Structural and magnetic phase transitions of shape-memory $Ni_{50}Mn_{25+x}Ga_{25-x}$ alloys with excess Mn

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Abstract: The Mn-excess $Ni_{50}Mn_{25+x}Ga_{25-x}$ alloys with $1 < x < 7$ were developed to investigate structural transitions and magnetic properties. The martensitic transformation temperature (T_M) for the structural transformation from tetragonal to cubic was clearly observed from magnetization, electrical resistivity and X-ray diffraction studies as a function of temperature for temperatures below 400 K. The T_M value increased roughly from 260 K to 355 K with increasing Mn concentration and T_M showed an abrupt change at the composition $x = 5$. For the structural transition, the Curie temperature (T_C) decreased slightly from 380 K and was insensitive to variations on the Mn/Ga ratio. During the heating and the cooling processes, the samples showed a temperature hysteresis at and below T_M. A magnetic-field-induced strain (MFIS) of about 0.2 % at an applied magnetic field of 4.2 kOe was derived by using the martensitic transition temperature for polycrystalline samples.

Author Keywords: Austenite; Field-induced strain; Martensite; Shape-memory alloy; Twin variants

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