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PŮVODNÍ PRÁCE/ORIGINAL PAPER

Nepodceňujme mikrobiální precipitaci oxihydroxidů železa a manganu v životním prostředí

Let's not underestimate the microbial precipitation of iron and manganese oxyhydroxides in the environment

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Abstract

Dolníček (2020) described several occurrences of bog iron (*limonite*), which according to his article originates in recent streams by chemical precipitation, without the important role of microorganisms on this process. However, similar occurrences of reddish or orange slime, frequently accompanied by oil-like films floating on the water, are according to many papers ascribed to the biogenic iron oxidation by bacteria. To solve the origin of such precipitates, we have sampled similar materials in four places near Ostrava - Hrabová, two close to Řepiště and Staříč, and also two sites in the vicinity of Hulín investigated by Dolníček (2020). In all cases, scanning electron microscopy of dried samples at the low vacuum (ca 50 Pa) revealed a dominant share of tubular sheaths of the *Leptothrix-Sphaerotilus* group of bacteria. The prevailing diameter of 1.5 to 1 μm should point to genus *Leptothrix*, while those with a diameter up to 2.5 μm (genus *Sphaerotilus*) are far less common. Spiral chains of *Gallionella* were recognized in all samples, as well as rare pennate diatoms. Space between bacterial filaments is predominantly filled with densely stacked particles micrometer to submicrometer in size, sometimes with oval, fibrous, or tabular shape. It might be both decomposed material of previously mentioned genera and some other small-sized bacteria. Energy-dispersive spectroscopy shows dominant content of iron and oxygen, with a minor admixture of Si, Ca, Al, and P. Powder X-ray diffraction of such microbial mats is showing clastic admixtures (quartz, feldspar group minerals, illite-muscovite, and kaolinite) and two broad low-intensity peaks of ferrihydrite. Only sample D from Řepiště locality shows an absence of ferrihydrite and the presence of hematite and magnetite and/or maghemite. Therefore, we demonstrated that bacterially-induced precipitation plays a major role in the genesis of such recent bog iron occurrences and there are ways how to characterize such material by both biological and mineralogical procedures.

Key words: biomineralization, bioreduction, Fe-oxidizing and Fe-reducing bacteria, ferrihydrite, bog iron

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