

# FLUORESCENT OXIDE NANOPARTICLES FOR TECHNICAL APPLICATIONS

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## ABSTRACT

Fluorophore/Polyethyleneimine (PEI) - covered oxide nanoparticles ( $\text{Fe}_3\text{O}_4$ ) for technical applications were synthesized in two step. The fluorescent magnetic nanoparticles with a controlled morphology were prepared by a combined method (complexation – hydrolise – co-precipitation). The presence of the polymer PEI on the surface of  $\text{Fe}_3\text{O}_4$  nanoparticles was supported by the FT-IR spectrum. The structure and morphology of nanoparticles were examined by X-ray diffraction (XRD) and scanning electron microscope (SEM). The  $\text{Fe}_3\text{O}_4$  composite have particle sizes below 25 nm, the saturation magnetization value determined by VSM corresponds to a typical ferromagnetic behavior and the fluorescent properties reveal in black light, which makes it suitable for technical applications.

Keywords: fluorescent, magnetic, nanoparticles, magnetite, technical applications

## EXPERIMENTAL RESULTS

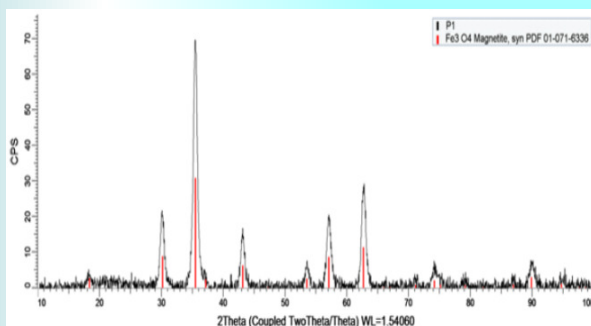


Fig. 1. X-ray diffraction patterns of the fluorescent magnetic nanocomposite

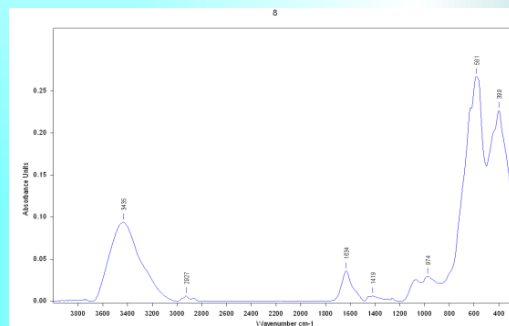


Fig. 2. FTIR spectra of the fluorescent magnetic nanocomposite

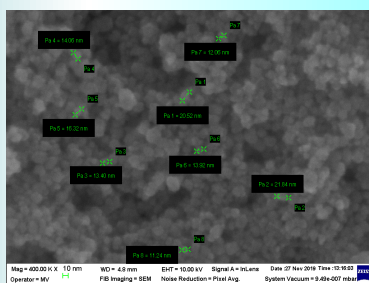


Fig. 3. SEM photograph of the fluorescent magnetic nanocomposite

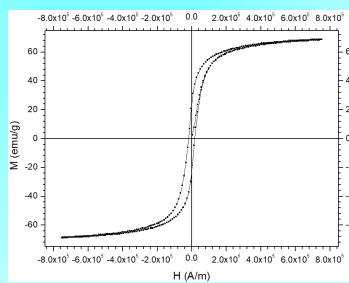


Fig. 4. Hysteresis loops of the fluorescent magnetic nanocomposite

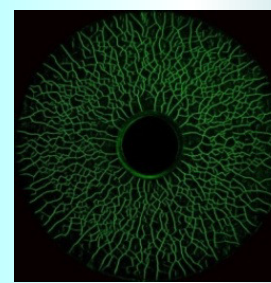


Fig. 5. Fluorescent magnetic nanocomposite powder deposited on etalon

## CONCLUSIONS

\*The fluorescent magnetic nanoparticles have been synthesized using a combined method (complexation – hydrolise – co-precipitation). \*The presence of magnetite phase was confirmed by X-ray powder diffraction. \*The SEM investigation have an average particle size of about 25 nm. \*The FTIR spectroscopy reveals the presence of polymer PEI on the magnetic oxide nanoparticles surface; The characteristic peak corresponding to PEI were clearly observed at 650/cm<sup>-1</sup> (NH wagging vibration), 1634/cm<sup>-1</sup> (NH<sub>2</sub> - scissoring vibration) in the FTIR spectrum. \*Magnetic measurement showed that the nanoparticles are ferromagnetic with the saturation magnetization value of 68 emu/g. \*The magnetic nanocomposite powder deposited on etalon is fluorescent in black light. \*The characterization results indicate that fluorescent magnetic nanocomposite powder, obtained in this work, are suitable for technical applications.

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