

Synthesis, characterization of a new lanthanum (III) coordination polymers with 3D open framework

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Abstract

The synthesis and assembly of metal–organic frameworks (MOFs) with open architectures or porous structures from small molecular building blocks have attracted high concern for some years and are still of considerable interests [1-2], owing to the observation of the large number of potential applications in catalysis, gas sorption and desorption, fluorescent sensing, opto-electronic devices, and molecular magnetism [3]. A novel 3D crystal structure of the title compound $\text{La}_2(\text{C}_4\text{H}_2\text{O}_4)_3(\text{C}_4\text{H}_4\text{O}_4) \cdot 2\text{H}_2\text{O}$ ($\text{C}_4\text{H}_4\text{O}_4$ = Fumaric acid) has been synthesized via hydrothermal procedure. Its molecular structure was determined by single X-ray diffraction analysis. The compound crystallizes with space group $C2/c$ and the cell parameters are $a = 8.4299(5) \text{ \AA}$, $b = 14.6789(8) \text{ \AA}$, $c = 8.8096(5) \text{ \AA}$, $\beta = 103.318(3)^\circ$, $V = 1060.80(11) \text{ \AA}^3$, and $Z = 4$ ($R1 = 0.02$). The La(III) center is a distorted tricapped trigonal prism coordinated by nine oxygen atoms, eight O atoms from seven distinct fumarate moieties, including one protonated fumarate unit and one water a molecule. La(III) ions are connected into a framework structure by the oxygen atoms of the carboxyl groups. The $\text{LaO}_8(\text{H}_2\text{O})$ polyhedra centres are edge-shared through three carboxylate bridges of the fumarate ligand, forming chains in three dimensions to construct the MOF. The crystal structure is stabilized by $\text{O} \cdots \text{H} \cdots \text{O}$ hydrogen-bond interactions between the coordinated water molecule and the carboxylate O atoms, and also between oxygen atoms of fumaric acid.

Keywords: Lanthanum(III); hydrothermal synthesis; coordination polymer; open framework

References

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