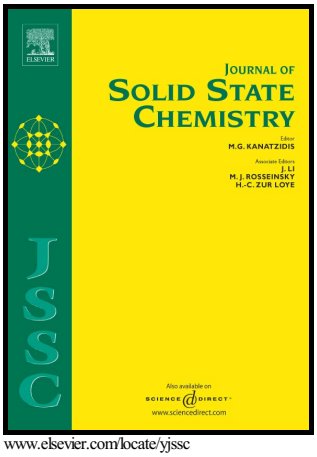

www.elsevier.com/locate/yjssc

A Water Stable Europium Coordination Polymer as Fluorescent Sensor for Detecting Fe^{3+}, CrO_4^{2-}, and $Cr_2O_7^{2-}$ Ions

Chen Chen, Xiaolei Zhang, Peng Gao, Ming Hu

PII: S0022-4596(17)30402-4
DOI: https://doi.org/10.1016/j.jssc.2017.10.004
Reference: YJSSC19966

To appear in: *Journal of Solid State Chemistry*

Received date: 21 July 2017
Revised date: 30 September 2017
Accepted date: 3 October 2017

Cite this article as: Chen Chen, Xiaolei Zhang, Peng Gao and Ming Hu, A Water Stable Europium Coordination Polymer as Fluorescent Sensor for Detecting Fe^{3+}, CrO_4^{2-}, and $Cr_2O_7^{2-}$ Ions, *Journal of Solid State Chemistry,* https://doi.org/10.1016/j.jssc.2017.10.004

A Water Stable Europium Coordination Polymer as Fluorescent Sensor for Detecting Fe^{3+}, CrO_4^{2-}, and $Cr_2O_7^{2-}$ Ions

Chen Chen, Xiaolei Zhang, Peng Gao, Ming Hu*

(Inner Mongolia Key Laboratory of Chemistry and Physics of Rare Earth Materials; School of Chemistry and Chemical Engineering, Inner Mongolia University, Hohhot 010021, China)

Abstract: A europium coordination polymer constructed by the 4'-(4-carboxyphenyl)-2,2':6',2″-terpyridine ligand (HL), namely, $[EuL(CH_3COO)Cl]_n$ (**1**), has been prepared by the solvothermal method. Compound **1** was structurally characterized by the elemental analysis, FT-IR, powder X-ray diffractions (PXRD), thermogravimetric (TG) analysis, and single-crystal X-ray diffraction. Complex **1** displays a novel linear chain structure, which further extends to the 3D supramolecular structure via $\pi\cdots\pi$ and hydrogen bonds interactions. The luminescent properties of **1** were investigated in detail, which exhibit the fluorescent sensing for detecting Fe^{3+}, CrO_4^{2-}, and $Cr_2O_7^{2-}$ ions in aqueous solution, respectively. In addition, **1** shows high sensitive and selective sensing for CrO_4^{2-} and $Cr_2O_7^{2-}$ anions with the great quenching efficiency. Furthermore, the luminescent sensing mechanisms of differentiating analytes are explored in detail. It is worth noting that there exists the weak interaction between Fe^{3+} ions and carboxylate oxygen atoms of CH_3COO^- groups through XPS characterization, resulting in the high quenching effect of **1**.

Keywords: coordination polymer; europium; fluorescence; sensor.

1. Introduction

Metals ions play the critical roles in the fundamental biological processes in living bodies, especially for iron ion, since it is an indispensable biological element in cellular metabolism [1-2]. As is well known, hexavalent chromium ion is widely used in industry as an important oxidant, and it is a potentially persistent, carcinogenic, and highly toxic pollutant, which can result in some severe diseases, such as lung cancer and gene mutation [3-4]. Furthermore, it is worth pointing out that detection of iron ion and hexavalent chromium ion is also vital in life science, medicine and pharmacology, environmental science, and so on [5-6]. Accordingly, it is of great significance and an imperative task for chemists to develop more efficient sensors for the detection of Fe^{3+}, CrO_4^{2-}, and $Cr_2O_7^{2-}$ ions in the rapid and accurate pathway.

Coordination polymers (CPs), as a class of crystalline hybrid inorganic–organic materials self-assembled from organic ligands and metal ions/cluster centers through coordination bonding, have received the enormous attention in the last decades due to their numerous applications in gas storage/separation, catalysis, magnetism, fluorescent sensing, and so forth [7-12]. Comparing with other kinds of CPs, the fluorescent lanthanide coordination polymers (Ln-CPs) have gained the ever-increasing concerns on account of their optical properties with the large Stokes shifts, high color purity, short response time, and high sensibility [13–14]. Consequently, the fluorescent Ln-CPs based on their diverse structures and the tunable luminescence have been employed as the

*Corresponding author. Tel.: +86-471-4992981.*E-mail addresses*:hm988@126.com.