SIGNS OF BIOWEATHERING IN ORDINARY CHONDRITES. I. Gyollai[1,2], M. Polgári[2], Sz. Bérczi[1], M. Veres[3], A. Gucsik[4], E. Pál-Molnár[5], [1]Eötvös University, Dept. of Materials Physics, Cosmic Materials Space Res. Group, H-1117 Budapest, Pázmány P. str. 1/a, Hungary, e-mail: gyildi@gmail.com; [2]Research Center for Astronomy and Geosciences, IGG, HAS, 1112 Budapest, Budaörsi str. 45, Hungary, e-mail: rodokrozit@gmail.com; [3]Wigner Research Centre for Physics, HAS, H-1121 Budapest, Konkoly-Thege M. str. 29-33, Hungary, e-mail: veres.miklos@wigner.mta.hu; [4]University of Johannesburg, Dept. of Geology, 2600 Auckland Park, Johannesburg, South Africa; [5]Szeged University, Dept. of Mineralogy, Geochemistry and Petrology, 6722 Szeged, Egyetem str. 2, Hungary, e-mail: palm@geo.u-szeged.hu

Introduction: Chondrite constituents are considered as solar cloud condensates and surviving primordial dust grains accumulated in chondrules and minerals. The chondrites are fragments of asteroidal sized parent bodies where several transformation processes occurred: thermal metamorphosis, impact induced shock transformations and aqueous alteration. The aim was a high resolution textural and mineralogical characterization of the transformation products of UOC.

Samples: We investigated Mező-Madaras, Knyahinya, Mócs and Nyírábrány meteorites. The Mező-Madaras chondrite is brecciated and xenolithic. In Knyahinya, Nyírábrány and Mócs the boundaries of the chondrules are obscured, while the matrix is partly recrystallized, with gradually grown mineral grains in the matrix.

Methods: High resolution petrographic structural-textural studies were undertaken on four thin sections using a petrographic microscope (OM). We used FTIR and micro-Raman spectroscopy for the determination and distribution of micro-mineralogy and organic compounds.

Microtexture: Mineralized microbially produced texture (MMPT) in the form of pearl necklace-like, vermiform inner signatures, embedded in the stone meteorites has been observed for the first time. Our observations (OM) focused on the iron-containing opaque grains, glass, olivines and pyroxenes, which were well populated by micrometer-sized microbial filamentous elements and clusters in their boundary region within the matrix and inside the minerals. In the chondritic textures we observed that microbial "invasion" started in the fine-grained matrix and extended into the chondrules mainly through the Fe-containing minerals. The MMPT is very extensive, reaches 70-80 % of the sections, and is intimately woven in the full cross-section of the thin sections of the whole stone meteorite. All thin sections showed signs of Fe mobilization and oxidation (brown haloes around mineral grains, brown filaments).

Mineralogy: *ATR-FTIR* The iron-oxidizing microbial structures have a mixed composition containing iron oxides (ferrihydrite. goethite) [1], olivine [2], and montmorillonite [3]. Hydrocarbon compounds were also detected (long chain hydrocarbon, diene; [4,5], and C-H stretching of aliphatic hydrocarbons [4]. The presence of olivine and montmorillonite spectra proves the weathering of olivine, while the appearance of ferrihydrite corresponds to bacterial originated remobilization of iron from olivine and troilite. IR vibrations of isoprenoids were also detected [5,6,7].

Raman spectroscopy Besides olivine and pyroxene, hydrogenated amorphous carbons and carbonyl and also peaks, related to organic materials of recent iron bacteria were detected (isoprenoid) [3]. The kandite group of minerals (kaolinite, dickite, halloysite) correspond to weathering of Fe-Mg-silicates [8]. The smectite group was also detected (montmorillonite, nontronite). The spectra also contain iron oxide phases (ferrihydrite, lepidocrocite, magnetite).

Results: Our data confirm dense and invasive terrestrial microbially mediated contamination in the chodrites, supported by microtexture, micromineralogy and embedded organic compounds, which effected most of the mass of the samples. As the transformation processes are supposed to happen on the parent bodies, it raises contradictions as it seems that these products manifest in microbially mediated texture. In our study we offer basically different interpretation to solve these contradictions.

References: [1] Glotch TD, Rossman GR (2009) Icarus, 204, 663–671. [2] Matrajt G, Muñoz GM, Dartois CE, d'Hendecourt L, Deboe D, Borg J (2005) Astron & Astrophys, 433, 979–995. [3] Parikh SJ, Chorover J (2006) Langmuir, 22, 8492-8500. [4] Rajasekar A, Maruthamuthu S, Muthukumar N, Mohanan S, Subramanian P, Palaniswamy N (2006) Corros Sci, 47, 257–271. [5] Orlov AS, Mashukov VI, Rakitin AR, Novikova ES (2012) J Appl Spectr, 79/3, 484-489. [6] Zhao J, Zhu H, Wu Y, Jian R, Wu G (2010) Chin J Polymer Sci, 28/3, 385–393. [7] Chen D, Shao H, Yao W, Huang B (2013) Internat J Polymer Sci, http://dx.doi.org/10.1155/2013/937284. [8] Frost RL (1995) Clays & Clay Miner, 43/2, 191-195.