Title of the thesis: "**Design of Luminescent Polypyridyl-Imidazole based Ruthenium Complexes for the Construction of Sensors, Switches and Logic Devices**"

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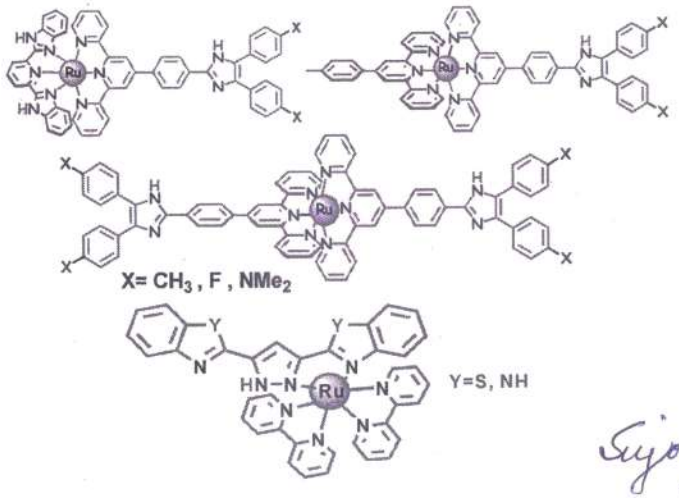
Abstract

This thesis deals with the Ru(II) complexes based on polypyridyl-imidazole ligands. All the complexes were synthesized and thoroughly characterized by standard analytical tools and spectroscopic techniques. Absorption and luminescence spectral characteristics as well as electrochemical behaviour of the complexes were thoroughly investigated via different optical channels and spectroscopic techniques as well as by cyclic and square-wave voltammetry. Binding constant and detection limit of the complexes towards selected anions were evaluated from the spectral titration data in both aqueous and organic media. Temperature dependent emission spectral measurements were executed to acquire knowledge about deactivation dynamics of the complexes. pH-induced modulation of the absorption and emission as well as electrochemical properties were thoroughly investigated and associated pK_a values of the complexes were determined. The absorption and emission spectral response upon the influence of external stimuli were utilised to fabricate multiple Boolean (BL) and Fuzzy logic (FL) operations. Finally, soft computing techniques {Artificial Neural Networks (ANNs), Fuzzy-logic and Adaptive Neuro-Fuzzy Inference System (ANFIS)} were employed to fully understand as well as to forecast the complete sensing behaviors of the complexes. DFT and TD-DFT studies were also carried out to understand the electronic structures of the complexes and for appropriate assignment of the spectral bands.

The thesis is comprised of 6 chapters and consists of 287 pages.



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