TERRESTRIAL WEATHERING OF METEORITES FROM LUT DESERT (IRAN): A MULTIMETHOD APPROACH

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Introduction: Effects of terrestrial weathering of meteorites are observed in most of the finds. It can be evidenced as the formation of secondary minerals and enrichment/depletion of different chemical factors [e.g. 1 & 2]. It has been shown that weathering alters meteorites from distinct geographical conditions in a different way [3]. The information obtained from the quantification of these changes from different regions can give us insights into the meteorite weathering processes and paleoclimatology of the collection surface [3]. We report the preliminary data on the weathering effects of nine different ordinary chondrites (OCs) found in Lut desert (Iran) to compare them with those from other regions of the Earth.

Methods: Magnetic susceptibility was measured to observe the effect of weathering on the magnetic minerals (mostly Fe-Ni metal). Polished sections and powders of ordinary chondrites from Lut and other hot desert were chosen. Reflected light microscopy was used to investigate weathering products. Primary and secondary mineral phases were investigated by XRD. [4] also present the iron mineralogy based on Mössbauer spectroscopy. Carbon (total, carbonate and organic) and N were measured by gas chromatography. ICP-AES (CEREGE) and ICP-MS (Università di Pisa) were used to determine major and trace concentrations.

Results: Weathering degree of Lut desert OCs varies between W2-W4. In most of the meteorites from Lut desert, troilite is transformed to pyrite/marcasite instead of iron oxy/hydroxides like in other hot deserts. Total C content of Lut OCs varies between 0.072-0.0328 percent which is much higher than the measured contents for two Atacama and one Moroccan OCs in this work. Lithium, Sr, Mo, Ba, Tl, Th and U are enriched by a factor of 2 to 100 with respect to fall OCs. Lithium and Tl enrichment exceeds what is reported from other hot deserts [5-7]. Enrichment in Sr is higher than in Atacama and similar to Saharan and some Omani meteorites. The Sr/Ba ratio is <1 for Atacama, near 1 or slightly larger for Saharan and Omani and >>1 for meteorites from Lut desert.

Conclusion: The chemical and mineralogical effects of meteorite weathering on OCs from Lut desert show considerable differences compared to other regions. Chemical data plots of OCs from Lut show distinctive fields and trends that are characteristics for these meteorites. In particular the Sr/Ba ratio can be used as a geographic fingerprint.

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