CHARACTERIZATION OF BIO-MAGNETIC NANOPARTICLES SYNTHETIZED IN THE PRESENCE OF WATER PLANT EXTRACTS

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ABSTRACT

In this work, the synthesis of bio-magnetic (Fe₃O₄) nanoparticles (MNPs) was performed by co-precipitation method in the presence of water extracts of the Sumbucus ebulus L. leafs; and its characterization was performed. The characterization of bio-MNPs was performed by using Scanning electron microscopy (SEM), Xray diffraction (XRD) and Fourier transform infrared spectroscopy (FTIR) techniques. The results are compared with MNPs synthetized at the same reaction conditions in the absence of plant extract. According to the SEM analysis, visible stains can be observed on the surface of the bio-MNPs, which originate from the remains of the plant extract. The XRD pattern of bio-MNPs shows that characteristic peaks matched well with the magnetite phase that can be indexed to the face-centered cubic crystalline structure. However, the broad peaks as well as the small intensity of the peaks indicate the low crystallinity of the product. On FTIR spectra, it can be noticed that biosynthesis has improved the functionalization of MNPs due to the presence of a large number of functional groups on its surface compared to native one. A wide peak was observed at 3402 cm⁻¹ which is attributed to the -OH stretching vibrations in water, -COOH group and polyphenols. Peaks between 2900 cm⁻¹ and 2800 cm⁻¹ are representative bands of C-H stretching vibrations of -CH₃ and -CH₂ groups. Peak observed at about 1700 cm⁻¹ attributed to the carbonyl symmetric vibration. Peak at 1078 cm⁻¹ is attributed to asymmetric stretching vibration of -C=O, which is an indication of the presence of -COOH groups. It can be concluded that the valuable biomaterial has been synthesized, and its possible applications will be further examined. Depending on the volume and quality of the plant extract, the size of the particles can be affected, as well as their biological properties; so their functionality can be significantly improved.

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