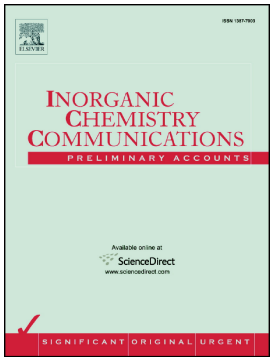

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Synthesis, crystal structure and magnetic properties of a dinuclear dysprosium single-molecule magnet

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Keywords: Dinuclear dysprosium complex; Schiff base ligand; Single-molecule magnet;

Abstract

To seek novel dysprosium based single-molecule magnets, a dinuclear dysprosium complex, namely $[Dy_2(L)_2(DBM)_2(DMF)_2]\cdot 2DMF$ (**1**) was successfully obtained by employing tridentate Schiff base ligand (where H_2L = 2-hydroxy-N'-(2-hydroxy-3-methoxybenzylidene) benzohydrazide), HDBM = dibenzoylmethane, DMF = dimethylformamide). Single-crystal X-ray structural analysis reveals that the key feature of **1** is neutral dinuclear complex, in which two Dy(III) ions with eight-coordinated environment are bridged by two phenoxido oxygen atoms from two Schiff base ligands. Interestingly, complex **1** could be regarded as the structurally related derivatives to our previous reported complex of $[Dy_2(L)_2(DBM)_2(DMF)_2]$ (**1a**) but adding two guest DMF solvents. More importantly, the energy barrier to magnetic relaxation of **1** is slightly higher, with a value of 33K, when compared to the corresponding complex **1a** of 24K, which provides a good example towards regulating magnetization dynamics in dinuclear dysprosium (III) single-molecule magnets by guest solvent molecules.

1. Introduction

Compared to the traditional permanent magnets, single-molecule magnets (SMMs) are discrete molecules retaining magnetization over long periods of time and offer unique properties that have been proposed as the basis of ultrahigh-density information storage and quantum computing [1-5]. Thanks to the significant magnetic anisotropy and the large magnetic moment, the Kramers ion, dysprosium(III), is the most widely utilized to construct SMMs with a high energy barrier to magnetic relaxation, which are not easily satisfied in d-block transition metal-based SMMs [6-11]. Among the various Dy(III) based complexes, dinuclear $\{Dy_2\}$ SMMs represent the idea configurations which can be used to study the single-ion effective anisotropic barriers *versus* the energy barriers arising from the two interaction metal centers [12-14]. In the course of searching novel and promoting the developments of $\{Dy_2\}$ SMMs, some interesting results have been reported such as fine-tuning terminal solvent ligands to rationally enhance the energy barrier in a phenoxido-bridged $\{Dy_2\}$ system and a record energy barrier of 721 K in a