



Some novel Schiff base chemosensors (**L1-L5**) have been designed based on electron activating/deactivating properties and characterized by single crystal X-ray crystallography. Among those, the molecular probe having most electronegative group selectively sense Al^{3+} and Zn^{2+} by switching on the fluorescence in the adduct. The molecule **L1** remains non-fluorescent in solution due to photo-induced electron transfer (PET), excited state intramolecular proton transfer (ESIPT) and C=N bond isomerization. However, in presence of metal ion, chelation-induced enhanced fluorescence (CHEF) comes into play to inhibit all the processes and induce dramatic fluorescence increase in the adduct. The underlying mechanism and experimental observations have been corroborated with theoretical calculations. The chemosensor, **L1** has been found to be effective to determine the concentration of the selective ions in real sample (drug analysis) and detect them in living cells through optical imaging at physiological pH.