EFFECT OF THERMAL HISTORY ON THE FORMATION OF D03 ORDERED STRUCTURE IN FE-GA ALLOYS

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Abstract

It has been recently shown that an increase in the magnetostriction of Fe occurs when small amounts of Ga or Al are added, which is linked to the formation of D03 sort range order (SRO) in the disordered Fe structure. The structural transitions due to different cooling rates from high temperature and the effect of substitution of Ga with Al on the ordering processes were investigated in this work. Two iron-based alloys Fe-13 at. % Ga and Fe-8 at. % Al-3 at. % Ga are studied. Dilatometric and calorimetric tests were carried out to check ordering in these alloys after different heat treatments. They have revealed that the cooling rate after annealing plays an important role for the formation of D03 ordered phase. Moreover, ordering in the studied alloys leads to the increase of microhardness. The values of activation energy for the two alloys calculated from DSC curves show that ordering in Fe-8 at. % Al-3 at. % Ga alloy requisite more energy than in Fe-13 at. % Ga alloy.

Keywords: Fe-Ga alloys, ordering process, cooling rate, activation energy, Dilatometry, DSC

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