Tb/Eu-Metal Organic Framework for Optical Nanothermometer

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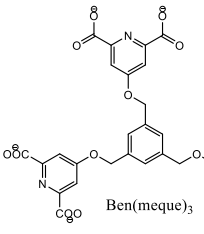
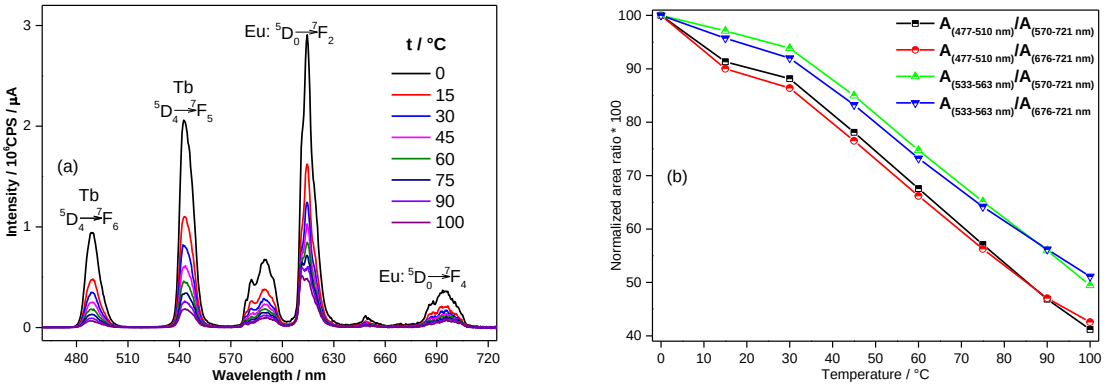
Due to their tunable luminescence properties owing to the remarkable electronic configuration of the trivalent lanthanide ions, Lanthanide containing Metal Organic Frame-work (Ln-MOFs) hold great promise for development of various types of optical sensors[1], particularly luminescence temperature sensors that, comparing to the so-called contact thermometers, have various advantages such as: accurate temperature measurements of fast-moving objects and at the submicron scale, noninvasive, operation in strong electromagnetic fields and corrosive environment. In the last few years, the interest in Ln-MOFs with potential application in ratiometric luminescence thermometry has gained intense attention. In this kind of thermometry, temperature sensing is based on intensity ratios of independent transitions from the same materials. This makes the luminescence-temperature correlation independent of the concentration and inhomogeneity of luminescent centers as well as the optoelectronic drifts of excitation source and detectors, overcoming the main drawbacks of intensity-based measurements of only one-transition luminescence based thermometers. In this work, it is report a series of visible luminescent Ln-MOF represented by the general formula ($Tb_{0,4}Eu_xGd_{1,6-x}Ben(meque)_3$) where $Ben(meque)_3$ is 4,4',4''-((benzene-1,3,5-triyltris(methylene))tris(oxy))tris(pyridine-2,6-dicarboxylate) ion, a nono-dentate ligand previously synthetized and characterized. The syntheses were carried out in water at 60 °C and the compounds were characterized by CHN, TGA, PXRD,IR, UV-Vis and photoluminescence spectroscopy. The temperature-dependent photoluminescent properties of the MOFs were investigated in terms of both intensity and emission lifetime. The results indicate that they have potential as probes in optical thermometers. The following figures show the temperature-dependent photophysical parameters of the $Tb_{0.4}Eu_{0.3}Gd_{1.3}Ben(meque)_3$) in the temperature range of 0 - 100 °C.





Temperature-dependent emission spectra (a) and fitted curves of the some integrated intensity ratio (b) of the mixed Ln-MOF $Gd_{1.3}Tb_{0.4}Eu_{0.3}Ben(meque)_3$ in the temperature range of 0–100 °C.

Ref.[1)] Y. Cui et al; *Coord. Chem. Rev*;**2014,** 273–274, 76–86.

[2)] D. Jaque; F. Vetrone**;** *Nanoscale*, **2012**,4**,** 4301-4326.

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