Łukasiewicz
PORT Polish Center
for Technology Development

It's Getting Hot in Here: Intracellular Temperature Sensing Through Light Emission

Luis D. CARLOS, [a)]

[a)] *A Phantom-g, CICECO-Aveiro Institute of Materials, Physics Department, University of Aveiro, Campus Universitário de Santiago, 3810-193 Aveiro, Portugal; lcarlos@ua.pt*

The emergence of luminescent nanothermometry during the last decade opened up the possibility of measure thermal flows at spatial scales below 10 μm, unreachable by conventional electrical methods [1]. Diverse phosphors capable of providing a contactless thermal reading through their light emission properties have been examined, e.g., polymers, DNA or protein conjugated systems, organic dyes, quantum dots, and trivalent lanthanide (Ln^{3+}) ions incorporated in organic-inorganic hybrids, multifunctional heater-thermometer nanoplatforms, upconverting, downconverting and downshifting nanoparticles. The implementation of these Ln^{3+}-based phosphors (with an emphasis in upconverting nanoparticles) as ratiometric thermometers was extensively reviewed in the past five years [1].

In the last couple of years, the focus of luminescence thermometry has gradually shifted from the fabrication of more sensitive nanoarchitectures towards the use of the technique as a tool for thermal bioimaging and the unveiling of properties of the thermometers themselves and their local surroundings, as, for instance, the instantaneous ballistic velocity of Brownian nanocrystals suspended in both aqueous and organic solvents [2].

After a general perspective of the work done on luminescence nanothermometry since the explosion of the field at one decade ago, the lecture will be focused on a recent example [3] illustrating the potential of the technology to measure the intracellular temperature.

References:

[1] C. D. S. Brites, S. Balabhadra, L. D. Carlos, Adv. Opt. Mater., Vol. 7, **2019**, 1801239

[2] C. D. S. Brites, X. Xie, M. L. Debasu, X. Qin, R. Chen, W. Huang, J. Rocha, X. Liu, L. D. Carlos, Nature Nanotech., Vol. 11, **2016**, 851.

[3] R. Pin ol, J. Zeler, C. D. S. Brites, Y. Gu, P. Te llez, A. N. Carneiro Neto, T. E. da Silva, R. Moreno-Loshuertos, P. Fernandez-Silva, A. Isabel Gallego, L. Martinez-Lostao, A. Martí nez, L. D. Carlos, A. Milla n, Nano Lett,Vol.. 20/9, **2020**, 6466.