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Enthalpies of formation of rare earth niobates, RE_3NbO_7

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Abstract

High-temperature oxide melt solution calorimetry was used to investigate energetics of a series of rare earth niobates RE_3NbO_7. All of investigated compounds were found to be stable in enthalpy in respect to their oxides. The enthalpy of formation from oxides becomes more exothermic as the size of the RE cation increases, a trend seen previously in other RE compounds including pyrochlores, perovskites, and phosphates. For smaller RE cations the enthalpy of exchange of RE between niobates and titanates is close to zero, whereas larger RE are energetically favored in the titanate pyrochlores. Implications of the results from the geochemical and material engineering points of view are discussed.

Keywords: Niobates, oxide melt solution calorimetry, heat of formation, pyrochlore, defect fluorite, rare earth minerals