

Pyrite-Bacteria interaction on Acidic Environments: Astrobiological implications

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The latest results from Mars Rovers regarding the existence of jarosite ($((\text{SO}_4)_2\text{KFe}_3 \cdot 6\text{H}_2\text{O})$) in the surface of Mars seems to indicate the past water presence on the red planet (Squyres, S.W. et al.,) In addition, this water had to be acidic water in order to provide ferric iron in solution to form the mineral. Jarosite was first described in Jaroso town (South-East Spain). There is another interesting scenario from an astrobiological point of view in Spain (South-West): Rio Tinto. This river is 100 Km long and its high ferric iron concentration in the water gives a dark red color. The driven force of the leaching process in this river are the microbes that thrive in its water taking advantage of the pyrite present in the subsurface of this area (López-Archilla, et al.;

Amaral Zettler, et al.). The result is a red color water with acidic pH and yellow material (jarosite) precipitation along the river.

To gather chemical information about jarosite formation we have studied the interaction between the acidophilic microbes and the pyrite by a combination of Scanning Electron Microscope (SEM) and X-ray Photoemission Spectroscopy (XPS). We have followed the microbe's metabolic products formation that are the reactants needed for the formation of the jarosite as a function of time. Interesting pictures of jarosite spheres ultrastructure were taken by SEM. Some of the spheres seems to be fossilized bacteria that recovered itself by precipitates from the metabolic processes. Could exist this type of fossilized bacteria in Mars jarosite? What kind of bacteria could be present in this possible past Mars environment?.

Bibliography

- Squyres, S.W. et al., (2004) *Science* **306** 3 Dec.
López-Archilla, A.I. et al., (2001) *Microb. Ecol.* **41**, 20.
Amaral Zettler, L.A. et al., (2002) *Nature* **417**, 137.