Magnetocaloric effect in amorphous $Fe_{11}Ni_{70}Zr_7B_{12}$

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The magnetocaloric effect (MCE) occurs in all magnetic materials with variations of applied magnetic field $\mu_0 H$ and is related to changes of magnetic entropy ΔS_m. MCE manifests itself in heating or cooling of the material (adiabatic temperature change, ΔT_{ad}) and is used in magnetic refrigeration, which nowadays is becoming an alternative to conventional cooling cycles.

Our investigation is focused on the MCE in structurally metastable $Fe_{11}Ni_{70}Zr_7B_{12}$ alloy with quenched-in topological disorder. The sample was prepared by melt-spinning under Ar atmosphere on a rotating copper wheel.

Our measurements are summarized as follows: X-ray diffraction confirmed the presence of a fully amorphous structure; the Curie temperature T_C of the investigated sample equals 275 K; the maximum value of magnetic entropy changes ΔS_{mpk} is 0.68 J/kgK (determined for $\mu_0 H = 7$ T); a rather high value of δT_{FWHM} was obtained which we associate with topological disorder. A relatively low saturation magnetization $M = 35$ Am^2kg^{-1} is a consequence of significant content of Ni, which has a weaker ferromagnetism than Fe or Co, common elements in well-known amorphous or nanocrystalline soft magnetic materials.