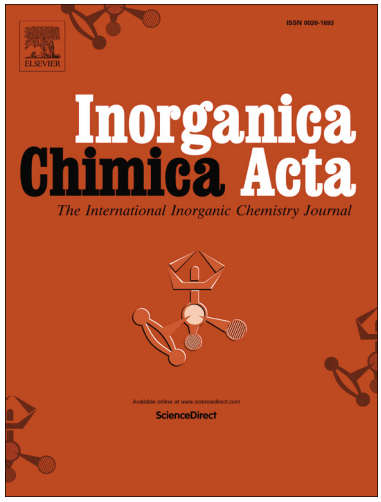

Research paper

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Supertetrahedral T2 Clusters in 3d-4f {Fe_4Ln_6}: Synthesis, Crystal Structure, Magnetic and Photoluminescent Properties

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ABSTRACT

Two new isomorphous Iron(III)-lanthanide(III) coordination clusters of general formula $[Fe_4Ln_6(bpte)_4(\mu_4\text{-}O)_4(EG)_4(\mu_3\text{-}OMe)_{3.3}(\mu_3\text{-}Cl)_{0.70}Cl_2(MeOH)_2][Fe_4Ln_6(bpte)_4(\mu_4\text{-}O)_4(EG)_4(\mu_3\text{-}OMe)_4Cl_2(MeOH)_2]\cdot 30H_2O\cdot MeOH$ (H_2bpte = 1,2-bis(3-(pyridin-2-yl)-1H-1,2,4-triazol-5-yl)ethane, EG = ethylene glycol, Ln = Dy(**1**), Ho(**2**)) have been successfully synthesized under hydrothermal conditions. The crystal structure of **2** consists of two asymmetric units having two isostructural cores {$Fe_4Ho_6(\mu_4\text{-}O)_4$} of T2 supertetrahedral cluster nuclei ultra-structural unit. Both complexes **1** and **2** are found to be isomorphous which is confirmed by FTIR, elemental analysis, PXRD, and thermal studies. These are the first supertetrahedral T2 coordination clusters reported as 3d-4f system. The magnetic measurements indicate that antiferromagnetic coupling in both of these complexes. The solid-state photoluminescent measurements for **1** and **2** were done but only **1** gave rise to a measurable emission peaks which are associated with the *4f→4f* transitions with a maximum at 574 nm (cyan emission).

Keywords

Coordination Clusters, Lanthanides , Transition metal, T2 supertetrahedral , 3d-4f complexes

1. Introduction

In recent years, the synthesis and characterization of high-nuclearity metal complexes like polyoxometalates (POMs), metal chalcogenides [1,2] and metal-organic frameworks (MOFs) [3] have received considerable attention in chemistry, physics and materials science. An example of these architecture structures are supertetrahedral with T2, T3 and T4 topologies, which are usually