Sequential leaching to distinguish genetic processes in Fe-Mn crusts from the NE Atlantic.

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Marine Fe-Mn crusts concentrate in their structure high contents of several coveted elements and metals. Water depth, oxygen minimum zone, biological activity, water masses and currents and the proximity to the coast are environmental factors which may affect metal concentration. Mineralogy derived shows that there are different speciation of elements in Mn oxides and Fe oxi-hydroxides. Mineralogical studies and sequential leaching on two samples (DR07-8 and DR16-13) recovered during the DRAGO 2011 Cruise from The Paps and Tropic Seamounts respectively (Canary Island Seamount Province) have been analyzed here.

DRX studies in bulk samples and solid phases after leaching revealed that Fe oxi-hydroxides are essentially goethite group minerals and scarce contents of unstable feroxyhite. Mn oxides vary in studied samples: DR07-8 shows the presence of todorokite and δ-MnO_2 (essentially vernadite), while sample DR16-13 only shows the presence of vernadite.

During sequential leaching experiment, four solutions were extracted in which there have been dissolved four principal mineral groups: carbonates, Mn oxides, Fe oxi-hydroxides and silicates. Each solution have been analyzed with ICP-AES and ICP-MS. Mn fraction incorporates the major amounts of Co, Ni, Ba and Tl (Σ up to 8000 $\mu g g^{-1}$). Fe fraction incorporates essentially metals like Mo, Pb, As, Th and U (Σ up to 1500 $\mu g g^{-1}$). Some elements like V, Cu and Zn have quite similar partition between Mn and Fe solutions.

REEs also show differences in concentration between Mn and Fe minerals. LREEs (especially Ce) essentially are associate with Mn minerals, while HREEs prefer Fe oxides (Σ up to 600 and 24 $\mu g g^{-1}$ respectively).

Obtained results show that valuables cations (Co, Ce, Ni and Cu) interact with different Mn oxides depending on genetic process. Diagenetic process favors the presence of minerals like todorokite which concentrate essentially Ni and Cu (4400 and 1150 $\mu g g^{-1}$ respectively), when the sample is exposed to hydrogenesis gradually concentrates also Co. Purely hydrogenetic minerals like vernadite, with low growth rate, concentrate higher amounts of Co and Ce (4900 and 1900 $\mu g g^{-1}$ respectively) and less Ni and Cu.