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## Title | The coming of age of luminescence nanothermometry

**Abstract** | The emergence of luminescent nanothermometry during the last decade opened the possibility of measuring thermal flows at spatial scales below 1  $\mu\text{m}$ , unreachable by conventional electrical methods. Diverse phosphors capable of providing remote detection through their light emission properties have been examined, e.g., polymers, DNA or protein conjugated systems, organic dyes, quantum dots, and trivalent lanthanide ( $\text{Ln}^{3+}$ ) ions incorporated in organic-inorganic hybrids, multifunctional heater-thermometer nanoplateforms, upconverting, downconverting and downshifting nanoparticles.<sup>1</sup>

In recent years, luminescence nanothermometry has entered a more mature stage. Although new classes of thermographic phosphors continue to be reported, e.g., covalent organic frameworks<sup>2</sup> and single-ion magnets,<sup>3,4</sup> we are perceiving a gradual shift in the emphasis of the technique. The research efforts are now focused on establishing comprehensive theoretical backgrounds and standardization procedures (both in data acquisition and processing and in measurement methodologies), discussing the reliability, repeatability, and reproducibility of the technique, and developing new applications.<sup>5</sup>

The lecture will give a general perspective of the work done on luminescence nanothermometry since the explosion of the field one decade ago, illustrating the potential of the technology with recent examples of heat transfer at the nanoscale,<sup>6</sup> thermal bioimaging,<sup>7</sup> and the unveiling of the anomalous properties of liquid water.<sup>8</sup>

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**Bio** | [Dr. Luís Carlos](#) received his Ph.D. in Physics from the University of Évora in Portugal in 1995, where he studied photoluminescent polymer electrolytes incorporating lanthanide salts. He later joined the Department of Physics at the University of Aveiro as Associate Professor and is currently a Full Professor. He is a member of both the Lisbon Academy of Sciences and the Brazilian Academy of Sciences and has held visiting professor positions at several universities, including S. Paulo State University (Brazil), University of Montpellier (France), and University of Wroclaw (Poland). In 2000, he founded the research group "Phantom-g" on photonic hybrids and nanomaterials at the University of Aveiro. His research interests include luminescence nanothermometry, luminescent solar concentrators, green photonics, and self-assembly in hybrid materials. Over the past thirty years, Dr. Carlos has co-authored over 550 papers, given 90 plenary/keynote/invited talks, and collaborated with multiple international universities around the world.

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