TSAREV L5: RE-FITTING OF THE EXTRACTED METAL GRAINS MÖSSBAUER SPECTRUM.

M. V. Goryunov, E. V. Petrova and M. I. Oshtrakh, Department of Experimental Physics, Institute of Physics and Technology, Ural Federal University, Ekaterinburg, 620002, Russian Federation (goryunov_asd@mail.ru, evgeniya.petrova@urfu.ru, oshtrakh@gmail.com).

Introduction: Ordinary chondrites from L group contain 25–28 wt% of total iron and 15–19 wt% of iron in Fe-Ni-Co alloy. Therefore, in spite of Mössbauer spectroscopy with a high velocity resolution permits to extract spectral components related to the major an minor iron-bearing phases in the bulk material [1], it is not too easy to reveal the real number of magnetic sextets attributed to various phases in Fe-Ni-Co alloy from the Mössbauer spectra like it was done for iron and stony-iron meteorites [2–4]. Earlier the Fe-Ni-Co grains magnetically separated from Tsaev L5 powder were studied at room temperature by Mössbauer spectroscopy with a high velocity resolution in 2007 [5, 6]. However, further experience in the fitting of the complex Mössbauer spectra of Fe-Ni-Co alloy in iron and stony-iron meteorites [2–4] shows the necessity to re-fit this Mössbauer spectrum.

Results: New examination of the previously measured Mössbauer spectrum of the metal grains from Tsarev L5 and fitted without residuals in [5, 6] demonstrated some misfits at the residual that is a good criterion of the fitting quality. Therefore, this spectrum was re-fitted basing on the recent results for Fe-Ni-Co alloys [2–4] with residual for the control. The results of the new fit of the metal grains spectra with the new fit of the bulk Tsarev L5 spectrum done in [1] are shown in Fig.1. These results are different from those obtained in [5] and demonstrate revealing of more spectral components. A comparison of the new spectra fits shows 3 magnetic sextets found in the bulk sample and 4 magnetic sextets observed in the metal grains. The values of H_{eff} and relative areas for sextets associated with corresponding phases are the following: (**i**) ~342 kOe, ~1.4%, α_2-Fe(Ni, Co), ~339 kOe, ~2.7%, α-Fe(Ni, Co) and ~337 kOe, ~1.7%, α-Fe(Ni, Co) for the bulk Tsarev L5 and (**ii**) ~352 kOe, ~19.8%, α_2-Fe(Ni, Co), ~338 kOe, ~41.2%, α-Fe(Ni, Co), ~337 kOe, ~23.2%, α-Fe(Ni, Co) and ~318 kOe, ~6.1%, γ-Fe(Ni, Co) for the metal grains. The relative fractions of these phases in alloy are: ~24% α_2-Fe(Ni, Co), ~47% α-Fe(Ni, Co) and ~29% α-Fe(Ni, Co) in the bulk Tsarev L5 and ~22% α_2-Fe(Ni, Co), ~46% α-Fe(Ni, Co), ~26% α-Fe(Ni, Co) and ~7% γ-Fe(Ni, Co) in the metal grains. The latter shows similar results with the former except revealing the γ-Fe(Ni, Co) phase. Moreover, the value of H_{eff} for the α_2-Fe(Ni, Co) phase is larger for the extracted metal grain spectrum. These results show an importance to study the extracted metal grains from the bulk ordinary chondrites in addition to the bulk material.

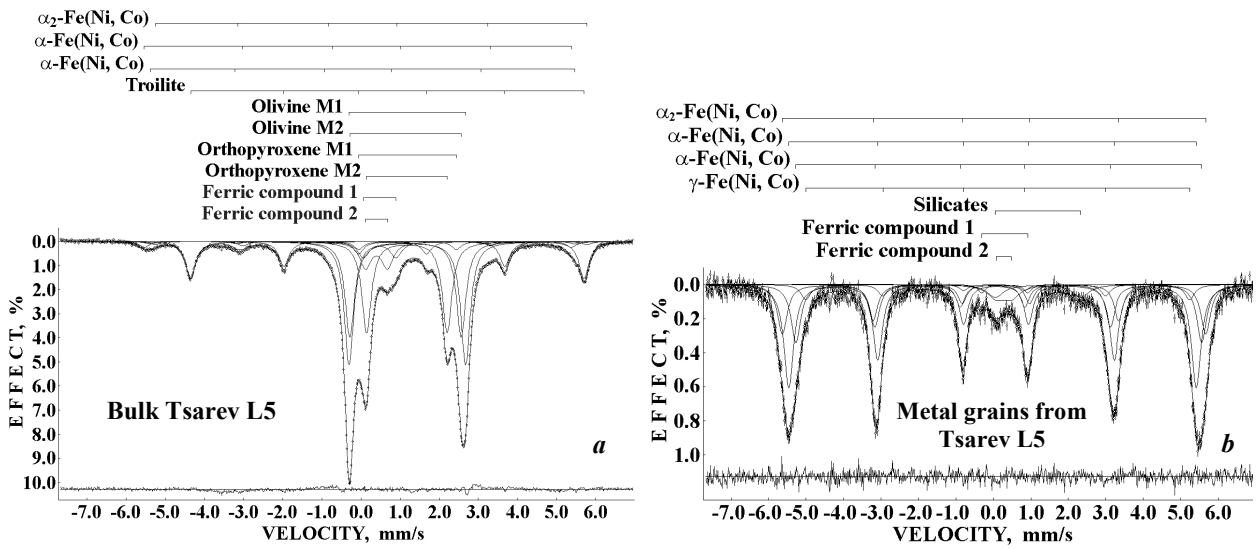

Fig. 1. Mössbauer spectra of the bulk Tsarev L5 (***a***) and Fe-Ni-Co alloy grains extracted from Tsarev L5 (***b***).

Acknowledgement: This work was supported by the Ministry of Science and Higher Education of the Russian Federation, project № FEUZ-2020-0060.

References: [1] Maksimova A.A. et al. (2017) *Spectrochimica Acta, Part A: Molecular and Biomolecular Spectroscopy* 172:65–76. [2] Goryunov M.V. et al. (2016) *Hyperfine Interactions* 237:15. [3] Goryunov M.V. et al. (2016) *European Journal of Mineralogy* 28:601–610. [4] Oshtrakh M.I. et al. (2018) *Journal of Molecular Structure* 1174:112–121. [5] Petrova E.V. et al. (2007) *Hyperfine Interactions* 177:81–87. [6] Petrova E.V. et al. (2008) *Journal of Physics and Chemistry of Solids* 69:1790–1795.