

**THERMAL AND SHOCK METAMORPHOSIS IN NWA-5011 L6 CHONDRITE** I. Gyollai<sup>1,2</sup>, Sz. Bérczi<sup>1</sup>, Sz. Nagy<sup>3</sup> <sup>4</sup>A. Gucsik<sup>1</sup>Eötvös University, Dept. Materials Physics, Cosmic Material Space Research Group,H-1117, Budapest, Pázmány P. s. 1/a. Hungary, <sup>2</sup>Department of Lithospheric Research Center for Earth Sciences, University of Vienna, Althanstrasse 14, A-1090 Vienna, Austria, <sup>3</sup>University of Szeged, Department of Mineralogy, Petrology and Geochemistry, H-6722 Szeged, Hungary, <sup>4</sup>Research Centre for Astronomy and Earth Sciences, Hungarian Academy of Sciences, H-1112 Budapest, Budaörsi út 45. Hungary

**Introduction:** NWA 5011 L6 (petrologic type) and S6 (shock stage) chondrite was found in Morocco, but the falling event is unknown. The first detailed description of NWA-5011 meteorite is given by [1]. The NWA 5011 meteorite has intermediate (W3) weathering rate, it contains hematite and limonite as secondary minerals. The major mineral components are olivine (and ringwoodite), pyroxenes (and akimotoite), plagioclase (and both lingunite and maskelynite), and troilite. Minor components are magnetite, ilmenite, apatite, withlockite and chromite. NWA-5011 meteorite contains a large shock vein (7 mm thick), and melt pockets. The sample has granular texture with rounded (up to 1 mm) olivines and with well preserved chondrules (0.5-4mm).

**Methodology:** The investigated thin sections from NWA-5011 meteorite were prepared and polished to 30 µm in thickness. The mineral assemblages and texture were characterized with a Nikon Eclipse LV100POL optical microscope in polarized and reflected light modes (Eötvös University). The chemical compositions were determined using an Amray 1830 scanning electron microscope (Eötvös University, Budapest) with EDAX PV9800 EDS detector, a beam current of 1 nA and a defocused spot size of 10–50 nm. The collection time was 100 sec. For the measurements we used international olivine, pyroxene, and feldspar as standards. Analyses were determined at an accelerating voltage of 20 kV.

**Results and discussion:** NWA-5011 is composed of 26 chondrules up to 4 mm, shock-metamorphism driven melt veins and recrystallized matrix. Our study purposes reconstruction of the original texture overwritten by the shock features NWA-5011

meteorite. The chondrules composed of olivine (in shock vein as ringwoodite), pyroxenes (in shock vein as akimotoite and majorite), and they have mostly porphyritic texture (up to 1 mm), 1 large glassy chondrule (5 mm), 4 radial chondrules (0.5-4 mm). Radial chondrules have more texture type: pyroxene-lath (3 chondrules), wormy intergrowth (2 chondrules) with spongy texture. Several granular chondrules have partly spongy texture because of thermal annealing. Two radial chondrules (0.5 mm) started to recrystallize to microgranular-microporphyritic texture. More chondrules are sheared and fragmented by shock veins. Inside the large shock vein the chondrules are melted, sheared, and original pyroxenes and olivines are altered to their high pressure polymorphs.

**Conclusion:** The original texture was well preserved in the less shocked part of NWA-5011 sample. Shearing of chondrules is the signature of the initial stage of shock metamorphism (high pressure related process). Presence of large chondrules with well crystallized rim (glassy, radial chondrule) suggests that the initial petrologic type of the meteorite might have been L4 before the overprinting of shock metamorphic processes.

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**References:** Nagy, Sz., Bérczi, Sz., Józsa, S., Gucsik, A., Veres, M., 2010. 41st Lunar and Planetary Science Conference, #1228



Figure 1. Chondrules in our section of the NWA-5011 L6 and S6 chondrite sample. Note the wide black shock vein.

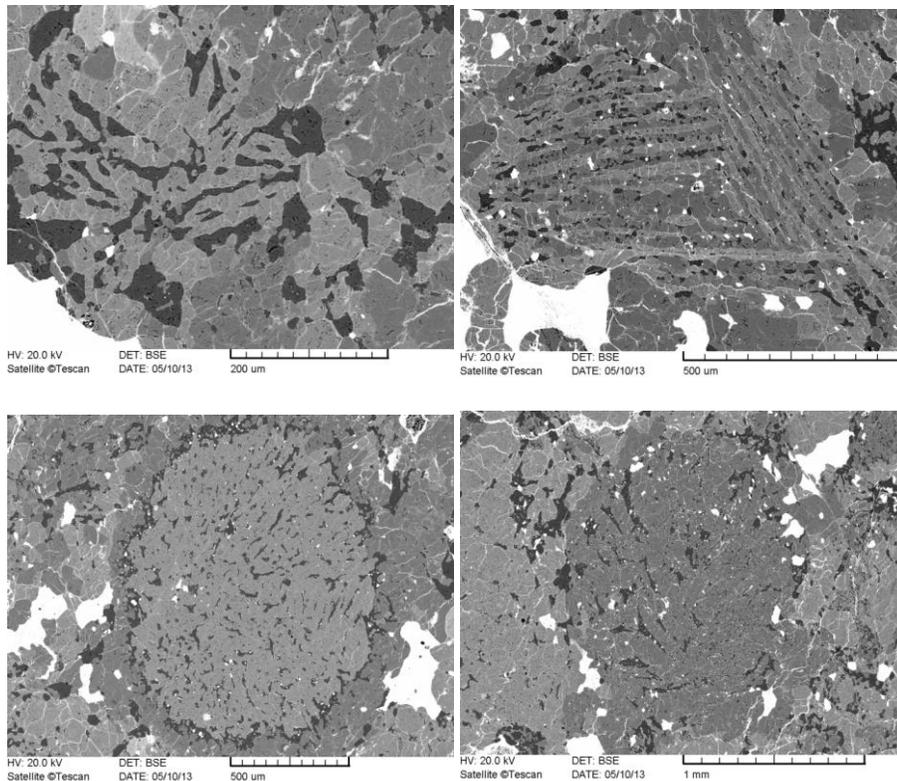


Figure 2. A) olivine-feldspar in barred-granular chondrule with recrystallized rim. B) radial-barred chondrule with more crystallization growth of olivine containing melt pockets. C) olivine chondrule with spongy texture and melt rim D) granular-barred chondrule with pyroxene.