

**ACTIVITY COEFFICIENTS OF NEODYMIUM IN Fe-Nd ALLOY***Krylosov A.V., Rebrin O.I.*Ural Federal University  
620062, Ekaterinburg, Mira st., 19

For the production of Fe–Nd–B permanent magnets, it is possible to use a Fe–Nd alloy, which can be obtained in various ways. This raises the question of studying the thermodynamic properties of such an alloy.

Using the emf method, the equilibrium potentials of the Fe–Nd alloy were measured in an equimolar mixture of sodium and potassium chlorides containing 3.3% by weight of neodymium chloride relative to the In–Nd alloy. Based on these measurements, the activity coefficients of neodymium in the alloy were determined. The activity of neodymium in the alloy with indium is known [1] and is expressed by the equation:

$$\lg a_{\text{Nd (In)}} = 4.271 - 12218 / T.$$

Measurements were performed in the temperature range of 1003–1093 K. The neodymium concentration in the alloy with indium was 5.48% by weight, which corresponds to the two-phase region (InNd<sub>3</sub>+Liq) [2].

Fe–Nd and In–Nd alloys are two-phase systems: a saturated solution of neodymium in equilibrium with an intermetallic compound, in the case of indium – InNd<sub>3</sub> [2], and in the case of iron – Fe<sub>17</sub>Nd<sub>2</sub>, Fe<sub>17</sub>Nd<sub>5</sub> [3]. The activity of neodymium in the Fe–Nd alloy is determined by its activity in a saturated solution. The calculations were based on the assumption that neodymium in the alloys is reversible relative to Nd<sup>3+</sup> ions in the salt phase [4]. Taking this assumption into account, a mathematical transformation was performed to calculate the activity of neodymium in the Fe–Nd alloy, taking into account the activity of neodymium in the In–Nd alloy and the measured potential difference between these alloys.

Based on the data obtained, an equation was developed for the functional dependence of neodymium activity in iron on temperature:

$$\lg a_{\text{Nd (Fe)}} = 104.18 - 0.243 / T + 1 \cdot 10^{-4} \cdot T^2.$$

The resulting equation matches the E<sub>eq</sub> (emf) temperature dependence for the peritectic reaction. Liq + Fe<sub>17</sub>Nd<sub>2</sub> ↔ Fe<sub>17</sub>Nd<sub>5</sub> [5].

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