

Abstract

The thesis addresses the exploitation of coordination bonding and hydrogen bonding along with other non-covalent interactions as influential tools for the generation of functional materials. In this process, a strategy is developed to generate higher dimensional networks with Ni_4O_4 cubanes as SBUs; consequently, the ferromagnetic behavior of the complexes got tuned depending on the molecular aggregations and exchanged pathways. The luminescence sensing technique is adapted for the detection and quantification of nitro-explosives and ferric ion from aqueous solution in ppm levels by electron-rich coordination networks. Further, the eminent role of solvents and anions for the formation of metal-organic gels has been elucidated with an α,β -unsaturated ketone and silver salts in various organic solvents. The carboxylic acids and resorcinol derivatives with two bis-pyridyl substituted α,β -unsaturated ketones are shown to generate ionic and neutral complexes where the secondary and tertiary ammine moiety formed several charge assisted hetrosynthons and hydrogen bonded networks. Furthermore, two flexible tri-carboxylic acids with ether and ammine linkages behaved differently in their complexes with various bis-pyridyl bases in terms of molecular geometry, synthon formation and supramolecular network geometry. The study emphasis on crystallization conditions, nature of frameworks, role of solvents and anions, molecular geometries and hydrogen bonding or other non-covalent interactions in determining the supramolecular assemblies and respective properties. The main aspect of these studies is the exploration of the functional properties such as magnetism, luminescence, detection of lethal environmental pollutant and waste water management.

Keywords: cubanes, coordination polymers, metal-organic gels, cocrystals, salts, ferromagnetism, luminescence, sensing, dye adsorption.