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PLANT-MEDIATED SYNTHESIS OF COBALT FERRITE NANOPARTICLES

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Spinel type materials have long been a topic of interest because they may exhibit different sizes depending on synthesis method. Also, they can be use as magnetic materials, pigments, catalysts and refractory materials. Among them, cobalt ferrite is of interest due to its properties such as high mechanical resistance, high thermal stability, low temperature sinterability, low surface acidity and good diffusion. Cobalt ferrite has the spinel structure and the chemical formula of AB_2O_4 in which Co^{2+} (A) ions occupy tetrahedral sites and Fe^{3+} (B) ions occupy the octahedral sites. In order to synthesize spinels with high surface area, different wet chemistry techniques have been attempted such as co-precipitation, hydrothermal method, sol–gel, combustion, microemulsion, sonochemical method, etc.

In this research, we have used the method of green chemistry for synthesizing cobalt ferrite. This is an ecological method for the synthesis of monodisperse nanoparticles of small size, which are very important for applications. Cobalt ferrite were prepared by using sol–gel autocombustion method from $Co(NO_3)_2 \cdot 6H_2O$ and $Fe(NO_3)_3 \cdot 9H_2O$ as starting materials and plant extract as an effective reducing agent. Spinel structure of synthesized particles has been confirmed by XRD. The crystallite size of 20 nm is obtained from Scherer formula. The FTIR spectra contain two main peaks at 600 cm^{-1} and 400 cm^{-1} corresponds to Me-O bands at tetrahedral and octahedral sites respectively. The surface morphology and elemental composition were proved by using of SEM and EDS respectively. The cationic distribution was estimated from Mossbauer spectroscopy data. The new antistructural modeling was used for describing of surface-active centers. The $CoFe_2O_4$ nanoparticles obtained by ecofriendly method using plant extract as chelating/gelling agent could be used as good candidate for biomedical applications, such as drug delivery and hyperthermia application.

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