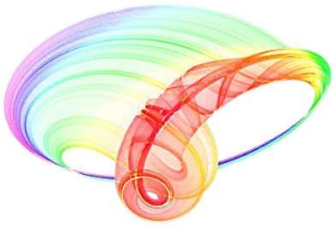
# Book of abstracts



IX International School and Conference on Photonics

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Belgrade, 2023

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# Luminescent thermometry using lanthanide and transition metal-activated phosphors

Ž. Antić
*Center of Excellence for Photoconversion, Vinča Institute of Nuclear Sciences – National Institute of the Republic of Serbia, University of Belgrade*
e-mail: zeljkaa@gmail.com

Temperature is both a thermodynamic property and a fundamental unit of measurement. It plays an important role in our daily lives, from determining the clothing we wear to the efficiency of gas turbines and is by far the most measured physical quantity. As our civilization advances, scientific and technological development, environmental and health problems, and market demands generate a continual need for the development of novel measurement concepts and instruments, especially for temperature. Today's standard thermometers are not able to provide a spatial resolution of measurements better than 1 μm, nor inter or intra-cellular, tissue, or temperatures in harsh environments, on fast-moving objects, and in tough-to-access places.

To address the needs, temperature measurements that harness changes in the optical properties of materials are considered promising, among which temperature measurements using luminescent materials have gained significant attention in recent years. This interest is motivated by the near-infinite range of potential sensor materials, the temperature sensitivity of luminescence, and the ease with which luminescence can be detected in comparison to other optical signals. Luminescence thermometry utilizes temperature changes of luminescence properties of specific material to achieve thermal sensing by temporal (rise and decay time) or spectral (intensity, band shape, spectral peak position, bandwidth, and polarization) alterations of the emission. The method offers semi-invasive, fast, precise, and reliable two-dimensional thermal imaging of macroscopic and microscopic systems at temperatures ranging from cryogenic to approximately 1700°C. To date, different types of materials have been used for luminescence thermometry probes: lanthanide and transition metal ion-activated phosphors, semiconductor quantum dots, organic dyes, metal-organic complexes and frameworks, polymers, carbon-based materials, luminescent proteins, etc. Depending on the application, each class of materials presents unique advantages over others. Herein, the focus will be on luminescent thermometry using lanthanide and transition metal-activated phosphors.