MICROBIOLOGICAL INFLUENCE OF PHOTO-TROPHIC BACTERIA ON METEORITES IN VITRO

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Introduction: Meteorites after fall experience terrestrial weathering. Meteoritical minerals can be destroyed, altered or substituted by various ways. Earlier (e.g. [1]) researchers observe mostly chemical processes connected with terrestrial weathering. Biological influence was not in focus of attention. Nevertheless meteorites often fall into medium with high abundance of microorganisms. In this work we research microbiological influence on different types of meteorites.

Experimental: Fragments of 4 meteorites were prepared for investigation: light and dark lithologies of the Chelyabinsk meteorite (LL5), iron and pallasite parts of Seymchan (Pallasite, PMG), Tsarev (L5) and Dronino (Iron-ung). Polished sections of these samples were made using standard metallographic technique. Prepared fragments of extraterrestrial matter were placed into medium with phototrophic purple bacteria *Ectothiorhodospira shaposhnikovii.* These bacteria usually live in anaerobic areas of fresh and salt waters. One can obtain small amount of them in soil. The weight of each fragment was measured before exposure in medium, right after exposure, then after washing with water and acid etching. Surface of each fragment were investigated using inverted optical microscope Axiovert 40 MAT or FE SEM Carl Zeiss Sigma VP with EDS unit.

Results and Discussion: Bacterial traces after exposure have been found on the surfaces of each meteorite. Layer of organic matter with remains of cells covered all samples. Changing of medium pH has been detected. The solution originally was alcalescent. Organic acids producing due to bacterial activity resulted in acidification which should lead to corrosion acceleration. Weight changing during exposure in comparison with [2] was relatively small. It can be explained by different bacterial species. In [2] bacteria used iron and sulfur as source of energy for their activity. In this work above-mentioned purple bacteria need light for photosynthesis and components of meteoritical minerals only as a source of reductant (iron or sulfur).

Examination of samples after the end of exposure and their washing with water reveal big amount of rust in various forms. Some samples had prismatic crystals on their surface which are unusual for unaltered meteorites. EDS data show concentration of iron, phosphorus and oxygen in this crystal which is similar to vivianite, but this mineral can be a byproduct of bacterial activity.

Mediums with iron meteorites demonstrated the highest optical density after exposure. The biggest increasing of bacteria biomass has been noticed in these mediums also. Thus, it can be assumed that iron minerals are more preferential substrate for purple bacteria and this type of meteorites is more susceptible for microbiological influence.

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References: [1] Rubin A. 1997. *Meteoritics & Planetary Science* , 32: 231-247. [2] Yakovlev G. A., Grokhovsky V.I., Firsov N.N., Voropaeva O.V. 2013. *Meteoritics & Planetary Science* 48:5292.