



Movility of metals in surface sediments of the Santa Rosalia mining region, Wester Gulf of California

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The sediments near Santa Rosalía (Peninsula of Baja California) are contaminated by a variety of metals produced by ancient copper mineral smelting. However high metal enrichments were not detected in the brown seaweeds collected in the contamination “hot spot”, suggesting low bioavailability of the metals. To check this hypothesis, a sequential chemical leaching was applied to the sediments from the coastal zone of Santa Rosalía with different levels of metals. The concentrations of Cd, Cu, Fe, Mn, Ni, Pb and Zn in four fractions (metals interchangeable or incorporated into carbonates F1, oxy-hydroxides F2, organic matter/sulphides F3 and detrital components F4) of the leaching were measured by atomic absorption spectrophotometry.

In the sediments, non-contaminated or slightly contaminated by copper, the mobile fraction F1 and relatively mobile F2 were the most important for Cd, Cu, Mn and Pb. The fraction of metals associated with organic matter/sulfides F3 was relatively low in all samples. For Fe and Ni the residual fraction F4 was always high (more than 65 %) because of strong affinity of these two metals to the crystalline matrix of the natural sediments (usually aluminosilicates). The sediments moderately contaminated with copper, conserve the same trend.

However, in the sediments with highest levels of copper, the metals Cu, Mn, Pb y Zn increase drastically their occurrence in fraction F4 (63-81 %). Particularly, the copper relative abundances in this kind of sediments with concentrations of this metal ranging from 2895 mg kg⁻¹ to 4818 mg kg⁻¹ followed the next sequence: residual fraction F4 ($79.5 \pm 4.6\%$) > absorbed form and carbonates F1($14.0 \pm 4.6\%$) > Fe and Mn oxyhydroxides F2($5.7 \pm 1.5\%$) > associated with organic matter and sulfides F3 ($4.3 \pm 3.6\%$). These four metals were presumably incorporated during copper mineral smelting inside of the residual components, which are very resistant to physico-chemical action and presumably cannot be removed to the water column.