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Direct and indirect measurement of magnetocaloric effect in NiCoMnGa alloys*

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The Co-substitution for Ni in the Mn-rich NiMnGa Heusler alloys changes substantially their structural and magnetic ordering. Temperature of martensitic transitions T_M decreases and difference between magnetization of their martensitic and austenitic phases increases with increasing Co-content [1]. These results stimulated us to study magnetocaloric effects (MCE) in the $Ni_{50-x}Co_xMn_{25+y}Ga_{25-y}$ alloys ($x=0;5;7$) by the direct adiabatic measurement of dT induced by field 1T and by the indirect determination of MCE from magnetization measurements in fields up to 5T using the Maxwell relation. In comparison with pure stoichiometric alloy Ni_2MnGa , $dS(T_M) = -2.2$ J/Kkg, the substantially higher and positive values of $dS(T_M)$ were determined for the Co-doped alloys, $dS(T_M) = +6.7$ J/Kkg for $x=5$ and $+9.9$ J/Kkg for $x=7$. The adiabatic dT measurement was used to estimate specific heat of the alloys. The results will be discussed within the basic thermodynamic relations.

[1] S.Y. Yu et al., Appl. Phys. Lett. 91, 102507 (2007)

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