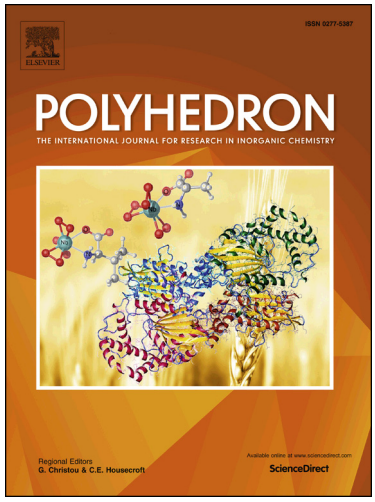

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Construction and crystal structure of a pair of tetranuclear Zn(II) chiral clusters that exhibit ferroelectric behavior under a higher frequency electric field at room temperature

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Abstract

A pair of novel enantiomerically chiral clusters, R/S- $[Zn_4(HL)_2(L)_2\cdot(CH_3OH)_2]\cdot(NO_3)_2$, have been obtained via the self-assembly of R/S-H_2L Schiff base ligands with divalent zinc nitrate (H_2L = 2-[(1-benzyl-2-hydroxy-ethylimino)-methyl]-6-methoxy-phenol). The compounds were characterized by single-crystal X-ray diffraction, elemental analysis and infrared spectroscopy. Their structures reveal that the enantiomers are not only in a chiral space group but also have a non-centrosymmetric polar packing arrangement. Both clusters display ferroelectric behavior at room temperature. Impressively, the clusters show well-defined ferroelectric hysteresis loops with high Ps values at a relatively high frequency of 100 Hz, which is very rarely in the field of molecule-based ferroelectrics.

Keywords: Chiral clusters; Crystal structure; Luminescence properties; Ferroelectric

1. Introduction

In the past decade, chiral polynuclear transition-metal cluster complexes have attracted much attention in the multifunctional materials fields not only due to the strictly fundamental aspect, but also the potential technological applications in various areas such as ferroelectric materials [1], magnetic materials [2], optical materials [3], asymmetric catalysis [4], enantioselective separation [5] and so on. Chiral polynuclear clusters usually have lower space dimensions and symmetry when they belong to polar point groups, whilst interesting chiral ferroelectric behaviors can be forecast [6]. Chiral ferroelectrics, especially chiral multifunctional ferroelectric systems which