Adiabatic and isothermal magnetocaloric effect in $La(FeSi)_{13}$ alloys

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The magnetocaloric effect (MCE) for the $LaFe_{13-x}Si_x$ alloys was studied at adiabatic ΔT and isothermal ΔQ conditions. The measurements were carried out in magnetic field of $H = 18$ kOe created by the commercial magnetic system based on Halbach structure (AMT&C). The maximum adiabatic temperature change in the $LaFe_{11.78}Mn_{0.41}Si_{1.32}H_{1.6}$ alloy was detected at $T_0 = 274$ K in the cooling regime, and at $T_0 = 276$ K in the heating regime and amounted to $\Delta T = 4.5$ K in magnetic field of 18 kOe. The obtained values are comparable with MCE for other famous $LaFe_{13-x}Si_x$ alloys. The maximum isothermal heat for this alloy near $T_C = 275$ K at the cooling and heating regimes was $\Delta Q = 3400$ J/kg in magnetic field of 18 kOe. The obtained ΔQ values are in 2 times higher than the values for Gd in the same field. Also, measurements of the ΔQ-effect were carried out for the $LaFe_{11.6}Si_{1.4}$ alloy, which exhibits the magnetostructural phase transition near $T_C = 190$ K. The maximum isothermal heat was found $\Delta Q = 3000$ J/kg near T_C in the cooling and heating regimes in field of 18 kOe. The obtained ΔQ values for the $LaFe_{11.6}Si_{1.4}$ alloy turned out to be slightly lower than for the $LaFe_{11.78}Mn_{0.41}Si_{1.32}H_{1.6}$ alloy, which can be explained by the difference in the T_C temperatures.

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