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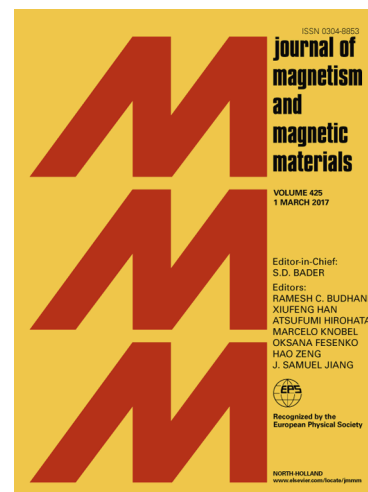
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Changes in structural, magnetic and magnetocaloric properties due to homogenization annealing in $\text{Ni}_{54}\text{Mn}_{19}\text{Ga}_{27}$

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Abstract

Structural and magnetic transformations in the Heusler system $\text{Ni}_{54}\text{Mn}_{19}\text{Ga}_{27}$ due to different annealing time are studied by X-ray diffraction (XRD) and magnetization measurements. The developing of inter-martensitic and second order phase transition are investigated as a function of the annealing time. Analysis of the XRD data reveals that the austenite state has an $L2_1$ structure, whereas the structures of the martensite is a 14M (tetragonal) and the alloy crystallizes in the mixture phase at room temperature. In magnetic measurements, these martensite and austenite phases are ferromagnetic and due to ferromagnetic exchange caused different Curie temperatures for the austenitic and martensitic states in the sample with as prepared, 0.5 and 1 h except 5h. The saturation magnetization changed from 35 to 68 A m²kg⁻¹ and the coercivity of these decreased from 1.8 to 0.3 mT as a function of annealing time. And also, the magnetic entropy change was determined to be 2.4 Jkg⁻¹K⁻¹ for as-prepared sample and 5.4 Jkg⁻¹K⁻¹ for 5 h sample. At 2 T magnetic field, the calculated relative cooling power (RCP) values for all alloys were found to be 85.8, 113.8, 120.8, 169.1 Jkg⁻¹ as annealing time increase.

Keywords: Heusler alloys, annealing time, magnetocaloric effect, Curie temperature, relative cooling power

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