POLYCYANIDOPLATINATE MOLECULAR BUILDING BLOCKS FOR THE MODULATION OF Eu(III)- AND Tb(III)-BASED OPTICAL THERMOMETRY

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Materials exhibiting photoluminescent phenomena arouse an immense scientific interest due to their broad application spectrum in optical storage and communication, chemical sensing, and optical thermometry. Polycyanidometallate-based materials incorporating lanthanide, Ln(III), complexes are promising candidates for the functional molecular materials due to the versatility of d- and f-metal complexes utilizing highly customizable inorganic and organic ligands which enable the rational design and modulation of physicochemical properties of the material.[1-4] We have undertaken the challenge of employing Eu(III) and Tb(III) complexes, whose emission is sensitive to temperature changes, for the combination with polycyanidoplatinate(II,IV) ions into the materials demonstrating the optical thermometric property that can be highly tunable through, e.g., the d-metal-ion-substitution or the excitation-wavelength-variation. Our studies resulted in a series of novel luminescent materials, including one-dimensional $\{[Eu^{III}_{0.6}Tb^{III}_{1.4}(H_2O)_4(terpyO_3)]_2[M^{II}(CN)_4]_3\}\cdot 8H_2O$ (M = Pd, Pt; $terpyO_3$ = 2,2′:6′,2″-terpyridine tri-N-oxide) coordination polymers, serving as an effective colorimetric, as well as emission-lifetime- and emission-intensity-ratio-based ratiometric luminescent thermometer, for which the optical properties are efficiently modulated by the Pd-to-Pt substitution (Figure 1).[3,5] Using this example and others, we will discuss the role of cyanido metal complexes in the tuning of Ln-based ratiometric optical thermometers.

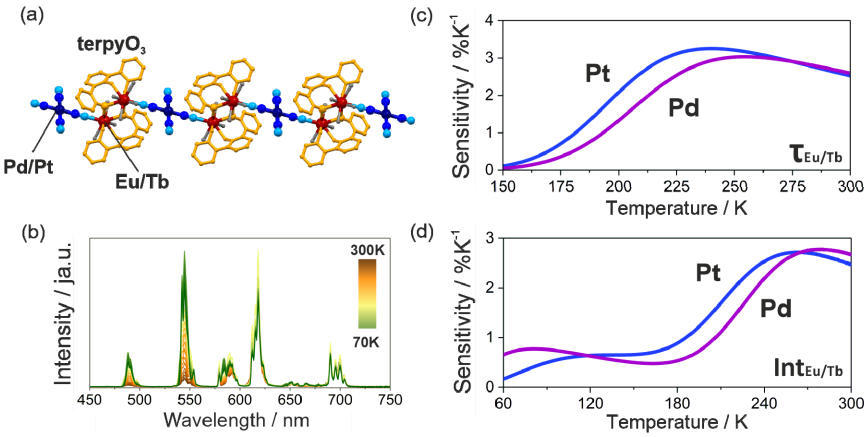

Figure 1. The view on the $\{Eu_{0.6}Tb_{1.4}(Pt/Pd)\}$ chains (a), the temperature dependences of their emission (b), and relative thermal sensitivities for the 323 nm excitation (c, d).

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