The Influence of Shell Thickness on the Performance of Type-I Heterostructured Quantum Dot Based Electroluminescent Devices

정병국, 임재훈[1], 박명진[2], 배완기[3], 이도창†
한국과학기술원; [1]Los Alamos National Laboratory;
[2]서울대학교 전기공학부; [3]한국과학기술연구원
(dclee@kaist.edu†)

Quantum dot based electroluminescent devices assure the highly efficient optoelectronic application with narrow spectra in a wide range of wavelength from visible to near IR based on colloidal synthesis methods. To understand the optical properties and electronic properties of quantum dot, structural engineering of QDs and synthetic methods have been rapidly developed in the recent past. Despite a lot of effort to understand the device physics of QLEDs, several issues have been building up is still left. Here, we synthesized core/shell heterostructureCdSe/$Zn_{1-x}Cd_xS$ QDs with different shell thicknesses and tested the QDs in electroluminescent device. According to spectroscopic analysis, the non-radiative decay pathways in QDs (e.g. energy transfer, charging and non-radiative Auger recombination) are attenuated while the shell thickness increases. As a consequence of attenuation, the device efficiency and the efficiency roll-off characteristics on high current densities are enhanced. The devices contained CdSe/$Zn_{1-x}Cd_xS$ with the thickest shell present higher device efficiency and brightness than thin shell one.