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Electronic Supporting Information (ESI)

Polyol Assisted Chitosan-coated MnFe₂O₄ Nanoparticles: Assessing Magneto-Hyperthermia Efficacy and Toxicological Effects on *Garra mcclellandi* Fish

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1. XPS analysis of Mn-Ferrite

Figure S1a-d indicates the XPS spectrum showed five prominent peaks of Mn-Ferrite at 529.56, 642.17, and 711.11 eV which are attributed to O 1s, Mn 2p, and Fe 2p respectively. The XPS signal of the Fe 2p area displays two main peaks at 711.11 eV and 725.04 eV, probably indicative of $2p_{3/2}$ (Fe³⁺) and $2p_{1/2}$ (Fe²⁺) ions, accordingly (see Figure S1c).¹ Figure S1b depicts the XPS spectrum of the Mn 2p domain, comprising two notable peaks at 641.17 eV for Mn $2p_{3/2}$ and 653.58 eV for Mn $2p_{1/2}$, which means Mn²⁺ state along with a satellite peak at 644.9 eV.² likewise, trio evident fitting peaks (O1, O2 and O3) at 529.41, 530.98, and 532.96 eV using the XPS spectra of O 1 s can be seen in Figure S1d, which are indicative of absorbed H₂O and metallic oxides.^{3,4}



Figure S1. XPS spectra of Mn-Ferrite NP (a) survey, (b) Mn element, (c) Fe element, (d) O element.

References:

- Kanjana, N.; Maiaugree, W.; Poolcharuansin, P.; Laokul, P. Synthesis and Characterization of Fe-Doped TiO2 Hollow Spheres for Dye-Sensitized Solar Cell Applications. *Mater. Sci. Eng. B* 2021, 271 (May), 115311. https://doi.org/10.1016/j.mseb.2021.115311.
- (2) Lamdab, U.; Wetchakun, K.; Kangwansupamonkon, W.; Wetchakun, N. Effect of a PH-Controlled Co-Precipitation Process on Rhodamine B Adsorption of MnFe2O4 Nanoparticles. *RSC Adv.* 2018, 8 (12), 6709–6718. https://doi.org/10.1039/c7ra13570j.
- (3) Tien, T. V. T. N. K. C. D. T.; Tu, N.; Huong, N. V. Q. P. T. L. Carbon Encapsulated -MnFe 2 O 4 Nanoparticles : Effects of Carbon on Structure , Magnetic Properties and Cr (VI) Removal Efficiency. *Appl. Phys. A* 2020. https://doi.org/10.1007/s00339-020-

03760-7.

 (4) Venkatesha, N.; Pudakalakatti, S. M.; Qurishi, Y.; Atreya, S. RSC Advances a Potential Contrast Agent for Magnetic Resonance Imaging. 2015, 97807–97815. https://doi.org/10.1039/c5ra20474g.