

Abstract

This thesis deals with the supramolecular networks of ligands containing multiple secondary amide functionalities (bis, tris and tetra amides). Several analogues of amides containing various substituents were synthesized and their associations in the solid state *via* inter molecular interactions were studied. The materials were characterized by single crystal and powder X-ray diffractions, IR, NMR and elemental analysis. Some of these compounds were explored for their ability to form co-crystals, polymorphs, solvates and coordination networks. The crystal structures of these materials were solved and analyzed in detail.

A series of bis(pyridyl)alkanediamides (Reverse Amides) is synthesized and the effect of pyridyl group in the occurrence of amide-to-amide hydrogen bonds is discussed. The results obtained here are compared with the previously explored homologous series of bis(pyridylcarboxamido)alkanes (Amides). The interference of pyridine group in amide-to-amide hydrogen bond is observed to be more frequent in reverse amides compared to their amide analogues. The complexation reactions reveal that the coordination polymers of amides and reverse amides with shorter spacers $-(\text{CH}_2)_2-$ and $-(\text{CH}_2)_4-$ doesn't prefer any particular network geometry. While more consistency was observed with amides and reverse amides containing longer spacers $-(\text{CH}_2)_6-$, $-(\text{CH}_2)_8-$ and phenyl. It is observed that hydrophobic interactions between the longer and phenyl spacer ligands are playing important role for further assembling of the coordination polymers.

The results on 1,3,5-benzenetricarboxamide and Ethylenediamine-N,N,N',N'-tetraamide derivatives suggest that the conformational flexibility and synthon interference influence the geometries of supramolecular architectures in several ways. The concentration and solvent of crystallization was also found to play a major role in the formation of particular assembly in these analogues. The interference of one functionality in to the recognition pattern of other functionality was found to be minimum when the functional groups exhibit the tendency of self recognition. The faithful transfer of supramolecular synthons observed in the crystal structures of molecules in to their corresponding coordination networks was demonstrated very effectively. Further the

properties such as porosity, topology, guest exchange, anion exchange and templating effects involved in several of these materials were explored.

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