Geophysical Research Abstracts
Vol. 18, EGU2016-8201-1, 2016
EGU General Assembly 2016

Possible role of Rhodotorula sp. in the formation of jarosite in the AMD environment of Muskau Arch, Poland

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The Muskau Arch is situated in the west of Poland and in the east of Germany. This region is a belt formed by push and frontal moraines during the Middle-Polish (Riss) glaciation, especially during the Wartanian glaciation. The occurrence of glacier caused folding and forming the glacitectonic type of lignit deposits which were mined for over 150 years. Both open pit and underground mining methods has exposed metal sulfides (mainly pyrite) to air and water causing bio-oxidation. Due to this process the acidity of many reservoirs have increased significantly (pH values between 2 and 4). As a consequence of changes in the environment, new mineral phases precipitated from highly acid waters rich in, among others, various forms of Fe and S. Precipitation of ochreous minerals such as schwertmannite, goethite and jarosite was partly catalyzed by many various acidophilic and acid-tolerant microorganisms: bacteria, archaea and probably yeasts.

Jarosite $KFe_3^{3+}(OH)_6(SO_4)_2$ can be precipitated both in abiotic conditions and as a by-product of the activity of living organisms. The example of biomineralization induced by fungi *Purpureocillium lilacinum* in similar AMD environment of Rio Tinto is reported (Oggerin et al, 2014). Recently, jarosite is also considered as a possible biosignature of life on Mars. The assessment of microbial participation in formation of jarosite is an elementary step in geomicrobiological and astrobiological research.

Isolated by us Rhodotorula sp. is an unicellular pigmented yeast. Fungi from the genus Rhodotorula F.C. Harrison belong to Sporidiobolalas part of phylum Basidiomycota. They are common environmental inhabitants. Some species, known from Rio Tinto, can live in extreme acidic soils at pH of about 2 (Lopez-Archila et al, 2004). For the first time, authors isolated strain Rhodotorula sp. from surface precipitates in Ł ęknica region (Muskau Arch). This ochreous precipitate contains jarosite. The yeast might be an important factor in indirect enzymatic catalysis of the oxidation of pyrite. Jarosite precipitates from solution containing sulphate, possibly product of active enzymatic oxidation of sulphur compounds by Rhodotorula. As a result of this investigation a model of sulphur transformation mediated by Rhodotorula in AMD environment and its role in precipitation of jarosite was proposed. This work is partially funded by AGH research grant no 11.11.140.319.

López-Archilla, A., González, A., Terrón, M., Amils, R. 2004. Ecological study of the fungal populations of the acidic Tinto River in southwestern Spain. Canadian Journal of Microbiology, 50 (11), 923-934.

Oggerin, M., Rodriguez, N., del Moral, C., Amils, R. 2014. Fungal jarosite biomineralization in Rio Tinto. Research in Microbiology. 165, 719-725.