Influence of MnAs size-effect on thermal and magnetostructural transformation in $MnAs-ZnGeAs_2$ alloys.

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The development of spintronic modern materials science takes place in parallel with both the search and creation of new materials superlattices consisting of magnetic and non-magnetic nanolayers, and the development of granular structures based on ferromagnetic nanoclusters phase and a nonmagnetic matrix. Interest in MnAs is due to the fact that this ferromagnetic is characterized by giant magnetocaloric effect (GME) and the value of cold-storage capacity in MnAs - 442 J/kg, which is much higher than the known magnetocaloric materials, operating at room temperatures, such as Cd with q = 43.8 J/kg and $Cd_5(SiGe)_4$ with q = 240 J/kg. In this case, the nature and mechanism of magnetostructural junction investigation in manganese arsenide is given the considerable attention. The narrow range of hysteresis temperature and the anisotropy presence in the magnetic junction area, leading to irreversible thermal hysteresis loops, create difficulties for devices operating in the “heating-cooling” mode. It is seemed interesting to investigate the magnetic manganese arsenide transformation in composite alloys. The phase boundary will reduce the mass transfer possibility, and manganese arsenide nanosized clusters of will come to minimizing the anisotropy on the hysteresis loop irreversibility. By differential scanning calorimetry method (DSC) the structural transformation of manganese arsenide from hexagonal to the orthorhombic modification was studied. It was measured the temperature range and the enthalpy of the thermal effect. The temperature range was 39.5-46 ^{0}C, ΔH = -5.6 J/g. In the $MnAs-ZnGeAs_2$ composite due to the phase boundaries, leading to a decrease in mass transfer it was observed a stabilization of arsenide magnetostructural transformations cycling in the $MnAs-ZnGeAs_2$ composite alloys. With increasing nanodispersion arsenide clusters it was occurred the change in the nature of the structural transformation from first type to second.