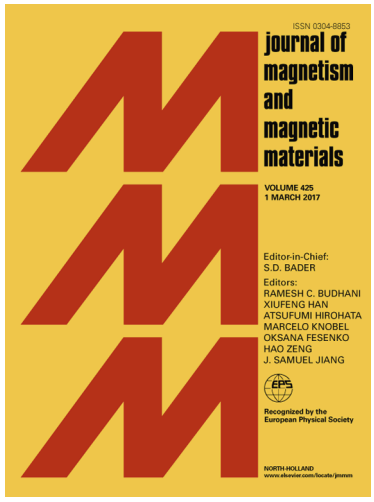

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Enhancement in Magnetocaloric Properties of NiMnGa alloy through Stoichiometric Tuned Phase Transformation and Magneto-Thermal Transitions

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Abstract:

The investigation is focussed on phase generation and magetocaloric properties of a series of $Ni_{77-X}Mn_XGa_{23}$ (x = 22, 23, 24, 25, 27) alloys prepared through arc melting furnace. With increase in Mn content, the alloys showed systematic transition from a non-modulated martensite (NM) to a fully austenitic parent phase through an appearance and coexistence of modulated (M) structure. Intermediate Mn containing alloy (Mn_{24}) not only displayed high magnetic entropy change (ΔS_M) of -7.7 J/Kg/K but also large Relative cooling Capacity (RCP) of 169 J/Kg at 3 Tesla magnetic field compared to other alloys. The coexisting martensite (NM, M) and parent austenite as well as overlapping thermomagnetic and structural transformation was deliverable through tuning of alloy chemistry wherein Ni was systematically substituted by Mn. Transmission electron microscopy (TEM) supported the proposition with existence of martensite plates of different morphology in Mn_{24} alloy exhibiting superior magnetocaloric properties.

Keywords :

Magnetocaloric, Martensite transformation, Magnetostructural coupling, Relative cooling Capacity

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