Role of dissimilatory metal-reducing bacteria in arsenic transport within manganese and iron oxide containing aggregates

SAMANTHA C. YING, SARAH GRIFFIS,
YOKO MASUE-SLOWEY AND SCOTT FENDORF

Department of Environmental Earth System Science, Stanford University, Stanford, California, USA
(*correspondence: sammying@stanford.edu)

Manganese oxides are ubiquitous phases in terrestrial environments that have high sorptive capacities for arsenic. However, the fate of arsenic within mineralogically and physically complex systems representative of natural environments remains unresolved. Here, we investigate As dynamics in a diffusively-controlled system using a Donnan reactor where Mn oxides and *Shewanella sp.* ANA-3 are isolated by a semi-permeable membrane through which arsenic can migrate. As (III) is simultaneously added to both chambers, where As (III) injected into the birnessite chamber is rapidly oxidized to As (V) which slowly redistributes across both chambers. As (V) that enters the Shewanella chamber is then re-reduced by the bacteria to As (III). The As (III) from the bacterial reduction is then able to diffuse back into the Mn oxide containing chamber and re-oxidized, leading to a gradual increase in aqueous Mn (II) concentrations due to reductive dissolution of the Mn oxide solid phase. To further explore the role of Mn oxides in controlling the fate and transport of arsenic, we investigate arsenic dynamics in an aerobic aggregate composed of ferrihydrite- and birnessite-coated quartz sand fused by an agarose polymer. Mn and Fe oxide coated sands, having pre-adsorbed As (V), are cast into cohesive spheres and inoculated with *Shewanella sp.* ANA-3. Arsenic (III) produced by bacterial reduction of As (V) diffuses into the aggregate exterior (proximal to advecting, aerated solutes), where it is re-oxidized to As (V) by Mn-oxides; following oxidation, As (V) is repartitioned onto the Fe oxides. These results illustrate the dynamic interplay of biogeochemical transformation, physical heterogeneity of natural systems, and mixed sorbents on the fate of arsenic.

Dating and Nd-Sr-Pb isotopic geochemistry of sulphide deposits in the Suzhou region, China

WANG YINXI*[1], WANG YUANYUAN[2], HU XIN[1]
AND LI HUIMING[1]

[1]Center of Modern Analysis, Nanjing University, Nanjing 210093, China (*correspondence: yxwang@nju.edu.cn)
[2]Nanjing Institute of Geology and Paleontology, Academy of Sciences, Nanjing 210008, China

Introdution

The Yili Pb, Zn and Ag deposits lie on the west side of the Chenghuangshan granite-porphyry body of Indo-Chinese epoch and in the skarn body near contact belt between the granite-porphyry body and wall rock in the Suzhou region, China.

Discusion of Result

.The Rb-Sr and Sm-Nd dating of the orebody give the ages of 231.3±5.7Ma and 232.6±7.3Ma, respectively. The ages slightly approximate the U-Pb age (243Ma) of the rock body crystallization. This may be related to the subsequent geological effect on the Rb-Sr and Sm-Nd isotope system of the Yuli orebody. The isotopic characters of the Yuli orebody are:ε_{Nd} (t)=-10.1 ~ -10.3, $(^{87}Sr/^{86}Sr)_i$=0.70985 ~ 0.70996, $(^{206}Pb/^{204}Pb)_I$ =18.357 ~ 18.432, $(^{207}Pb/^{204}Pb)_i$=16.147 ~ 16.238 and $(^{208}Pb/^{204}Pb)_i$=39.715 ~ 39.746. Because of the good linearity of Rb-Sr and Sm-Nd internal isochron between the whole rock, these evidences reflect the character of magmatic source but not that of minerial source region where the dimetasomatism of rock or rock and magma took place. Evidently, the above-mentioned Rb-Sr and Sm-Nd isotopic ages reflecte the ages of the Yuli skarn.

The minerogenetic ages of Pb, Zn and Ag deposits in this are 231.3±5.7Ma and 232.6±7.3Ma, belonging to the Indo-Chinese epoch. The age of the skarn rock body is also the Indo-Chinese epoch, and that the Chenghunangshan granite-porphyry is the parent rock in which the skarn polymetallic ore deposit was formed [1].

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[1] Wang Yinxi *et al.* (1992) *Chinese Science Bulletin* **37**, 36–39.