THE OCTAHEDRITE AND PALLASITE PART METALLOGRAPHIC COMPARISON OF THE SEYMCHAN METEORITE

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Introduction: The Seymchan meteorite was found in 1967 near the village of the same name in the Magadan Region and was classified as an iron meteorite (octahedrite type). The participants of the following expeditions managed to find in the same area a more rare type of meteorites - pallasite, which in addition to metallic minerals contains a large number of silicates. The authors [1] found that octahedrite and pallasite are parts of the same meteorite. Thus, it was proved that the Seymchan meteorite is a pallasite with large areas of a metallic alloy. As is known, the more preferable places for the nucleation of a new phase are the grain boundaries. In the pallasite part quantity of such boundaries (olivine/metal) is higher than in octahedral and, therefore, the probability of segregate of the α-phase is higher. We assume that this could affect the mechanisms of metal growth and, consequently, the structure. In this work, various metallographic parameters of fragments from the pallasitic and octahedral parts were investigated.

Experimental: Fragments from octahedral and pallasite parts of Seymchan (PMG) have been chosen for the research. Samples were cutted, grinded, polished and etched in accordance with standard metallographic technique. The meteoritic metal microstructure was examined using Zeiss Axiovert 40 MAT inverted microscope and FE-SEM ∑IGMA VP.

Both in octahedral part and pallasite part, group of parameters were measured: average width of zoned taenite (from the kamacite/tetrataenite interface to martensite α_2), average width of cloudy zone, average width of tetrataenite rim and average size of high-nickel particles in cloudy zones. Sizes of these particles were determined in compliance with [2].

Results and Discussion: One can find kamacite α-Fe(Ni, Co), taenite γ-Fe(Ni, Co), zoned taenite and plessite (α + γ) in the metallic structure of both part of the Seymchan meteorite. The plessite has coarse structure and, consequently, was formed according to nucleation mechanism V $\gamma \rightarrow \alpha 2 + \gamma \rightarrow \alpha + \gamma$ [3] as in pallasite and in octahedrite.

Average values of metallic structure parameters have been measured. For pallasite: size high Ni particles in the cloudy zone – 118 nm, the width of cloudy zone – 7,8 µm, the width of tetrataenite rim – 2,3 µm, the width of zoned taenite – 54 µm. For octahedrite: size high Ni particles in the cloudy zone – 142 nm, the width of cloudy zone – 7,7 µm, width of tetrataenite rim – 2,2 µm, width of zoned taenite – 61 µm. The average width of the cloudy zone, the width of tetrataenite rim, the width of the zoned taenite are about the same. So, deviation in the sizes of high nickel particles can not be explained by stereological or orientation effects and hint to the difference in formation process of these zones in pallasite and octahedrite parts of Seymchan has been found.

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References: [1] v. Niekerk D. et al. (2007) *Meteoritics & Planetary Science* 42:5196. [2] J. I. Goldstein et al. (2009) *Meteoritics & Planetary Science* 44:343–358. [3] Yang J. et al.(2010) *Geochimica et Cosmochimica Acta* 74:4471–4492.