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Surface Modified Multifunctional $ZnFe_2O_4$ Nanoparticles for Hydrophobic and Hydrophilic Anti-Cancer Drug Molecules Loading

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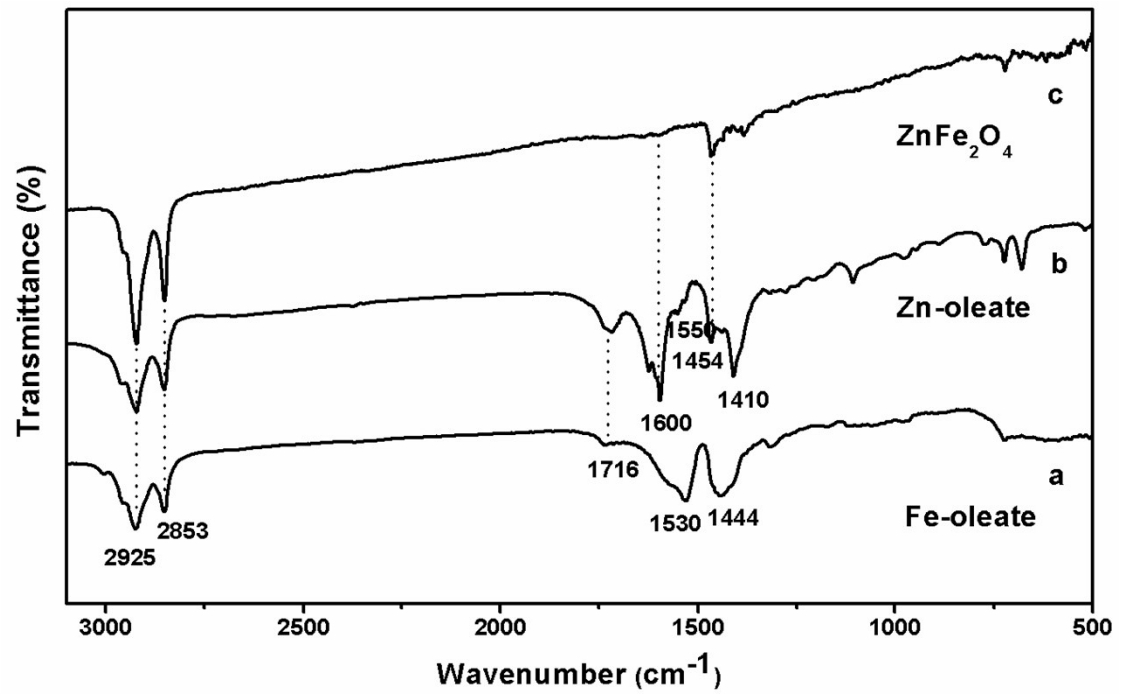


Fig. S1: FT-IR spectra of (a) Fe-Oleate (b) Zn-Oleate (c) as prepared $ZnFe_2O_4$ nanoparticles

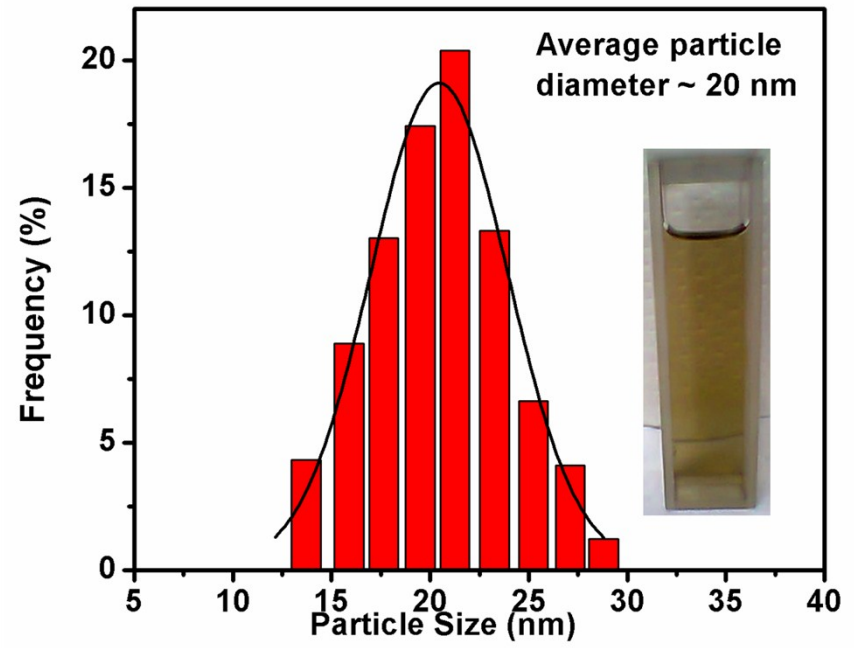


Fig. S2: The measured particle size distribution of (a) chloroform dispersed $ZnFe_2O_4$ nanoparticles (inset) and the average particles size is ~20 nm.

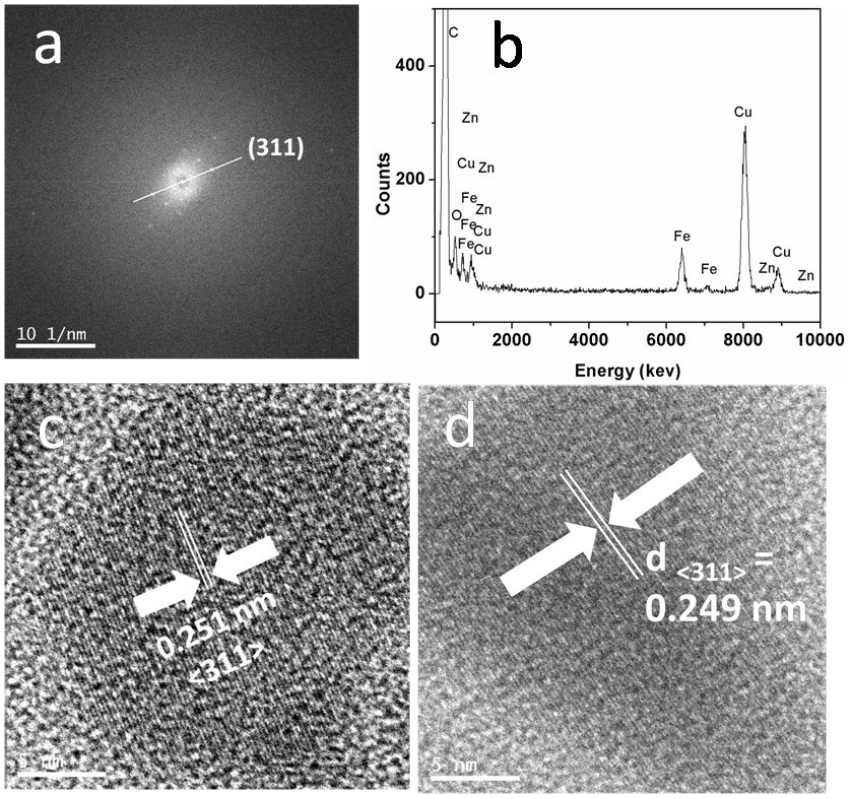


Fig. S3: (a) Fast Fourier transformation (FFT) pattern clearly indicates the mono crystalline nature of the particles which have 311 planes of $ZnFe_2O_4$ (b) Energy-dispersive X-ray spectroscopy (EDS) shows the presence of Zn and Fe elements in the sample (c) and (d) are HRTEM images of $ZnFe_2O_4$ nanoparticles.

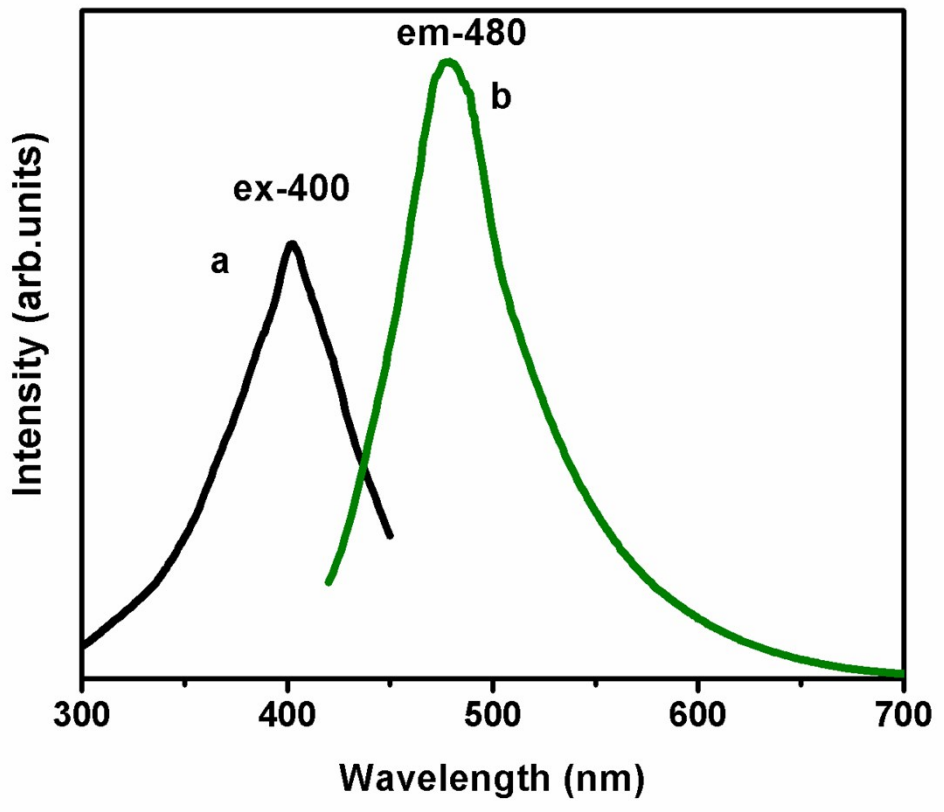


Fig. S4: (a) The excitation spectrum at $\lambda_{emission}$ 480 nm and (b) Emission spectrum at $\lambda_{excitation}$-400 nm of $ZnFe_2O_4$ nanoparticles.

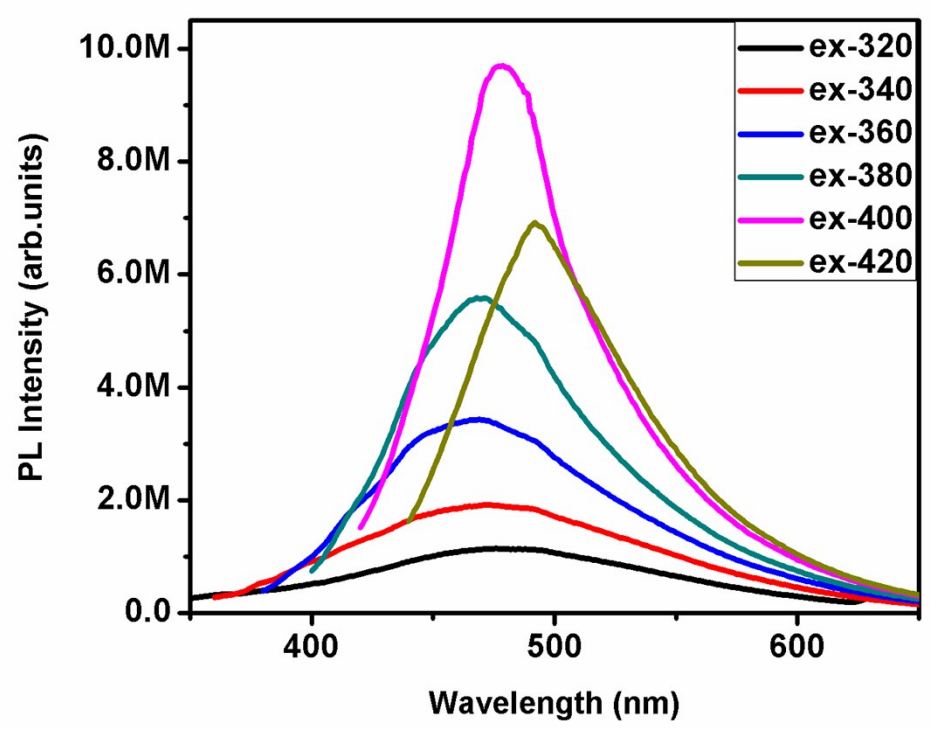


Fig. S5: The photoluminescence spectra of chloroform dispersed $ZnFe_2O_4$ nanoparticles. The solution was excited at different excitation wavelengths, $\lambda_{excitation}$- 320, 340, 360, 380, 400 and 420 nm and emission peaks were centered at 470-480 nm. The highest intense peak was $\lambda_{emission}$-480 nm corresponding to the $\lambda_{excitation}$-400 nm

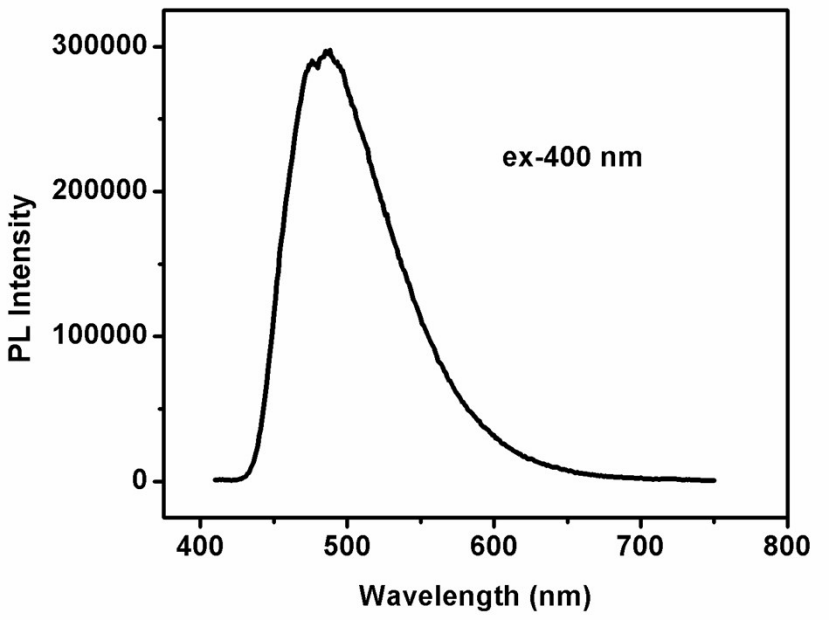


Fig. S6: Fluorescamine test performed to confirm the presence of primary amines groups on hydrophilic nanoparticle. For the test 200 µl of hydrophilic $ZnFe_2O_4$ solution and 100 µl of carbonate buffer solution were mixed together and fluorescamine was added the solution. The emission of the solution was carried upon excitation wavelength of 400 nm.

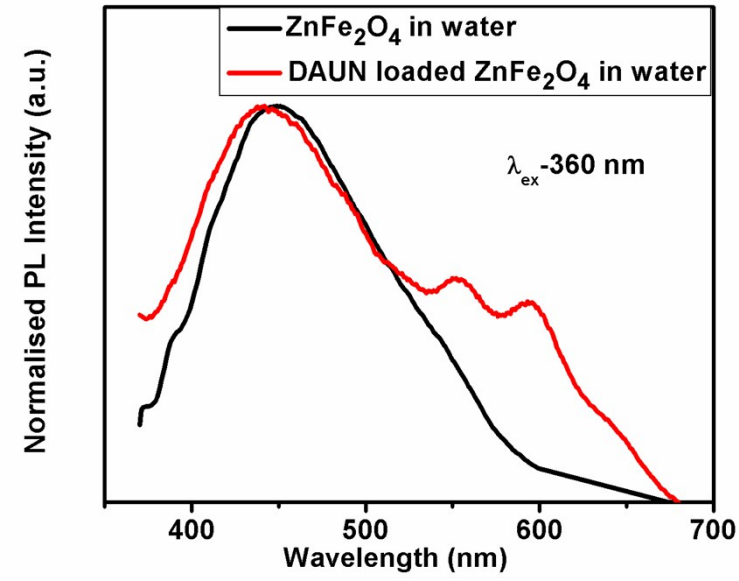


Fig. S7: The photoluminescence spectra of water dispersed $ZnFe_2O_4$ and DAUN loaded $ZnFe_2O_4$ nanoparticles on excitation at 360 nm.

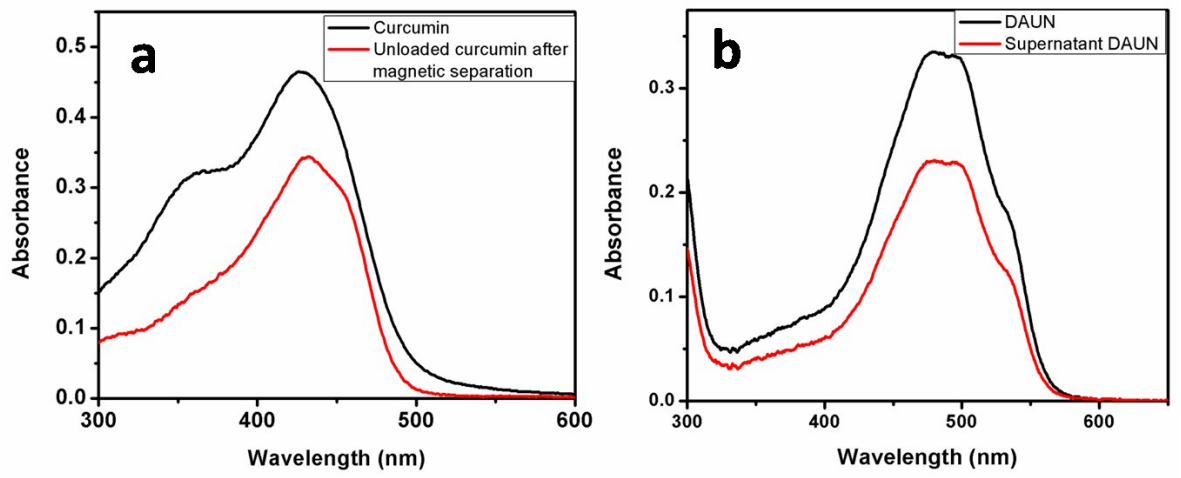


Fig. S8: UV-visible spectra for (a) Curcumin loading and (b) DAUN loading on $ZnFe_2O_4$ nanoparticles

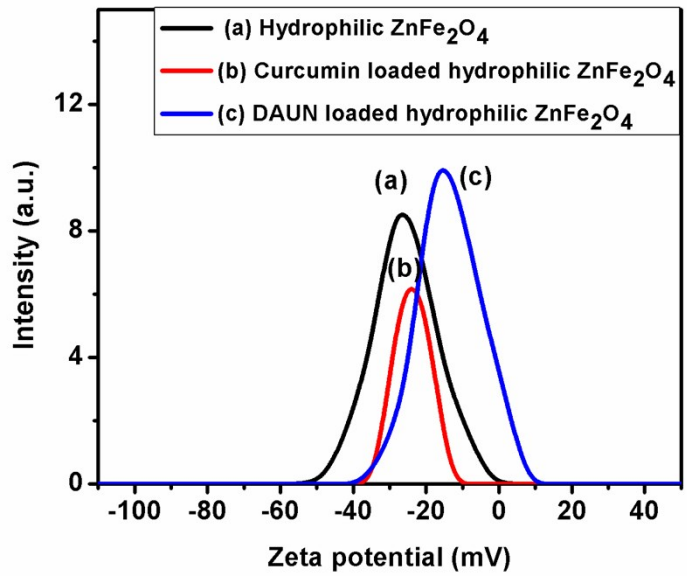


Fig. S9: Zeta potential measurement of hydrophilic and drug loaded $ZnFe_2O_4$ nanoparticle

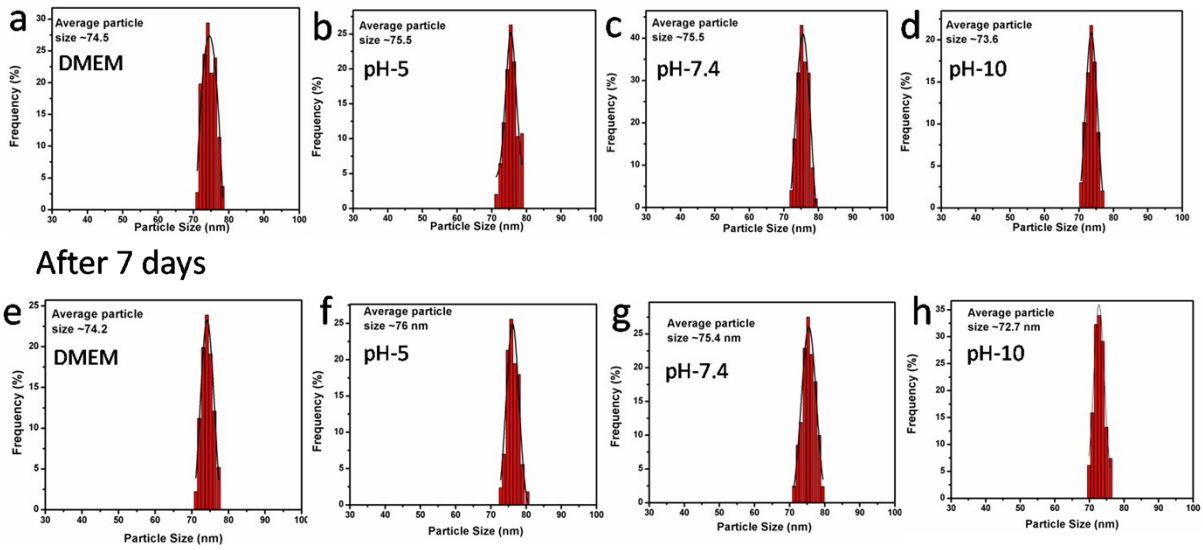


Fig. S10: Hydrodynamic particle size of $ZnFe_2O_4$ nanoparticles in DMEM and different pH-buffer solutions.

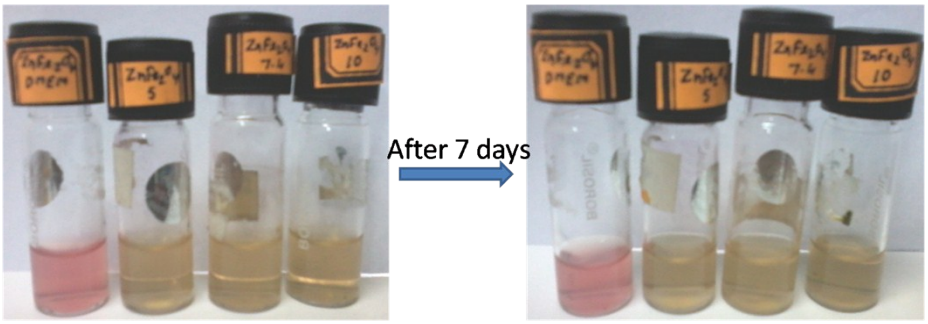


Fig. S11: Colloidal stability of $ZnFe_2O_4$ nanoparticles in DMEM and different pH-buffer solutions. Digital images show optically clear solutions.

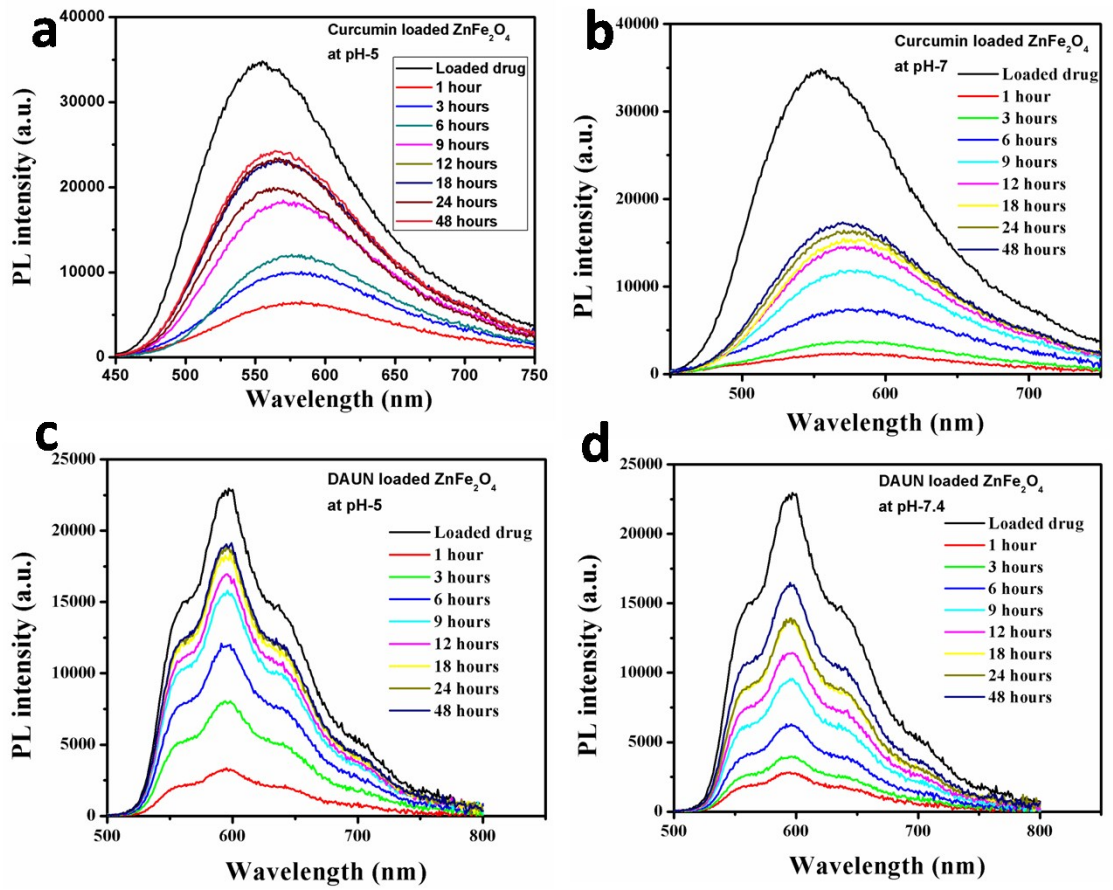


Fig. S12: Emission spectra depicting the drug release from curcumin loaded $ZnFe_2O_4$ nanoparticles a) at pH ~5 b) at pH ~7.4 and DAUN loaded $ZnFe_2O_4$ nanoparticles c) at pH ~5 and d) at pH ~7.4

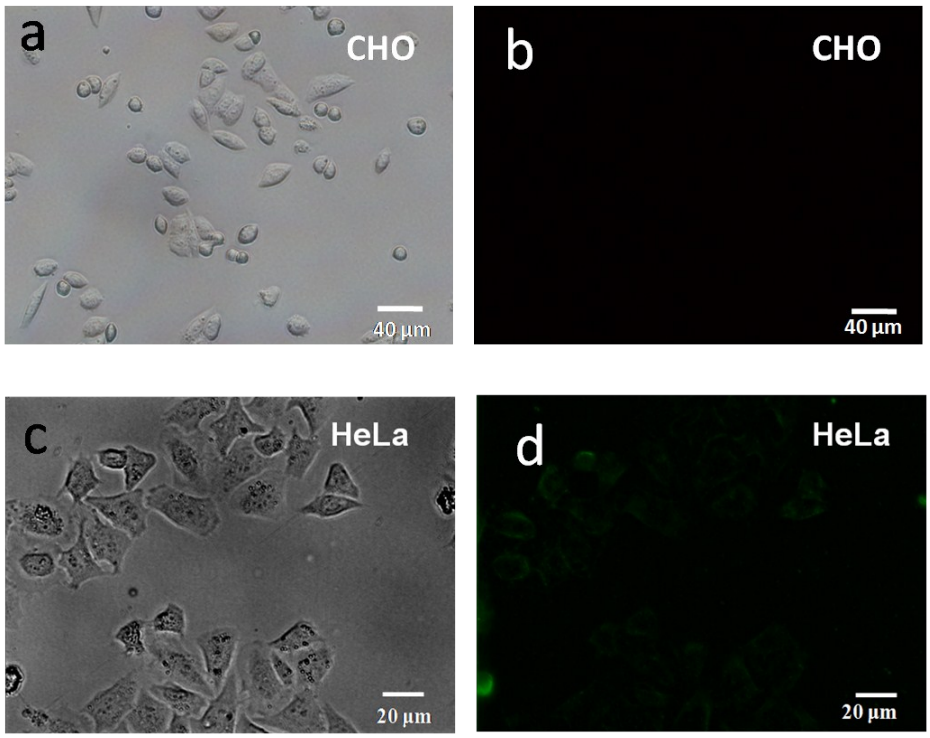
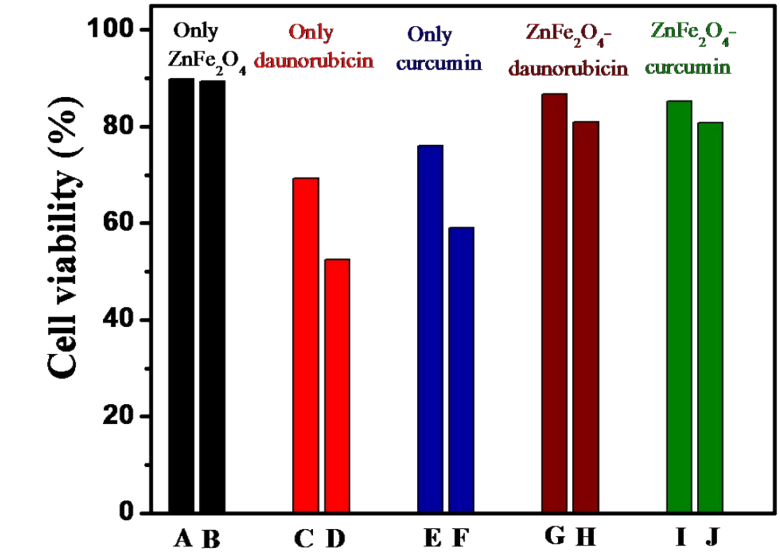


Fig. S13 The bright field (a,c) and fluorescence (b,d) imaging of CHO and HeLa cells respectively.



	A	B	C	D	E	F	G	H	I	J
Particle concentration (µg/ml)	250	500					250	250	250	250
Drug concentration (µg/ml)			5	10	5	10	0.8	1	0.8	1

Fig. S14: MTT assay of $ZnFe_2O_4$ nanoparticles (A, B), daunorubicin (C, D) and curcumin (E, F), daunorubicin (G-J) and curcumin (K-N) loaded $ZnFe_2O_4$ nanoparticles treated on normal cell line (CHO).