Synthesis of Near Infrared Emitting InAs-based Nanocrystals using Aminoarsine

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Near infrared (NIR) emitting semiconductor nanocrystals (NCs) gain significant research due to they are considered as promising candidate in various applications. InAs NCs possess the advantage of being RoHS-compliant (European Union's "Restriction of Hazardous Substances" directives), and tunable bandgap, promoting them as the most appealing alternative among the possible NIR nanomaterials. [1] The most developed synthesis strategy of InAs NCs faces the limitation of As precursror. The commonly used tris-trimethylsilyl or tris-trimethylgermil arsine (TMS-As/TMGe-As) are highly reactive, toxic, and not commercially available. In the pursuit of a safer and cheaper As precursor, tris(dimethylamino)arsine (amino-As) have emerged as an attractive alternative. Amino-As overcome the limitations of traditional As precursor, renewing the research interest for InAs NCs. Current challenge of aminoarsine strategy is to improve the optical properties to reach the standards of TMS-As/TMGe-As strategy. In this regards, we reported a $ZnCl_2$-based synthesis approach of InAs NCs by using amino-As as As precursor.[2] Through the overgrowth of wide bandgap ZnSe, InAs@ZnSe core@shell NCs were obtained, reaching a photoluminescence quantum yield of near 70% at ~900 nm, and their Auger rates reduced with increasing shell thickness.[3] High resolution scanning transmission electron microscopy (HRSTEM) analysis indicates that InAs@ZnSe NCs do not exhibit strain at the core-shell interface, likely due to the formation of an In-Zn-Se interlayer revealed by our elemental and X-ray photoelectron spectroscopy (XPS) analyses. Our work represent a promising starting point for the synthesis of InAs-based NCs using amino-As as the As precursor.