

Supporting Information

Fluorescence determination of Fe(III) in drinking water using a new fluorescence chemosensor

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Abstract

A new fluorescence chemosensor based on (Z)-2-(1-(3-oxo-3H-benzo[f]chromen-2-yl)ethylidene)hydrazine-1-carbothioamide(CEHC) has been developed for the determination of Fe(III) in drinking water. The optimum conditions were acetate buffer solution with a pH 5.0. In this approach, the determination of Fe(III) is based on static quenching of the luminescence of the probe upon increasing concentrations of Fe(III). The CEHC sensor binds Fe(III) in a 1:1 stoichiometry with a binding constant $K_a = 1.30 \times 10^4 \text{ M}^{-1}$. CEHC responds to Fe(III) in a way that is more sensitive, selective, and quick to turn off the fluorescence than to other heavy metal ions. Selectivity was proved against seven other metal ions (Mn(II), Al(III), Cu(II), Ni(II), Zn(II), , Pb(II), and Cd(II)). The calibration curve was constructed based on Stern-Volmer equation. The linear range was 0.5- 150 μM with the correlation coefficient of 0.99942, and the LOD was 0.76 μM . The method was successfully applied to determine Fe(III) in drinking water samples, and the accuracy of the chemosensor was validated by atomic absorption spectrometry.

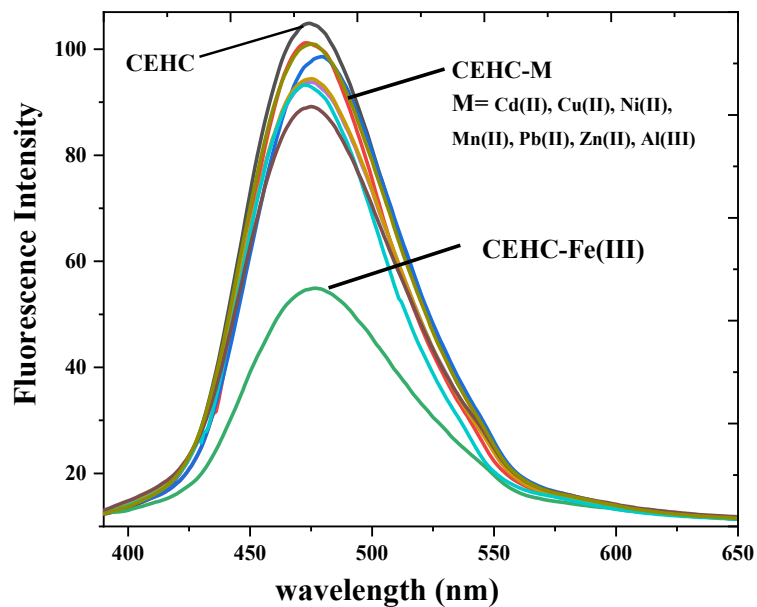


Fig. (1S) Fluorescence emission spectra of CEHC (1×10^{-4} M) in absence and presence of different metal ions ($40 \mu\text{M}$) at room temperature. Excitation was done at $\lambda_{\text{exc}} = 333$ nm

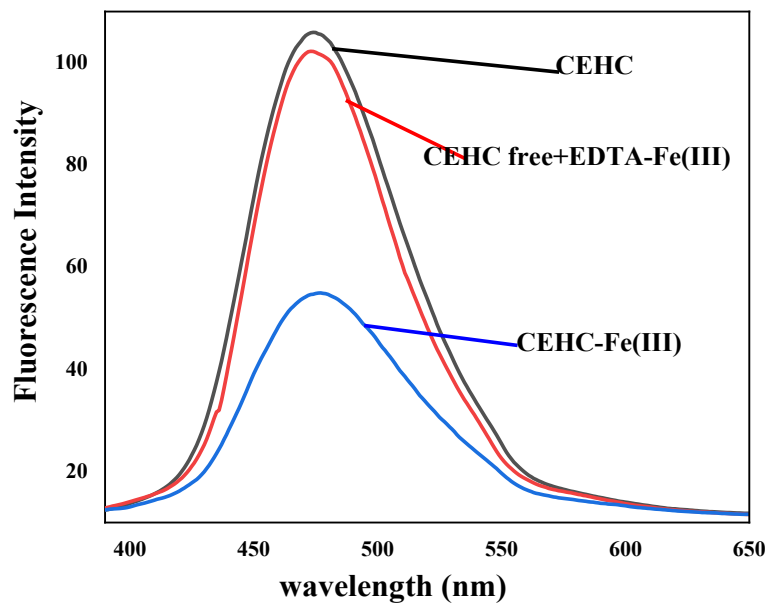


Fig. (2S) Fluorescence spectra of 100 μ M CEHC in the absent and presence 40 μ M of Fe(III) and EDTA at λ_{ex} = 333 nm, room temperature.

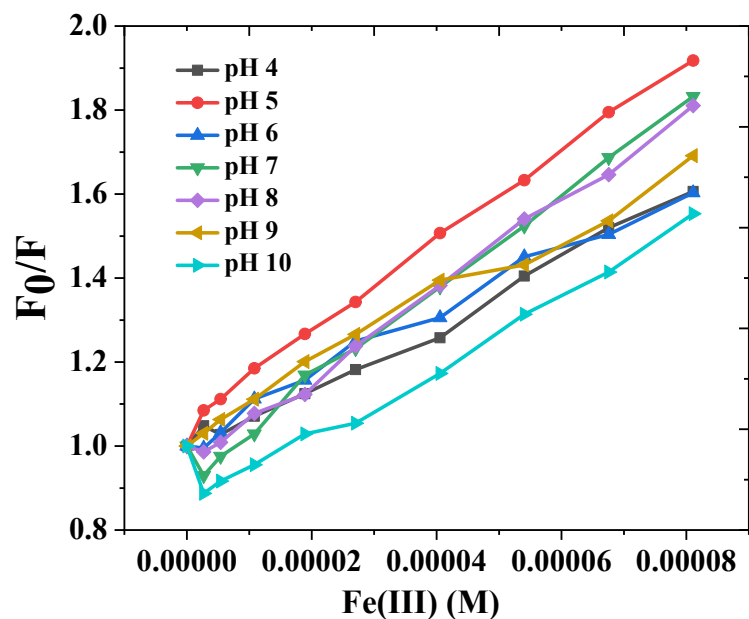


Fig. (3S) The Stern-Volmer plot for the interaction of CEHC with various concentrations of Fe(III) ions at different pH, $\lambda_{ex/em}$ =333/475 nm, and room temperature.

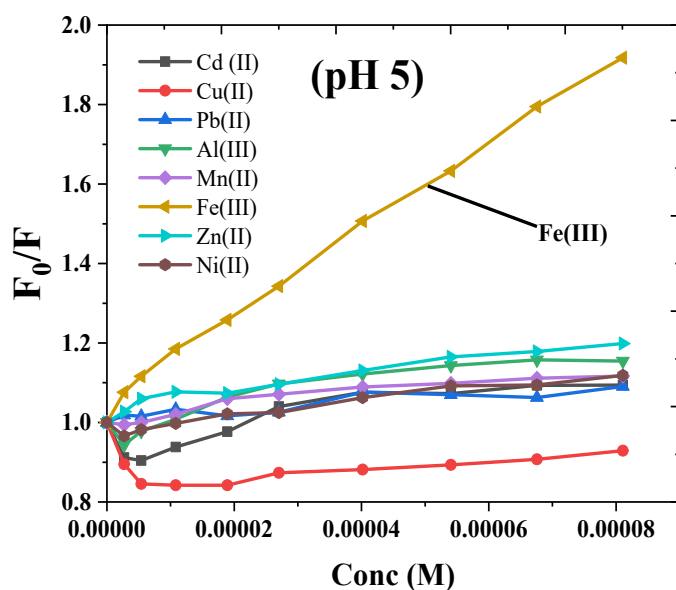


Fig. (4S) The Stern-Volmer plot for the interaction of CEHC with various concentrations of different heavy metals in acetate buffer at pH 5, $\lambda_{\text{ex/em}}=333/475$ nm, and room temperature.

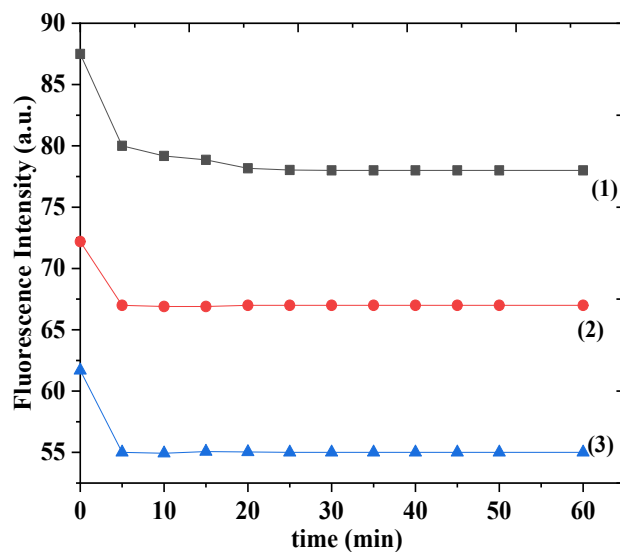


Fig. (5S) Fluorescence response of 1.0×10^{-4} M CEHC in presence of a Fe(III) with different concentrations at different times. The concentrations of Fe(III) (μM) are: (1) 10.0, (2) 30.0 and (3) 50.0, respectively.

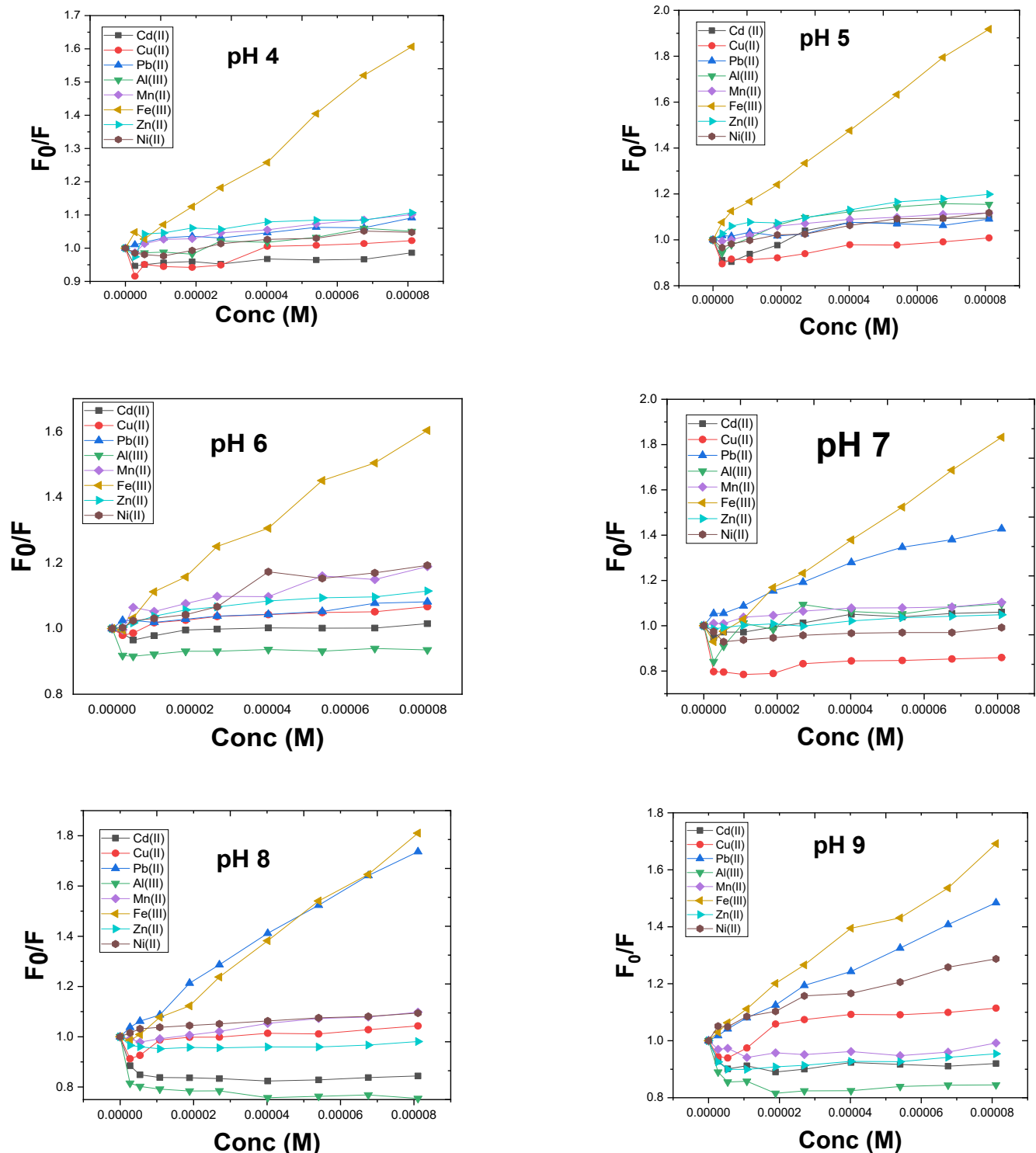


Fig. (6S) The Stern-Volmer plots for the interaction of CEHC with various concentrations of different heavy metals at different pH, $\lambda_{ex/em}=333/475$ nm, and room temperature.

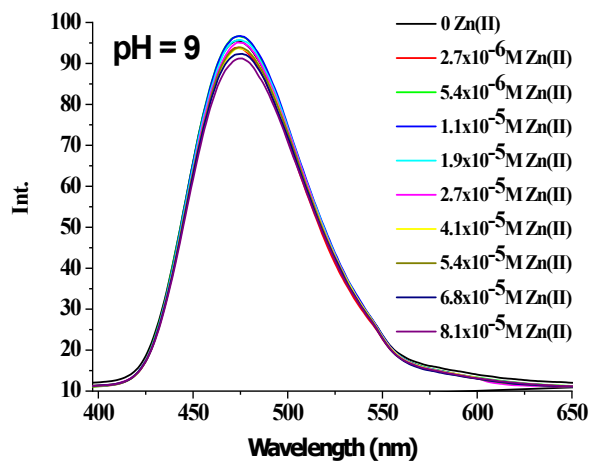
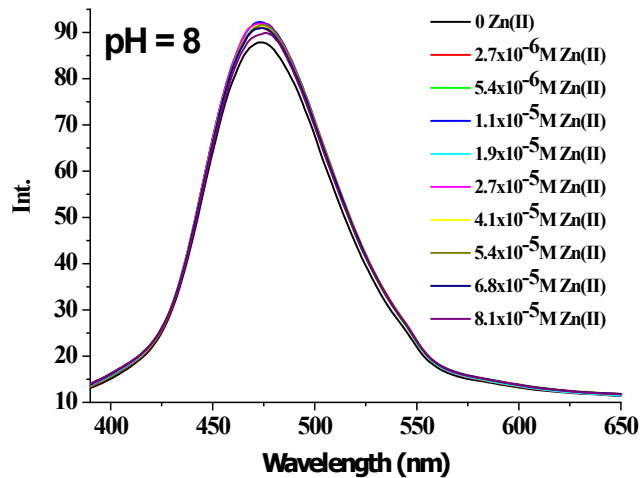
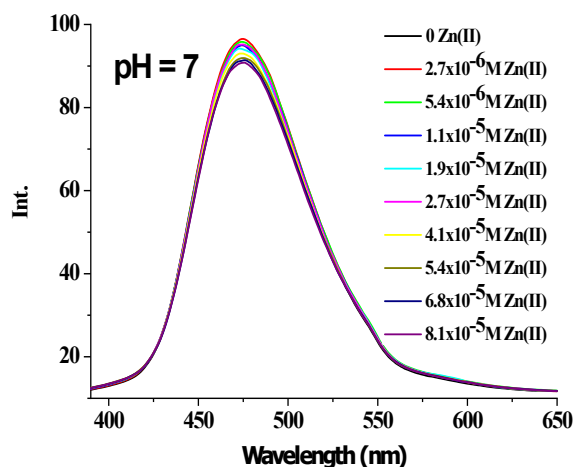
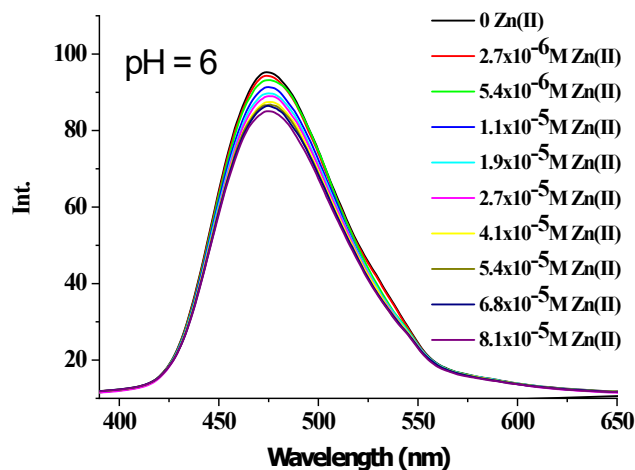
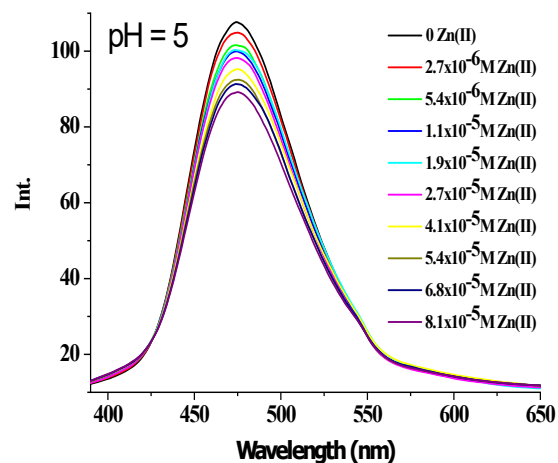
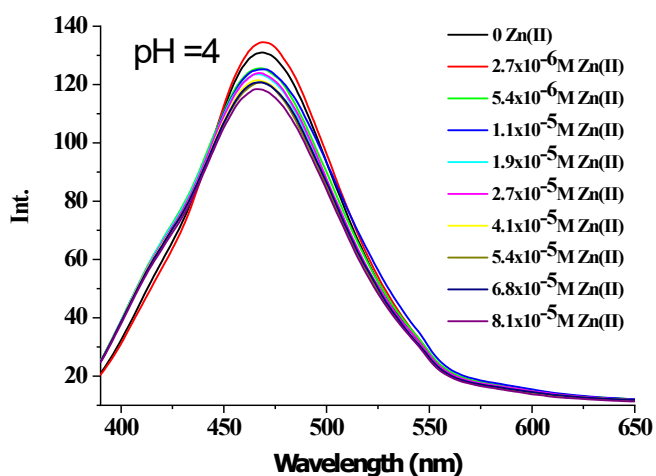


Fig. (7S) Emission spectra of 100 μM of CEHC in the absent and presence of various concentrations of Zn(II) at different pHs, $\lambda_{\text{ex}} = 333 \text{ nm}$ and room temperature.

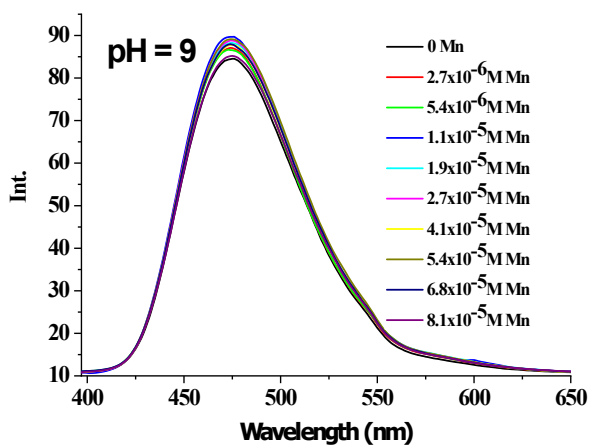
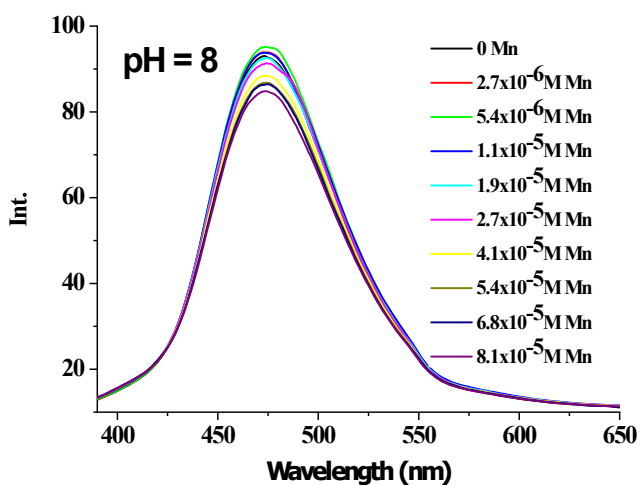
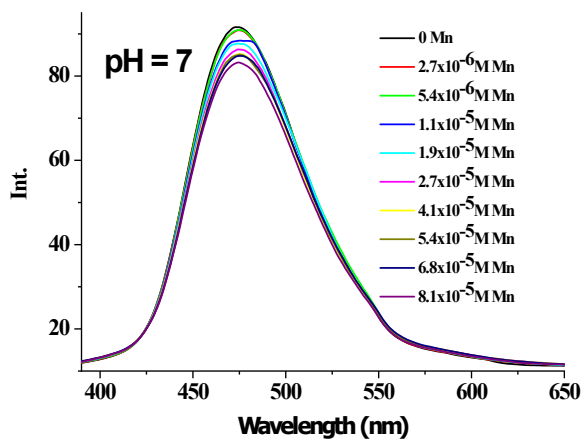
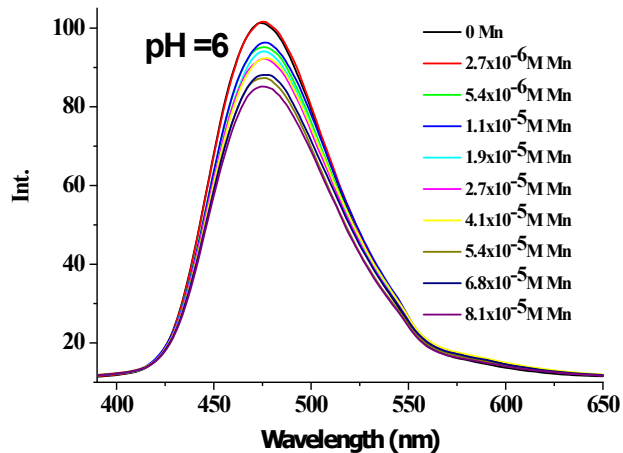
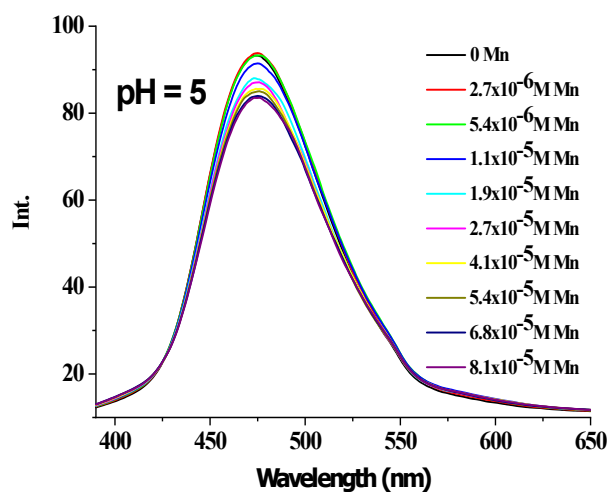
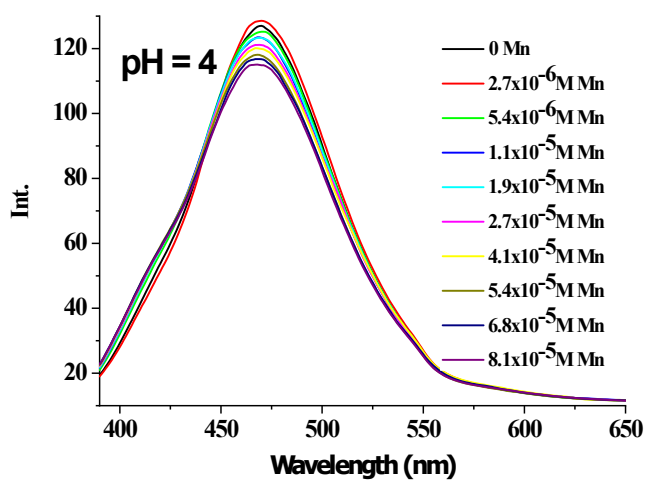


Fig. (8S) Emission spectra of 100 μ M of CEHC in the absent and presence of various concentrations of Mn(II) at different pHs, $\lambda_{\text{ex}} = 333$ nm and room temperature.

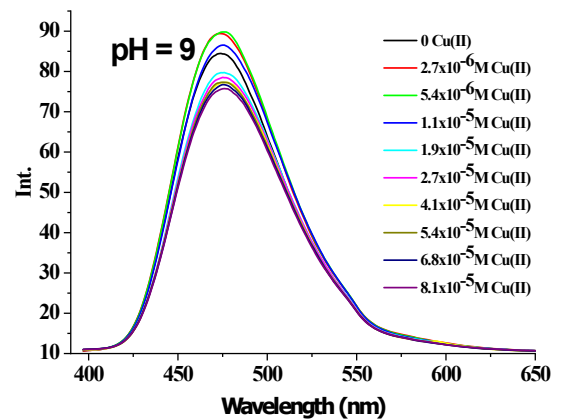
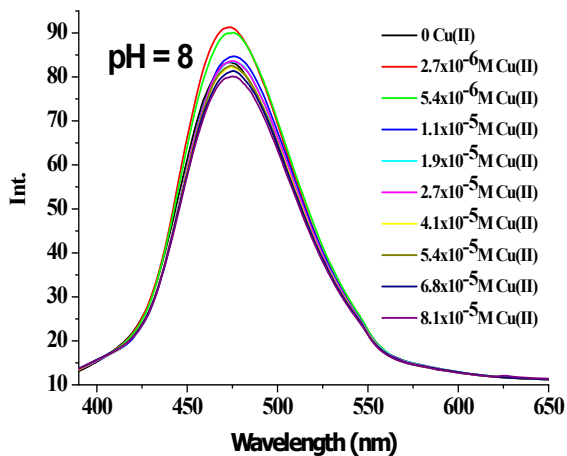
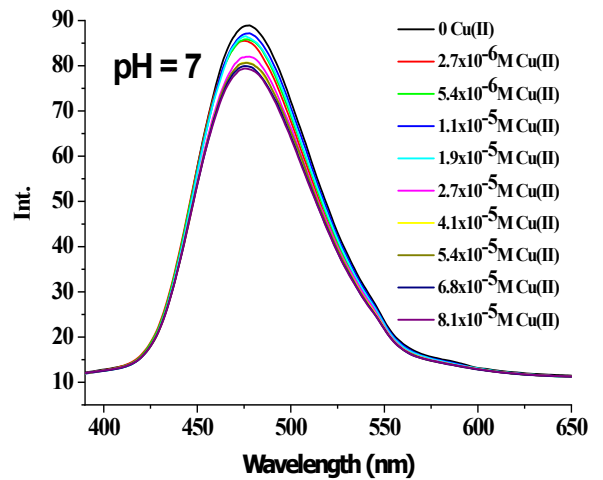
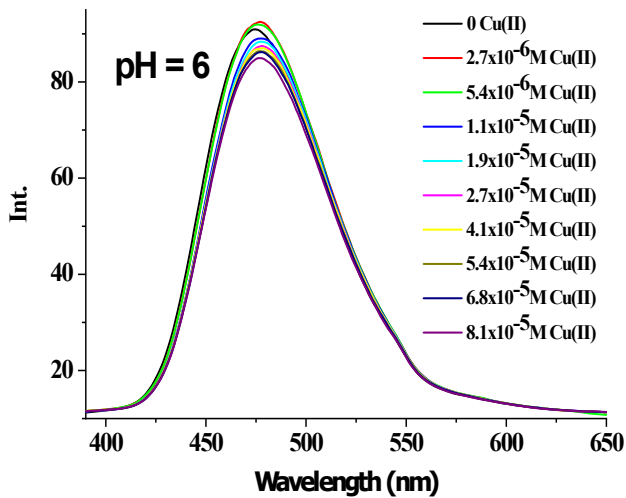
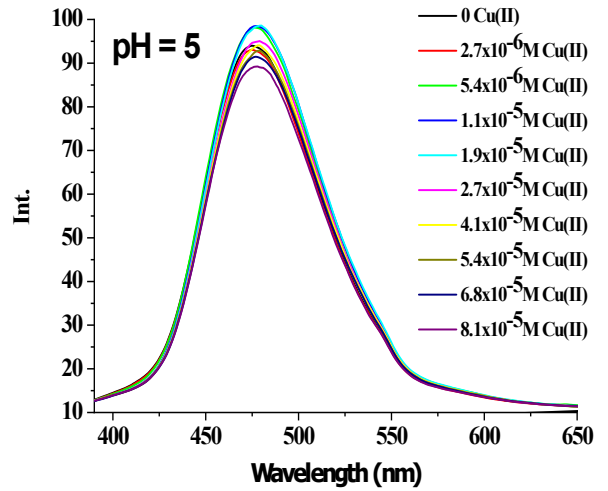
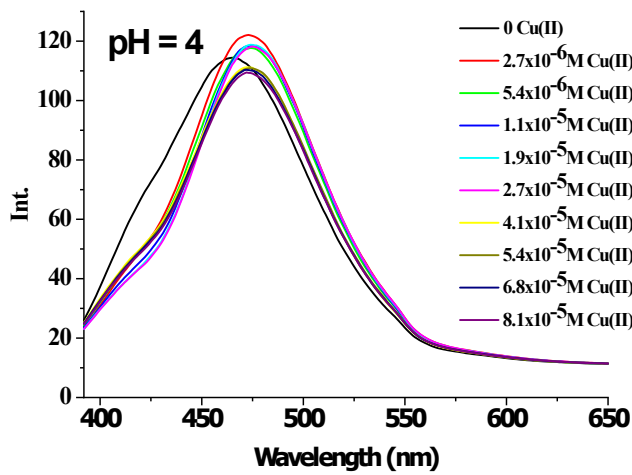


Figure (9S) Emission spectra of 100 μM of CEHC in the absent and presence of various concentrations of Cu(II) at different pHs , $\lambda_{\text{ex}} = 333 \text{ nm}$ and room temperature.

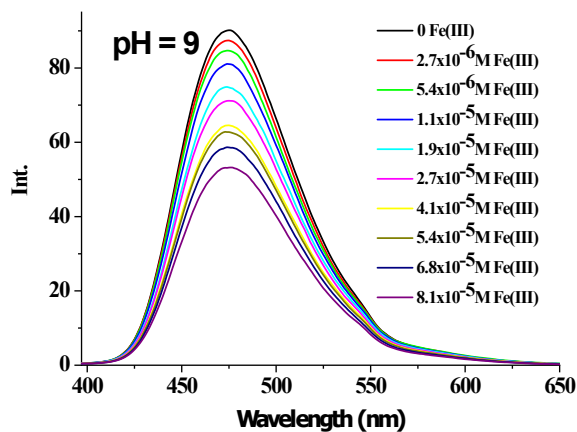
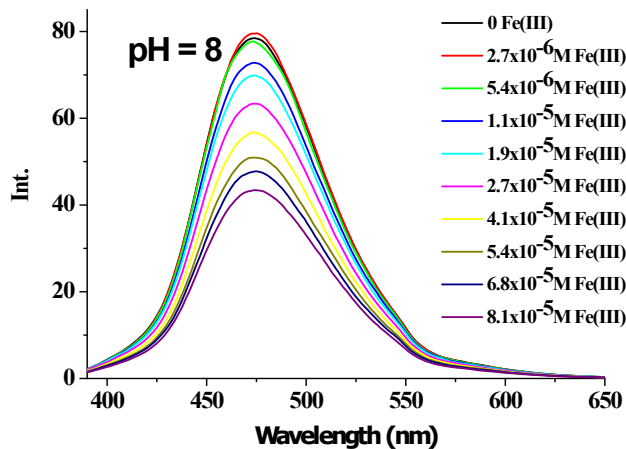
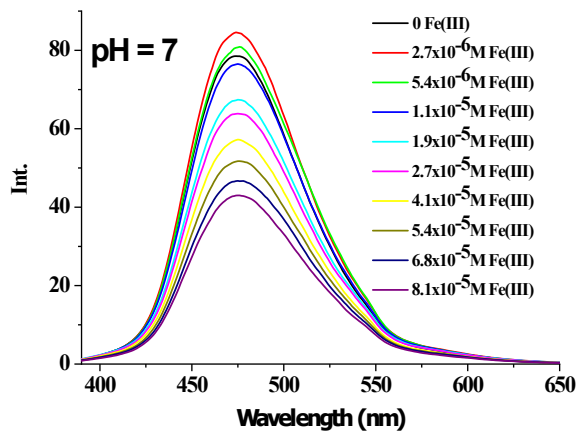
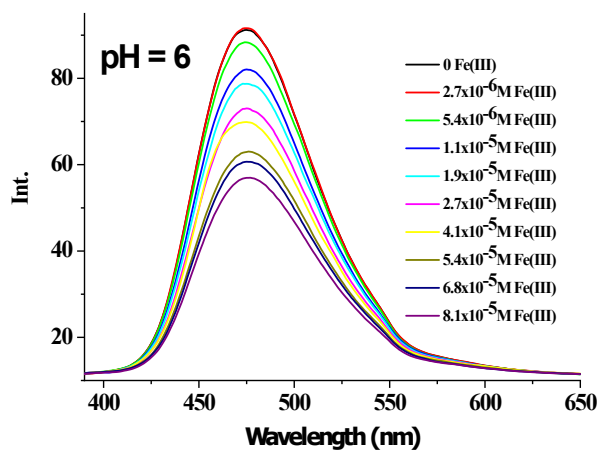
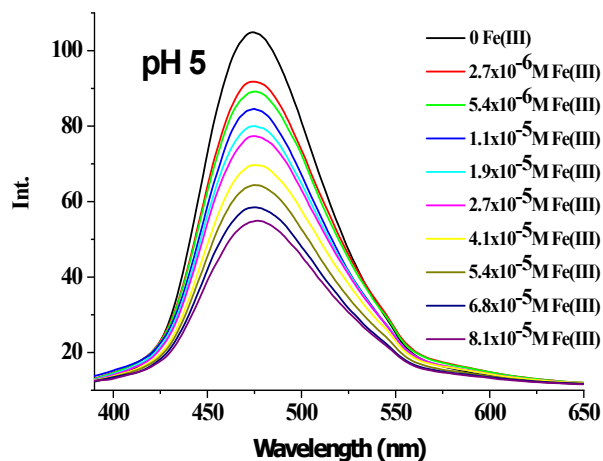
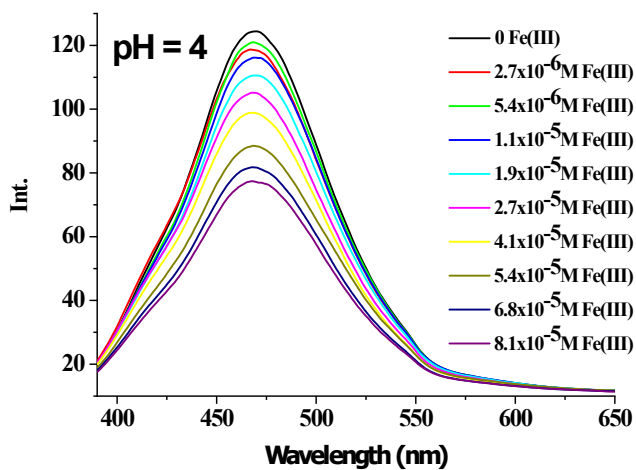


Figure (10 S) Emission spectra of 100 μ M of CEHC in the absent and presence of various concentrations of Fe(III) at different pHs , λ_{ex} = 333 nm and room temperature.

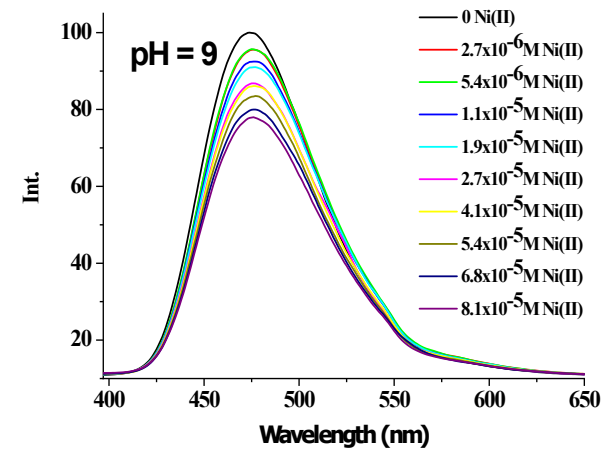
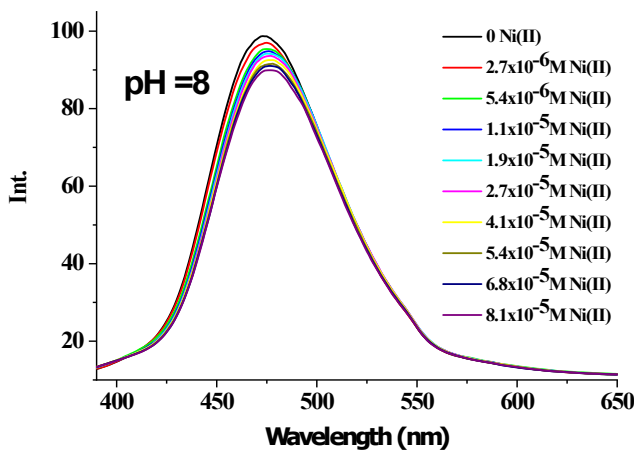
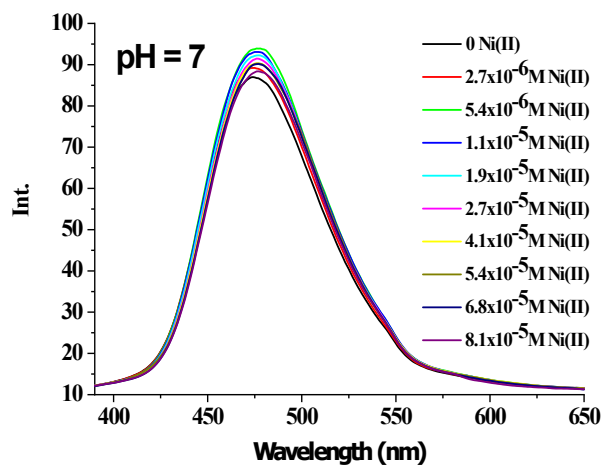
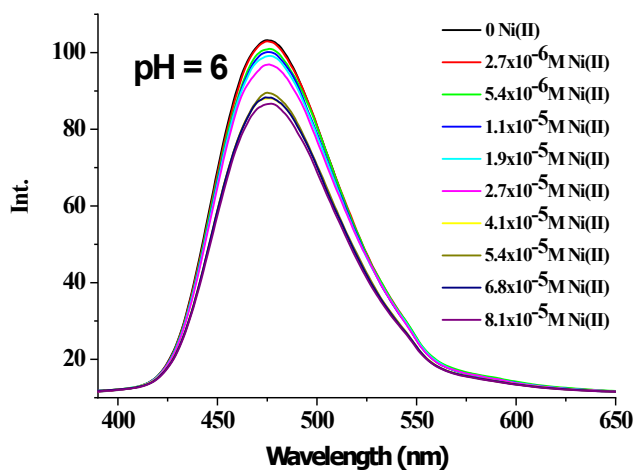
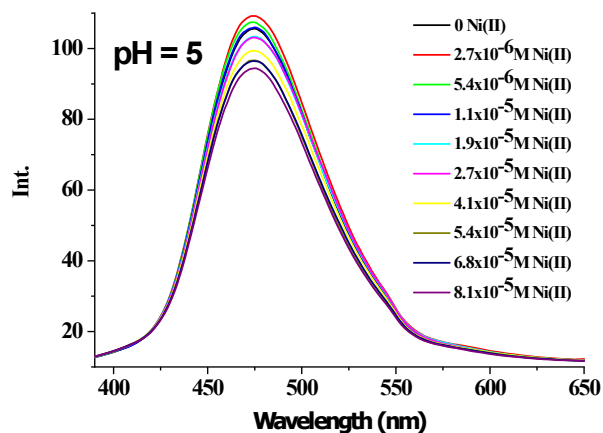
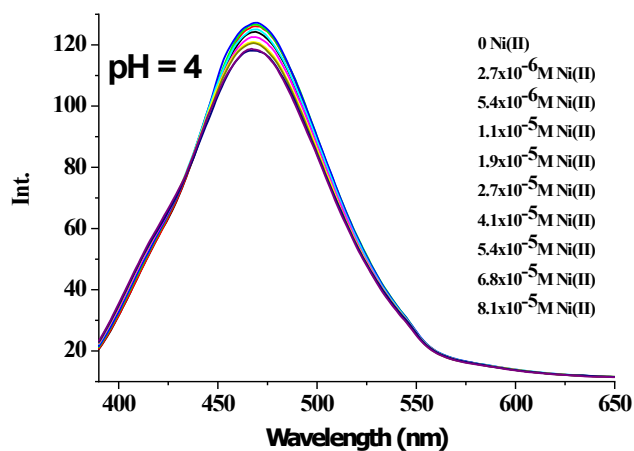


Fig. (11 S) Emission spectra of 100 μM of CEHC in the absent and presence of various concentrations of Ni(II) at different pHs, $\lambda_{\text{ex}}=333$ nm and room temperature.

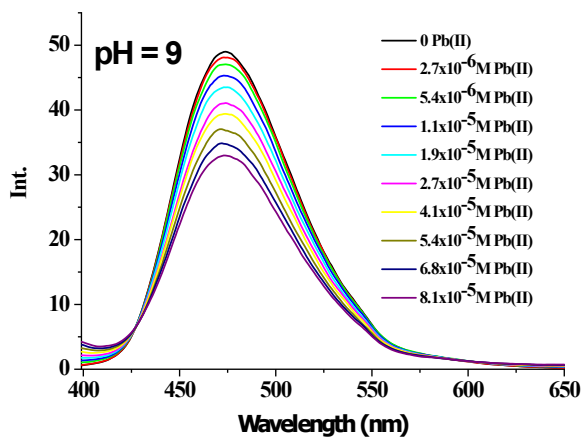
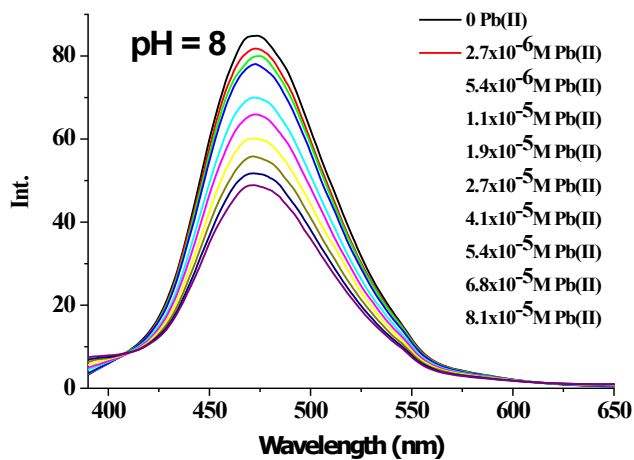
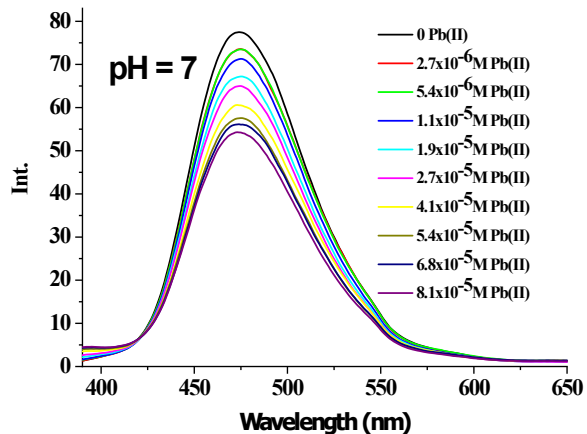
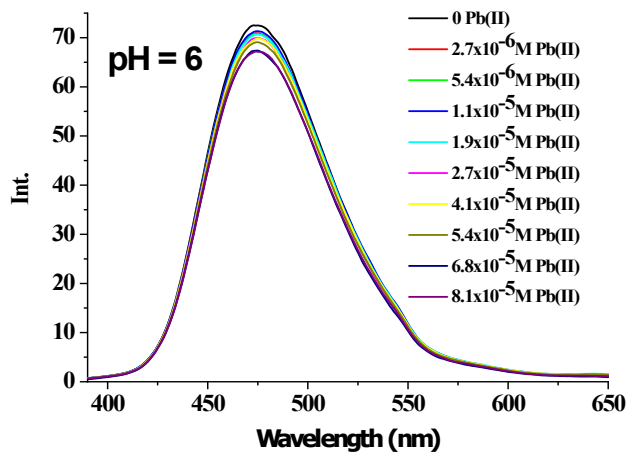
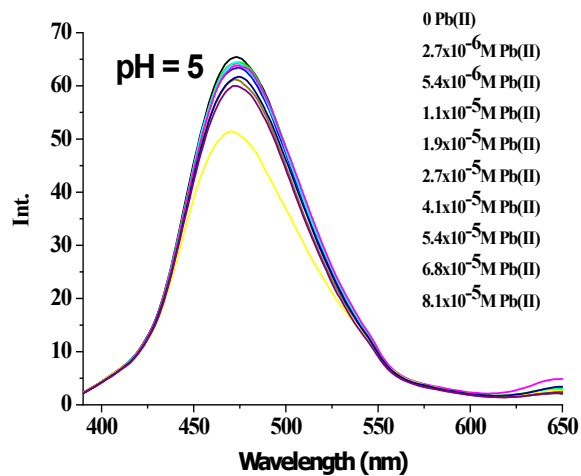
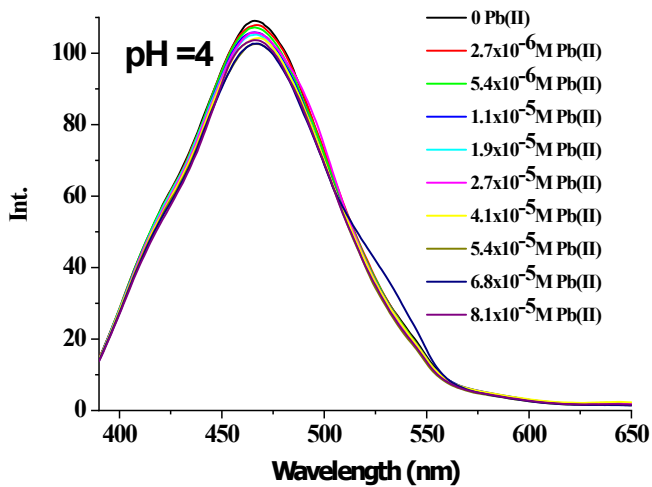


Fig. (12 S) Emission spectra of 100 μM of CEHC in the absent and presence of various concentrations of Pb(II) at different pHs, $\lambda_{\text{ex}} = 333 \text{ nm}$ and room temperature.

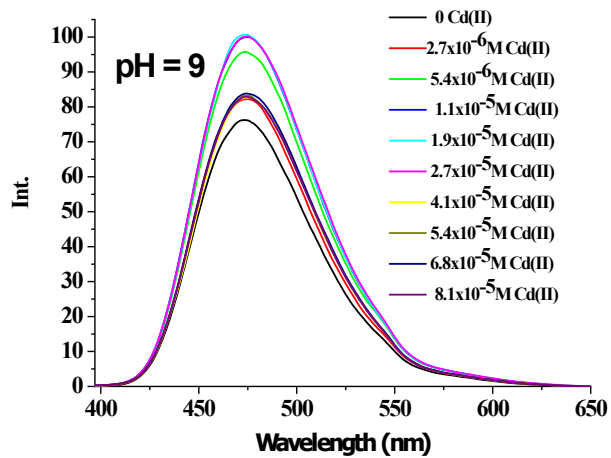
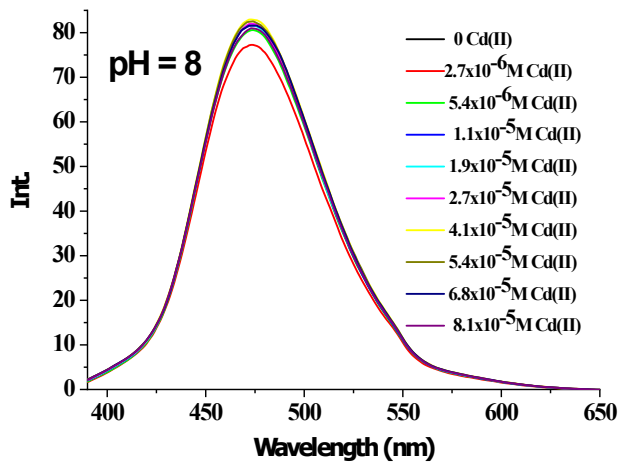
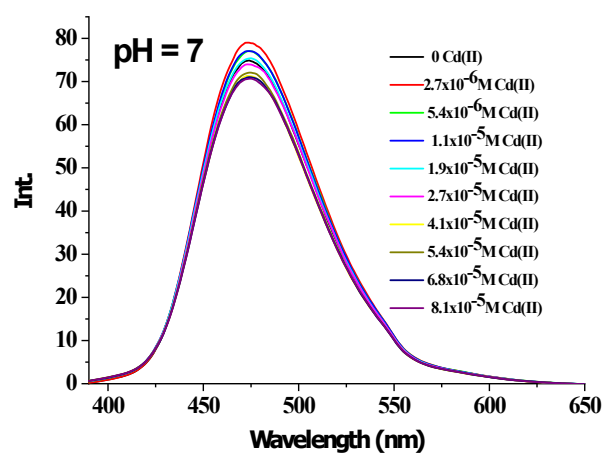
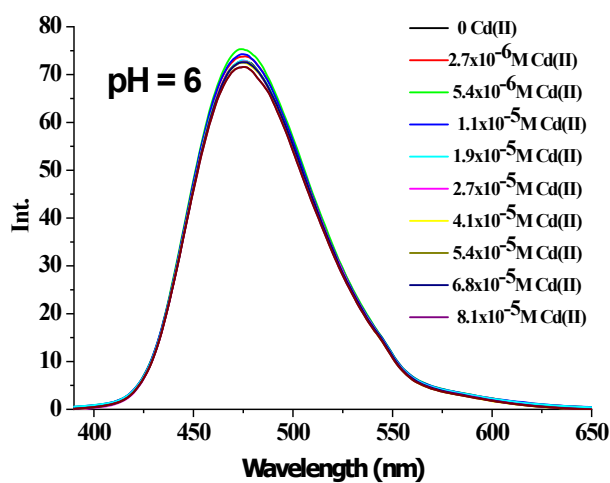
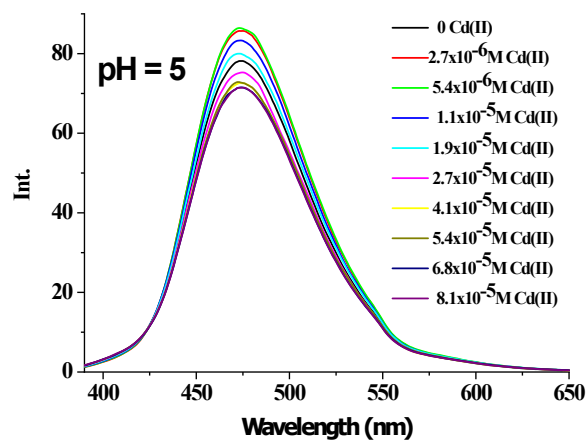
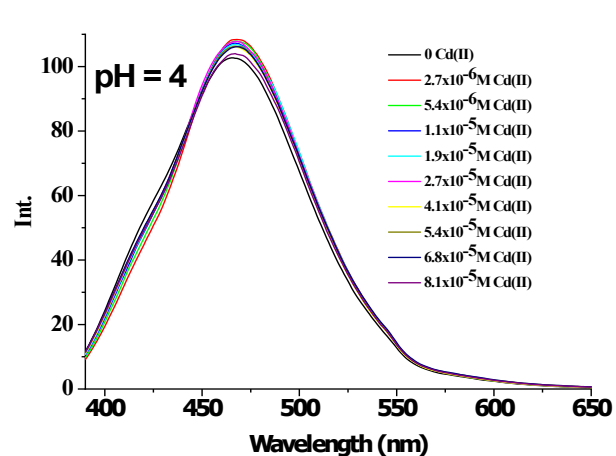


Fig. (13 S) Emission spectra of 100 μM of CEHC in the absent and presence of various concentrations of Cd(II) at different pHs, $\lambda_{\text{ex}} = 333 \text{ nm}$ and room temperature.

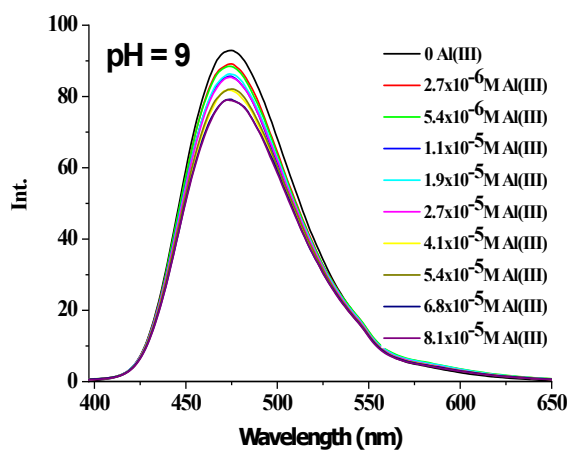
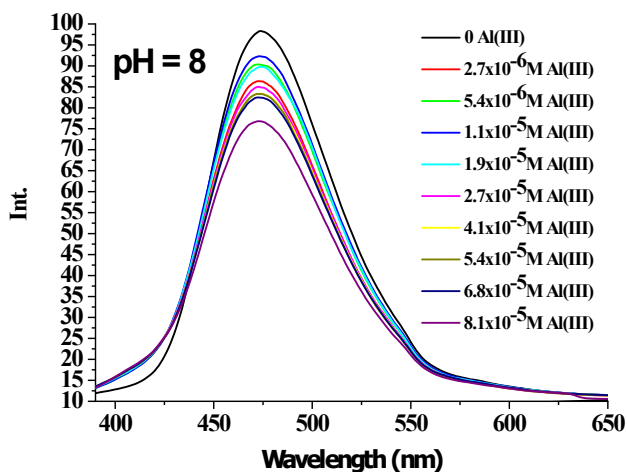
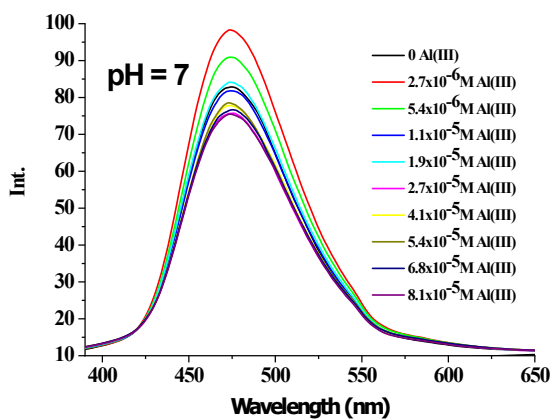
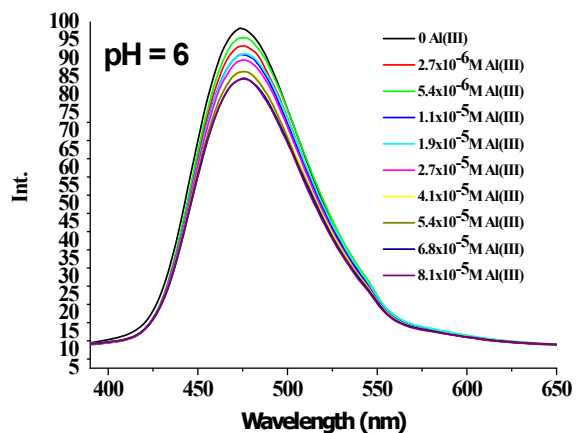
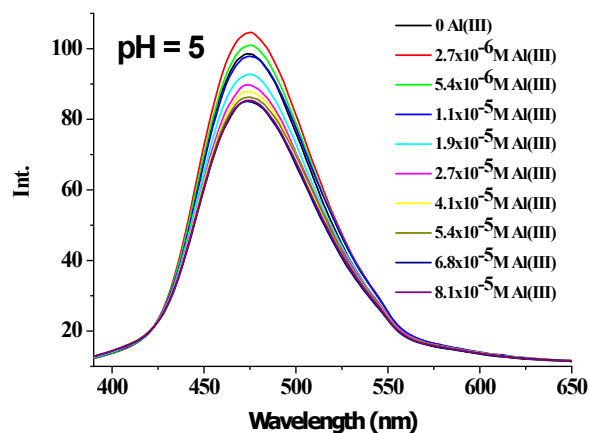
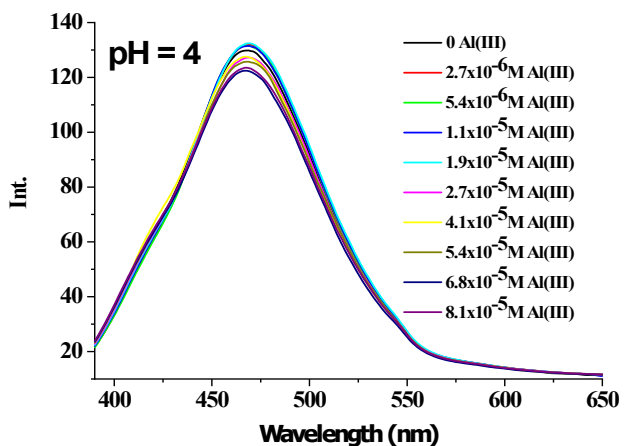


Fig. (14 S) Emission spectra of 100 μ M of CEHC in the absent and presence of various concentrations of Al(III) at different pHs, λ_{ex} = 333 nm and room temperature.