MÖSSBAUER SPECTROSCOPY OF GIBEON IRON IVA METEORITE.

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Introduction: Neumerous fragments of Gibeon meteorite were found in Namibia since 1838. This meteorite was classified as iron IVA (fine octahedrite). In this work we present the preliminary results of Gibeon iron meteorite study using optical microscopy, scanning electron microscopy (SEM) with energy dispersion spectroscopy (EDS) and Mössbauer spectroscopy with a high velocity resolution.

Experimental: Polished slice of Gibeon iron meteorite was prepaed by the standard technique. Then this sclice was analyzed using 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). Further thin powder was obtained from the fragment surface and used for the study by means of Mössbauer spectroscopy with a high velocity resolution at room temperature.

Results: An analysis of Gibeon iron IVA meteorite slice using optical microscopy demonstrated 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) (see Fig. 1***a***). The content of Ni in the α-phase was determined about ~7.2 at.% while that in the γ-phase appeared to be in the range ~27–34 at.% that indicates concentration region for paramagnetic γ-Fe(Ni, Co) phase mainly. The average Ni content in plessite structure was found ~11.6 at.%. The Mössbauer spectrum of Gibeon iron IVA meteorite is shown in Fig. 1***b***. This spectrum has asymmetrical six-line pattern which cannot be fitted well with one magnetic sextet. The result of the best fit demonstrates the presence of 4 magnetic sextets and small paramagnetic singlet. Basing on the Mössbauer hyperfine parameters we can relate these components to α_2-Fe(Ni, Co) and α-Fe(Ni, Co) phases in the magnetic state and γ-Fe(Ni, Co) phase in the paramagnetic state. The absence of magnetic γ-Fe(Ni, Co) phase correlates with the main Ni concentration range corresponding to the paramagnetic state of this phase. The presence of several spectral components which were related to the α-phase may be a result of variations in the local Ni concentrations which can give an average value of ~7.2 at.%. Mössbauer parameters of revealed spectral components are compared with the Mössbauer data obtained for some other iron meteorites in [1, 2].

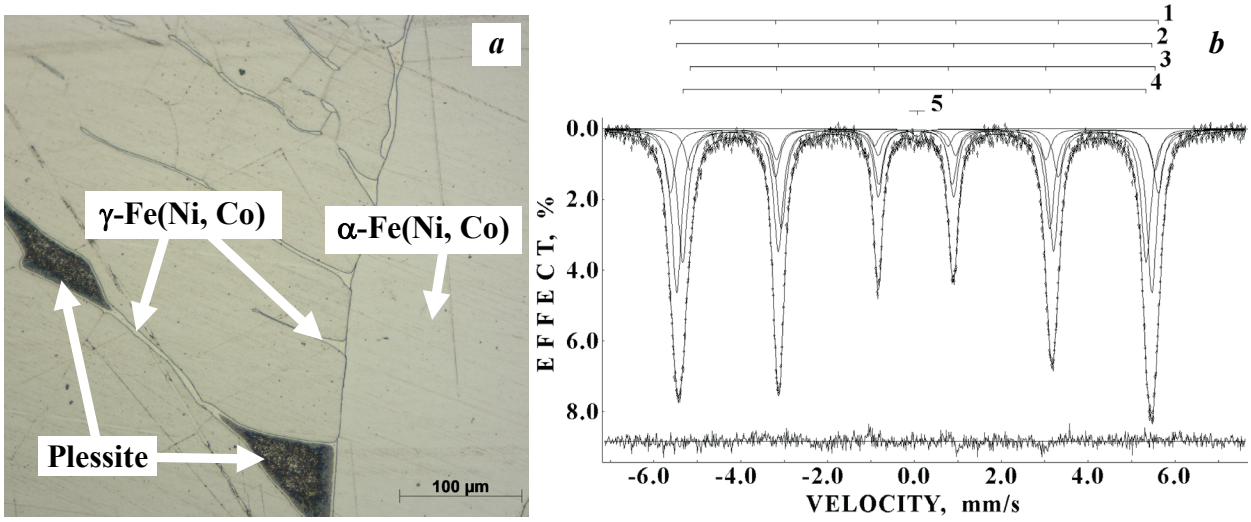

Fig. 1. Gibeon iron IVA meteorite: optical microphotograph of the polished slice (***a***) and the room temperature Mössbauer spectrum, 1–5 are the results of the best fit, differential spectrum is shown below (***b***).

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References:

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