SYNTHESIS AND CHARACTERIZATION OF GOLD-IRON-NON-FERROUS METAL (COBALT, COPPER, NICKEL) COMPOSITE MAGNETIC NANOPARTICLES

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Among various hybrid materials, gold – iron - non-ferrous metal (cobalt copper, nickel) composite magnetic nanoparticles have attracted particular attention because of their biological compatibility and applicability in biotechnology, nanomedicine, targeted drug delivery, therapy and the diagnosis of various diseases[1]. In addition, the catalytic activity of such particles was shown.

Despite the number of works devoted to the production of gold-containing composite magnetic nanoparticles, the problem of developing approaches for the synthesis of such systems cannot be considered finally solved at the moment. There is a problem of reproducibility of the synthesis techniques, which are proposed in the literature. In addition, the mechanism of recovery of gold on the surface of the magnetic core has not fully understood. This presents the greatest difficulty in obtaining such systems due to the large difference in the crystal structure of the magnetic material and gold nanoclusters.

The aim of this work is the development of methods and selection of conditions for the synthesis of gold-containing composite magnetic nanoparticles, as well as their characterization and study of magnetic properties.

According to transmission electron microscopy data, samples of copper, cobalt, nickel ferrites and magnetite, obtained under optimal conditions, are magnetic cores with a size of 10–30 nm. Uniformly distributed spherical gold nanoclusters with an average diameter of 1 nm are detected on the surface of these cores. These conclusions are confirmed by the results of the study of the surface of the material using X-ray photoelectron spectroscopy. Gold recovery occurs on the surface of magnetic cores exclusively. There are no separate large gold crystallites in solution. The resulting nanoparticles are suitable for biomedical and catalytic applications.

References
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