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Cover Profile

Ln_3Q_9 as a Molecular Framework for Ion-Size-Driven Assembly of Heterolanthanide (Nd, Er, Yb) Multiple Near-Infrared Emitters


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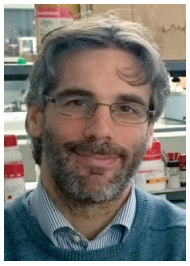
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Invited for the cover of this issue is the group of Flavia Artizzu and Paola Deplano at the University of Cagliari (Italy). The image depicts the Three Graces of Canova, illustrating an assembly of three entities, as does the Ln_3Q_9 molecular framework with three different NIR-luminescent lanthanide ions. Read the full text of the article at 10.1002/chem.201405634.

What was the most significant result of this study?

The achievement of a simple molecular strategy, based on tuning metal composition in the Ln_3Q_9 framework, exploiting the ionic radii of the lanthanoids to synthesize specifically located ions in complexes. A discrete entity containing three different lanthanides (Nd, Er, Yb) has been isolated, in which the central position of the larger Nd ion is well distinguished from the terminal ones of the smaller Yb^{3+} and Er^{3+} ions. This molecular architecture, which allows communication between the metals, has proved to afford multiband NIR-emission, of remarkable relevance for NIR optical technologies.

How did the collaboration on this project start?

The interest in lanthanide quinolinolato complexes rose about one decade ago in view of their promising applications as low-cost electroluminescent materials in the NIR region. At that time, the literature completely lacked in optimized synthetic procedures and X-ray structural studies, and interpretation of the photophysical properties of lanthanide quinolinolates was largely unsatisfactory. Therefore, a collaboration involving complementary and interdisciplinary expertise in synthetic strategies and characterization, including structural investigation, covered by the Cagliari and Parma chemistry teams, and in advanced photophysical studies, covered by the Cagliari photophysics team, was started with the aim to shed light on the structure/properties relationship of this class of complexes. This joint effort has been successful in revising largely accepted incorrect formulations of lanthanide quinolinolates and in reaching a deep knowledge of their chemical and photophysical behavior, crucial for the design of lanthanide complexes with desired and optimized properties.

What do you consider the most exciting developments in the field?

The appeal of this research relies on the prospect to achieve tailored (multi)-functionalities in a pre-designed molecular framework affording solution-processable materials. The special benefit of this strategy is that combined physical properties can be attained through mild solution techniques by assembling selected ligands, bearing suitable features, with lanthanide ions as carriers of functionality such as luminescence and magnetism, thanks to the favored communication among the components in the molecular edifice.

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