

Functional soft hybrid organic-inorganic nanomaterials: from macromolecular to self-assembled systems

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The main challenge to take up in the design of hybrid organic-inorganic materials is to keep the added value of inorganic entities while preventing their self-aggregation within the hybrid matrix. We will describe in this presentation the strategies we developed to design luminescent octahedral transition metal atom clusters containing hybrid nanomaterials.

The term "metal atom cluster" describes a finite group of metal atoms held together by metal-metal bonds. The $[(M_6L^i_8)L^a_6]^{n-}$ unit (a = apical, i = inner, M = Mo, Re; L = halogenide, chalcogenide, $1 < n < 8$) constitutes the basic building block in the octahedral cluster chemistry and is easily obtained *via* high temperature solid state synthesis. Metallic clusters show unusual electronic, magnetic and optical properties due to the full delocalization of valence electrons on the whole metallic scaffold. In particular, they can be highly emissive in the red-NIR area.

Two types of hybrid materials will be described: macromolecular and liquid crystalline (clustomesogen) materials. In both cases, inorganic clusters were introduced either by covalent grafting or by using supramolecular interactions (ionic self-assembling or host-guest strategies). We will show that whatever method is adopted, the transition metal cluster luminescence is kept and can sensitize the IR luminescence of trivalent rare earth ions.

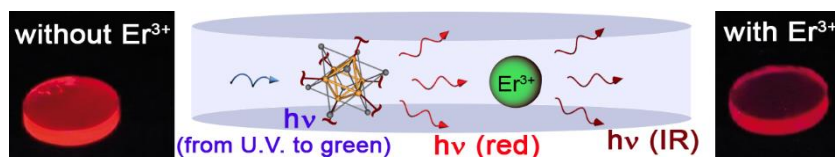


Figure 1: Polymer pellets containing Mo₆ clusters which sensitize Er³⁺ IR photoluminescence

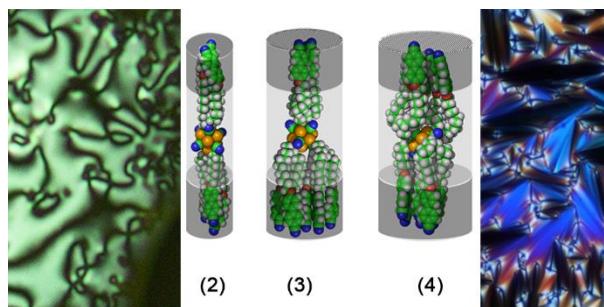


Figure 2: Polarized optical micrographs of nematogenic and smectogenic clustomesogens obtained via ionic assembling and their respective representation.

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Fields of Research

hybrid organic inorganic nanomaterials, polymers, liquid crystal, luminescence

Publications

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