

ABSTRACT

Thesis title: "Synthesis, Structure and Properties of Metal-Organic Compounds of Cadmium and Vanadium"

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The main focus of the research work is to synthesize metal-organic compounds. The structure of the metal-organic compounds (MOCs) were determined by single crystal X-ray diffraction techniques and thoroughly characterized by several techniques like PXRD, ^1H NMR, UV-Vis, FTIR, TGA, gas sorption and ESI-MS analysis.

In **first work**, we have synthesized two new coordination polymers *via* hydrothermal method such as, $[\text{Cd}_2(2,3\text{-pzdc})(\text{tz})_2]$ (**2.1**) and $[\text{Cd}_2(2,3\text{-pzdc})(\text{dtz})_2]$ (**2.2**). The compound **2.2** showed higher lifetimes of the excited states and higher overall current magnitude than that of the compound **2.1**, indicating the higher conductivity of compound **2.2**. This behavior indicates a probable role of hydrogen-bond interactions in the lower resistance and higher conductivity of compound **2.2** compared to compound **2.1**. In **second work**, we have synthesized $[\text{Cd}(\text{PDA})(\text{L})_2]$, (**3.1**) using hydrothermal method. The synthesized compound **3.1** showed selective and efficient sorption of large anionic dye remazol brilliant blue R (RBBR) in aqueous medium. The compound **3.1** also exhibited photoluminescence based sensing behaviors towards Fe^{3+} , Cr^{3+} and Al^{3+} ions in aqueous medium based on luminescence quenching effect due to formation of charge transfer species through the molecular level interactions between metal ions ($\text{Fe}^{3+}/\text{Cr}^{3+}/\text{Al}^{3+}$) and compound **3.1**. In **third work**, a new Cd(II)-based 2D compound $[\text{Cd}(\text{BTCH})(\text{L})]$ was successfully synthesized *via* hydrothermal method. The compound **4.1** showed luminescence quenching effect due to possibility of formation of molecular level interaction between compound **4.1** and the metal ions (Fe^{3+} , Cr^{3+} and Al^{3+}). The compound **4.1** also exhibited luminescence quenching effect in the presence of TNP due to the energy transfer from the excited state of the ligands of compound **4.1** to the analyte (TNP). In **fourth work**, two new dioxidovanadium compounds were synthesized in three different methods (acidic, neutral and basic medium). The compound **5.1** showed highly selective luminescence turn on behaviour along with 33 nm blue shift in presence of Al^{3+} ions in aqueous medium. Whereas the compound **5.2** showed luminescence quenching behaviour in the presence of Fe^{3+} , Al^{3+} and Cr^{3+} ions. The luminescence response mechanism of both the compounds in presence of metal ions has been correlated with the molecular level interactions.

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