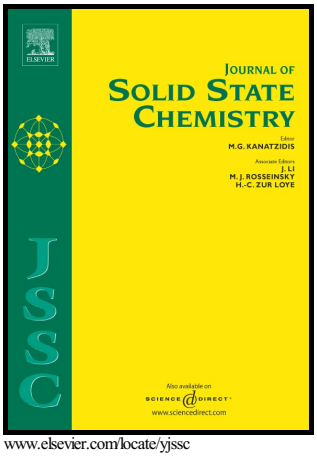

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Design and Syntheses of Hybird Metal-Organic Materials Based on $K_3[M(C_2O_4)_3]\cdot 3H_2O$ [M(III) = Fe, Al, Cr] metallotectons

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Abstract

By using $K_3[M(C_2O_4)_3]\cdot 3H_2O$ [M(III) = Fe, Al, Cr] ($C_2O_4^{2-}$ = oxalate) metallotectons as the starting material, we have synthesized eight novel complexes with formulas $[\{Fe(C_2O_4)_2(H_2O)_2\}_2]\cdot(H\text{-}L_1)_2\cdot H_2O$ 1, $[Fe(C_2O_4)Cl_2]\cdot(H_2\text{-}L_2)_{0.5}\cdot(L_2)_{0.5}\cdot H_2O$ 2, $[\{Fe(C_2O_4)_{1.5}Cl_2\}_2]\cdot(H\text{-}L_3)_4$ 3, $[Fe_2(C_2O_4)Cl_8]\cdot(H_2\text{-}L_4)_2\cdot 2H_2O$ 4, $K[Al(C_2O_4)_3]\cdot(H_2\text{-}L_5)\cdot 2H_2O$ 5, $K[Al(C_2O_4)_3]\cdot(H\text{-}L_6)_2\cdot 2H_2O$ 6, $K[Cr(C_2O_4)_3]\cdot 2H_2O$ 7, $Na[Fe(C_2O_4)_3]\cdot(H\text{-}L_6)_2\cdot 2H_2O$ 8 (with L_1 = 4-dimethylaminopyridine, L_2 = 2,3,5,6-tetramethylpyrazine, L_3 = 2-aminobenzimidazole, L_4 = 1,4-bis-(1H-imidazol-1-yl)benzene, L_5 = 1,4-bis((2-methylimidazol-1-yl)methyl)benzene, L_6 = 2-methylbenzimidazole). Their structures have been determined by single-crystal X-ray diffraction analyses, elemental analyses, IR spectra and thermogravimetric analyses. Compound 3 is a 2D H-bonded supramolecular architecture. Others are 3D supramolecular structures. Compound 1 shows a $[Fe(C_2O_4)_2(H_2O)_2]^-$ unit and 3D antionic H-bonded framework. Compound 2 features a $[Fe(C_2O_4)Cl_2]^-$ anion and 1D iron-oxalate-iron chain. Compound 3 features a $[Fe_2(C_2O_4)_3Cl_4]^{4-}$ unit. Compound 4 features distinct $[Fe_2(C_2O_4)Cl_8]^{4-}$ units, which are mutual linked by water molecules to generated a 2D H-bonded network. Compound 5 features infinite ladder-like chains constructed by $[Al(C_2O_4)_3]^{3-}$ units and K^+ cations. The 1D chains are further extended into 3D antionic H-bonded framework through O-H···O H-bonds. Compounds 6-8 show 2D $[KAl(C_2O_4)_3]^{2-}$ layer, $[KCr(C_2O_4)_3]^{2-}$ layer and $[NaFe(C_2O_4)_3]^{2-}$ layer, respectively.

Keywords: metallotectons; oxalate; supramolecular structures