^{97}Mo isotope abundance enrichments in selected iron meteorites

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Molybdenum isotope abundance anomalies in iron meteorites have been reported and are characterized by either a coupled excess in p-and r-process material, or a corresponding deficit in s-process nuclides [1-3]. Isotopes of Mo are synthesized by p-process (^{92,94}Mo), s-only process (^{96}Mo), r-only process (^{100}Mo) and a combination of s- and r-process (^{95,97,98}Mo). Furthermore ^{97}Mo is the end-product of the extinct radionuclide ^{97}Tc which has a mean halflife of 4.2 Ma. Unfortunately ^{92,94,96}Zr and ^{96,98,100}Ru are isobaric with the corresponding Mo isotopes, which requires a chemical separation process to eliminate Zr and Ru, and produce a Mo extract suitable for mass spectrometric analysis.

Nine iron meteorite samples were subjected to a carefully designed ion-exchange process to remove any traces of zirconium and ruthenium, and the molybdenum isotope abundances were measured by thermal ionization mass spectrometry. After normalizing the isotope amount ratios to ^{98}Mo/^{95}Mo = 1.5401, we identified excess ^{97}Mo for some of the iron meteorites. We propose that this enrichment in the ^{97}Mo isotope abundance is the result of the decay of ^{97}Tc. Tc is highly siderophile and Mo is only moderately siderophile. Therefore, there would have been fractionation between these two refractory elements. The time that elapsed between the injection of ^{97}Tc and the formation of the cores of some asteroids was sufficiently short to enable the incorporation of live ^{97}Tc into the iron-rich cores of some parent bodies.

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[3] Dauphas, Marty & Reisberg (2001) *Astrophys. J.* **565**, 640-644.

Black crust on the dolomite in polluted urban atmosphere: Differences in dry and wet deposition dominated environments

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Building stones exposed to an urban atmosphere are subject to significantly accelerated weathering caused by relatively high concentration of atmospheric pollutants.

Black crust developed on the Middle Triassic dolomite exposed to weathering in relatively highly polluted atmosphere in Kraków (S Poland) were studied. Samples were collected in two contrasting environments - from the wall subjected to rainwater washing (wet deposition environment) and samples from the wall sheltered against rain (dry deposition environment).

The black crusts from both environments differ in color, morphology and mineral composition. Both are composed of gypsum with subordinate dolomite. In samples sheltered against rainwater washing soil derived dust (quartz, micas, feldspars), calcite and whewellite occur in small amount. In samples from rainwater washed surface also authigenic, non-stoichiometric dolomite ('protodolomite') and calcite in sheltered against rain samples are authigenic. This difference suggests that dissolution of the dolomite rock occurs on rainwater washed surfaces. Whewellite originates from the metabolism of microorganisms.

Values of δ^4S_{CDT} (1.88-5.75‰) and $\delta^{18}O_{SMOW}$ (4.99-8.60‰) in gypsum from both groups of samples are very similar. δ^4S_{CDT} values are very close to those measured in rainwater in Kraków and generally slightly higher than in gypsum from black crust developed on the Jurassic limestone. Isotopic composition of S indicates that fuel combustion is its dominant source. Lack of differences in O isotopic composition can suggest that in both environments sulphate ion from aerosol dominates in gypsum. Formation of sulphate ion in reaction of SO_3 with water resulting from condensation on sheltered surfaces in conditions of relatively high relative humidity is probably negligible.