ti, Cr or Ni anomalies.

References: [1] Trinquier A. et al. 2009. *Science* 324:374-376 [2] Regelous M. et al. 2009. *EPSL* 272:330-338. [3] Dauphas N. et al. 2002. *APJ* 565: 640-644 [4] Sprung P. et al. 2010. *EPSL*. doi:10.1016/j.epsl.2010.02.050. [5] Burkhardt C. et al. 2008. *GCA* 72:6177-6197. [6] Dauphas N. et al. 2004. *EPSL* 226:465-475.