

Abstract

This thesis deals with the utilization of coordinate bonds and hydrogen bonding interaction along with other weak interactions for the generation of coordination polymers (CPs) metal organic gels(MOGs), understanding the network topologies of the CPs in terms of coordination modes attained by the central metal ion, bridging modes of the linkers, robustness of the networks and various noncovalent interactions. Interestingly some of the CPs and MOGs were found to contain distinct photophysical properties which was evident from their solid state emission spectra. They were also shown to exhibit reversible solvatochromism and photo conductivities at room temperature. Mixed valent CPs were synthesized *via* solvothermal reaction between an exodentate ligand in presence of aromatic and aliphatic dicarboxylate linkers and the resulting CPs were analyzed in terms of their network geometries and specially mixed valent CPs were analyzed by CV and DRS studies. Reactions of *bis*-pyridyl β -diketones with transition metal salts resulted in the formation CPs and MOGs. Crystal structure analysis of the CPs showed their isostructurality in terms of non coordinated pyridyl groups, bite angles and grid dimensions. Solvothermal reactions of two bis-(N-pyridyl amides) with transition metal salts in the presence of aliphatic and aromatic dicarboxylates resulted in the formation CPs. Crystal structures of all these CPs were analyzed and all of the CPs modified GCEs were found to have significant electrochemical properties which were elucidated in terms of their specific capacitance. Reaction of bis-pyridyl cyclopentanone with transition metal resulted in the formation of CP which showed reversible solvatochromism (yellow \rightarrow brown) and reversible photo conductivity (low photo conductivity \rightarrow high photo conductivity). Reaction of a series of bis-pyridyl ligands with Ag(I) in presence of mono- and bis- aromatic sulfonates were found to result in the formation of CPs. Some of these CPs were found to contain short Ag...Ag interactions which was assisted by the sulfonates. These CPs showed ligand based luminescence which was further assisted by such argentophilic interactions.

Keywords: Coordination Polymers, Metal Organic Gels, Solvothermal Reactions, Electrochemical Properties, Luminescence, Solvatochromism, Conductivity.