Effect of Hole Injection on InP Quantum Dot-Based Light-Emitting Diodes

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Since quantum dots (QDs) have fascinating properties that they can control emission wavelength according to their size, have narrow linewidth and be capable of a solution process, researches have been conducted to use QDs as a light-emitting materials of a next-generation electroluminescent device. We have studied the effects of hole injection on the InP-based quantum dot light-emitting diodes (QD-LEDs). In order to analyze the device characteristics according to injected hole current from anode to InP QDs, the HTLs with various electric field dependent mobility were introduced on the InP-based QD-LEDs and current density-voltage-luminance (J-V-L) analysis was conducted. In addition, in order to analyze the carrier injection barrier between HTL and anode, the hole-only devices (HODs) were fabricated and the hole current density was analyzed. The hole current density was greatly increased by introducing the C60 thin film at the interface between HTL and anode, the driving voltage of InP-based QD-LEDs was decreased and power efficiency was increased accordingly.