

Chemical Speciation of Pt in Natural Waters - Implications for its Geochemical Behaviour

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Solution speciation and geochemistry of trace elements is required in order to study and predict their biogeochemical behaviour (i.e., reactivity, transport, fate, toxicity) in natural systems. This requires thermodynamic models that accurately describe the interactions between ultratrace elements and natural ligands in the environmental compartments. However, the solution speciation of platinum in natural waters has been, however, poorly characterised, and the available speciation calculations reported in the literature are not fully consistent. For example, it is still controversial whether Pt(II) or Pt(IV) is the dominant redox form in natural waters at surface conditions. Also, the stability constants with some inorganic ligands (e.g. Cl⁻, OH⁻), which are expected to play an important role in Pt speciation are still unknown or the reported data are inconsistent, and only estimates have been provided. On the other hand, an important fraction of trace elements in natural waters is known to be complexed with natural organic matter (NOM); although several papers report the interaction of Pt with NOM, the stability constants of their complexes have not yet been calculated.

We have therefore undertaken a critical review of the literature dealing with the speciation of dissolved Pt (II) and Pt(IV) in natural waters. Calculations of the "best" estimate of their speciation based on the critically-selected stability constants are given and compared with available experimental speciation data, and the results are discussed with respect to the implications for the geochemical behaviour of Pt.