

Europium Doped Iron Oxide Nanomaterials for Cancer Treatment

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Orthoferrite nanomaterials have proven advantages in the biomedical field, offering promising candidature for imaging and hyperthermia applications [1]. Magnetic hyperthermia utilizes heat generated through magnetic nanomaterials to kill the cancer cells without causing any significant or irreversible damage to normal cells. In the present study, the potential of Eu doped iron oxide nanoparticles is assessed for their magnetocaloric properties and suitability in biological applications. The chemical coprecipitation method was used to synthesize FeEu nanomaterials. The synthesized nanomaterials FeEu0, FeEu2.5, FeEu5 and FeEu7.5 were doped with Eu molar percentages of 0, 2.5, 5 and 7.5. The X-ray diffraction (XRD) analysis confirmed the formation of Eu doped iron oxides. A common phase of trieuropium iron oxide (Eu_3FeO_6) was observed for the FeEu samples with slight peak shifts. The crystallite sizes were also found to increase with increasing dopant concentration. The presence of the M-O bonding has been confirmed through the Fourier transform infrared spectroscopy, which confirmed the presence of iron oxide-based nanomaterials. The doping of rare earth materials has affected the magnetic properties of the FeEu nanomaterials. The effect of Eu doping on the saturation magnetization (M_s) of nanomaterials was observed with the increasing field, as shown in figure 1. The M_s values of undoped Fe_3O_4 was observed to decrease from 65.8 emu/g to 28.7 emu/g for the highest dopant percentage of 7.5. The synthesized nanomaterials have shown the magnetic characteristics required for heat generation in magnetic hyperthermia. Further studies such as heat generation capability and cytocompatibility of FeEu nanomaterials will be required to confirm the suitability for biological applications.

References

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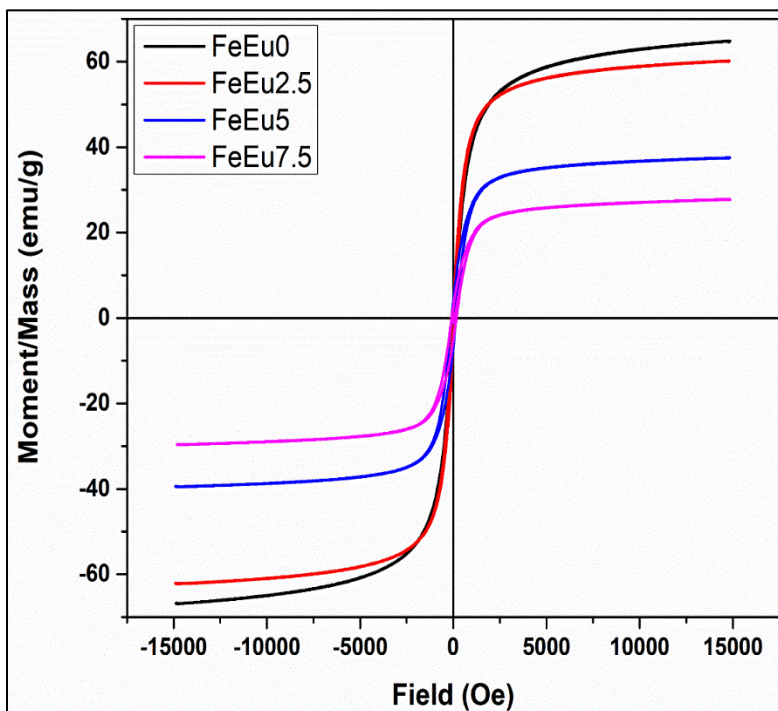


Figure 1 Effect of Eu doping on the magnetic properties of iron oxide nanomaterials