First findings of impact melt in the IIE Netschaëvo meteorite

N. VAN ROOSBROEK[*1], L. PITTARELLO[2], C. HAMANN[3], A. GRESHAKE[3], V. DEBAILLE[1], R. WIRTH[4] AND PH. CLAEYS[2]

[1]Lab. G-Time, Université Libre de Bruxelles, 1050 Brussels, Belgium (* nvroosbr@ulb.ac.be, vdebaill@ulb.ac.be)
[2]Earth System Science, Vrije Universiteit Brussel, 1050 Brussels, Belgium (lidia.pittarello@vub.ac.be,phclaeys@vub.ac.be)
[3]Museum für Naturkunde, Leibniz-Institut für Evolutions- und Biodiversitätsforschung, 10115 Berlin, Germany. (christopher.hamann@mfn-berlin.de, ansgar.greshake@mfn-berlin.de)
[4]GeoForschungsZentrum Potsdam, D-14473 Potsdam, Germany (richard.wirth@gfz-potsdam.de)

About half of the IIE irons contain silicate inclusions [1]. They can be classified into five subgroups from primitive to differentiated [2]. The inclusions of Netschaëvo previously described in literature are chondritic clasts with preserved chondrules and belong to the most primitive subgroup [3]. This study focuses on two silicate inclusions of Netschaëvo, which present new features never described before, investigated with SEM/EDX, EPMA, Raman, and FIB-TEM.

The inclusions are characterized by a porphyritic texture dominated by olivine and pyroxene clasts embedded in a quenched melt, which is partially crystallized in microlitic domains. Large olivine and pyroxene grains (20-200 μm) exhibit subrounded- to amoeboid-shaped compositionally homogeneous cores ($Fa_{14.3\pm0.3}$ and $Fs_{14.8\pm0.3}Wo_{1.2\pm0.3}$, respectively) and locally hypidiomorphic overgrown and compositionally zoned rims (Fa_{25} to Fa_{34} and $Fs_{22}Wo_{1}$ to $Fs_{35}Wo_{14}$, respectively). Fine-grained olivine crystals in the melt are mostly hopper-shaped (Fa_{17} to Fa_{31}). A TEM foil taken from the quenched melt, at the boundary between the silicate and metal host, was investigated with TEM and reveals dendritic Cl-apatite, elongated thin crystals of P-bearing olivine, and phase-separated glass droplets.

The investigated inclusions show textures produced by shock melting, rapid cooling, recrystallization, and silicate liquid immiscibility. The compositions of the cores of large olivine and pyroxene grains are consistent with those reported in the chondrule-bearing inclusions [2] indicating common precursor material. This suggests that Netschaëvo is likely an impact-melt breccia and that collisions played a major role in the formation of the IIE group.

[1] Ruzicka (2014) *Chemie der Erde* **74**, 3-48. [2] Mittlefehldt et al. (1998) *Planetary Materials,* 4.1-4.195. [3] Bild and Wasson (1977) *Science* **197**, 58-62.