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EDITORIAL

Editorial

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If you type "quantum dot" in your web search engine, you are overwhelmed by pictures showing series of bright vials of different colors, ranging from blue to red. The captions inform you that all of the multi-colored vials in each photo contain the same chemical compound—typically cadmium selenide (CdSe). Although I have been working in the field for a number of years, I am still captured by the fact that these glowing colors are a direct manifestation of quantum theory and arise from nanometer-sized objects that are manufactured with extreme precision in a chemistry laboratory.

Many characteristics of matter undergo a significant change when transitioning from the macroscopic world of our senses to the world of nanometers. This is why the nanoscale has become a new fascinating playground that scientists, with the help of increasingly more sophisticated experimental and theoretical tools, can explore. The nanoscale has also turned out to provide a unique meeting point for researchers working in disciplines as different as physics and medicine, passing through chemistry, biology, materials science and engineering.

Colloidal nanoparticles are appropriate systems both to investigate the unconventional phenomena that can take place at the nanoscale and to exploit them for innovative applications. Optical and electronic properties, for example, are strongly affected by size effects. Thanks to the progress made in materials synthesis, the making of nanoparticles with a strict control of size and shape has become a routine laboratory practice in many instances, and several kinds of colloidal quantum dots are commercially available nowadays.

As a photochemist, I am deeply intrigued by the possibility of constructing nanoparticle-based, made-to-order chromophores and luminophores just by

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adjusting their diameter. Quantum dots enable the observation of fascinating and uncommon phenomena that arise from their interaction with light, such as blinking, multi-exciton generation and two-photon processes. These properties are important not only for their technological potential but also for their conceptual implications—as noted above, the effects of quantum mechanics are brought to our sight!

As a supramolecular chemist, I am attracted by the almost unlimited possibilities offered by the interfacing of nanoparticles with molecular units, surfaces or other nanomaterials to yield inorganic–organic hybrids with tailored physical and chemical properties. Indeed, in recent years the set of components that may be employed to assemble new systems and materials from the bottom up has been extended from (supra) molecular species to nano-sized particles of various morphologies and chemical composition.

The collection of articles which appears in this issue of *Topics in Current Chemistry* is aimed at providing an overview of the recent advances in the development of photoactive semiconductor nanocrystals. The area is so vast that it could not be exhaustively covered in this compendium. However, my hope is that the articles will entice the reader by providing a taste of the vivacity of the field, stimulating the interest of researchers and raising the curiosity of students and non-specialists. The active engagement of leading scientists in the field ensures that the topics presented in this compendium are of high current interest and are discussed in a competent and authoritative manner. Indeed, the various contributions provide a view of the field from diverse perspectives—from ultrafast excited-state relaxation to light-emitting diodes—and underline both the exciting fundamental challenges and the appealing prospects for practical applications that this dynamic research field can offer.

I would like to express my gratitude to the colleagues and friends who have shared their knowledge and supported this editorial endeavor by providing clear and engaging texts, high-quality schemes and splendid images. I hope that the reader will enjoy reading these articles as much as I did while collecting and assembling them in the issue. Finally, I thank the editorial staff at Springer for their support throughout the development of this topical collection.

Bologna, October 2016

Alberto Credi