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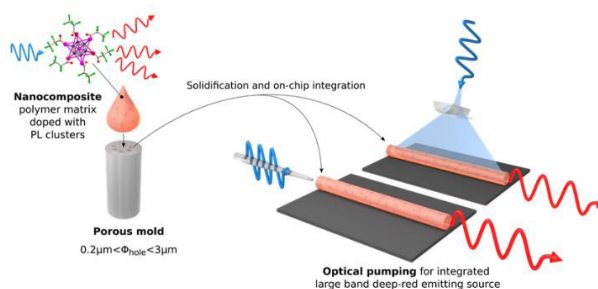
Inorganic metal atom clusters as phosphorescent dyes for the design of hybrid copolymers and nanomaterials

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Metal atom clusters are aggregates of metal atoms held together by metal-metal bonds. Mo₆ octahedral clusters are stabilized by inner ligands (Li) in face-capping positions and apical ligands (La) in terminal positions to form [Mo₆L₈L₆^a]ⁿ⁻ units. On one hand, the concept of [Mo₆L₈L₆^a]ⁿ⁻ unit constitutes a useful virtual object to describe the crystal and electronic structures of cluster-based solid state compounds. On the other hand, the dissolution of solids affords discrete [Mo₆L₈L₆^a]ⁿ⁻ units in solution that constitute real and handleable molecular objects with unique physico-structural properties usable as building blocks in the elaboration and structuration of molecular assemblies and nanomaterials. The delocalization of electrons on all the metal centers leads to specific physical properties as for instance luminescence and even photocatalytic properties. Optical properties of [Mo₆L₈L₆^a]²⁻ octahedral cluster units are characterized by a large absorption window from UV to visible and a large emission window from 550 nm to the NIR region. Thus, such clusters can be used as red phosphorescent dyes for many potential applications including nanoparticles for bio-labeling, liquid crystals and luminescent nanocomposites for lighting and displays. Cs₂Mo₆X₈X₆^a (X=Cl, Br and I) ternary compounds are prepared by solid state chemistry route at high temperature. Interestingly, these ceramics are soluble in many common solvent affording functional [Mo₆X₈X₆^a]²⁻ cluster units that can be further use as building blocks for the design of hybrid co-polymers. Cluster based hybrid co-polymers associate the mechanical and shaping properties of the organic matrices along with the phosphorescent properties of inorganic metallic clusters. We will present here (1) the origin of dual emission of Mo6 cluster based compounds and (2) several examples of potential applications of nanomaterials based on the incorporation of [Mo₆X₈L₆^a]²⁻ cluster units in organic polymers (i.e., oxygen sensors and optical waveguides).



Biography

Stéphane Cordier is a Specialist in crystal chemistry and cluster-based compounds. He has developed methodologies that aim at using cluster-based ceramics for the design of hybrid nanomaterials and in particular cluster-based copolymers. His research covers a continuum from fundamental research in order to correlate physical properties to crystal and electronic structures of solid state compounds for the integration of inorganic clusters onto functional surfaces or in optoelectronic devices. He is the In-charge of the Group Solid State Chemistry and Materials at the Institute of Chemical Sciences of Rennes, France.

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