

Biogenically formed metal sulfide phases

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The biologically mediated formation of metal sulfide precipitates in anoxic sediments represents a potentially important mechanism for the sequestration of toxic metal elements. Our current knowledge of the structure and reactivity of these biogenic metal sulfides is scarce, limiting our ability to effectively assess contaminant sequestration in, and remobilization from, these solids. In a series of experiments, pure cultures of sulfate-reducing *Desulfovibrio* bacteria were exposed to growth media amended with dissolved Zn, Fe and/or Pb. The resulting precipitates were characterized using x-ray absorption spectroscopy. Subsequently, these solids were reacted in oxygenated water to assess their reactivity and metal remobilization potential.

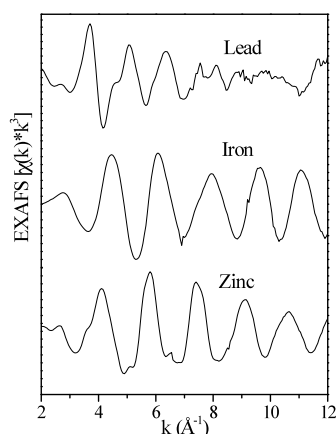


Figure 1: χ -transformed EXAFS spectra of biologically-mediated metal sulfide precipitates.

Biogenically mediated Zn and Fe sulfides showed significantly more short range crystallographic order than abiotically prepared amorphous precipitates. Lead sulfide, however, formed only in samples containing dissolved sulfide species prior to Pb addition, due to competition from dissolved Pb sorption to the *Desulfovibrio* cells. These results indicate that, for some metals, sulfide phases precipitated directly proximate to cell surfaces may be relatively ordered. This finding could have implications for precipitate stability in systems that cycle between oxic and anoxic conditions.

Causes and consequences of ecosystem retrogression

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In the long-term absence of rejuvenating disturbances, ecosystem properties such as NPP, decomposition, and pedogenic processes undergo substantial declines termed ecosystem retrogression. Here we review and synthesize the findings from studies of long-term chronosequences that include retrogressive stages. Studies on retrogressive chronosequences in contrasting regions provide unparalleled opportunities for developing general principles about the long-term feedbacks between biological communities and pedogenic processes, and how these control ecosystem development.