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White Light -Emitting Diodes with Multi-Shell Quantum Dots

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Replacing the existing illumination with solid-state lighting devices, such as light-emitting diodes (LEDs) are expected to reduce energy consumption and environmental pollution as they provide better efficiency and longer lifetimes. Currently, white light emitting diodes are composed of UV or blue LED with down-converting materials such as highly luminescent phosphors

White light-emitting diodes (LED) were fabricated with multi-shell nanocrystal quantum dots for enhanced luminance and improved stability over time. Multi-shell quantum dots (QDs) were synthesized through one pot process by using the Successive Ionic Layer Adsorption and Reaction (SILAR) method. As prepared, the multi-shell QD has cubic lattice of zinc-blend structure with semi-spherical shape with quantum yield of higher than 60 % in solution. Further, highly fluorescent multi-shell QD was deposited on the blue LED, which resulted in QD-based white LED with high luminance with excellent color rendering properties.