POLYMER-MEDIATED SYNTHESIS OF Fe-Co NANOCRYSTALLINE ALLOYS: FORMULATION AND PROPERTIES

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Iron and cobalt-containing nanoparticles (NPs) are promising candidates for use in information recording devices due to a high coercive force and magnetic susceptibility. But, a significant drawback of NPs is the tendency of nanoparticles to rapid oxidation till formation of antiferromagnetic oxide CoO in case of CoNPs, that causes a sharp change in the magnetic properties.

Heterometallic metal polymer nanocomposites were obtained by co-crystallization of the acrylamide complexes of Fe (III) and Co (II) and their subsequent polymerization in the frontal regime and controlled thermolysis of polymer products. Electron microscopy data suggests that as a result of thermal transformations of acrylamide complexes with a given ratio of components, nanoscale particles of alloys stabilized by carbonized polymer matrix are formed. Studies of the magnetic properties as well as the EPR and FMR spectroscopy data indicate that the paramagnetic centers are not isolated, but form ferromagnetic domains as in case of the product of cocrystallizate of acrylamide complexes of Co (II) and Fe (III) nitrate. Analysis of the phase composition of the nanocomposite forming by the XRD method (Figure) indicates the formation of a CoFe nanocrystalline alloy (CoFe-44-1433).

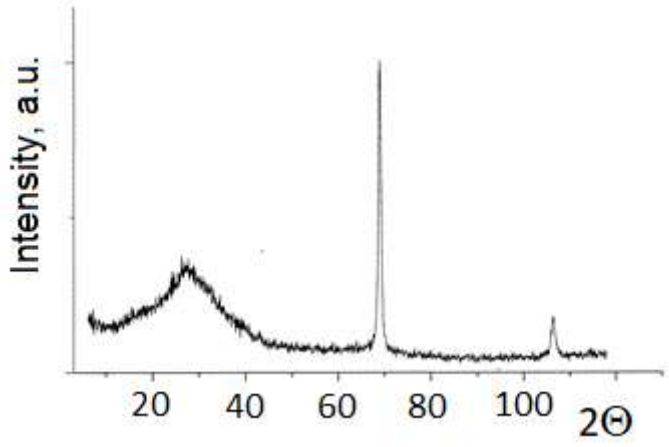

Figure. XRD for acrylamide Fe(III)-Co(II) complex thermolysis product obtained in isothermal conditions at 390°C

Polymer-mediated synthesis of nanocomposites is an effective way to obtain nanocrystalline alloys with controlled sizes and properties of nanoparticles.

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