Cr behavior after oxidation by Mn-oxides along a weathering profile in New Caledonia

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In New Caledonia, tropical weathering of ultramafic rocks leads to the formation of deep weathering profiles very enriched in Cr and Mn. The co-occurrence of these two elements could be hazardous for the environment since laboratory studies have shown that immobile Cr^{III} can be oxidized to very mobile Cr^{VI} by Mn^{III-IV}-oxides.

Mineralogical and spectroscopic investigations performed along a 60 m core drilled across a weathering profile in New Caledonia indicated the occurrence of significant amounts of Cr^{VI} (up to 20 wt% of total chromium) in a peculiar pedo-lithological unit exceptionally enriched in Mn^{III-IV}-oxides (mainly asbolan). Complementary analyses at the micron-scale by EPMA indicated that Mn^{III-IV}-oxides are mainly embedded within a matrix of Fe-(hydr)oxides (goethite and hematite) and spatially-resolved µ-XANES analyses showed that Cr^{VI} is mainly sorbed at the surface of these Fe-(hydr)oxides. Such a distribution suggests that, after oxidation of Cr^{III} to Cr^{VI} at the surface of Mn^{III-IV}-oxides, oxidized Cr is desorbed and secondary trapped by Fe-(hydr)oxides embedding the Mn^{III-IV}-oxides.

These results indicate that the redox reaction between Cr^{III} and Mn^{III-IV}-oxides already evidenced in laboratory studies is active at the studied site. They also emphasize the importance of Fe-(hydr)oxides to limit the mobility of Cr^{VI} at the studied weathering profile.

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Wax esters synthesized by acidophilic eukaryote *Euglena Mutabilis*: Biochemical relics of the anaerobic past of the earth?

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The most conspicuous feature of some acid mine drainage systems is the presence of Fe-rich stromatolites overlain by dense biofilms of photosynthetic eukaryotes. The living biofilms and biogeochemical processes that produce these Fe-rich stromatolites may serve as potential analogs for those that may have contributed to the formation of Late Archean–Early Proterozoic banded iron formation. We collected biofilm samples of acidophilic protist *Euglena mutabilis* from the Green Valley coal mine site in western Indiana. Lipid analysis showed that *E. mutabilis* contained abundant wax esters of (by total carbon number) C_{25}-C_{32}, with C_{26}, C_{27} and C_{28} predominating. The major fatty acids of the wax esters were C_{12-14} short-chain fatty acids. These wax esters are different from those commonly found in marine animals and terrestrial plants which have carbon numbers of C_{28-46}. We speculate that the wax esters may be the biochemical relics of the anaerobic past of the Earth and the detection of these compounds has important implications for the evolution of eukaryotes and the paleo-environmental conditions on early Earth. This type of biochemical machine may have allowed early eukaryotes to survive recurrent anoxic conditions on early Earth.