

## **Measurement of free radium and thallium with Donnan membrane technique : application to complexation study with dissolved organic matter**

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Radium (Ra) and thallium (Tl) are potential contaminants at the vicinity of mining sites and are harmful pollutants. Radium 226 is a uranium 238 daughter and can be found in mine where uranium is present (e.g. uranium or coal mines mainly). Tl is both lithophilic and calcophilic elements and found in sulfur ores (associated with lead, zinc, antimony,...) or in rocks containing K-feldspar. Speciation of Ra and Tl is poorly-known mainly due to their low concentrations in aquatic environments.

Review of Ra and Tl geochemistry clearly shows a lack of quantitative information about interactions with natural organic matter. Organic ligands could play an important role in Ra or Tl bioavailability, chemical reactivity (adsorption or photo oxidation inhibition or catalysis) and hence geochemical transfers.

Based on equilibrium between two solutions that are separated by a selectively permeable membrane, the so-called "Donnan membrane technique" (DMT) provides a measure of free ion concentrations.[1]. Analytes measurements are performed by HR-ICP-MS Element 2 (Thermo Scientific). Experimental setup allows the Donnan equilibrium to be reached after 100 and 120 hours for Tl and Ra, respectively. Experiments performed with purified natural organic matter allows to calculate complexation constants in multiple pH conditions. With this work, we contribute new data and interpretations to an active debate on Ra and Tl geochemical modelling. In conclusion, this work brings a new view on risk assessment for mining activities.

[1] Temminghoff *et al.* 2000. Determination of the chemical speciation of trace metals in aqueous systems by the Wageningen Donnan Membrane Technique. *Analytica Chimica Acta*, 417, 149-157