UNUSAL WEATHERING EFFECTS IN THE EL6 CHONDRITE NORTHWEST AFRICA 4282.

F. Brandstätter and G. Kurat. Naturhistorisches Museum, Burgring 7, A-1010, Vienna, Austria. franz.brandstaetter@nhm-wien.ac.at, gero.kurat@univie.ac.at.

Introduction: NWA 4282 is a recently described EL6 chondrite that exhibits some unusual weathering features. One rock fragment (mass ~ 1.5 kg) purchased in Morocco was partly covered by a brownish-black to light-brown crust. A cut through the fragment (polished plate) revealed that the crust has an average thickness of ~1 - 2 mm. Parallel to the surface and along cracks some brownish staining is visible. However, the interior of the meteorite consists of a light-grey to medium-grey groundmass and looks fresh without any indication of weathering. Surprisingly, it turned out that the apparently un-weathered interior has weathering grade W5 [1].

Results: Microscopically, the overall texture of the meteorite is characterized by (i) a strongly re-crystallized silicate matrix with crystals of enstatite and plagioclase of about 20- 200 µm in size, (ii) the presence of numerous empty "holes" resulting in a porous appearance, (iii) the low abundance of opaque phases which comprise mainly daubreelite, minor troilite and metal, (iv) occurrence of relic chondrules and (v) the absence of metal grains > 10 µm in size and of other sulfides typical for EL chondrites such as oldhamite and alabandite, e.g. [2]. In places, a yellow-brownish, yet unidentified (Na, Cr, Fe) sulfate is present. This phase, apparently being a terrestrial alteration product, occurs as aggregates up to 200 µm in size. Compositions of enstatite (in wt%: <0.05 FeO, 0.2 CaO, 0.8 Al_2O_3) and plagioclase ($Ab_{82}An_{15}Or_3$) are quite similar to the composition of these phases reported for the Neuschwanstein EL6 chondrite [3]. Silicon contents of kamacite (1.2 wt% Si) are within the compositional range reported for equilibrated EL chondrites [4]. SEM investigations revealed that many enstatite crystals in the interior of the meteorite contain narrow (< 10 – 20 µm) silica-bearing veins which are connected to each other. The veins have a "zig-zag" boundary to the surrounding enstatite host which apparently is the result of corrosion. Mostly, silica forms a seam attached to the enstatite whereas the central part of the veins is empty.

Discussion: The interior part of NWA 4282 has weathering grade W5 without exhibiting a corresponding Fe-staining. This indicates an unusual weathering process for this meteorite. The presence of numerous empty holes and the low abundance of opaque phases, especially the lack of large metal grains and the absence of oldhamite and alabandite suggest that these phases were dissolved and removed from the meteorite's interior. The presence of silica-bearing veins in enstatite indicate that aqueous alteration of enstatite took place under acidic conditions – as is also supported by experiments [5] which revealed that only under acidic conditions enstatite alters to silica whereas under alkaline conditions phyllosilcates are formed. The missing Fe-staining indicates metal dissolution at moderate O fugacity.

References: [1] Wlotzka F. 1993. *Meteoritics* 28: 460. [2] Brearley A. J. and Jones R. H. 1998. In: *Planetary Materials* (ed. Papike J. J.). Rev. Mineral. 36. Mineral. Soc. America:3/1-398. [3] Bischoff A. and Zipfel J. 2003. Abstract # 1212. 34th Lunar and Planetary Science Conference. [4] Zhang Y. et al. 1995. *Journal of Geophysical Research* 100: 9417-9438. [5] Ohnishi I. and Tomeoka K. 2005. *Meteoritics & Planetary Science* 40: A118.