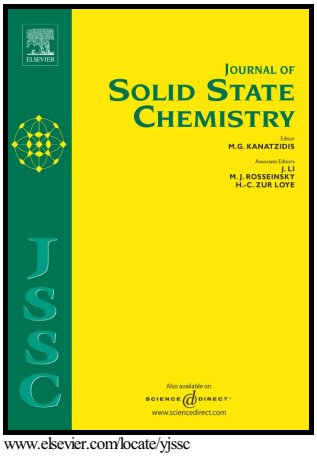

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Triangular and Linear Co_3 Cluster Based Metal-Organic Frameworks: Structures and Magnetic Properties

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Abstract

We have synthesized three new cobalt based inorganic-organic hybrid materials by solvothermal method, these structure have either angular or linear trimeric cobalt cluster as a secondary building unit. In case of compounds **1** and **2**, the cobalt centers were corner shared through common bridging –OH group to form the triangular cluster. Interestingly in compound **1**, the monomeric cobalt center is linked with framework while in compound **2** the monomeric cobalt unit is trapped inside the pore of the framework. In compound **3**, the cobalt centers are corner shared to form the linear trimeric cluster. These trimeric cobalt clusters are connected through BTB ligands to form two-dimensional coordination polymer structure. All three structures have common BTB (1,3,5-Tris(4-carboxyphenyl)benzene) ligand, whereas in case of compound **1** and **2**, BPE (1,2-bis (4-pyridyl) ethane) and for **3**, DPB (1,4-Di(4-pyridyl)benzene) have been used as co-ligand. The magnetic measurements revealed the large and positive values of θ_{CW} in compounds **1** and **2**, respectively. This implies that the dominant interaction between the Co spins are antiferromagnetic in nature. In case of compound **3,** the structure is quite different from the other two compounds. In compound **3** the coupling between the Co-atoms drastically reduce compared to compounds **1** and **2**, respectively, resulting in a paramagnetic behavior. We have also measured the optical band gap energy for all three compounds and results show that the band gap is relatively low and it is in the range of 1.82 eV to 1.89 eV.

Graphical abstract