Ratiometric molecular thermometers based on dual emissive Eu(III) complexes

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Synthesis and study of luminescent complexes, which exhibit temperature-dependent emission properties in physiological temperature range and their application as intracellular temperature measurement [1], is one of the most interesting and challenging task in the chemistry of transition metal complexes.

In present work we synthesized two neutral europium (III) complexes on the basis of new N-heterocyclic diimine ligands (Fig. 1). Both complexes (Eu1 and Eu2) demonstrate dual emission generated by nearly independent fluorescence of diimine ligand and {Eu(tta)$_3$} fragment luminescence.

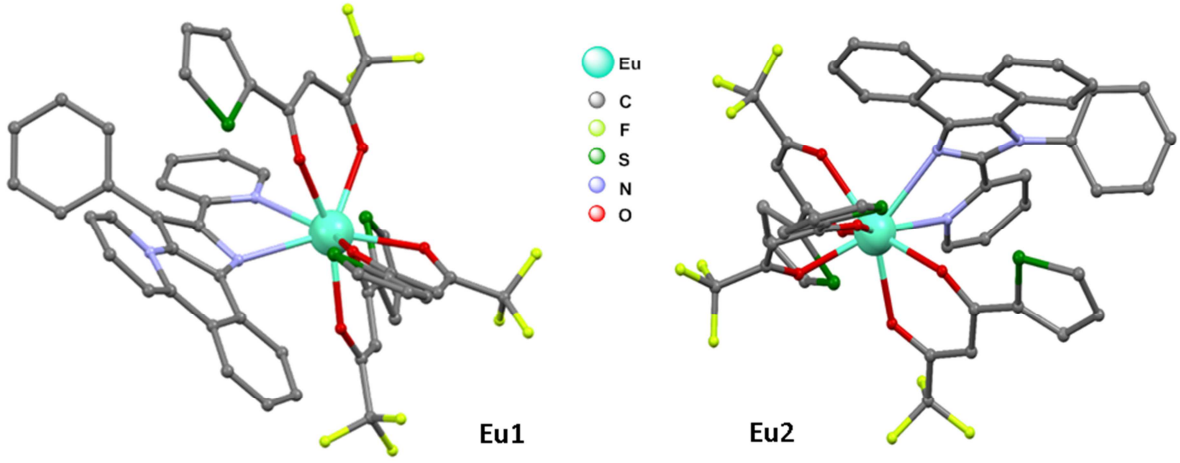

Figure 1. Solid state structures of the complexes Eu1 and Eu2

It was established that both complexes demonstrate temperature dependent emission intensity and lifetime in the 34-44^{o}C temperature range (Fig. 2a,b). It is worth noting that only Eu-centered emission responses to the temperature variations, whereas diimine-centered fluorescence does not show significant changes. It was also shown that emission lifetime displays linear dependence on temperature in the biologically attractive temperature interval (Fig. 2c).

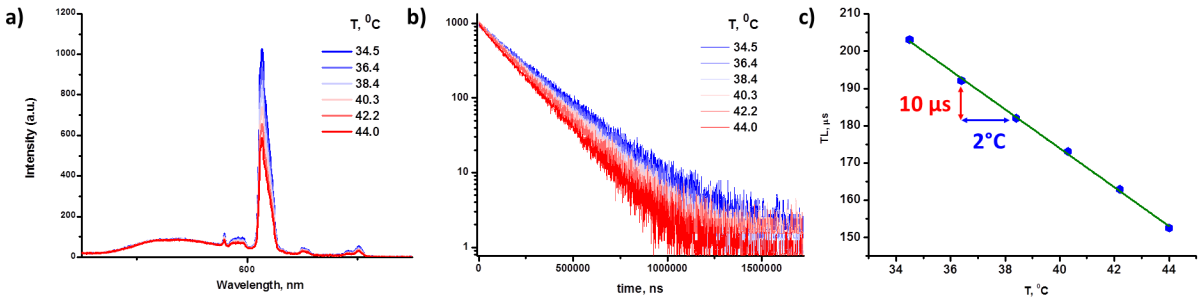

Figure 2. a) Emission spectra of Eu1 at different temperatures, λ_{ex} = 351 nm, b), c) dependence of emission lifetime at 614 nm on temperature

The results observed makes these europium complexes prospective candidates for further investigations as intracellular molecular thermometers.

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References:

[1] S. Uchiyama, C. Gota, *Rev. Anal. Chem.*, **2017**, 36, 1