

STUDY OF ^{57}Fe OCCUPYING THE M1 AND M2 SITES IN OLIVINE FROM PALLASITES OMOLON AND SEYMCHAN USING MÖSSBAUER SPECTROSCOPY.

M. I. Oshtrakh¹, D. G. Patrusheva¹, E. V. Petrova¹, V. I. Grokhovsky¹ and V. A. Semionkin^{1,2}. ¹ Faculty of Physical Techniques and Devices for Quality Control and ² Faculty of Experimental Physics, Ural State Technical University – UPI, Ekaterinburg, 620002, Russian Federation. E-mail: oshtrakh@mail.utnet.ru.

Introduction: Mössbauer spectroscopy with a high velocity resolution appeared to be useful for evaluation of Fe^{2+} and Mg^{2+} distribution in two crystallographically non-equivalent six-fold octahedral sites denoted as M1 and M2 in both olivine and pyroxene in ordinary chondrites [1]. Therefore, in the present work this technique was applied for the study the ^{57}Fe in the M1 and M2 sites and evaluation of Fe^{2+} and Mg^{2+} distribution in olivines extracted from Omolon PMG and Seymchan PMG.

Experimental: Olivine samples extracted from Omolon and Seymchan fragments were powdered while magnetic fraction was removed using magnet. Olivine powder was used for sample preparation with thickness of $\sim 6\text{--}8$ mg Fe/cm^2 . Mössbauer spectra were measured in 4096 channels at 295 and 90 K using Mössbauer spectrometric complex described elsewhere [2, 3].

Results and Discussion: Mössbauer spectra of both olivines measured at 295 K have similar shape with peak asymmetry (Fig. 1) while those measured at 90 K have inverse peak asymmetry. Spectra were better fitted using 4 or 3 quadrupole doublets which were related to the ^{57}Fe in the M1 and M2 sites and minor ferrous and ferric compounds. Some differences of Mössbauer parameters and $\text{Fe}^{2+}\text{--Mg}^{2+}$ distribution in olivines from Omolon and Seymchan were discussed. Basing on relative areas of components 1 (M1) and 2 (M2) and well known data of olivine chemical analysis evaluation of $\text{Fe}^{2+}\text{--Mg}^{2+}$ distribution coefficient and temperature of equilibrium cation distribution was performed for spectra measured at 295 and 90 K. The results indicated differences of the ^{57}Fe dynamics in the M1 and M2 sites of olivines.

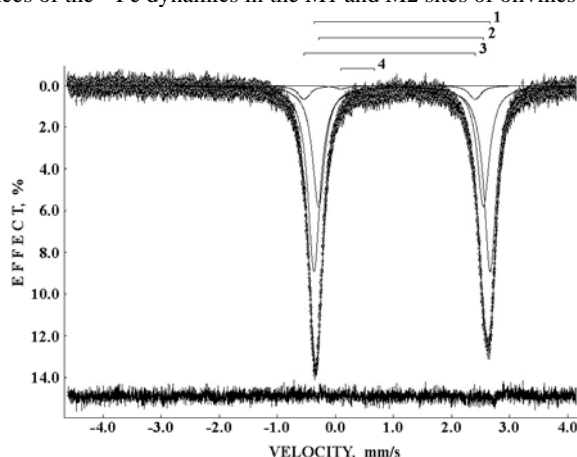


Fig. 1. Mössbauer spectrum of olivine from pallasite Omolon measured in 4096 channels at 295 K. 1 – ^{57}Fe in M1 sites, 2 – ^{57}Fe in M2 sites, 3 – ferrous compound, 4 – ferric compound.

References: [1] Oshtrakh M.I. et al. 2008. *Meteoritics & Planetary Sci.* **43**: 941–958. [2] Grokhovsky V.I. et al. 2009. *Eur. J. Mineral.* **21**: 51–63. [3] Semionkin V.A. et al. 2010. *Bull. Rus. Acad. Sci.: Phys.* **74**: 416–420.