THERMODYNAMIC PROPERTIES AND THERMAL EXPANSION OF "HEAVY" RARE-EARTH DITITANATES AT HIGH TEMPERATURES

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Rare-earth dititanates, $RE_2Ti_2O_7$, with a cubic structure are promising components in the design of catalysts, solid-state fuel cells, optical and laser materials, protective coatings and matrices for the disposal of radioactive waste.

Previously, the heat capacity of $RE_2Ti_2O_7$ was measured systematically in the low-temperature region, and the results obtained are in satisfactory agreement (e.g., [1, 2]), while the measurements in the high-temperature region were carried out fragmentarily. Data on the enthalpies of formation of rare-earth dititanates of the yttrium subgroup are presented in [3].

In this study, $RE_2Ti_2O_7$ titanates (RE=Tb-Lu) were synthesized by reverse precipitation followed by stepwise calcination to 1500°C. The samples were characterized by X-ray diffraction (phase composition and lattice parameters) and SEM with EDX spectroscopy (particle size, element composition).

The heat capacity of rare-earth dititanates was determined in the temperature range of 300–1850 K by differential scanning calorimetry using the ratio method. Based on the obtained values and literature data, Gibbs energies were calculated to assess the stability of rare-earth dititanates towards action of high temperature and of CMAS oxides.

Crystallographic parameters of RE dititanates were studied by X-ray diffraction at high temperatures and thermal expansion coefficients were calculated.

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This work was performed under the State Assignment of Kurnakov Institute of General and Inorganic Chemistry, Russian Academy of Sciences.