

BROWN-BLACK COLORED OLIVINES IN SOME MARTIAN METEORITES (SNC): LABORATORY SIMULATION OF SHOCK RELATED NEOFORMATION OF STRONGLY MAGNETIC NANO PHASES (NATIVE FE-NI, MAGNETITE)

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Recently, native Fe-Ni or magnetite nano particles in brown/black colored Fe-bearing olivines could be detected in several Martian (SNC) meteorites. Kurihara et al. (2008a,b) reported the results of laboratory shock experiments on natural San Carlos olivines: depending on the sample properties (olivine powder with/without graphite) and the degree of shock (20 – 46 GPa) magnetite (Ni free) or Ni bearing Fe nano phases could be detected in the olivine matrix by TEM, EDX and Electron Diffraction analyses. For our experiments, we used selected samples of this set (natural or powdered olivines). The very high sensitivity of our magnetic methods provides a detailed view to the effects of shock, especially dynamics and kinetics of this process, on the magnetic properties of olivines and consequently of the shock-induced neoformation of nano sized ferri(o)magnetic phases. The 40GPa sample (with graphite) behaves differently from all others because it contains quite a significant amount of native Fe (with low Ni) while both the 20GPa and the 40GPa sample without graphite are mainly dominated by magnetite like phases (eventually also maghemite or Mg-ferrite). Our data clearly indicate that already at 20GPa the magnetic signature and phase composition is significantly modified. Graphite was also found in Martian meteorites by Raman spectroscopy in YM 000593 (nakhlite) and SaU 060 (olivine phyric shergottite), but not in situ on Mars so far by the landers or rovers.

Martian Meteorites, shocked olivines, magnetic nano phases

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