A Robust Strategy to Monodisperse Functional Nanocrystals with Precisely Tunable Dimensions, Compositions and Architectures for Solar Energy Conversion and Photocatalysis

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Nanocrystals exhibit a wide range of unique properties (e.g., electrical, optical, and optoelectronic) that depend sensitively on their size and shape, and are of both fundamental and practical interest. Breakthrough strategies that will facilitate the design and synthesis of a large diversity of nanocrystals with different properties and controllable size and shape in a simple and convenient manner are of key importance in revolutionarily advancing the use of nanocrystals for a myriad of applications in lightweight structural materials, optics, electronics, photonics, optoelctronics, magnetic technologies, sensory materials and devices, catalysis, drug delivery, biotechnology, and among other emerging fields. In this talk, I will elaborate a general and robust strategy for crafting a large variety of functional nanocrystals with precisely controlled dimensions (i.e., plain, core/shell, and hollow nanoparticles) for use in energy-related applications (i.e., solar cells and photocatalysis) by capitalizing on a new class of *unimolecular* star-like block copolymers as nanoreactors. This strategy is effective and able to produce *organic solvent-soluble* and *water-soluble monodisperse* nanoparticles, including metallic, ferroelectric, magnetic, luminescent, semiconductor, and their core/shell nanoparticles, which represent a few examples of the kind of nanoparticles that can be produced using this technique. The applications of these functional nanocrystals on plasmonic solar cells and photocatalysis will also be discussed.

Biography

Dr. Zhiqun Lin is a Professor at the School of Materials Science and Engineering at the Georgia Institute of Technology. He received his BS degree in Chemistry from Xiamen University in 1995, MS degree in Macromolecular Science from Fudan University in 1998, and PhD degree in Polymer Science and Engineering from University of Massachusetts, Amherst in 2002. He was a postdoctoral associate at UIUC. He joined the Department of Materials Science and Engineering at the Iowa State University in 2004 and was promoted to Associate Professor in 2010. He moved to Georgia Institute of Technology in 2011. His research interests include polymer-based nanocomposites, block copolymers, polymer blends, conjugated polymers, quantum dots (rods, tetrapods and wires), functional nanocrystals (metallic, magnetic, semiconducting, ferroelectric, multiferroic, upconversion and thermoelectric) of different architectures (plain, core/shell, hollow and Janus), solar cells (organic-inorganic hybrid solar cells and dye sensitized solar cells), hierarchically structured and assembled materials, and surface and interfacial properties. He has published more than 141 peer reviewed journal articles (with an h-index of 41), 6 book chapters, and 2 books. Currently, he serves as an Associate Editor for *Journal of Materials Chemistry A*, and an editorial advisory board member for *Nanoscale*. He is a recipient of *Frank J. Padden Jr. Award in Polymer Physics* from American Physical Society, an *NSF Career Award*, a *3 M Non-Tenured Faculty Award*, and an invited participant at the National Academy of Engineering's 2010 US Frontiers of Engineering Symposium. More information on his research can be found at http://nanofm.mse.gatech.edu/.