Structural and magnetic phase transitions of shape-memory Ni\textsubscript{50}Mn\textsubscript{25+x}Ga\textsubscript{25-x} alloys with excess Mn

Thuy N.P., Nong N.V., Yao Y.D.

Faculty of Electronics and Telecommunication, College of Technology, Hanoi National University, Hanoi, Viet Nam; International Training Institute for Materials Sciences, Hanoi, Viet Nam; Institute of Physics, Academia Sinica, Taipei 115, Taiwan

Abstract: The Mn-excess Ni\textsubscript{50}Mn\textsubscript{25+x}Ga\textsubscript{25-x} alloys with 1 < x < 7 were developed to investigate structural transitions and magnetic properties. The martensitic transformation temperature (T\textsubscript{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\textsubscript{M} value increased roughly from 260 K to 355 K with increasing Mn concentration and T\textsubscript{M} showed an abrupt change at the composition x = 5. For the structural transition, the Curie temperature (T\textsubscript{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\textsubscript{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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Correspondence Address: Thuy, N. P.; Faculty of Electronics and Telecommunication, College of Technology, Hanoi National University, Hanoi, Viet Nam; email: thuynp@vnu.edu.vn
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Authors with affiliations:
1. Thuy, N.P., Faculty of Electronics and Telecommunication, College of Technology, Hanoi National University, Hanoi, Viet Nam
3. Yao, Y.D., Institute of Physics, Academia Sinica, Taipei 115, Taiwan

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