

WATER-SOLUBLE SALTS IN OMAN DESERT CHONDRITES.

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Introduction: Cut surfaces of chondritic meteorites collected in the central deserts of Oman in 2001-2003 show often efflorescence of salts after storage under room conditions. Analyses by EDS showed a predominance of Mg, Fe and Cl. The role of this salt was studied in the alteration of the chemical composition of meteorites by weathering originating from the prolonged resting of these specimen in the deserts of Oman by measuring the water-extractable ion concentrations in three meteorites.

Experiments: Salts were observed on surfaces that were cut with polypropylene alcohol as coolant. Three L chondrites of similar size but from different localities were studied showing different degrees of weathering (W1, W2, W4) and having terrestrial ages of 5000 and 17000 years, respectively. A slice of 5 mm was cut out of the meteorites. Out of these slices rods were cut and the rods were divided into pieces (~5x5x10mm, 1g mass). Series of samples forming profiles from the surface to the interior of the meteorites were contacted with water (1:10 dilution) for 24 hours and the resulting solution measured for the ions of interest by ion chromatography (F, Cl, NO₃ and SO₄) and by ICP-OES (Na, Mg, K, Ca, Fe, Sr and Ba). The concentrations of water-extractable elements were measured in soil samples (<0.15 mm fraction) from the same desert areas to obtain background salt concentrations. For seven meteorite samples weight loss/gain upon drying at 100°C followed by storage under room conditions was studied.

Results: From the soluble ions Cl and Fe dominate the resulting solutions by more than an order of magnitude. We do not find a diffusion controlled uniform decrease of the soluble compounds from the surface to the interior of the meteorites as measured for halogens in Antarctic chondrites [1]. It seems that the presence and number of cracks and veins control the transport of contaminants into the interior of the meteorites. The presence of localized veins is also indicated by the fact that a second series of samples from the same meteorite shows rather different leaching results. Weathering mobilizes chlorine from soils and leads to its enrichment in meteorite, aiding the oxidation of native iron into the soluble FeCl₂ compound, which is concentrated along veins and cracks. The bulk iron concentration in desert soil is about half the one in the meteorite samples, leaching of soil samples only liberates very small quantities of Fe due to its oxidized state in the soil. Among the ions leached from the meteorite samples, iron originates from the meteorite while chlorine must be a contaminant from the desert. Drying at 100°C led to a weight loss of 0.23±0.07wt.% in seven samples. After 150 days of reequilibration under room conditions, 51-79% of the lost mass was regained, indicating the presence of a hygroscopic constituent.

Conclusions: Weathering of meteorites influencing their composition in hot deserts is controlled by temperature regime, humidity and local composition of the soil and the duration of all these processes. The degree of alteration is therefore rather unique for every single specimen. The strong enrichment of chlorine in some chondritic meteorites in the Oman desert and the hygroscopic nature of Fe and Mg chlorides indicate the presence of a chloride brine in the pore space.

References: [1] Langenauer M. and Krähenbühl U. 1993 *Earth and Planetary Science Letters* 120: 431-442