

Accepted Manuscript

Research paper

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PII: S0020-1693(18)30142-7
DOI: <https://doi.org/10.1016/j.ica.2018.06.009>
Reference: ICA 18301

To appear in: *Inorganica Chimica Acta*

Received Date: 26 January 2018
Revised Date: 23 April 2018
Accepted Date: 6 June 2018



Please cite this article as: M.N. Akhtar, X-F. Liao, Y-C. Chen, M.A. AlDamen, G-Z. Huang, J-L. Liu, J. Khan, M-L. Tong, Supertetrahedral T2 Clusters in 3d-4f $\{\text{Fe}_4\text{Ln}_6\}$: Synthesis, Crystal Structure, Magnetic and Photoluminescent Properties, *Inorganica Chimica Acta* (2018), doi: <https://doi.org/10.1016/j.ica.2018.06.009>

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Supertetrahedral T2 Clusters in 3d-4f {Fe₄Ln₆}: Synthesis, Crystal Structure, Magnetic and Photoluminescent Properties

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ABSTRACT

Two new isomorphous Iron(III)-lanthanide(III) coordination clusters of general formula [Fe₄Ln₆(bpte)₄(μ₄-O)₄(EG)₄(μ₃-OMe)_{3.3}(μ₃-Cl)_{0.70}Cl₂(MeOH)₂][Fe₄Ln₆(bpte)₄(μ₄-O)₄(EG)₄(μ₃-OMe)₄Cl₂(MeOH)₂]·30H₂O·MeOH (H₂bpte = 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 {Fe₄Ho₆(μ₄-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

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