MORPHOLOGY AND COMPOSITION OF MAGNETIC MICROSPHERULES FROM THE SNOWS OF ANTARCTICA.

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Introduction: Cosmic dust continuously flows to the surface of the Earth. Microspherules are found among the finds of cosmic dust. Their findings are ubiquitous. However, they have some similarities in structure and composition with volcanic and technogenic microspherules [1, 2]. The almost complete absence of continental and industrial dust in central Antarctica makes it possible to extract and study cosmic dust from fresh ultra-pure snow obtained in clean zones near the station. Therefore, for the search and further study of space spherules, we used the insoluble sediment collected from the snow in the area of Vostok station.

Methods: The first stage consisted of fieldwork related to the collection and filtration of freshly fallen clean snow, followed by laboratory research of particles deposited on the filters. An optical microscope and a steel needle were used to select microparticles. The steel needle made it possible to select magnetic microparticles, minerals - ferrimagnetic. With the help of a scanning electron microscope equipped with an energy dispersive analyzer, we have studied the surface microtextures and the composition of magnetic microspherules.

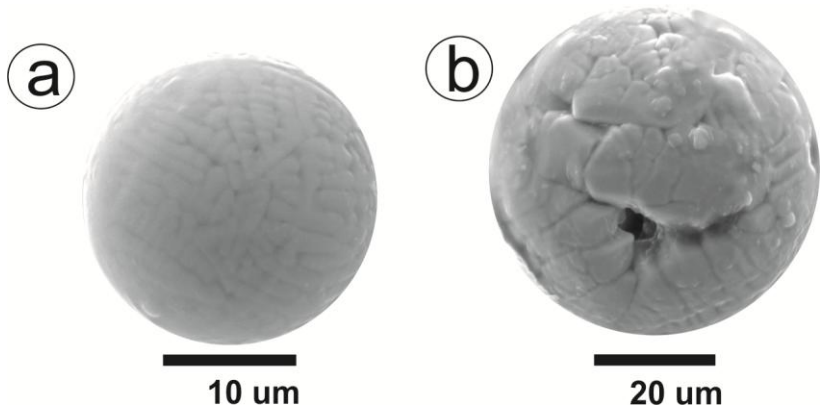

Fig. 1. Morphology of magnetic microspherules (a – dendritic microspherule, b – mosaic microspherule).

Results: Microscopic examination of 30 magnetic microspherules showed that they all have a spherical shape and sizes from 4 to 70 μm. Surface microtextures are dendritic (Fig. 1a). and mosaic types (Fig. 1b). On the surface of microspherules with a mosaic texture, crystals of a cubic syngony characteristic of the family of ferrispinelides are found. Among the studied microspherules, there are hollow ones. This is determined by the detected holes (Fig. 1c). It is noted that the hollow microspheres have a diameter of more than 30 μm. The composition of the studied microspherules is represented by three groups: magnetite, trevorite-magnetite, trevorite-chromite-magnetite.

Discussion: The studied microspherules have an external similarity and composition characteristic of I-types micrometeorites [3]. The chemical and mineral composition also allows them to be classified as space spherules [4].

Conclusions: Cosmic precipitation studies provide information on the structure and composition of particles arriving on Earth. The long-term and continuous accumulation of information will make it possible to detail data on the structure, composition, and dynamics of the passage of individual meteoroid streams, and will make it possible to conclude the features of the structure and evolution of parent bodies of meteoroids.

References: [1] Glukhov M.S. et al. 2018. Meteoritics & Planetary Science 53: A6202. [2] Karpov G.A., Mokhov A.V. 2010. Journal of Volcanology and Seismology, 3: 19-35. [3] Genge M.J. et al., 2008. Meteoritics & Planetary Science. 43: 497-515 [4] Goderis S. et al. 2020. Geochimica et Cosmochimica, 270: 112-143.