

Lanthanide Coordination Polymers in Luminescence-based Thermometry

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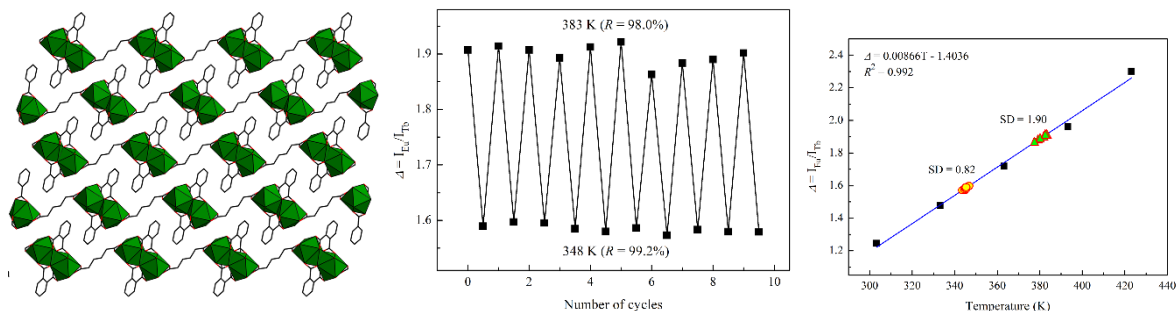
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Abstract

Hurtled with intrinsic constraints of traditional thermometers apropos to emerging technologies in the last few decades, the alternative temperature measurement techniques of exceptional spatial, temporal and temperature resolution and accuracy have been in assiduous limelight. Amidst several potential approaches, those based on lanthanide photoluminescence have gained zealous attention owing to their fast response, exceptional sensitivity as well as spatial and temperature resolution. Herein, the very recently emerging temperature probes based on lanthanide coordination polymers of which all structural components such as the lanthanide nodes and the organic linkers can be designed for desired functions will be introduced. Ratiometric luminescence behaviors and corresponding mechanisms will be presented based on the lanthanide coordination polymers developed by our research group: for example, $[\text{Ln}(\text{L})_{0.5}(\text{NO}_2\text{-BDC})(\text{H}_2\text{O})]\cdot 3\text{H}_2\text{O}$ ($\text{Ln} = \text{Eu}^{\text{III}}, \text{Tb}^{\text{III}}, \text{Gd}^{\text{III}}$ and $\text{Eu}^{\text{III}}/\text{Tb}^{\text{III}}/\text{Gd}^{\text{III}}$; $\text{L} = \text{BDC}^{2-}$ or $\text{BDC}^{2-}/\text{NO}_2\text{-BDC}^{2-}$ when $\text{H}_2\text{BDC} = 1,4\text{-benzenedicarboxylic acid}$), and $[\text{Ln}(\text{ad})_{0.5}(\text{phth})(\text{H}_2\text{O})_2]$ ($\text{Ln} = \text{Eu}^{\text{III}}, \text{Gd}^{\text{III}}, \text{Tb}^{\text{III}}$, $\text{Eu}^{\text{III}}/\text{Tb}^{\text{III}}$; $\text{H}_2\text{ad} = \text{adipic acid}$, $\text{H}_2\text{phth} = \text{phthalic acid}$). Performances of these materials in terms of relative sensitivity (S_r), temperature resolution and measurement repeatability will also be included.



Keywords: Coordination polymer, Lanthanide, Luminescence, Thermometry.