

Formation of solid solution in Cu and Co doped FeNi: theory and experiment

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FeNi-based alloys are well known as soft magnetic materials when crystallized in the regular structure (bcc, fcc) [1], but FeNi tetragonal (L1₀) phase exhibits hard magnetic properties [2]. In this work we calculated enthalpies of formation of FeNi in various structural states using Miedema's thermodynamic modeling [3], which has been already used with success for other Fe-based alloys [4]. We considered competition between solid solution and amorphous phase (also in near equiatomic compositions), which mimics solidification process. Moreover, the influence of Cu- and Co-doping on the enthalpy was evaluated. Possibility of vitrification was excluded on the basis of our calculations, confirming high probability of formation of solid solution in all mentioned cases. For Cu-doped alloys, enthalpy of formation of solid solution was decreased by Cu addition in broad range of compositions, while Co had almost negligible effect.

References:

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