MAGNETOCALORIC EFFECT IN MELT-SPUN $Gd_{65}Fe_{20-y}Co_yAl_{10}X_5$ (X = Si, B) ALLOYS

J. Marcin[a], J. Kováč[a], I. Škorvánek[a], S. Pączek[b], Z. Śniadecki[c], B. Idzikowski[c]

[a]Institute of Exp. Physics, Slovak Academy of Sciences, Watsonova 47, 040 01 Kosice, Slovakia

[b]Faculty of Applied Physics and Mathematics, Technical University of Gdańsk, Narutowicza 11/12, 80-952 Gdańsk, Poland

[c]Institute of Molecular Physics, Polish Academy of Sciences, M. Smoluchowskiego 17, 60-179 Poznań, Poland

Recently developed Gd(Fe,Mn)Al-based glassy alloys prepared by melt-spinning are good candidates for magnetic refrigerants at temperatures around 150 K [1]. In this work, we report on beneficial effect of partial Co substitution for Fe on magnetocaloric properties of melt-spun $Gd_{65}Fe_{20-y}Co_yAl_{10}X_5$ (X = Si, B) alloys. The magnetic entropy changes, ΔS_M, were calculated from the magnetization versus applied field dependences measured by SQUID magnetometer in the temperature range from 5 to 250 K. The value of the magnetic entropy change found in $Gd_{65}Fe_{10}Co_{10}Al_{10}B_5$ ribbon in the magnetic field change from 0 to 5 T at 150 K is ΔS_M = 7.02 J/kgK. This ΔS_M value is higher than that reported for its Co-free $Gd_{65}Fe_{20}Al_{10}B_5$ counterpart [1], where the ΔS_M reached under the same conditions 5.17 J/kgK. The values of refrigeration capacity, RC, were determined as the area below the ΔS_M peak with the integration limits corresponding to the temperatures at its half maximum. The RC value at 5 T for $Gd_{65}Fe_{10}Co_{10}Al_{10}B_5$ ribbon was calculated to be 766 J/kg, which is slightly higher that that reported for the Co-free alloy. The enhanced values of magnetic entropy changes and the high refrigeration capacity make these Co-substituted glassy alloys promising magnetic refrigerants in temperature range of 80–180 K.

[1] Y.K. Fang, C.H. Lai, C.C. Hsieh, X.G. Zhao, H. W. Chang, W.C. Chang W.Li, J. Appl. Phys. **107** (2010) 09A901