

Petrographic and Chemical Analyses of Ferricretes Exposed in Currently Arid Gondwana landscape, Northwestern, India.

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This paper deals with petrography and chemical data (¹⁰Be, Major oxides & REE) of the ferricretes exposed in Jaisalmer upland, Rajasthan. This work was carried out to understand the process of pedogenesis, minimum exposure age and the dominant source of Be. Ferricretes in the Jaisalmer basin have been formed over the middle Jurassic- Middle Eocene sandstone and limestone. Ferricretes are indurated duricrusts composed of iron oxide (hematite, magnetite) cementing detrital grains of quartz and feldspar. Petrographic studies indicate that the complex process of groundwater fluctuation and pedogenesis in a near shore environment has formed the ferricretes. High MnO (6.4 to 8.3%) and TiO₂ (1.31 to 1.56%) content indicate that the ferricretes have been formed by Mn-rich groundwater derived by weathering of Middle Jurassic –Middle Eocene marine rocks via differential organic complexes. REE data indicate no significant weathering pattern of the bedrock. Our study reveals that the ferricretes contain comparatively less ¹⁰Be concentration in the ferricretes formed on sandstone than limestone. The difference may be due to leach of ¹⁰Be, comparatively less amount of clays in limestone than sandstone, erosion of fine particles from the surface of the soil or inadequate sampling. The exposure age of the ferricrete surface is approximately 28,000 yrs BP. Terrigenous dust component may also be a probable source for ¹⁰Be.

Muddying the Waters of Debate: Is Dredging a Significant Source of Trace Metals to the Estuarine Environment?

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Billions of tons of contaminated sediments are dredged annually from world harbors mixing oxic, biologically active sediments, anoxic, more contaminated subsurface sediments, and overlying water. These resuspended sediments can be both a sink and source of toxic metals, although to what extent remains unclear. As debate over the impact of dredging languishes, a better understanding of the controls on trace metal mobility becomes critical if environmental hazards are to be assessed. Metal solubility from moderately contaminated surface sediments of the Venice Lagoon was investigated by mixing with clean, filtered seawater in a series of laboratory experiments. The mixing conditions included (i) continuous suspension of sediment at constant TSS (1000 mg/L) for one hour, and (ii) brief suspension (440 mg/L) followed by natural settling over a 2-week period. In both experiments, transition and heavy metals (Cu, Pb, Zn, Ni, etc.) showed no release. Instead, these metals were scavenged from the water column by the added solids. After about a week, however, we observed significant release of Cd, Cu, and Ni from the settled solids. By contrast, significant fractions (2-8%) of metal(oid) oxyanions and CH₃Hg were desorbed under the same experimental conditions. Aqueous As, Se, and V concentrations increased as suspended matter settled (TSS=436 mg/L to 0 mg/L within 48 hours), while CH₃Hg desorbed quickly, and then decreased to below detection limits within several days. At this writing, studies are still under way using deeper sediments (5-30cm), which are up to 10 times higher in metals than the surface sediments. The results of these experiments and Hg methylation studies will be presented, and possible biogeochemical mechanisms discussed.