# CHAPTER 6

# CONCLUSIONS

The influences of supramolecular interactions, namely the hydrogen bonding, the aromatic–aromatic (π–π) and aliphatic–aromatic (CH/π) interactions, on structural architectures and supramolecular assemblies are illustrated as significant in the derivation of a new polymorph of 1,3,5–triazine–2,4,6–triaminehexaacetic acid (TTHA) and also the other five new metal–organic materials, including $[Ni_3(C_9H_{11}NO_3)_6(OCH_3)]\cdot 4CH_3OH$ (**I**), $[Co(C_9H_{10}NO_3)(C_6H_4NO_2)(H_2O)_2]$ (**II**), $[Ni(C_9H_{10}NO_3)(C_6H_4NO_2)(H_2O)_2]$ (**III**), $(C_6H_{11}N_2)_2[Zn_3(C_8H_4O_4)_3Cl_2]$ (**IV**) and $(C_8H_{15}N_2)_2[Zn_3(C_8H_4O_4)_3Cl_2]$ (**V**).

In Chapter 2, the synthesis and characterization of a new polymorph of TTHA ($C_{15}H_{18}O_{12}N_6$) are reported. The reported polymorph is different from the previously known polymorph in various aspects, including molecular conformation, type and pattern of hydrogen bonding interactions. Such differences can be accounted for by a different spatial arrangement and subsequently different modes of coordination of the carboxylates expressed by the TTHA, rendered by the flexible $–N(CH_2COOH)_2$ arms.

In Chapter 3, the synthesis and characterization of a new trinuclear Ni–complex, $[Ni_3(C_9H_{11}NO_3)_6(OCH_3)]\cdot 4CH_3OH$, containing incomplete cubane core structure are presented. The stabilizations of the incomplete cubane structure by the hydrogen bonding interactions including the strong O–H···O, N–H···O and the weak C–H···O types are discussed. The presence of $-CH_2-$ group in the tyrosinate structure provides the flexibility to the $-(C_6H_4)OH$ part, which arranges in such a way that the $-OH$ groups of all tysosinate anions are associated in the O–H···O hydrogen bonding interactions with the neighboring cluster and methanol molecules. This then regulates the supramolecular assembly in this complex.

In Chapter 4, the synthesis and characterization of a chiral decorated metal–nicotinate frameworks, including $Co(C_9H_{10}NO_3)(C_6H_4NO_2)(H_2O)_2$ and $Ni(C_9H_{10}NO_3)(C_6H_4NO_2)(H_2O)_2$, are reported. Both complexes express the isostructural one–dimensional linear chain, which are accumulated into the three–dimensional solid state structure by the strong O–H···O type of hydrogen bonding interactions.

In Chapter 5, the synthesis and characterization of two new metal–organic materials, $(C_6H_{11}N_2)_2[Zn_3(C_8H_4O_4)_3Cl_2]$ and $(C_8H_{15}N_2)_2[Zn_3(C_8H_4O_4)_3Cl_2]$ derived from the ionothermal technique, are reported. The crystal structures of these complexes feature the same isoreticular $[Zn_3(BDC)_3Cl_2]^{2-}$ anionic layered structure, which is intercalated by the $EMIm^+$ or $BMIm^+$ cations. The difference in hydrogen–bonding type *i.e.* C–H···O in $(C_6H_{11}N_2)_2[Zn_3(C_8H_4O_4)_3Cl_2]$ and aliphatic CH/$\pi$ in $(C_8H_{15}N_2)_2[Zn_3(C_8H_4O_4)_3Cl_2]$, imparts the effect on the sheet structure and consequently the difference in thermogravimetric properties of the these two compounds.