

## Transport properties of Nb and Ta in hydrothermal fluids: thermodynamic analysis of hydroxo- and fluoride complexes over a wide range of temperatures and pressures

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Despite tantalum (Ta) and niobium (Nb) are essential metals in modern society their geochemical behaviour, especially in hydrothermal fluids is still poorly known. The goal of this study is to identify stoichiometry of Nb and Ta aqueous species and to estimate stability of their complexes' formation in a wide range of temperatures (0 – 600 °C) and pressures (0.1 – 300 MPa).

The whole set of the available experimental data on Nb<sub>2</sub>O<sub>5</sub> [1, 2] and Ta<sub>2</sub>O<sub>5</sub> [3] solubility in hydrothermal HF-NaF-KF-NaOH fluids were processed by the OptimA program [4] to reveal stoichiometry of aqueous species and estimate their Gibbs free energies,  $g(T, P)$ , at given  $T$ ,  $P$  point.

The estimated  $g(T, P)$  values for hydroxide and fluoride complexes were then used to generate the HKF model [5] parameters of these species by use of the OptimB [4]. As a result thermodynamic description of Nb and Ta aqueous species is available to perform various thermodynamic models of hydrothermal transport and accumulation of these metals in a wide range of temperatures (0 – 600 °C), pressures (0.1 – 300 MPa) and fluid compositions.

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