



EFFECT OF HYDROGEN BONDING ON THE FLUORESCENCE OF PROTONATED 1,10 PHENANTHROLINE AND 1,10 PHENANTHROLINE-5-AMINE

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1,10-Phenanthroline is an important chelating bidentate ligand for transition metal ions and its excitation and emission wavelengths in acetonitrile are 267 nm and 364 nm respectively. Upon protonation, 1,10-Phenanthroline shows a red shifted emission peak at 415 nm. 1,10-Phenanthroline-5-amine a derivative of 1,10-Phenanthroline excites and emits at 280 nm and 515 nm in acetonitrile respectively. It has an increased fluorescence quantum yield than pristine 1,10-Phenanthroline.

Solvent polarity and environmental effects have prominent consequences on spectral properties of fluorophores. Linear Solvation Energy Relationship (LSER) is used to qualitatively understand the above effects. Microscopic parameters such as α , β and π^* are used to explain the variations of solvent properties. Hydrogen-bond acidity of a solvent is described by a scale of α , hydrogen-bond basicity of a solvent is described by a scale of β and solvent dipolarity/polarizability is described by a scale of π^* .

In this study, the effect of hydrogen bonding on the fluorescence intensity of protonated 1,10-Phenanthroline (fluorescence peak at 415 nm) and 1,10-Phenanthroline-5-amine (fluorescence peak at 515 nm) at different solvent environments were studied. The effects of hydrogen bonding from different organic solvents with distinct polarities (methanol, water, DMF, DMSO, dichloromethane and chloroform) were tested.

Fluorescence of both peaks was quenched by solvents. Stern-Volmer plots were generated for every solvent quenching process. β values of the hydrogen bond accepting solvents with protonated 1,10-Phenanthroline gave a linear correlation for Stern-Volmer quenching constant whereas α values of hydrogen bond donating solvents with 1,10-Phenanthroline-5-amine gave a linear correlation for Stern-Volmer quenching constant.

Thus, it can be concluded that hydrogen bond accepting solvents quench fluorescence of protonated 1,10-Phenanthroline whereas hydrogen bond donating solvents quench fluorescence of 1,10-Phenanthroline-5-amine. Due to the formation of hydrogen bonding complex between the chelating core of the fluorophores and the solvent molecules, the fluorescence of fluorophores decreases.



Keywords: Linear Solvation Energy Relationship (LSER), Stern-Volmer plot, Fluorophore, 1,10-Phenanthroline-5-amine.

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