SHOCK-TRANSFORMED OLIVINE GRAINS TO RINGWOODITE IN THE METEORITE OF NWA 5011. Sz. Nagy[1] (ringwoodit@yahoo.com), A. Gucsik[2] [1]Eötvös Lóránd University of Budapest, H-1117 Budapest, Pázmány Péter sétány 1/c., Hungary; [2]Max-Planc Institute for Chemistry, Department of Geochemistry, Joh.-J. Becherweg 27, D-55128, Mainz, Germany.

Introduction: The ringwoodite (γ-phase olivine) was firstly identified in Tenham meteorite in 1969. During the last 40 years, ringwoodite has been determined in many other meteorites especially in L-type chondrites. Ringwoodite may coexist with wadsleyite (β-phase olivine) which has a pale fawn colouration [1-4]. The ringwoodite formation have take place in shock-induced melt veins, which contains the matrix of mixtured glassy and other high pressure mineral polimorphs. The colour of ringwoodite varies between the meteorites, between different ringwoodite bearing aggregates, and even in one single aggregate [1]. We provide our optical observations about the ringwoodite aggregates in the shock-induced melt veins of NWA 5011 meteorite, and about the micro-Raman spectroscopy identification.

Sample and Experimental Procedure: The polished thin section of NWA 5011 meteorite was prepared with 30-µm in thickness. The mineral assemblages and texture were characterized with a Nikon Eclipse LV100POL optical microscope. Raman spectra were recorded with a Renishaw Rm-2000 Raman spectrometer attached to a Leica DM/LM microscope. The laser wave lenght was 785 nm, with focused energy of 8 mW. The microscope has focused the excitation beam into a 1-µm diameter spot.

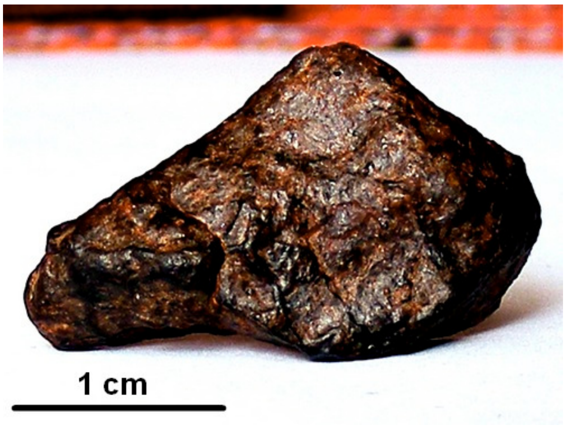

Fig. 1. *The hand specimen of NWA 5011 meteorite. On the left side occur a 2-mm wide shock-induced melt vein.*

The NWA 5011 meteorite was found in Morocco, in 2005. The most characteristics features are on the hand specimen the shock-induced melt veins, which some of them reach 5-mm wide (*Fig. 1*). The main modal components are: pyroxene, olivine, maskelynite?, and opaque phase. The pyroxene grains occur as euhedral, tabular grains, with high density cracks. The weathering rate for the sample is W3. The olivine occur as euhedral or subhedral grains, and colorless.

Discussion: In the NWA 5011 meteorite the olivine grains transform in partly and/or complete to ringwoodite. They have vary colors from dark blue to pale blue. Most of times they occur as mineral assemblages in the shock-veins (*Fig. 2*). However, some grains occur as a large monocrystal, which are more than 100-µm long, and 50-µm wide. In the case of large monocrystals the transformation is almost complete. The transformation mechanism of olivine to ringwoodite is most probably to beginning of the nucleation of growing crystallites during the release of shock-pressure [5]. The characteristic granular texture of transformed ringwoodite assemblages might have represents this mechanism. In some cases the edges of ringwoodite grains occur as glassy boundaries. It is interesting to note, that shock-veins which have in the central part of the sample, we didn't identify ringwoodite, on the other hand at that shock-veins that lie in outer region of the bulk rock contain abundant ringwoodite aggregates. It is probably due to the high-temperature is being longer times within the sample, and because the size of these shock-veins are significant, the slower cooling rate is not favour to remaining of the ringwoodites.

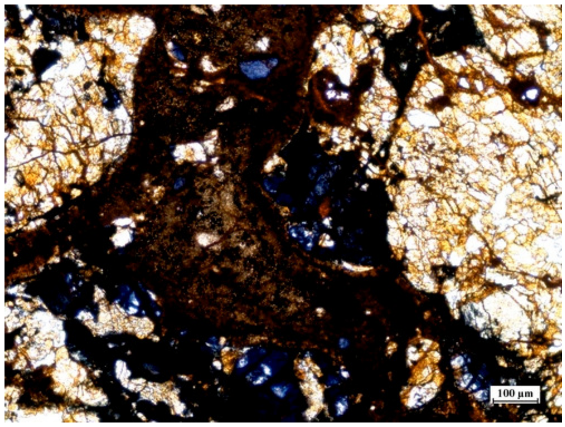

Fig. 2. *Plane-polarised light micrograph of ringwoodite assemblages in the NWA 5011 highly shocked meteorite.*

We didn't observe ringwoodite lamellae in host olivine grains. The ringwoodite crystallites are in excess of 10-µm in size. The NWA 5011 is an L6 chondrite with a complex shock-induced melt-veins, that suggests that the rock was a highly porous breccia before shock.

Raman spectroscopy identification: According to the [6, 7], the main vibrational peaks are at 799 and 844 cm^{-1} for ringwoodite. In our spectrum (*Fig. 3*), both vibrational peaks are present at 797 and 845 cm^{-1} respectively.

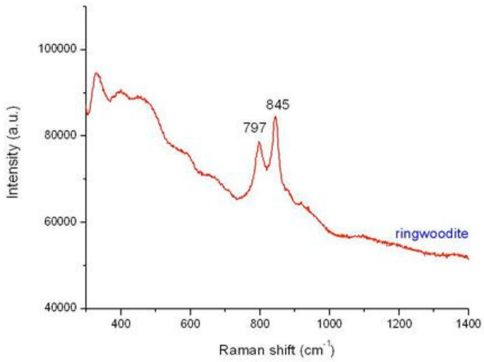

Fig. 3. *Raman spectrum of dark blue ringwoodite aggregate from the NWA 5011 meteorite.*

We didn't observe raman peaks of wadsleyite (β-phase olivine). We observed strong fluorescence at low Raman shift in the case of dark blue ringwoodite too, as it was detected by [5].

Conclusion: The NWA 5011 meteorite is a basic type rock with S6 shock-stage. The ringwoodite assemblages reflect the high pressure and temperature environment. We want to investigate in details the shock-veins environment by EMPA, and SEM, and understanding the formation mechanism and know the physical conditions of ringwoodite in this sample.

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