



Synthesis and Characterization of $Mg_{0.5}Zn_{0.5}Fe_2O_4$ coated with Polymer (Polyvinyl Alcohol) Nanocomposites via ultrasound assisted emulsion liquid phase

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Abstract:

Nanocomposites of $Mg_{0.5}Zn_{0.5}Fe_2O_4$ -Polyvinyl alcohol were successfully synthesized using two steps: the nanoparticles of $Mg_{0.5}Zn_{0.5}Fe_2O_4$ were synthesized via micro-emulsion and then embedded into polyvinyl alcohol (PVA) matrix by ultrasound assisted emulsion liquid phase method. This approach can be solving problems in the dispersion and stabilization of $Mg_{0.5}Zn_{0.5}Fe_2O_4$ nanoparticles in the PVA matrix. The result showed that the prepared nanoparticles of $Mg_{0.5}Zn_{0.5}Fe_2O_4$ diffuse homogeneously in a polyvinyl alcohol matrix, maintaining the particle shape and size of the $Mg_{0.5}Zn_{0.5}Fe_2O_4$ nanoparticles. It was found that the aggregation of $Mg_{0.5}Zn_{0.5}Fe_2O_4$ nanoparticles could be reduced under ultrasonic irradiation. High resolution transmission electron microscopy (HRTEM) images reveal the presence of spherically shaped nanoparticles in the polyvinyl alcohol chains with an average size of 22nm. The XRD patterns indicate that the crystalline structure of composite is single phase cubic and the crystallite size decreases gradually from 44 to 22 nm by increasing concentration (0.1-0.5g) of nanoparticles with PVA. The interaction between the PVA and nanoparticles in nanocomposites samples were confirmed by Fourier-transform infrared spectroscopy via the shifting of bands revealed from Fourier-transform infrared spectra. The dielectric properties are found to be higher for $Mg_{0.5}Zn_{0.5}Fe_2O_4$ -reinforced blend systems than the pure blend system due to polarization exerted by the incorporation of nanoparticles. Dielectric constant and loss factor shows the decreases trend with varying concentrations of nanoparticles with constant polymer concentration. This occurred due to the grain boundary effect which becomes dominant at low frequencies.

Biography:

Mujahid Mustaqeem has expertise in the synthesis and characterization of nanoparticles, nanocomposites, materials chemistry and analytical chemistry. He has experience in research, evaluation and teaching. He has expertise in micro-emulsion, solo-gel and co-precipitation methods for the synthesis of nanoparticles. He has strong expertise to utilize XRD, FTIR, Dielectric data to interpreted it.

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