Standard Gibbs Energy of Formation and Entropy of Lanthanide-Iron Oxides of Garnet Crystal Structure

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Abstract : Standard Gibbs energy of formation $\Delta G_{for}(298.15)$ of lanthanide-iron double oxides of garnet-type crystal structure $R_3Fe_5O_{12}$ - RIG (R – are rare earth ions) from initial oxides are evaluated. The calculation is based on the data of standard entropies $S_{298.15}$ and standard enthalpies $\Delta H_{298.15}$ of formation of compounds which are involved in the process of garnets synthesis. Gibbs energy of formation is presented as temperature function $\Delta G_{for}(T)$ for the range 300-1600K. The necessary starting thermodynamic data were obtained from calorimetric study of heat capacity and by using the semi-empirical method for calculation of $\Delta H_{298.15}$ (formation). Thermodynamic functions for standard temperature – enthalpy, entropy and Gibbs energy - are recommended as reference data for technological evaluations. Through the isostructural series of rare earth-iron garnets the correlation between thermodynamic properties and characteristics of lanthanide ions are elucidated.

Keywords : calorimetry, entropy, heat capacity, Gibbs energy of formation, rare earth iron garnets
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