

Mixed Eu³⁺-Tb³⁺ Metal-Organic Frameworks build on Isophthalic acid ligand as Ratiometric Luminescent Thermometer

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Metal-Organic Frameworks are crystalline and porous hybrid materials built-up from metal ions as nodes linked by bridging ligands. They have attracted great interest due to their versatile chemistry, high surface areas and chemical functionality. Recently, lanthanide-based luminescent MOFs (Ln-MOFs), whose optical properties may come from the organic or inorganic part, have emerged as luminescent thermometers.¹ Indeed, compared to conventional thermometers, luminescent thermometers have unique and distinct advantages of fast response, high accuracy, non-invasive nature, high spatial resolution characteristics at the submicron scale where traditional methods are ineffective. The most promising non-invasive technique to measure the temperature relies on ratiometric luminescent thermometers where the absolute temperature is optically determined *via* the measurements of the intensities of two transitions of distinct emitting centers. In the case of mixed Ln-MOFs, the temperature is determined from the comparison of the intensity of both Ln³⁺ emissions, generally the transitions ⁵D₄-⁷F₅ of the Tb³⁺ and ⁵D₄-⁷F₂ of the Eu³⁺, respectively.² In this work, we designed a series of mixed Eu-Tb MOF with isophthalic acid as principal ligand. We studied the impact of modifications in Ln³⁺ coordination sphere on the thermometric performances. Indeed, mixed Eu-Tb MOF synthesized with isophthalic acid is a 2D structure and exhibit performance in the cryogenic range³ but mixed Eu-Tb MOF synthesized with isophthalic acid and acetic acid is a 3D structure where the Ln³⁺ coordination increases from 7 to 9. This latter MOF is sensible in the physiological range (Fig1).

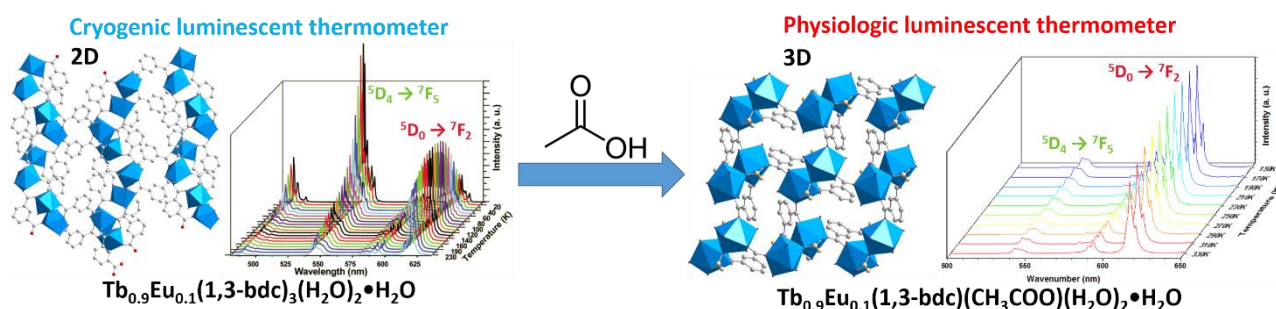


Figure 1 (Left) Crystal structure and emission spectra of the thermometer in the 12-230 K range of the mixed Eu-Tb MOF with isophthalic acid. (Right) Crystal structure and emission spectra of the thermometer in the 150-330 K range of the mixed Eu-Tb MOF with isophthalic acid and acetic acid.

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