

Enthalpies of formation of rare earth niobates, RE_3NbO_7

ALEKSANDRA MIELEWCZYK-GRYN^{1,2} AND ALEXANDRA NAVROTSKY^{1,*}

¹Peter A. Rock Thermochemistry Laboratory and NEAT ORU (Nanomaterials in the Environment, Agriculture, and Technology Organized Research Unit), University of California-Davis, One Shields Avenue, Davis, California 95616, U.S.A.

²Department of Solid State Physics, Faculty of Applied Physics and Mathematics, Gdańsk University of Technology, Narutowicza 11/12, 80-233 Gdańsk, Poland

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