

## Direct and indirect study of phase transitions in Heusler alloys in high magnetic field up to 14 T

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In recent years, searches and studies of new materials for the presence of the maximum magnetocaloric effect (MCE) have been actively pursued. A huge number of papers have been devoted to the study of MCE [1]. At the moment, prototypes of a magnetic refrigerator based on MCE [2] have been created. However, in present the wide use of magnetic refrigerators in everyday life remains unprofitable, because it lose to freon refrigerators according to technical parameters. The main technical parameters are  $\Delta T_{ad}$  magnetocaloric effect value and value of isothermal heat flow due to MCE. The authors of the work use an indirect method for determining the MCE value or small magnetic fields in the direct method, which are insufficient for the complete completion of the first-order phase transition. In modern literature, only in a small number of works MCE is studied under quasi-isothermal conditions with direct methods,[3-4]. Therefore, the authors of this paper study the MCE by unique device [5] and direct method in high magnetic fields up to 14 T in a wide range of temperatures under adiabatic and quasi-isothermal conditions. Heusler alloys Ni-Mn-X (Ga, In, Sn, Co) are chosen as samples, which are of great interest as a solid in the technology of magnetic cooling.

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