Advances in Reliable Intracellular Thermometry

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Luminescent nanoparticles, which exhibit strong temperature-dependent luminescence, are increasingly being utilized as wireless nanothermometers. These nanothermometers have proven effective in providing thermal readouts across a wide array of scenarios, ranging from integrated electronic devices to living organisms. Remarkably, luminescent nanothermometers have even been capable of measuring the temperature of living cells, detecting changes in cell metabolism through their thermal fingerprints. Despite these promising results, recent critical studies have raised concerns about the reliability of intracellular thermal measurements provided by luminescent nanothermometers. These concerns are well-founded, and the accuracy of these measurements must be rigorously evaluated. In this presentation, we will discuss the reliability and precision of luminescent nanothermometers for intracellular thermal sensing. Furthermore, we will demonstrate how new materials, based on phase transition properties, and advanced analysis technologies, such as neural networks, can significantly enhance the accuracy and reliability of intracellular thermal readouts.

Short Bio:

Daniel Jaque obtained his degree in Physics (1995) at Sussex University (UK) and PhD (1999) at Universidad Autónoma de Madrid, UAM (Spain). After his stay as assistant professor at Universidad Complutense de Madrid, he won the Ramón y Cajal scholarship (2002) and joined the Laser Spectroscopy Lab at UAM. In 2009 he was awarded with the Junior Research Award by the European Association for the Study of Rare Earths and Actinides. That very same year, he founded the Fluorescence Imaging Group – FIG (later renamed as nanoBIG), decisively entering the nanoscience field. Since then, nanoBIG has grown by the incorporation of researchers from different areas including chemistry, biology, medicine and pharmacy. The group's research activity

has mainly focused on bioimaging, nanotechnology for pre-clinical diagnosis and therapy, luminescence nanothermometry and optical trapping at the nanoscale. Dr. Jaque has published more than 400 research articles in peer-reviewed journals, obtaining over 20000 citations (H-index = 69) and he is the (co)author of 7 scientific books. His research activities are highly collaborative on an international scale (with more than 20 groups from America, Europe, Asia and Oceania) and he presented his work at more than 50 invited talks at international conferences. Dr. Jaque has been invited professor at Heriot Watt University (UK), Universidad Federal de Alagoas (Brazil), and Swinbourne University of Technology (Australia). He has been recently selected as president of the Scientific Committee of the International Conference of Luminescence. He has been Editor of Optics Express (2010-2012) and Optical Materials (2015-2019), and he is currently acting as Editor of Physica B and Vicerrector of Scientif Policy of Universidad Autónoma de Madrid (Spain).