

A NEW “*FERROVUM*” SPECIES IN A SCHWERTMANNITE-PRODUCING PLANT FOR MINE WATER TREATMENT

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Mining activities for metals or coal often result in the development of acid mine drainage due to the oxidation of sulfidic minerals which get exposed to oxygen. The acidic mine waters are characterized by low pH, high concentrations of sulfate and ferrous iron, and possibly dissolved heavy metals or metalloids. Conventional treatment comprises neutralization and oxidation yielding a sludge of iron oxides/hydroxides. Since iron usually occurs in AMD in the reduced form, biological iron oxidation provides an alternative approach to remove iron and some sulfate from the waters. Thus, the company G.E.O.S. Freiberg has designed a plant yielding the iron hydroxysulfate schwertmannite ($\text{Fe}_{16}[\text{O}_{16} \mid (\text{OH})_{10} \mid (\text{SO}_4)_3] \cdot 10 \text{H}_2\text{O}$) as product of iron oxidation at ca. pH 3.

Investigation of the microbial community of such a plant revealed the dominance of members of the new, and still not completely described genus “*Ferrovum*” and of *Gallionella/Sideroxydans*-related acidophilic iron oxidizers. After obtaining several *Ferrovum* cultures contaminated not or only slightly with *Acidiphilium* strains, the cultures were investigated physiologically and genome sequences were obtained of strains JA 12, Z-31, and PN-J185. While strain Z-31 turned out to be fairly similar to the type strain P3G of “*Ferrovum myxofaciens*”, strains JA12 and PN-J 185 showed considerable differences. While P3G and Z-31 appear to be diazotrophic and motile, PN-J185 and JA12 should be nonmotile and seem to be able to use a larger variety of fixed nitrogen sources (NH_4^+ , NO_2^- , NO_3^- , urea). The second group of *Ferrovum* strains also has a smaller genome (only 1.9 to 2.0 Mb) which may be due to losses of some metabolic pathways. They also have a lower G+C content in their DNA, and genome-based phylogenetic indicators suggest that both JA12 and PN-J185 represent new species.

Key words: Acid Mine Drainage, Mine Water Treatment, Iron Oxidation, *Ferrovum*, Genome Sequencing