

A COMPARATIVE STUDY OF TROILITE IN VARIOUS METEORITES USING MÖSSBAUER SPECTROSCOPY WITH A HIGH VELOCITY RESOLUTION.

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Introduction: Troilite FeS is the main sulfur mineral in the extraterrestrial matter. FeS was found in various meteorites in various forms (inclusions in iron meteorites or component of ordinary chondrites). Therefore, troilite may vary in different meteorites. To study meteoritic troilite Mössbauer spectroscopy with a high velocity resolution was used. This technique is useful for analysis of iron hyperfine parameters with high accuracy.

Experimental: Samples of various ordinary chondrites (Farmington L5, Tsarev L5, Vengerovo H6, Richardton H5, Saratov L4, Zvonkov H6) and FeS extracted from iron meteorite Sikhote-Alin IIAB were prepared as powder. Mössbauer spectra of these samples were measured using automated precision Mössbauer spectrometric system with a high velocity resolution [1] at room temperature in 4096 channels.

Results and Discussion: Mössbauer spectra of ordinary chondrites demonstrated usual complicated pattern with three magnetic sextets related to Fe–Ni alloy and FeS and five quadrupole doublets related to olivine, pyroxene and iron oxide. Mössbauer spectrum of troilite extracted from Sikhote-Alin consists of one magnetic sextet. It was interesting to observe variation of the values of magnetic hyperfine field for troilite in studied meteorites. This variation was in the range of ~308–323 kOe. The values of magnetic hyperfine field for troilite in ordinary chondrites may be divided in two groups with small differences of the field outside the instrumental error. The largest value of magnetic hyperfine field for troilite in ordinary chondrites was ~314 kOe for Zvonkov H6 while the smallest one was of ~308 kOe for Farmington L5. In contrast, the value of magnetic hyperfine field for troilite from Sikhote-Alin meteorite was ~323 kOe. These differences may be a result of small structural variations and deviations in stoichiometry in troilite from different meteorites. It is possible that small structural and composition variations reflect differences in mineral formation in the studied meteorites. Therefore, accurate Mössbauer hyperfine parameters of troilite may provide additional information for analysis of meteorites formation and evolution.

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References: [1] Semionkin V. A. et al. 2010. *Bulletin of the Russian Academy of Sciences: Physics* 74:416–420.