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Synthesis, crystal structure and adsorption properties of a novel 2-D coordination polymer $\{[Co(HPDC)_2(H_2O)_2].(H_2O)(DMSO)\}_n$

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Introduction

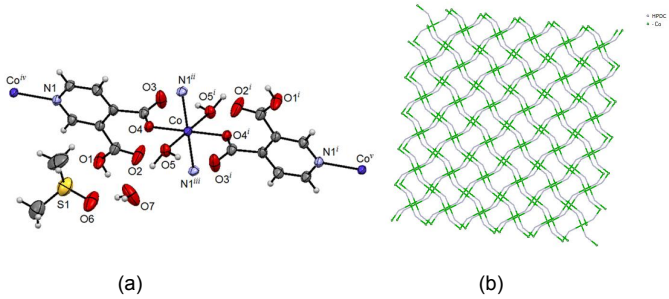
The synthesis and design of coordination polymers have attracted attention in the last years due to their potential application as chemical materials[1].

To achieve permanent porosity and high gas storage capacity, highly robust metal-organic frameworks have been the major research goal during the past decade.

In this work we report the synthesis, crystal structure and N_2 adsorption/desorption studies of the novel coordination polymer named $\{[Co(HPDC)_2(H_2O)_2].(H_2O)(DMSO)\}_n$ (H_2PDC = 3,4-pyridinedicarboxylic acid).

Results and Discussion

The coordination polymer was obtained by the reaction between H_2PDC ligand and $Co(NO_3)_2.6H_2O$ in DMSO/EtOH, through the diffusion method. Red crystals were collected by filtration after one month. The infrared spectrum, elemental analysis and TG analysis results are in accordance to the single crystal X-ray diffraction analysis, which revealed a compound with 2D polymeric structure. Each Co(II) center is coordinated by two pyridine nitrogen atoms, two oxygen atoms from carboxylate groups and two oxygen atoms from *aqua* ligands in an octahedral geometry (Figure 1a). There is also the presence of a lattice DMSO and water molecules. HPDC ligands bridge the metal centers generating a 2D sheet, that can be classified as 4-connected uninodal 2D net of (*4*,*4*) topology (Figure 1b)[2].



(a) (b)

Figure 1. (a) Crystal structure of the Co(II) coordination polymer and (b) simplified 2D net.

The porosity of the sample was evaluated by N_2 sorption experiment. About 80 mg of the compound was placed in a quartz cell and dried for 12 h at 100°C to remove the solvent molecules prior to measurements. The N_2 sorption isotherm obtained at 77 K exhibits a type III feature with low adsorption capacity, corresponding to a pore volume of 0.20 cm^3 (Figure 2). The Brunauer−Emmett−Teller (BET) and Langmuir surface areas were calculated to be 6.47 and 7.40 $m^2\ g^{-1}$, respectively, indicating a low adsorption capacity for this polymer, when compared with other polymers[3].

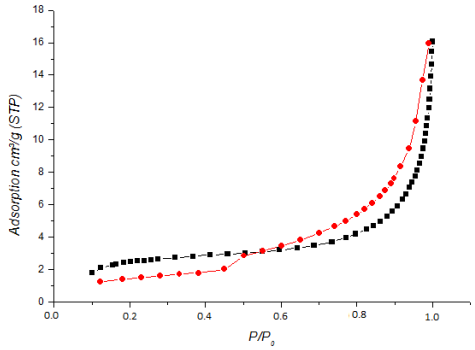


Figure 2. N_2 adsorption (black) and desorption (red) isotherms for the Co(II) coordination polymer.

Conclusions

In this work the synthesis, characterization and N_2 sorption studies of a coordination polymer, $\{[Co(HPDC)_2(H_2O)_2].(H_2O)(DMSO)\}_n$ (H_2PDC = 3,4-pyridinedicarboxylic acid), were reported. The results showed the formation of 2D net of (*4*,*4*) topology with low N_2 adsorption capacity

Aknowledments

FAPEMIG, CNPQ, UFJF and LAMATE (UFF).

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