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Synthesis and properties of cobalt ferrite nanoparticles in bacterial cellulose nanofiber scaffold

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Cobalt ferrite nanoparticle (NP) is a class of ferrite which has a potential for many applications but the agglomeration of magnetic NPs limits its full potential usage. In this research, cobalt ferrite NPs were synthesized in the presence of bacterial cellulose (BC) nanofibers which acted as the scaffolding templates. The BC was obtained from a commercially available nata de coo (coconut jelly) which was washed and rinsed in water several times before the freeze-drying process was applied. The cobalt ferrite was synthesized by using a coprecipitation method. In the presence of bacterial cellulose, $FeCl_2.6H_2O$ and $CoCl_2.6H_2O$ at the right stoichiometric ratio were mixed in deionized water. After that, NaOH was added to create the precipitation of cobalt ferrite NPs on the surface of the BC nanofibers. In this experiment, the concentration of chloride salt was varied and the method of BC drying was explored. The X-ray diffraction (XRD) patterns revealed the formation of the cobalt ferrite crystalline structures. The scanning electron microscope (SEM) showed the morphology of cobalt ferrite NPs which formed the nanotube-like structure surrounding the BC nanofibers. The thermal analysis showed the several weight loss characteristics and the thermal stability of NPs in BC scaffold up to 800 ℃. The Fourier transform infrared spectroscopy (FTIR) showed the characteristic peaks of O-H and C-O groups. Vibrating sample magnetometer (VSM) was used to study the magnetic properties of cobalt ferrite NPs in BC scaffold. The saturation magnetization was found to be influenced by the initial concentration of Fe and Co ions, and the drying processes.

Keywords: cobalt ferrite; nanoparticles; bacterial cellulose; magnetic properties;

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