Microbial Fe, As and S redox cycle aossociated with mineral alteration/precipitation in extreme environment, Yellowstone National Park, USA

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Redox reaction of trace metals associated with microbial elemental respiration is a ubiquitous process in natural environment in various geochemical condtions. Particularly, changes in elemental redox states of trace metal induced by microbial respiration result in the unexpected biogeochemical reactions in the light of biotic/abiotic mineralization. The objective of the present study is to investigate the microbe-mineral interaction in the acido-hyperhtermal hot-spring in Yellowstone National Park, USA to understand the mechanism of biogeochemical process and role of extremophiles in extreme environment.

The present study focused on distinguishing biotic and abiotic process during the secondary phase mineral formation in extreme environment, particularly Fe and As redox cycle. The secondary phase mineral formation with elemental compositions of the oxidative phase of Fe and As was identified only in enrichment set suggesting a major role of extremophiles are closely linked with the mineral formation. The considerable population of Fe-oxidizer (*Metallosphera yellowstonensis MK-1*) and As-oxidizer (*Sulfurihydrogenibium* sp.) was detected by phylogenetic analysis supporting the major role of extremophiles in biotic mineral alteration/formation process. Furthermore, As-oxidation was observed only in the enrichment set, however the inhibition of As-oxidation in the low pH conditions was previously reported, suggesting the role of extremophiles in the oxidation of As in the present study. The possible biotic/abiotic mechanism in mineral alteration/formation in extreme environment will be discussed.