HIGH-FIELD MAGNETIC BEHAVIOR AND ELECTRONIC STRUCTURE OF MELT-SPUN YCo_2-BASED SYSTEMS

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The high-field magnetic properties of structurally metastable intermetallic compounds (nanocomposites), melt-spun YCo_2, $Y_{0.9}Nb_{0.1}Co_2$ and $Y_{0.9}Ti_{0.1}Co_2$ have been investigated. Physical properties are reported from x-ray diffraction (XRD), vibrating sample magnetometry (VSM) and pulsed magnetic field measurements. The electronic structure was determined based on full potential density-functional calculations. The samples consist of single, $MgCu_2$-type phase, with changing lattice constants and mean grain size from 25 to 50 nm. The magnetic properties of examined compounds are similar to polycrystalline YCo_2, but the increase of magnetization at lower temperatures and hysteresis loops on M(H) curve shows a ferromagnetic ordering with small coercive fields. The bending of M(H) curve in field of more than 30 T may indicate the onset of a metamagnetic transition to a field-induced high-spin state. By adding Ti or Nb, the magnetization in low magnetic field increases and superposition of two hysteresis loops can be seen at low temperatures. For $Y_{0.9}Ti_{0.1}Co_2$ the calculated value of magnetic moment on Co is 1.1 μ_B/atom, and -0.9 μ_B/atom is induced on Ti atoms, with total magnetic moment value of 1.85 μ_B/f.u. Structural and chemical modifications affect the properties of YCo_2 alloy significantly.