

ABSTRACT

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Title: “Synthesis, Structure and Physicochemical Properties of Some Metal- Organic Frameworks.”

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The thesis presents a glimpse of recent advances in the field of gas adsorption, heterogeneous catalysis and luminescence properties of metal-organic frameworks vis-à-vis their synthesis and structural diversity.

This thesis consists of five chapter. Chapter 1 contain a summary of the work presented in this thesis along with a brief description of physical methods and equipments employed.

Chapter 2 illustrates the solvothermal synthesis of a cadmium(II) containing mixed-linker 3D MOF viz. $\{[\text{Cd}(\text{L}_1)(\text{L}_2)](\text{DMA})\}_n$ (**1**) (L_1 = 2-amino-1,4-benzenedicarboxylate, L_2 = 4,4'-azopyridine and DMA = N,N-dimethylacetamide). The compound exhibited a superior sensing activity towards tri-positive metal ions (Fe^{3+} , Al^{3+} , Cr^{3+}) through “turn-on” process and selective nitro aromatic (TNP) sensing activity through “turn-off” mechanism. In addition, capability to accept water molecule into pores of MOF has been studied by vapor sorption measurements.

Chapter 3 discusses the selective adsorption capacity of pre synthesize cadmium(II) containing mixed-linker 3D MOF viz. $\{[\text{Cd}(\text{L}_1)(\text{L}_2)](\text{DMA})\}_n$ (**1**) (L_1 = 2-amino-1,4-benzenedicarboxylate, L_2 = 4,4'-azopyridine and DMA = N,N-dimethylacetamide) towards CO_2 compared to other gas (H_2 , N_2 , CH_4) and evaluation of the heat of adsorption and selectivity parameter.

Chapter 4 accounts the synthesis of a one dimensional (1D) Cu(II) based mixed-linker polymer $\{\text{Cu}_2(\text{L}_3)_4(\text{L}_4)\}_n$ (**2**) (L_3 = 3-(2-thienyl)acrylic acid) L_4 = 4,4'- bipyridine) by layer diffusion method and characterization. The compound coupled with TEMPO (2,2,6,6-tetramethylpiperidin-1-yl)oxyl or (2,2,6,6-tetramethylpiperidin-1-yl)oxidanyl) exhibited good catalytic activity for oxidation of primary alcohols in absence of any base with high selectivity and good yield.

Chapter 5 reports the solvothermal synthesis and characterization of a series of cobalt (II) based 2D MOF named as $\{[\text{Co}(\text{L}_5)(\text{L}_2)](\text{H}_2\text{O})\}_n$ (**3**), $\{[\text{Co}(\text{L}_5)(\text{L}_6)]\}_n$ (**4**) and $\{[\text{Co}(\text{L}_5)(\text{H}_2\text{O})](\text{H}_2\text{O})_2\}_n$ (**5**) (L_5 = 5-amino-1,3-benzenedicarboxylic acid, L_2 = 4,4'-azopyridine and L_6 = 1,2-bis(4-pyridyl)ethane. The compounds contain redox active cobalt(II) centre and free amine functionality that played bi-functional catalytic role leading to catalyzing tandem reaction, styrene oxidation followed by Knoevenagel condensation.



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