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Versatile silica coating strategy on hydrophobic quantum dots towards nano-engineering

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Abstract

Semiconductor quantum dots (QDs) possess several advantages including 10 times brighter, mainly due to their wide absorption reign, compared with fluorescent proteins and organic dyes, ultra-stable against photobleaching, and present narrower and more symmetric emission spectra. More interesting, multicore QDs can be excited using single light source. In addition, hydrophobic (QDs) for biomedical aspects and nano-engineering fabrication should be perfectly synthesized allowing robust, reproducible and specifically sufficient biological probes in the optical window of 500-900nm to be achieved. In current work, an effective, versatile and direct silica coating strategy on hydrophobic QDs based on organosilane micellization and silicate deposition for nano-engineering purposes were carried out. This method skipped the conventional water solubilization step for oil-soluble QDs and greatly favored the fluorescence preservation by confining the QDs in a lipophilic interior of a silica bead. By this manner, we created a serious of CdSe/ZnS@SiO_2 nano-spheres ranging from 16 nm to 38 nm with multi-core structure and a tunable silica shell thickness. These nano-spheres exhibited a quantum yield of 90% relative to the oil sample, colloidal stability in biological medium and robust photochemical. Another approach to incorporate multiple hydrophobic I–III–VI_2 QDs for example copper indium sulfide directly into silica beads with a relative small size around 20nm. The silica coating layer maintained the emission properties of QDs regarding the photoluminescent spectrum, quantum yield and the PL lifetime. Also, silica coating on metal affinity induced QDs nano assemblies towards ultra bright, stable and color encoded fluorescent spheres were successfully achieved.

Biography

He-You Han has completed his PhD in 2000 from Wuhan University. He is the dean of Science College, at Huazhong Agricultural University. His research interest focuses on Nanosensors and Food Safety. He has published more than 70 papers in reputed journals and serving as an editorial board member in many journals for example Journal of Analytical Science, The Journal of Light Scattering, and The American Journal of Biomedical Sciences.