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Research Article

## Surface Functionalized Superparamagnetic Zn-Mg Ferrite Nanoparticles for Magnetic Hyperthermia Application Towards Noninvasive Cancer Treatment

Sandeep B. Somvanshi , Prashant B. Kharat, K. M. Jadhav

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### Abstract

Surface-functionalized superparamagnetic Zn-Mg ferrite ( $\text{Zn}_{0.4}\text{Mg}_{0.6}\text{Fe}_2\text{O}_4$ ) nanoparticles are prepared by sol-gel self-combustion route. The surface-modified Zn-Mg Ferrite nanoparticles are characterized by standard techniques. XRD pattern of the prepared sample ensures the nanocrystalline single phasic cubic spinel structure. FT-IR spectra reveals the presence of vibrational frequency-modes belonging to spinel structure and successful coating of oleic acid (OA) over Zn-Mg Ferrite. The nano-size spherical grains with some agglomeration and OA coating over Zn-Mg Ferrite are visualized in FE-SEM images. The hydrophilic surface of Zn-Mg Ferrite is confirmed by water contact-angle measurements. The BET surface-area is evaluated by recording  $\text{N}_2$ -isotherms. The M-H plots confirm the superparamagnetic nature of the prepared sample. The colloidal stability and distribution of particle sizes are estimated by Zeta potential and DLS measurements. Magnetic hyperthermia studies are carried out for different concentrations (2, 4, and 6  $\text{mg mL}^{-1}$ ) of the prepared sample. The biocompatible nature for the prepared sample is studied by cell-viability studies. All these results ensure the implementation of OA-coated Zn-Mg Ferrite nanoparticles with minimum dose rate (6  $\text{mg mL}^{-1}$ ) in magnetic hyperthermia therapies for noninvasive cancer treatment.

### Conflict of Interest

The authors declare no conflict of interest.

### Open Research



#### Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable

request.

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