Supporting information

Multifunctional Tunable $ZnFe_2O_4$@$MnFe_2O_4$ Nanoparticles for Dual-Mode MRI and Combined Magnetic Hyperthermia with Radiotherapy Treatment

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Table S1 – Dependence of purity and average crystallites size on initial precursors for ZM3 synthesis.

Sample №	Core	Precipitator	Fe^{3+} Source	Mn^{2+} Source	Temperature (°C)	Time (h)	Crystallite size D (nm)	Impurity
1	$ZnFe_2O_4$	NaOH	$FeCl_3 \cdot 6H_2O$	$MnCl_2 \cdot 4H_2O$	175	3	12.1	Fe_2O_3
2		NaOH	$Fe(NO_3)_3 \cdot 9H_2O$				10.0	Fe_2O_3
3		NH_4OH	$FeCl_3 \cdot 6H_2O$				9.5	none
4		NH_4OH	$Fe(NO_3)_3 \cdot 9H_2O$				9.1	none

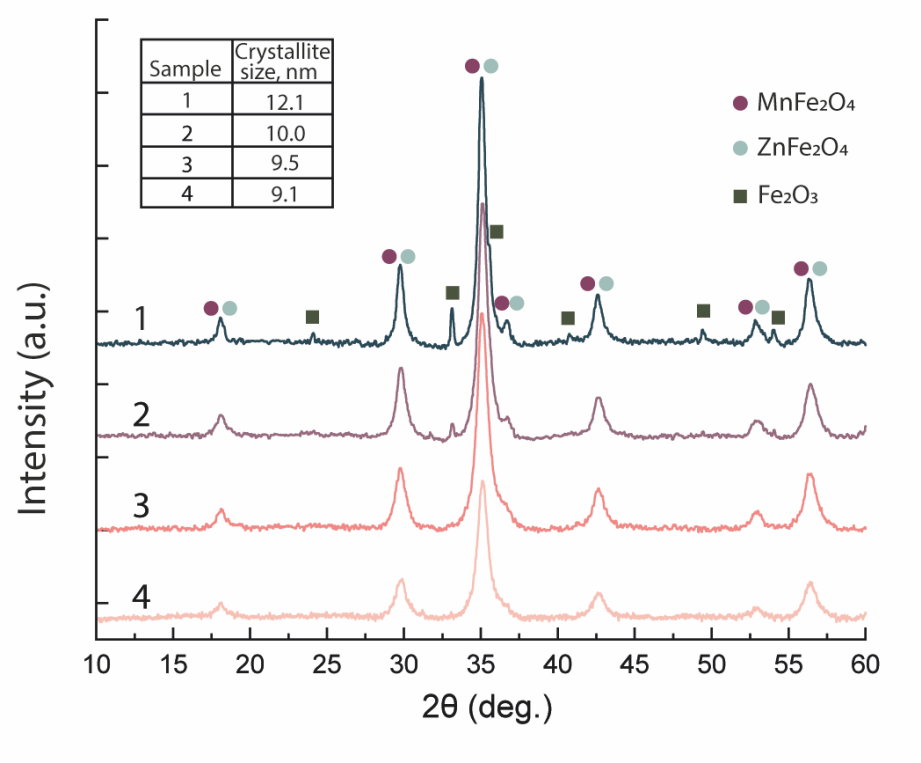

Figure S1 – XRD patterns and average crystallite size of ZM_3 obtained from different precursors.

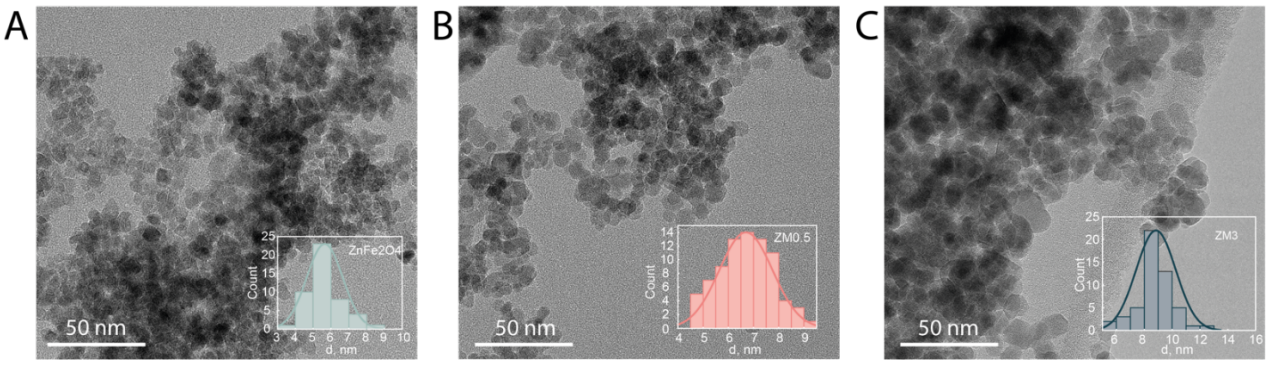

Figure S2 – TEM images and size distribution of (A) $ZnFe_2O_4$, (B) ZM0.5, and (C) ZM3.

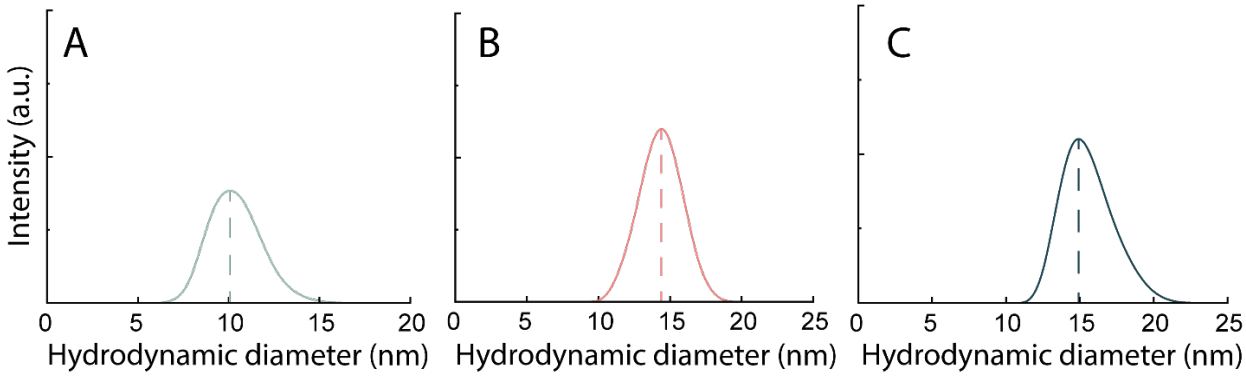

Figure S3 – MNP hydrodynamic diameters. (A) $ZnFe_2O_4$, (B) ZM0.5 coated with sodium citrate, and (C) ZM3 coated with sodium citrate in aqueous solution.

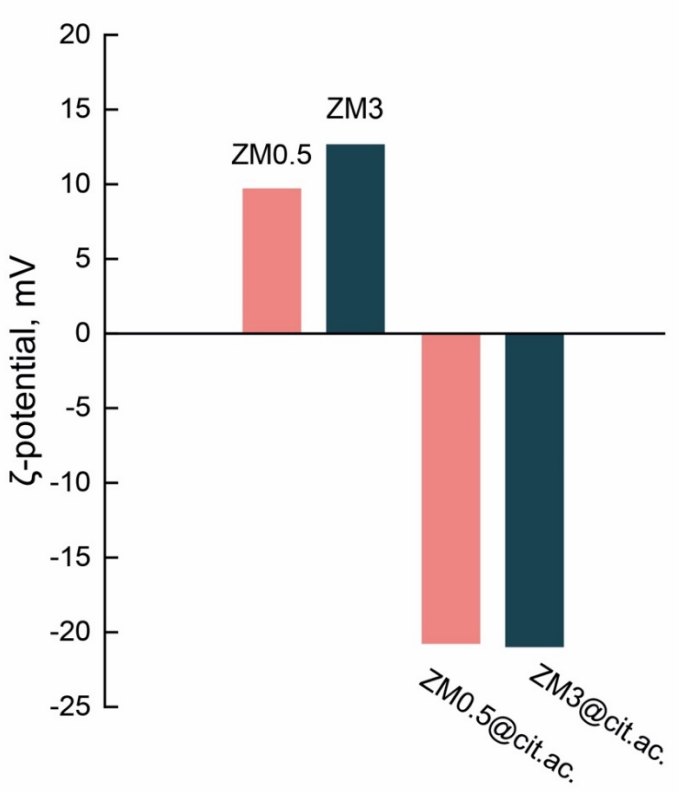

Figure S4 – Zeta potential change of ZM0.5 and ZM3 before and after sodium citrate coating.

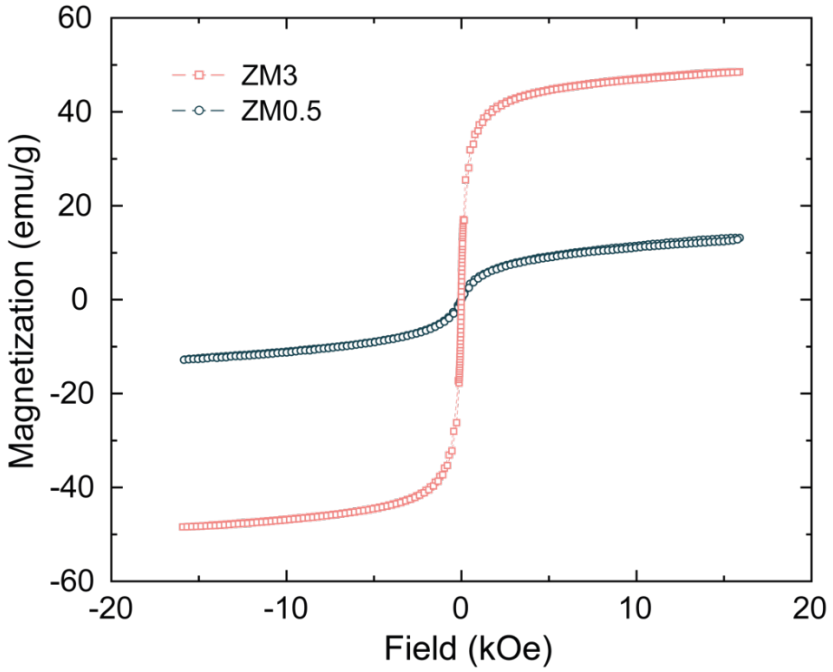

Figure S5 – Magnetization dependence on field strength of ZM0.5 and ZM3 at 42 °C.

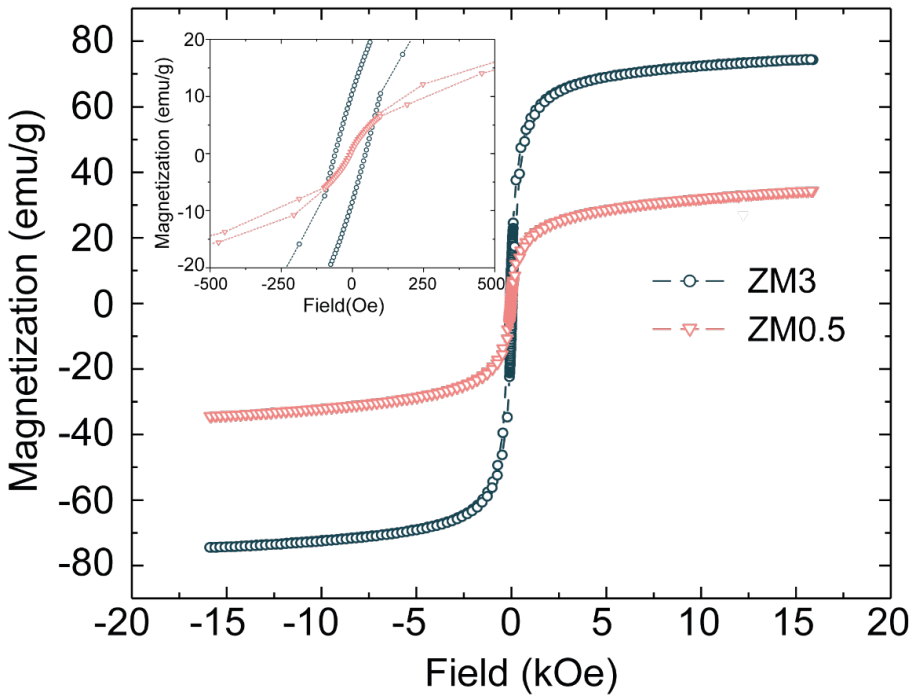

Figure S6 – Magnetization dependence on field strength of ZM0.5 and ZM3 at 90 K.

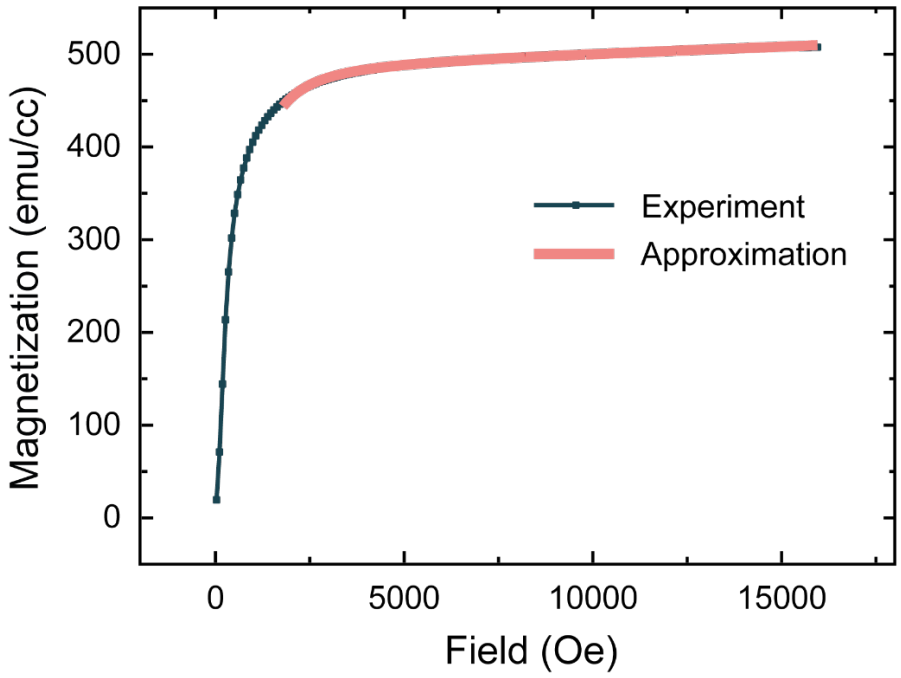

Figure S7 – Approximated Akulov's law magnetization curve for ZM3 sample at 90 K.