Nanocomposites and nanomaterials

Influence of electron radiation on parameters of Co nanotubes

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Polycrystalline Co nanotubes with a wall thickness of 20 nm were obtained by the template synthesis method. Their geometric dimensions correspond to the parameters of template pores (length ~ 12 μm, outer diameter ~ 110 nm). Studies of morphology and structure were carried out using scanning electron microscopy, energy dispersive spectroscopy, and X-ray analysis. In the crystal structure of nanotubes two phases were established: *hcp* α-Co with a = (2.5008±0.0031) Å and c = (4.0912±0.0063) Å, and also *fcc* β-Co with a = (3.5430±0.0010) Å.

The nanotubes were modified by irradiation with electrons with an energy of 5 MeV and doses up to 250 kGy. Irradiation leads to a 20% decrease of crystallite size and an increase of the texturization degree in [100] direction for α-Co and [111] direction for β-Co. The rearrangement of the crystal structure of the samples could be associated with the instability of the *fcc* phase of β-Co. The dependence of the resistance and the main magnetic parameters of Co nanotubes on the irradiation doses was studied. Conductivity of nanotubes increases monotonically with rise of radiation dose up to 200 kGy, then it goes to saturation. It is shown that magnetic anisotropy presents in the studied samples over the entire dose range, the coercivity values for a parallel orientation of the field relative to the nanotube axis are several times higher than the values for the perpendicular field direction. The obtained results indicate the possibility of applying electron irradiation for the modification of the crystal structure, conductive and magnetic properties of Co NT.