CHARACTERIZATION OF MUNDRABILLA IRON IAB-UNG METEORITE USING SCANNING ELECTRON MICROSCOPY AND MÖSSBAUER SPECTROSCOPY.

M. V. Goryunov and M. I. Oshtrakh, Institute of Physics and Technology, Ural Federal University, Ekaterinburg, 620002, Russian Federation, E-Mail: oshtrakh@gmail.com.

Introduction: Mundrabilla meteorite was found in 1966 in the Western Australia and classified as iron IAB-ung (medium octahedrite). A fragment of this meteorite have been characterized using optical microscopy, scanning electron microscopy (SEM) with energy dispersion spectroscopy (EDS) and Mössbauer spectroscopy with a high velocity resolution for the first time. This work presents the preliminary results of Mundrabilla iron meteorite investigation by mentioned techniques.

Experimental: Polished slice of Mundrabilla iron meteorite fragment was analyzed by means of optical microscope Axiovert 40 MAT (Carl Zeiss) and scanning electron microscope ΣIGMA VP (Carl Zeiss) with an X-max 80 energy dispersive spectroscopy device (Oxford Instruments). Then thin powder obtained from the fragment surface was studied using Mössbauer spectroscopy with a high velocity resolution at room temperature.

Results: Optical microscopy showed the presence of α-Fe(Ni, Co) and γ-Fe(Ni, Co) phases as well as plessite structures α-Fe(Ni, Co)/α_2-Fe(Ni, Co)+γ-Fe(Ni, Co) in Mundrabilla iron IAB-ung meteorite (see Fig. 1***a***). The content of Ni in the α-phase was found about ~7 at.% while that in α_2-Fe(Ni, Co) phase was in the range ~10–23 at.%. The content of Ni in the γ-phase was found in the range ~29–40 at.% including concentration region for paramagnetic γ-Fe(Ni, Co). The average Ni content in plessite structure was found ~12 at.%. The Mössbauer spectrum of Mundrabilla iron meteorite is shown in Fig. 1***b***. This spectrum demonstrates asymmetrical six-line shape which required more than one magnetic sextet for the best fit. The result of the best fit shows the presence of 5 magnetic sextets and small paramagnetic singlet. Basing on the hyperfine parameters these components can be assigned to α_2-Fe(Ni, Co), α-Fe(Ni, Co) and γ-Fe(Ni, Co) phases in the magnetic state and γ-Fe(Ni, Co) phase in the paramagnetic state. These results are compared with the Mössbauer data obtained for some other iron meteorites in [1, 2].

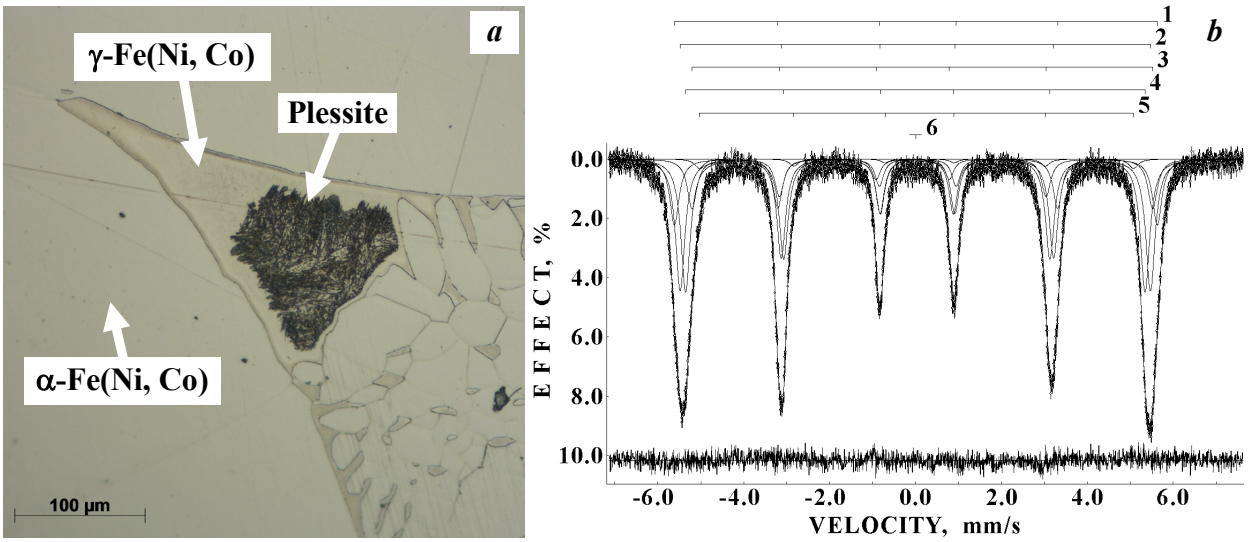

Fig. 1. Mundrabilla iron IAB-ung meteorite: optical microphotograph of the polished slice (***a***) and the room temperature Mössbauer spectrum, 1–6 are the results of the best fit, differential spectrum is shown below (***b***).

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References:

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