MOFs of Phenylamine and Pyridine Derivatives: Structure and Thermal Analysis

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One of the aims of crystal engineering is to produce extended frameworks utilising the wide range of possible covalent and supramolecular interactions. While the most common of the latter is probably the hydrogen bond (often used to generate organic as well as inorganic frameworks) a number of other interactions exist. Changes in experimental conditions may also influence the materials produced.

We have recently prepared a series of metal-organic hybrid materials using a series of phenylamine and pyridine derivatives with transition metals and lanthanides. The same component compounds can be used to prepare network structures, inorganic-organic layered structures or even simple salts. Changes in conditions (eg. pH or temperature) are critical in determining the type of material obtained. This paper will discuss some of the well-ordered MOF networks and layered compounds we have prepared, including the MOFs formed with 4,4'-dipyridyl-N,N'-dioxide using lead(II), copper(II), zinc(II) or cobalt(II) and the layered compounds formed using the same metals with phenylamines as the organic layers. Compounds have been characterised by single crystal and powder X-ray diffraction. Their thermal stability and decomposition behaviour has been studied using Differential Scanning Calorimetry, Thermogravimetry and Hot Stage Microscopy. Kinetic parameters of the desolvation and/or decomposition reactions have also been determined in some cases.

Keywords: crystal engineering, kinetics, thermal analysis