

Chemical Synthesis of Indium Phosphide Quantum Dots with Composition Gradient ZnSe_xS_{1-x} Shell

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Indium phosphide colloidal quantum dots (InP QD) have been regarded as promising alternatives to replace toxic cadmium chalcogenide QDs due to its low toxicity and wide emission control window. Despite the great benefit from the eco-friendly synthetic approach, InP QD's poor efficiency and stability make it impossible to apply for optoelectronic devices such as light-emitting diodes or photovoltaic devices. Herein, we demonstrate the synthesis of InP QDs with thick ZnSe_xS_{1-x} gradient shells (InP@ZnSe_xS_{1-x}), shown improved photo- and chemical stability. The InP@ZnSe_xS_{1-x} QDs were characterized by UV-Visible spectroscopy, photoluminescence spectroscopy, transmittance electron microscopy. Because of the Se gradient around the core, the reduction in quantum efficiency originated from the lattice mismatch was significantly improved, implying that the formation of quenching sites is minimized by the existence of a thick shell around the emitting core.