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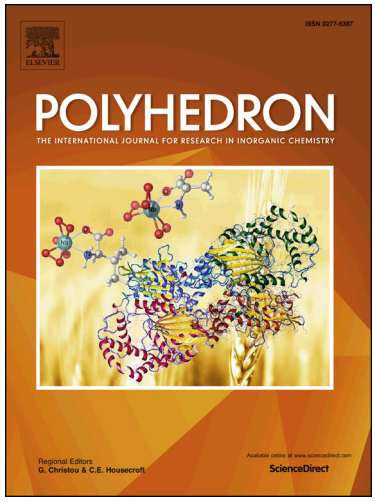

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PII: S0277-5387(17)30320-0
DOI: http://dx.doi.org/10.1016/j.poly.2017.04.033
Reference: POLY 12611

To appear in: *Polyhedron*

Received Date: 6 January 2017
Accepted Date: 10 April 2017

Please cite this article as: X. Guo, Y. Li, Q. Peng, Z. Duan, M. Li, M. Shao, X. He, Dual Functional Three-Dimensional LnMOFs for Luminescence Sensing of Nitrobenzene and Fe^{3+} Ions, *Polyhedron* (2017), doi: http://dx.doi.org/10.1016/j.poly.2017.04.033

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Dual Functional Three-Dimensional LnMOFs for Luminescence Sensing of Nitrobenzene and Fe^{3+} Ions

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Abstract:

Two lanthanide MOFs, namely $\{\{Me_2NH_2\}[Tb^{III}(L)]\cdot 3H_2O\cdot DMF\}_n$ (**1**) and $\{\{Me_2NH_2\}[Eu^{III}(L)]\cdot 3H_2O\cdot DMF\}_n$ (**2**), based on the flexible ligand 5-(bis(4-carboxybenzyl)amino)isophthalic acid (H_4L) have been synthesized under solvothermal conditions, where DMF = N,N-dimethylformamide. The two compounds exhibit a 3D structure with rectangle channels encapsulating $[Me_2NH_2]^+$ cations. The microporous structure as well as the confinement of cations inside the MOFs pores allows **1** and **2** to act as dual-functional luminescent materials to detect nitroaromatics and metal ions. The experiments show that the luminescence of sample **1** in DMF solution was quenched when the nitrobenzene (NB) content reached 2.3×10^{-2} mol/L and concentration of Fe^{3+} reached 5×10^{-4} mol/L.

Keywords: Lanthanide MOFs; Sensor; Crystal structure; Luminescence

1 Introduction

Metal-organic frameworks (MOFs) have been developed quickly because of their potential applications in gas storage and separation [1], ion exchange [2], dye adsorption and desorption [3], catalysis [4] and so on. Compared with transition metal-based MOFs, lanthanide MOFs (Ln-MOFs) have more prominent fluorescence properties for sensing due to their unique optical properties [5-7], which are derived from f–f transitions, that are known as the "antenna effect" [8-10]. So far, various Ln-MOFs have been prepared for detecting pesticides [11-13], explosives [14-18], cations [19-24], anions [25-28] and volatile organic compounds [29,30].

It is well known that iron is one of the indispensable elements for life, but the existence of a

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