Luminescence from Single CdSe Nanocrystals Embedded in ZnO Thin Films Grown by Using Atomic Layer Deposition

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Semiconductor nanocrystals (NCs) are excellent raw material in nanotechnology owing to their highly fluorescent with fluorescence quantum efficiency, novel optical and electrical properties. Semiconductor NCs have demonstrated potential properties for applications to macroscopic devices such as LEDs, PDs, solar cells, and sensors. Many of these applications involve the optical absorption or emission properties of the NCs, and require that they be embedded into a semiconductor p–n junction for carrier extraction or injection. In this study, we report the embedding of CdSe/ZnS core–shell NCs into ZnO films by atomic layer deposition (ALD). We have characterized the structure and optical properties of commercial CdSe/ZnS core–shell NCs embedded in ZnO layers. Our results show that fluorescence from NCs remains strong after the embedding process, an important requirement for fabrication of light emitting devices. Statistical evidence for a slight reduction in the emission line width of single NCs is observed, suggesting that spectral drift is suppressed by the ZnO embedding process.