

Upconversion Nanothermometry

Luís D. Carlos

*Departamento de Física and CICECO-Aveiro Institute of Materials, Universidade de Aveiro,
3810–193 Aveiro, Portugal*

*e-mail: lcarlos@ua.pt

Luminescent ratiometric thermometers combining high spatial and temporal resolution at the micro and nanoscale, where the conventional methods are ineffective, have emerged over the last decade as an effervescent field of research, essentially motivated by their potential applications in nanotechnology, photonics and biomedicine [1,2]. Among the distinct luminescent thermal probes, Ln^{3+} -based materials play a central role in the field due to their unique thermometric response and intriguing emission features (*e.g.*, high quantum yield, narrow bandwidth, long-lived emission, large Stokes shifts, and ligand-dependent luminescence sensitization).

This lecture presents a general revision of the work done in the last couple of years on ratiometric luminescent molecular thermometers, with particular emphasis on examples comprising upconverting nanocrystals [3].

[1] C. D. S. Brites, P. P. Lima, N. J. O. Silva, A. Millán, V. S. Amaral, F. Palacio, L. D. Carlos, *Nanoscale* **4** (2012) 4799.

[2] C. D. S. Brites, A. Millán, L. D. Carlos, in *Handbook on the Physics and Chemistry of Rare Earths*, J.-C. Bünzli, V. K. Pecharsky, Eds., Amsterdam: Elsevier Science B.V., Vol. 49, 339-427, 2016.

[3] C. D. S. Brites, X. Xie, M. L. Debasu, X. Qin, R. Chen, W. Huang, J. Rocha, X. Liu, L. D. Carlos, *Nat. Nanotech.* (2016), 10.1038/nnano.2016.111.