MAGNETOCALORIC EFFECT Gd(Ni$_{0.99}$Fe$_{0.12}$)$_2$

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At magnetic properties and magnetocaloric effect (MCE) studies of quasibinary $R(M_{1-x}Fe_x)_2$ (R – the heavy rare earth elements, M – Ni, Co) ferrimagnets, it was found that a partial Co/Ni replacement by Fe courses a significant MCE in the wide temperature range lower than Curie point (T_C) [1]. For a ferromagnetic material the existence of MCE in a wide temperature range is important for the possibility of usage in magnetic refrigerators.

In this work the results of measurements of magnetic and magnetocaloric properties of $Gd(Ni_{0.88}Fe_{0.12})_2$ intermetallic compound are presented. Sample was melted in arc furnace with helium protective atmosphere. The techniques of X-ray diffraction analysis, magnetic phase analysis and magnetization curves measurements, direct MCE measurement (ΔT-effect) and calculation of magnetic entropy change (ΔS) are described in [1].

Analysis of the X-ray diffraction data at room temperatures showed that sample contain mainly the 1:2 phase. The crystal lattice calculation parameter (a) equal 7.2242(2) Å. In Figure 1, temperature dependences of magnetic contribution to the entropy change are presented. The values of ΔT_{FWHM}, characterizing the distance between the highest and the lowest temperatures at the half maximum of the $\Delta S(T)$ peak, even in a field of 5 kOe comparable or exceeds ΔT_{FWHM} similar compounds $R(M_{1-x}Fe_x)_2$ [1]. Moreover, increasing the magnetic field causes an increase ΔS value at temperatures below T_C. Obtained dependences $\Delta S(T)$ agree well with the data of direct measurements of (ΔT -effect in magnetic field 17.5 kOe.

To our mind the mentioned MCE peculiarities in $R(M_{1-x}Fe_x)_2$ intermetallics originate from the specificmagnetic state of R-ions sublattice which belongs according of K. Belov classification [2] to a “weak” type. Due to that reason the R-sublattices are partially magnetically disordered in the range 0 K – T_C (state similar for paramagnet), but able to give a great response to the external magnetic field. Another possible reason is the sperimagnetic structure formation in R-sublattices due to the local electric crystal field change acting on R-ion from the Fe-ion neighbors. Speaking by another words – the deflection of R-ions magnetic moments out from the global easy axis. In that case the external magnetic field aligns them which produces entropy.

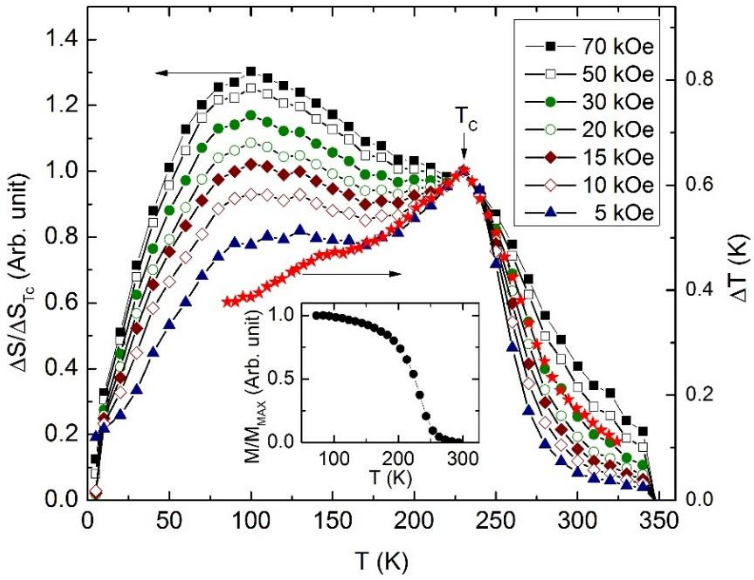

Fig. 1. Temperature dependencies of magnetic entropy change normalized to the value at T_C in different magnetic fields. Stars – ΔT(T). Inserts - M(T) at 1 kOe.

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НОВОЕ ПОКОЛЕНИЕ ПЛАЗМЕННЫХ СТАБИЛИЗАТОРОВ ДЛЯ КОСМИЧЕСКОЙ И НАЗЕМНОЙ ЯДЕРНОЙ ЭНЕРГЕТИКИ

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NEW GENERATION OF PLASMA STABILIZIERS FOR SPACE AND TERRESTRIAL NUCLEAR POWER INDUSTRY

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A dc discharge with a hot cathode is the subject to current and voltage oscillations, which have deleterious effect on its operation. The oscillations can be inhibited by installing an auxiliary electrode, placed outside of anode. By collecting a modest current through a small opening in anode, we show that the discharge becomes stable, in certain pressure range. This method of avoiding current and voltage oscillations can be used, for example, for high current stabiliziers.