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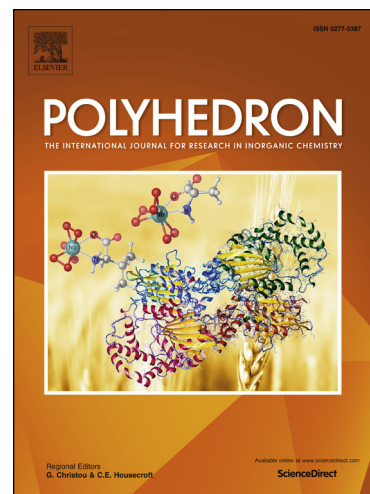
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# Synthesis, structure and magnetic studies of lanthanide metal-organic frameworks (Ln-MOFs): Aqueous phase highly selective sensors for picric acid as well as the arsenic ion

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## Abstract

A series of three lanthanide metal-organic frameworks (Ln-MOFs) consisting of a planar functionalized dicarboxylic acid was synthesized. The Ln-MOFs, with the composition  $[\text{Ln}_3(\text{PDC})_3\text{Cl}_3(\text{H}_2\text{O})]_n$  [Ln= La (**1**), Nd (**2**) or Pr (**3**),  $\text{PDCH}_2$  = pyridine-2,6-dicarboxylic acid], were characterized employing spectral, time resolved fluorescence, magnetic, single crystal X-ray and PXRD analysis. X-ray crystallography confirms that the structure of the Ln-MOFs is constructed by trinuclear ( $\text{Ln}_3$ ) units and the deprotonated  $\text{PDC}^{2-}$  ligand, which is simplified into a 3-c, uninodal net having the vab topology with the  $10^3$ -point symbol. The variable temperature magnetic susceptibility data indicate that there are antiferromagnetic interactions between  $\text{Ln}^{\text{III}} \cdots \text{Ln}^{\text{III}}$  ions in **2** and **3** with Curie constants of 5.917 (**2**) and 5.231 (**3**)  $\text{cm}^3 \text{K mol}^{-1}$ , Weiss constants -60.71 (**2**) and -48.43 (**3**) K, and  $zJ'$  values -0.98 (**2**) and -0.31 (**3**)  $\text{cm}^{-1}$ . The 3D polymers **1–3** are characterized as being highly selective, sensitive and discriminative dual chemosensors for picric acid (PA) and the arsenite ( $\text{AsO}_3^{3-}$ ) ion in aqueous medium. The sensing pathways were investigated by spectral titrations, time decay and DFT (B3LYP/def2-SVP) studies. The lowest detection limit has been discovered for the La analogue towards the sensing of both PA and  $\text{AsO}_3^{3-}$  {or As(III)} ions with ~0.22 and ~1.46 ppb, respectively. Such MOFs exhibiting bifunctional sensing behaviour for an

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