

FIRST FINDS OF SPACE MICROSPHERES IN THE EVAPORITES OF THE URALS FOREDEEP, RUSSIA

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Introduction: The unique Verkhnekamskoe salt deposit is the raw material base of the potash industry in Russia. It is located in the northern part of the Urals foredeep, the productive strata belong to the Kungurian Stage (273-283.5 million years ago) of the Permian System. Minerals of salts are represented by sylvinite, carnallite, halite. For the first time in the water-insoluble residue of salts of the Verkhnekamskoe deposit, metal microspheres have been discovered, which are considered by the authors as cosmic dust. Geologists pay attention to particles of cosmic dust in connection with the prospect of carrying out correlations of global, regional and local levels for different facies and mineral prospecting [1, 2].

Methods: In paper described morphology and analysis of the chemical composition of metallic microspheres. They were selected using permanent (for dry samples) and neodymium (for solution) magnets from coring samples of the saltiferous sequence of the Verkhnekamskoe deposit. The magnetic fraction was analyzed in the laboratory of the Kazan Federal University on the field-emission scanning electron microscope Phillips XL-30 equipped with an ESEM energy dispersive spectrometer.

Results: We examined 12 samples from a core of wells of the Verkhnekamskoe deposit. In the well No. 15, 26 microspheres were found. The average diameter of the investigated microspheres is 25 μm , the range is 5-80 μm (Fig. 1); they have a diverse relief surface (plaques, ledges, microcraters, triangular depressions, etc.).

Discussion: Recalculation of chemical analyzes of microspheres showed that magnetite predominates in their mineral composition. In addition to the described microspheres from the Verkhnekamskoe deposit, we detected magnetite microspheres from the Kungurian sediments of the Mechetlino section, which is located in the southern part of the Urals foredeep at a distance of 600 km from the Verkhnekamskoe salt deposit. The Mechetlino section is the candidate of the GSSP of the Kungurian Stage. Normal-marine sediments with a rich fauna without evaporation signs are common here.

Conclusions: The finds of microspheres in the Urals foredeep can be related to external cosmic events [3] and impact bombings in the Kungurian age. It is possible to use microspheres of cosmic origin as an additional tool for stratigraphic correlation of different-facies strata.

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References: [1] Sungatullin R.Kh. et al. 2017. *Meteoritics & Planetary Science*, 52, Is.: A336. [2] Sungatullin R.Kh. et al. 2017. *Russian Geology and Geophysics*, 58: 59-69. [3] Gillman M., Erenler H. 2008. *Int. J. Astrobiol.*, 7: 17-26.

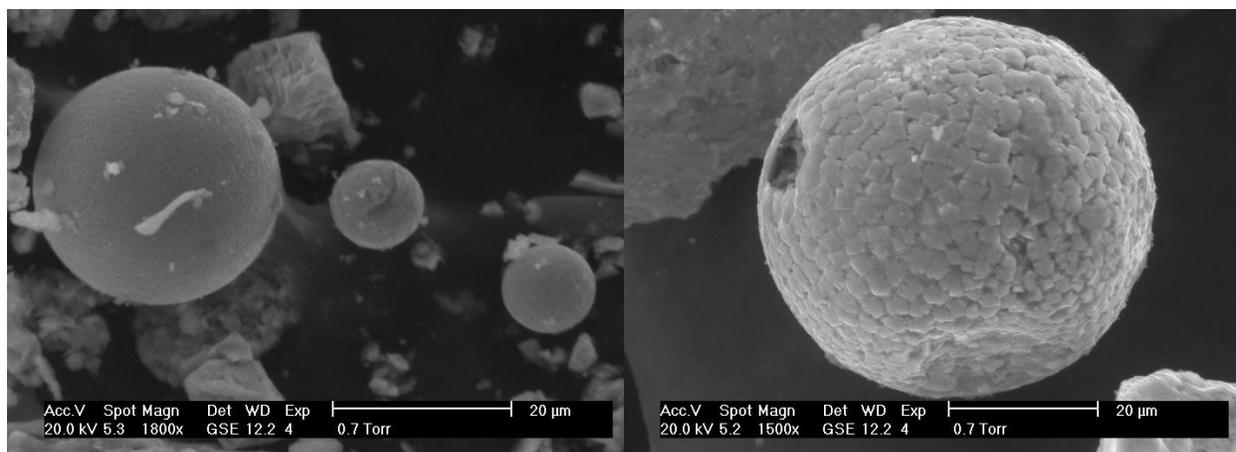


Fig. 1. Metallic microspheres from the deposits of the Kungurian Stage on the Verkhnekamskoe salt deposit.