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## Synthesis and evaluation of a transition metal ion- selective fluorescence sensor

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Heavy metals are a common pollutant of the environment. Some of these metals can be toxic and hence, developing methods to detect their presence is important. Fluorescent chemosensors are available for detection of these metal ions. However, some of them have limitations such as low sensitivity, variations in sensitivity at different pH, and low solubility in aqueous systems.<sup>1</sup>

A novel fluorescence probe (L) was synthesized by esterification of ferulic acid with 6-hydroxymethyl-pyridine-2-carboxylic acid methyl ester. The synthesized fluorescence probe 6-[3-(4-Hydroxy-3-methoxy-phenyl)-acryloyloxymethyl]-pyridine-2-carboxylic acid methyl ester (L), was purified with a yield of 35% and characterized using UV-visible, fluorescence, FTIR and <sup>1</sup>H NMR spectroscopy. Fluorescence studies of L showed an emission at 342 nm when excited at the wavelength of 300 nm in acetonitrile/water (3:2) mixture at room temperature.

The fluorescence profile of the ligand in the presence of various metal ions such as Mn(II), Fe(III), Co(II), Ni(II), Cu(II), Zn(II), Cd(II), Hg(I), Mg(II) and Pb(II) was studied at pH ~7. The two main group elements studied; Mg(II) and Pb(II), did not show any quenching of fluorescence. Significant quenching of fluorescence (15%, 21% and 85%) was observed for Ni(II), Co(II) and Cu(II), respectively. From the studied transition metal ions Cu(II) was selected for further studies because it showed the highest quenching demonstrating the selective interaction of Cu(II) with ligand compared to the other metal ions.

Study of the behavior of L and Cu-L complex at various pH (1, 3, 5, 7, 9, 12) indicated that quenching by Cu(II) was greater in the pH range 5-8. Copper (II) forms a 1:2 complex with the L as indicated by the fluorescence titration and the Job's plot. The Stern-

Volmer plot indicated that at least two processes of quenching take place. At lower concentrations of Cu(II), a higher quenching rate is observed suggesting that the quenching process could be due to static quenching with the formation of a Cu(II)-L complex. At higher concentrations of Cu(II), a slower quenching rate is observed. This latter quenching could be due to a combination of both static and dynamic quenching. The tolerance limit in the presence of Zn(II) found as molar ratio of 2:1 (Zn(II): Cu(II)) demonstrated that L is more selective towards Cu(II). The findings of this research suggest that the synthesized probe L has the potential to be used as an "on-off" fluorescence probe to detect Cu(II) in environmental samples.

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