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Flux of Metals between Sediment and the Water Column

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Abstract

The role of nitrogen-containing compounds in the flux of metals between sediment and the overlying water column is discussed.

The flux of metals between the sediment and the water column depends on the speciation of the metals. Diagenetic processes that alter the speciation of metals in the sediment depend on the composition of particulate material that is incorporated into the sediment. Chlorophylls, and degradation products of chlorophylls, are considered to be included in this particulate material. The porphin structure, common to chlorophylls and degradation products of chlorophylls, forms stable complexes with metal ions. Indeed, some of the most stable metallo-organic compounds are composed of metals bound to heterocyclic organic compounds (Hambright, 1975). Understanding the fate of metals in environmental systems requires an understanding of the interaction between naturally occurring heterocyclic compounds and metals. The metals of interest in our study are copper, lead, cadmium, zinc, chromium and mercury. We are currently using supercritical fluids to separate metallo-organic compounds from organic material.

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The use of supercritical fluid carbon dioxide and supercritical fluid methanol-modified carbon dioxide permits the extraction of thermally labile compounds and as well as the extraction of compounds subject to oxidation or reaction with solvents routinely used for separation of organically bound metals from complex matrices. The goals of this work include the determination of the proportion of metals bound to heterocyclic molecules relative to total metal concentrations in algal and sediment samples and the characterization of structures of metallo-organic molecules recovered from suspended sediment samples that include algae and bottom sediment samples. Analyses of the compounds that are extracted under supercritical fluid conditions are done using electrochemical, polarographic and spectral techniques.

References

Hambright, P., 1975, "Dynamic Coordination Chemistry of Metalloporphyrins", in Porphyrins and Metalloporphyrins, Smith, K. M., ed., Elsevier Scientific Publishing Company, New York.