

## The Mo isotopic composition of iron meteorites and chondrites

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Mass-independent Mo isotope anomalies in different components of primitive chondrites bear testimony to the presence of various nucleosynthetic components in the solar nebula. The Mo isotope composition of bulk meteorites can thus be used to investigate the efficiency to which these nucleosynthetic components were mixed and homogenized in the solar nebula prior to accretion of meteorite parent bodies. Several studies reported Mo isotope data for a variety of meteoritic materials [1-4]. However, as these studies yielded inconsistent results, the degree to which the initial Mo isotope heterogeneity has been erased by mixing in the solar nebula remains poorly constrained. To address this issue we re-examine the Mo isotopic composition of iron meteorites and chondrites. We developed an ion exchange procedure to efficiently separate Mo from all interfering elements and measured the Mo isotopic composition using the Nu1700 MC-ICP-MS at ETH.

Iron meteorites analyzed so far include Canyon Diablo (IAB), North Chile, Negrillos, Sikhote Alin (IIAB), Cape York, Henbury, Charcas (IIIAB), Duell Hill (IVA) and Tlacotepec (IVB). Most of them do not show resolvable Mo isotope anomalies outside the external reproducibility obtained for the terrestrial standard (i.e.,  $\sim 1\epsilon$  unit for  $^{92}\text{Mo}$  and  $^{100}\text{Mo}$  and  $\sim 0.5\epsilon$  units for all other Mo isotopes for a  $^{96}\text{Mo}/^{98}\text{Mo}$  normalization). Bulk rock chondrites including Allende (CV3), Murchison (CM2), Bremervörde (H3) and Kernauvé (H6) were digested in teflon beakers at 200°C for 9 days. Allende and Murchison appear to show a s-process deficit/r-process excess in their Mo isotope composition, in agreement with earlier reported data [2,3]. However as [1] pointed out, the measured anomalies might be due to incomplete digestion of refractory phases having anomalous Mo isotope compositions. The H chondrites as well as a terrestrial basalt standard show no Mo isotopic anomalies outside analytical resolution.

[1] Becker & Walker (2003) *Nature* **425**, 152–155. [2] Yin *et al.* (2002) *Nature* **415**, 881–883. [3] Dauphas *et al.* (2002) *ApJ* **565**, 640–644. [4] Chen *et al.* (2004) *LPS XXXV*, Abstract #1431.

## Mobilization of toxic metals linked to microbial Fe(III)-reduction in contaminated creek soils

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In the area of Ronneburg, Germany, uranium mining led to contamination of soil and groundwater with metals and radionuclides. Geochemical evidence in a metal-enriched horizon of contaminated creek soil indicated Fe(III)-reducing conditions. The objectives of this study were to i) study the activity of Fe(III)-reducing bacteria (FeRB) and their effect on the mobilization of heavy metals and uranium, and ii) to identify active FeRB. Rates of Fe(III)-reduction were low, but increased in the presence of amended carbon sources. In anoxic soil microcosms, biostimulated with ethanol or lactate, Mn, Co, Ni, Zn, As, and U were mobilized during microbial Fe(III)-reduction. Direct reduction of Mn and As and reductive dissolution of Fe(III)-oxides likely caused the release of sorbed metals, with unexpected mobilization of U observed. Subsequent sulfate-reduction was concurrent with immobilization of U, Co, Ni, Zn, and As. During Fe(III)-reduction the active microbial population was characterized using a DNA stable isotope probing (SIP) approach, combined with terminal restriction fragment length polymorphism (TRFLP) analysis, and cloning/sequencing of 16S rRNA gene sequences. The Fe(III)-reducing community was dominated by *δ-Proteobacteria* related to *Geobacter* in the <sup>13</sup>C-ethanol microcosms. In the <sup>13</sup>C-lactate microcosms the microbial community was more diverse and taxa related to *Acidobacteria*, *Firmicutes*, *δ-Proteobacteria*, and *β-Proteobacteria* were detected. Populations of FeRB in enrichment cultures could only tolerate micromolar concentrations of Ni, Zn, Cu, and Cd. Microorganisms in these enrichment cultures were affiliated with the *δ-Proteobacteria* and *Firmicutes*, but were related to different species than the FeRB identified by SIP. Our results suggest that Fe(III)-reducing communities, stimulated with ethanol or lactate, facilitate metal mobility and could potentially cause metal-enriched soil horizons to be a source of metal contaminants to groundwater. However, the low tolerance of FeRB to metal stress indicated that metal mobilization may be slowed due to inhibition of Fe(III)-reduction *in situ*.