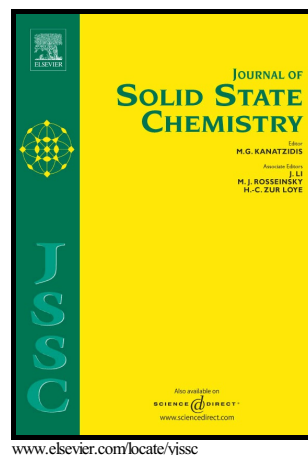


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PII: S0022-4596(18)30360-8  
DOI: <https://doi.org/10.1016/j.jssc.2018.08.028>  
Reference: YJSSC20346

To appear in: *Journal of Solid State Chemistry*

Received date: 4 July 2018  
Revised date: 18 August 2018  
Accepted date: 21 August 2018

Cite this article as: Li Zhao, Jie Zhang, Jiang Wang, Xiao-Yan Niu, Xiao-Qing Wang, Li-Ming Fan and Tuo-ping Hu, Structural Diversity, Gas Sorption Properties, Luminescent Sensing of Three Cd(II) Complexes Based on 3, 5-Di(2', 5-dicarboxylphenyl)pyridine, *Journal of Solid State Chemistry*, <https://doi.org/10.1016/j.jssc.2018.08.028>

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# Structural Diversity, Gas Sorption Properties, Luminescent Sensing of Three Cd(II) Complexes Based on 3, 5-Di(2', 5-dicarboxylphenyl)pyridine

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## ABSTRACT

Three 3D Cd(II) complexes, namely,  $\{[\text{Cd}_4(\text{L})_2(\text{dioxane})_3(\text{H}_2\text{O})_3]\cdot\text{DMA}\cdot 5\text{H}_2\text{O}\}_n$  (**1**),  $\{[\text{Cd}_2(\text{L})(\text{phen})(\text{H}_2\text{O})_{3.5}]\cdot 4\text{H}_2\text{O}\}_n$  (**2**) and  $\{[\text{Cd}_2(\text{L})(\text{phen})(\text{H}_2\text{O})_4]\cdot 3\text{H}_2\text{O}\cdot\text{DMA}\}_n$  (**3**) have been synthesized from the ligand of 3,5-di(2',5-dicarboxylphenyl)pyridine ( $\text{H}_4\text{L}$ ) with or without the assistance of phen auxiliary linker (phen = 1,10-phenanthroline). Complex **1** displays a 3D (4,4,9)-connected net with the point symbol of  $\{3.4^5\}\{3^2.4^{14}.5^5.6^{11}.7^2.8^2\}\{4^5.6\}$ . Complex **2** shows a 3D (4,8)-connected net with the point symbol of  $\{4^3.6^3\}_2\{4^6.6^{19}.8^3\}$ . Complex **3** presents a 3D 4-connected net with the point symbol of  $\{4^3.6^2.8\}$ . The fluorescence measurements showed **1-3** exhibit sensitive detection of Fe(III) and Cr(VI) ions with a low detection limit. In addition, the gas sorption isotherms of complex **3** for  $\text{N}_2$ ,  $\text{H}_2$ ,  $\text{CO}_2$  and  $\text{CH}_4$  were investigated, and the corresponding uptakes are  $239.8 \text{ cm}^3 \text{ g}^{-1}$  for  $\text{N}_2$  and  $93.9 \text{ cm}^3 \text{ g}^{-1}$  for  $\text{H}_2$  at 77K,  $50.5 \text{ cm}^3 \text{ g}^{-1}$  for  $\text{CO}_2$  and  $17.0 \text{ cm}^3 \text{ g}^{-1}$  for  $\text{CH}_4$  at 298K,  $54.8 \text{ cm}^3 \text{ g}^{-1}$  for  $\text{CO}_2$  and  $24.2 \text{ cm}^3 \text{ g}^{-1}$  for  $\text{CH}_4$  at 273K, respectively. Based on the  $\text{N}_2$  isotherm, the Brunauer–Emmett–Teller (BET) and Langmuir surface area of **3** were calculated to be 610.1 and  $710.5 \text{ m}^2 \text{ g}^{-1}$ , respectively. Moreover, the two binary gas mixtures adsorption was also studied, indicating that the adsorption of **3** for  $\text{CO}_2$  is better than that of  $\text{CH}_4$ , which was verified by ideal adsorbed solution theory (IAST) with the adsorption selectivity being 8.5 (landfill gas,  $\text{CO}_2/\text{CH}_4 = 0.5/0.5$ ) and 7.2 (natural gas,  $\text{CO}_2/\text{CH}_4 = 0.05/0.95$ ).

Graphical abstract:

Three 3D Cd(II) complexes have been synthesized from the ligand of 3,5-di(2',5-dicarboxylphenyl)pyridine ( $\text{H}_4\text{L}$ ) with or without the assistance of phen auxiliary linker (phen = 1,10-phenanthroline). For complexes **1-3**, the fluorescence measurements were studied, exhibiting sensitive detection of Fe(III) and Cr(VI) ions. In addition, the gas sorption isotherms of complex **3** for  $\text{N}_2$ ,  $\text{H}_2$ ,  $\text{CO}_2$  and  $\text{CH}_4$  were investigated.

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