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A Multifunctional Luminescent Metal-Organic Framework Showing Sensing,
Sensitization, and Adsorbent Abilities

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ABSTRACT: The luminescent metal-organic frameworks (LMOFs) have been widely used as sensors for toxic organic compounds or heavy metals due to their functional sites and accessible pores. About this work, a new luminescent metal-organic framework, $\{[\text{Cd}_3(\text{L})_2(\text{H}_2\text{O})_4]\cdot 4\text{H}_2\text{O}\}_n$ (**1**) has been synthesized through the spontaneous self-assembly of V-shaped asymmetrical tricarboxylate ligand ($\text{H}_3\text{L} = 2$ -(4-carboxylphenoxy)terephthalic acid) and $\text{Cd}(\text{NO}_3)_2\cdot 4\text{H}_2\text{O}$ under hydrothermal condition. Single crystal X-ray diffraction analysis H_3L is completely deprotonated and connects $\text{Cd}(\text{II})$ to exhibit a 3D microporous structure. Furthermore, the complex shows a strong fluorescence emission, and can act as a potential multifunctional fluorescent probe for detection of nitroaromatic, Fe^{3+} , $\text{Cr}_2\text{O}_7^{2-}$ and CrO_4^{2-} anions with high stability, selectivity and sensitivity. Secondly, the complex can effectively sensitize visible-light-emitting Tb^{3+} ions as an antenna and rapidly remove harmful organic dye Methylene Blue (MB) as an adsorbent. Thus, the multifunctional complex **1** combines optical-sensing, adsorption, and sensitization properties, which is very useful in many potential applications.

Keywords: Fluorescent sensor; Metal-organic frameworks; Sensitization; Adsorbent

1. Introduction

Exploring sensors as fast detectors of toxic organic compounds, heavy metals and noxious anions play an important role in environmental monitoring, medical science, and industrial production [1]. Nitroaromatic compounds (NACs), widely used in the agrochemical industry, are not only well-known explosives, but also notorious environmental pollutants [2]. Inhalation of NACs will lead to vomiting and coma, to which long-term exposure can even cause respiratory failure. So the harm of NACs on the security and environment has attracted people's attention. Additionally, Fe^{3+} ion is an indispensable biological element and plays a crucial role in the transport and storage of oxygen, the deficiency or excess of Fe^{3+} can induce physiological disorder

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