# Sorptive fractionation of natural organic matter and its impact on contaminants transport under flow-through conditions

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Natural organic matter (NOM) plays a key role on the fate, transport, and bioavailability of many contaminants. However, the transport of NOM under flow-through conditions and its impact on the fate of contaminants remains unclear. This is due to the highly heterogeneous chemical composition and the complex structure of NOM, which can lead to its fractionation at mineral-water interfaces.

The fractionation of Leonardite humic acid (LHA) at the goethite-water interface was investigated in static (batch, with goethite suspension) and hydrodynamically controlled (column filled with goethite coated sand (GCS)) conditions by using different analytical methods: dissolved organic carbon concentration measurement (DOC), UV–visible spectroscopy (absorbance at 254nm, Abs@254nm), fluorescence spectroscopy (excitation emission matrices (EEM)) as well as acid-base spectrophotometric titrations.

The combination of these techniques, applied to the same samples, provides an overview of several processes contributing to NOM fractionation. (i) Analysis of LHA in solution by DOC or Abs@254nm generally differs. Specific UV Abs@254nm ($SUVA_{254}$) shows, in fact, that aromatic compounds adsorb more strongly than aliphatic ones to goethite surface. (ii) Acid-base titrations show a different behaviour of carboxylic- and phenolic-containing compounds. (iii) PARAFAC analysis of EEM spectra allowed identifying several types of fluorophores with distinct adsorption behavior. The fact that environmental factors (pH, ionic strength, flow-through conditions…) do not have the same effect on these fractionation processes highlight the complexity of the mineral-NOM-water interface.

These results were further used to understand the mechanisms responsible for the enhanced mobility of a widely used quinolone antibiotic (nalidixic acid, NA) cause by the presence of LHA, under flow-through conditions in GCS column. Results from this study may have strong implications for assessment of the fate of NA as well as other contaminants in the environment.