# Cyanido-Bridged $Ho^{III}$-$M^{III}$ (M = Co, Rh, and Ir) Dinuclear Molecules Showing Slow Magnetic Relaxation and Luminescence Thermometry Based on Re-Absorption Effect

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Trivalent lanthanide ions ($Ln^{III}$), due to their large magnetic anisotropies, have been regarded as one of the most promising candidates in designing single molecule magnets (SMMs), which exhibit slow magnetic relaxation in the single-molecule domain. Since the behavior of such nanomagnets strongly depends on temperature, a contactless and accurate temperature measurement is of great importance for the future practical SMM operations. Thanks to the emissive properties of $Ln^{III}$, numerous research interest has been focused on the combination of SMMs with luminescent thermometry based on $Ln^{III}$ complexes.[1]

In these regards, we reported a series of cyanido-bridged dinuclear molecules, $\{[Ho^{III}(4\text{-pyridone})_4(H_2O)_2][M^{III}(CN)_6]\}\cdot nH_2O$ (M = Co, **1**; Rh, **2**; Ir, **3**) and their respective magnetically diluted samples by yttrium(III), **1@Y-3@Y**.[2] These compounds exhibit rare slow magnetic relaxation centered at the non-Kramer $Ho^{III}$ ion, and their SMM behaviors were elucidated by *ab initio* calculations. Photoluminescence study on **1@Y-3@Y** revealed an intense blue emission band from the 4-pyridone ligand, together with a series of re-absorption lines ascribed to the f-f transitions of $Ho^{III}$ ion. Additionally, the re-absorption peaks show variable temperature dependences, giving rise to an innovative approach in constructing ratiometric optical thermometry with high sensitivities.

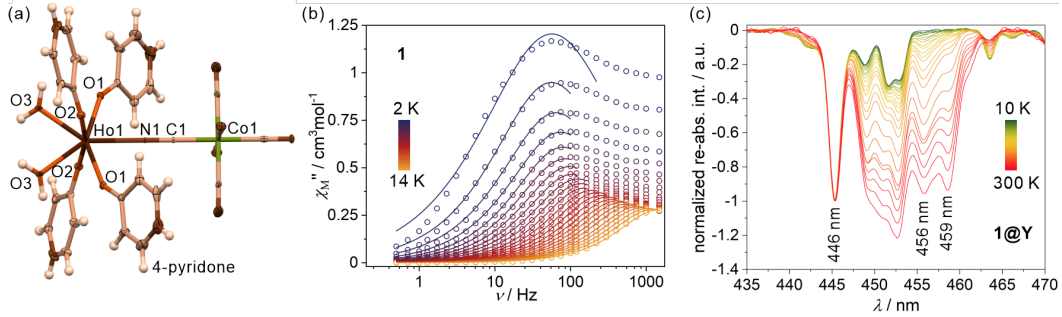


**Fig. 1**. Structure of dinulcear molecule of **1** (a), SMM characterization of **1** under zero *dc* field (b), and normalized *T*-dependent luminescent re-absorption f-f transitions of **1@Y** used for constructing optical thermometry (c).

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