Thermodynamic Approach of Lanthanide-Iron Double Oxides Formation

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Abstract : Standard Gibbs energy of formation ΔGfor(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 S298.15 and standard enthalpies ΔH298.15 of formation of compounds which are involved in the process of garnets synthesis. Gibbs energy of formation is presented as temperature function ΔGfor(T) for the range 300-1600K. The necessary starting thermodynamic data were obtained from calorimetric study of heat capacity – temperature functions and by using the semi-empirical method for calculation of ΔH298.15 of 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, enthalpy, heat capacity, gibbs energy of formation, rare earth iron garnets
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