LIGHT-EMITTING HYBRID MATERIALS FOR TEMPERATURE SENSING, MOLECULAR LOGIC AND IoT APPLICATIONS

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ABSTRACT:

Organic-inorganic hybrid materials had explosive growth since the 1980s, with the development of soft inorganic chemistry-based processes characterized by mild synthetic conditions, low processing temperatures, and the versatility of the colloidal state that allows the mixing of the organic and inorganic counterparts at the nanometer scale. This makes it possible to tailor and fine-tune many properties and to design specific multifunctional systems. In particular, the field of "Hybrid-Optics" has seen great development, both scientifically and in terms of applications.[1] Among the distinct systems, lanthanide-containing multifunctional materials have seen very rapid progress in the last two decades since the discovery of different structures with tuneable attributes and offering modulated properties.[1,2] The potential of these materials relies on exploiting the synergy between the intrinsic characteristics of sol-gel derived hosts (highly controlled purity, versatile shaping and patterning, excellent optical quality, easy control of the refractive index, photosensitivity, encapsulation of large amounts of isolated emitting centers protected by the host) and the luminescence features of trivalent lanthanide ions (high luminescence quantum yield, narrow bandwidth, long-lived emission, large Stokes shifts, ligand-dependent luminescence sensitization). Promising applications may be envisaged, such as light-emitting devices,[3] luminescent thermometers,[4] and mobile-based Internet of Things (IoT) applications.[5] This talk intends to provide an overview of some strategies implemented in the last couple of years in the Phantom-G in CICECO-Aveiro Institute of Materials to design highly efficient light-emitting Ln^{3+}-containing organic-inorganic hybrids for molecular logic gates, mobile-based IoT sensing, and luminescent thermometers.

References

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