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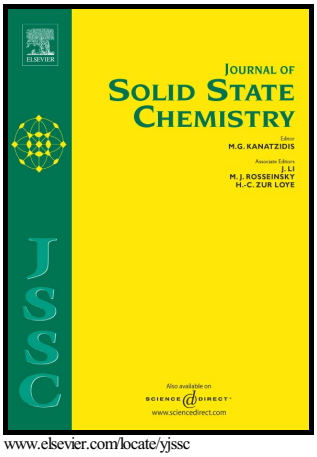

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Structural Diversity, Gas Sorption Properties, Luminescent Sensing of Three Cd(II) Complexes Based on 3, 5-Di(2', 5-dicarboxylphenyl)pyridine

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ABSTRACT

Three 3D Cd(II) complexes, namely, $\{[Cd_4(L)_2(dioxane)_3(H_2O)_3]\cdot DMA\cdot 5H_2O\}_n$ (**1**), $\{[Cd_2(L)(phen)(H_2O)_{3.5}]\cdot 4H_2O\}_n$ (**2**) and $\{[Cd_2(L)(phen)(H_2O)_4]\cdot 3H_2O\cdot DMA\}_n$ (**3**) have been synthesized from the ligand of 3,5-di(2',5-dicarboxylphenyl)pyridine (H_4L) 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 N_2, H_2, CO_2 and CH_4 were investigated, and the corresponding uptakes are 239.8 $cm^3\ g^{-1}$ for N_2 and 93.9 $cm^3\ g^{-1}$ for H_2 at 77K, 50.5 $cm^3\ g^{-1}$ for CO_2 and 17.0 $cm^3\ g^{-1}$ for CH_4 at 298K, 54.8 $cm^3\ g^{-1}$ for CO_2 and 24.2 $cm^3\ g^{-1}$ for CH_4 at 273K, respectively. Based on the N_2 isotherm, the Brunauer−Emmett−Teller (BET) and Langmuir surface area of **3** were calculated to be 610.1 and 710.5 $m^2\ g^{-1}$, respectively. Moreover, the two binary gas mixtures adsorption was also studied, indicating that the adsorption of **3** for CO_2 is better than that of CH_4, which was verified by ideal adsorbed solution theory (IAST) with the adsorption selectivity being 8.5 (landfill gas, CO_2/CH_4 = 0.5/0.5) and 7.2 (natural gas, CO_2/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 (H_4L) 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 N_2, H_2, CO_2 and CH_4 were investigated.