The influence of contaminant load on microbial ecology in a sandstone aquifer

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Due to widespread organic contamination derived from past industrial processes, microorganisms are becoming ever more important for the maintenance of potable groundwater supplies, as they have the ability to degrade organic contaminants *in situ*. Furthermore, the syntrophic relationships in mixed microbial communities found attached to geological surfaces results in an enhanced capability to degrade elevated levels of organic contaminants, making them integral to the natural bioremediation of contaminants [1]. Microbial biodegradation is also a sustainable alternative to costly and invasive engineering-based remediation techniques. However, contaminant toxicity can have a marked influence on microbial community structure and diversity [2], ultimately affecting the *in situ* biodegradation potential.

In this work, studies were conducted to investigate the effects of contaminant load on the indigenous microbial communities in a phenol-contaminated aquifer in the UK. Using denaturing gradient gel electrophoresis and pyrosequencing, groundwater (planktonic) microbial communities were profiled across the contaminant gradient, and compared to the attached communities formed on surrogate geological substrata incubated in the aquifer under the same hydrochemical conditions. Microbial community structure and function was found to be strongly influenced by contaminant load and groundwater hydrochemistry. Also, *in situ* microbial attachment studies reveal that the attached and planktonic communities differ markedly. These results are important for understanding the distribution and formation of microbial communities in contaminated environments and subsurface ecosystems, and lead to a better understanding of the function and limitations on *in situ* biodegradation processes in the Earth's Critical Zone.

[1] Davey and O'Toole. (2000), *Microbiol. Mol. Biol. Rev.*, **64**(4), 847-867. [2] Spence *et al.* (2001), *J. of Cont. Hydrol*, **53**, 285-304.

A new ore mineral assemblages from the Shilu iron-polymetallic deposit, Hainan Island, South China

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The famous Shilu iron-polymetallic ore deposit located in western Hainan Island, South China, occurs within Meso-Neoproterozoic, low-grade metamorphosed volcanoclastic sediments and carbonates. The Shilu deposit is considered to be a structurally reworked as well as hydrothermally altered and enriched ore deposit of Banded Iron Formation type. The deposit is very important iron producer from magnetite and hematite ores [1]. In our work we focused on the polymetallic sulfide mineralization, that is younger than iron oxide ores [2] and, in places, overprinted them. For the research we have chosen from the Shilu deposit several samples of sulfide ores from the Beiyi mine and its close vicinity. We have performed detailed ore microscopic studies as well as electrone microprobe analyses using CAMECA SX 100 equipped with EDS and WDS systems. In the studied samples pyrrhotite, chalcopyrite and Co-bearing pyrite (up to 11 wt% Co) dominated among ore sulfides. These ore minerals occur in quartz or calc-silicate rocks, either as disseminated grains, sometimes in veinlets, or in aggregates, that may form massive ores. Pyrrhotite and chalcopyrite may contain numerous solid inclusions, overgrowths and intergrowths of subordinate sulfides (sphalerite, galena), sulfosalts (glaucodot, costibite, cobaltite, arsenopyrite, ullmannite), sulfospinels (siegenite) and cassiterite, that belong to the minerals crystallizing at medium to low temperatures. Among these minerals siegenite and Co-bravoite dominate. Tiny crystals (10-20 μm in size) of Bi-minerals (matildite, cosalite) are also present. Moreover, in association with barite, calcite and chlorite, Ag-Hg amalgamate and cinnabar can occur. The results of our study point to the multistage medium- to low- temperature hydrothermal precipitation of ore sulfides that overprinted the Fe-oxide ores. We believe, our results will serve for better understanding of metallogenic processes in the Shilu iron-polymetallic deposit.

[1] Xu *et al.* (2011) *Ore Geol. Rev.* in press. [2] Bakun-Czubarow *et al.* (2010) *Acta Univ. Szeged., Acta Min.* **6,** 452.