World Academy of Science, Engineering and Technology
International Journal of Chemical and Materials Engineering
Vol:13, No:03, 2019

Selective Guest Accommodation in Zn(II) Bimetallic: Organic Coordination Frameworks

Authors : Bukunola K. Oguntade, Gareth M. Watkins

Abstract : The synthesis and characterization of metal-organic frameworks (MOFs) is an area of coordination chemistry which has grown rapidly in recent years. Worldwide there has been growing concerns about future energy supplies, and its environmental impacts. A good number of MOFs have been tested for the adsorption of small molecules in the vapour phase. An important issue for potential applications of MOFs for gas adsorption and storage materials is the stability of their structure upon sorption. Therefore, study on the thermal stability of MOFs upon adsorption is important. The incorporation of two or more transition metals in a coordination polymer is a current challenge for designed synthesis. This work focused on the synthesis, characterization and small molecule adsorption properties of three microporous (one zinc monometal and two bimetallics) complexes involving Cu(II), Zn(II) and 1,2,4,5-benzenetetracarboxylic acid using the ambient precipitation and solvothermal method. The complexes were characterized by elemental analysis, Infrared spectroscopy, Scanning Electron microscopy, Thermogravimetry analysis and X-ray Powder diffraction. The N2-adsorption Isotherm showed the complexes to be of TYPE III in reference to IUPAC classification, with very small pores only capable for small molecule sorption. All the synthesized compounds were observed to contain water as guest. Investigations of their inclusion properties for small molecules in the vapour phase showed water and methanol as the only possible inclusion candidates with 10.25H2O in the monometal complex [Zn4(H2B4C)2.5(OH)3(H2O)]·10H2O but not reusable after a complete structural collapse. The ambient precipitation bimetallic; [(CuZnB4C(H2O)2]·5H2O, was found to be reusable and recoverable from structure collapse after adsorption of 5.75H2O. In addition, Solvo-[CuZnB4C(H2O)2.5]·2H2O obtained from solvothermal method show two cycles of rehydration with 1.75H2O and 0.75MeOH inclusion while structure remains unaltered upon dehydration and adsorption.

Keywords : adsorption, characterization, copper, metal -organic frameworks, zinc
Conference Title : ICC 2019 : International Conference on Chemistry
Conference Location : Rome, Italy
Conference Dates : March 05-06, 2019