Geophysical Research Abstracts
Vol. 14, EGU2012-14112, 2012
EGU General Assembly 2012

Contribution of eukaryotic microbial communities to the formation of Fe-rich accretions in an extreme acidic environment

L. Rodrigues (1,2), T. Valente (3), A. Correia (2), A. Alves (2), B. Foing (4), and G. R. Davies (2)

(1) Faculty of Earth and Life Sciences, VU Amsterdam, The Netherlands, (2) Dep. of Biology & CESAM, Universidade de Aveiro, Portugal, (3) CIG-R, DCT/Universidade do Minho, Portugal, (4) VU Amsterdam & ESA/ESTEC, The Netherlands

In the acid mine drainage of Valdarcas, northern Portugal, Fe-rich tubular and spherical macroaccretions are directly associated with the presence of eukaryotic microorganisms. This raises the question whether they are biogenically-derived or the result of an abiotic process mediated by microeukaryotic phototrophs.

The drainage water at Valdarcas is characterized by very low pH values (pH<3.5), high metal solubility and presence of iron colloids. Mineralogical analysis (XRD and SEM) of the precipitates indicates a mixture of goethite, schwertmannite and jarosite.

Euglenophyta and Chlorophyta acidophilic algal were previously identified in this site. The spatial distribution of Euglena mutabilis indicated that it has a preference to grow up on schwertmannite-rich precipitates. Field observations demonstrate the existence of oxygenated microenvironments created by algal activity suggesting that algae influence iron minerals precipitation, especially schwertmannite.

The mineral-microorganism interactions are relevant to understanding this unique and extreme environment. Further investigations regarding the mineralogical and chemical characterization of these deposits, and the identification of microorganisms involved in the process could be helpful to enhance our knowledge of past Fe formations throughout Earth's primordial environment. It is expectable that this information will contribute to establish a framework for recognition of biosignatures on other planets and extraterrestrial bodies.

In this study, results on the chemical and mineralogical composition of the structures are presented. The biological context is characterised based on observations made by optical microscopy complemented with molecular data on the microbial communities obtained by culture independent methods.

The results are discussed within the context of two models: the studied Fe-rich stromatolites are microeukaryotic-mediated as described by previous workers from similar environments or are the consequence of inorganic precipitation of reduced iron species (Fe(III)) due to the oxygen generated by the photosynthesis?