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Biomineralization of Eukaryotic Biofilms in an Extreme Acidic Environment the Río Tinto (SW Spain). Implications in Solid Phase Partitioning.

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The Tinto river is an unique acidophilic extreme environment where eukaryotic organisms are the principal contributors of biomass and diversity of the river, over 65% of the total biomass. Members of the Bacillariophyta, Chlorophyta, and Euglenophyta phyla as well as ciliates, cercomonads, amoebae, stramenopiles, fungi and yeast have been detected. Most of the eukaryotic microbial communities founded in the river are distributed forming extensive biofilms along the riverbed. Research on microbial activity in acidic environments has concentrated primarily on bacteria with only few references to the biological activity of nonbacterial taxa. Using scanning electron microscopy and analytical techniques such as X- ray photoelectron spectroscopy (XPS) and X-ray energy dispersive spectroscopy (EDS) we have studied the solid phase partitioning of dissolved metals in the eukaryotic biofilms of the Tinto River. Riverbed sediments contain abundant highly mineralized biofilms which organisms have coatings of poorly crystalline iron oxyhydroxides and hydroxysulfates precipitates. In oxic environments these metal sulfides are not stable and can be remobilized. However, the presence of the biofilms helps to promote the association of metal ions in solution with the extracellular polymeric substances leading to the immobilization of the metals in solution. The presence of the eukaryotic biofilms has important implications in the mechanisms of decreasing toxic metals in solution in acid mine drainages systems and could have important influence in bioremediation mechanisms.