

MSE-Colloquium@NTU

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Carbon Dot Luminophores

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Abstract

Carbon dots (CDs) – small crystalline or amorphous carbon-based quasi-spherical nanoparticles – have recently attracted a lot of attention as promising fluorescent materials. One of their widely accepted advantages is the simplicity of the formation of highly luminescent CDs from a wide variety of organic precursors. At the same time, several recent studies on these chemically synthesized CDs raised questions about the actual nature of the resulting products; their strong luminescence can originate from the presence of molecular organic fluorophores. On the other hand, use of proper synthetic procedures indeed yields purely carbon dot samples of different sizes; color-tunable fluorescence of CDs with blue, green, yellow, orange, red and even near-infrared emission can be achieved, with the color depending on size of the π -conjugated domains in the CD graphitic core. Recently, we have extended the family of these light-emitting colloidal carbon nanoparticles towards other shapes, such as nanorods with linearly polarized emission, nanobelts and nanorolls. Applications of CDs in biolabelling, upconversion LEDs and in luminescent solar concentrators will be considered.

Biography

Andrey L. Rogach is a Chair Professor of Photonics Materials at the Department of Materials Science and Engineering, and the Founding Director of the Centre for Functional Photonics (CFP) at City University of Hong Kong. He received his Ph.D. in Physical Chemistry (1995) from the Belarusian State University in Minsk studying formation and properties of silver nanoparticles in different media. He worked as a postdoc (with Horst Weller) and then as a staff scientist at the Institute of Physical Chemistry of the University of Hamburg, Germany from 1995 to 2002. From 2002–2009 he held a tenured position of a lead staff scientist at the Department of Physics of the University of Munich, Germany, where he completed his habilitation in Experimental Physics on light emission and harvesting with semiconductor nanocrystals. He joined City University of Hong Kong as a Full Professor in 2009 and has been advanced to Chair Professor in 2012. His research focuses on synthesis, assembly and optical spectroscopy of colloidal semiconductor and metal nanocrystals and their hybrid structures, and their use for energy-related and optoelectronic applications. He authored over 500 scientific publications with an h-index of 132 {*Google Scholar*} in these fields that have been extensively (over 62,000) cited, which ranked him as Highly Cited Researcher (*Clarivate Analytics*) – Cross-Field 2018 & 2019 and Material Science 2020 & 2021. He holds honourable appointments as an Adjunct Professor at Trinity College Dublin (Ireland) and University of Electronic Science and Technology of China (Chengdu), and Honorary Professor at Xi'An Jiaotong University, Jilin University, and Peking University Shenzhen Graduate School (China). Prof. Rogach is a Foreign Member of the Academia Europaea, and a Fellow of the Electromagnetic Academy, USA. He is serving as an Associate Editor of ACS Nano (IF 15.88) since 2011.