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Effect of extra nonmagnetic Ga atoms on lattice ordering and magnetic properties of Fe_2CoGa and Co_2FeGa Heusler compounds

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Abstract

Arc-melting with ball milling was used for preparing $\text{Fe}_2\text{CoGa}_{1+x}$ and $\text{Co}_2\text{FeGa}_{1+x}$ ($x=0,0.2$) Heusler samples. Effect of extra nonmagnetic Ga atoms on lattice ordering and magnetic properties of Fe_2CoGa and Co_2FeGa Heusler compounds was studied. Rietveld refinement showed that lattice parameter of the samples increases in the presence of extra Ga atoms. Results showed that $\text{Co}_2\text{FeGa}_{1.2}$ has a partial lattice disordering. Saturation magnetization of Co_2FeGa sample was lower than Slater – Paulig prediction due to the crystallite size on a scale of nanometer. Reduction of saturation magnetization by increasing Ga atoms was explained through the change of lattice parameter, lattice ordering, and crystallite size. Saturation magnetization of Fe_2CoGa sample was greater than Slater – Paulig value. Change of lattice parameter by increasing Ga atoms resulted a decrease of saturation magnetization in $\text{Fe}_2\text{CoGa}_{1.2}$.

Keywords: Heusler alloys, magnetic properties, lattice ordering, Rietveld refinement

For full article, refer to the Persian section