Integration of quantum dots photo-sensor with quantum dots LED

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Abstract (300 word limit)

Recently, the photo thin film transistor (TFT) with colloidal quantum dots (QD) have been investigated deeply. This type of photo-TFT has high responsivity, high detectivity, and tunable detecting wavelengths. Quantum dots LED is also mentioned as a promising display with high efficiency, saturated color, and low cost. Because both QD photo sensors and QD LEDs can be fabricated with solution process, an interactive device with QD photo-TFTs and QD LEDs is studied in this work.

Because PbS QDs and Ge QDs show strong absorption in infra-red (IR) waveband, it is used as the active materials for IR sensor in this work. CdSe/ZnS quantum dot has extraordinary properties of light emission, so it is used as light emitters in the QD LED. To improve the performance of photo-TFT, the QDs are deposited on the active layer to increase the photoconductivity under illumination. For the QD LED device, the ETL, HTL, and device structure are optimized to decrease the driving current. The structure of integrated devices is shown in Fig.1.

Because the photo current is amplified by TFT, the responsibility of QD photo-sensor is about 10^4 A/W. For the QD LED developed in this paper, the power efficiency is about 30 lm/W for green light. The peak brightness of green light is as high as 10,060 cd/m^2.

Image

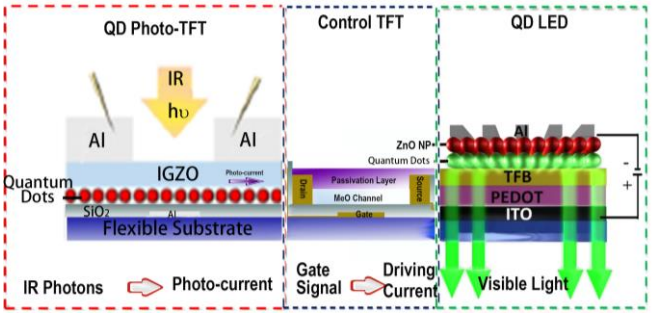


Figure.1 QD photo-TFT is integrated with QD LED

Recent Publications

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Biography

Wei Lei is a professor in the department of electronic engineering in Southeast University , China. His first research activities were focused on charged particle optics and application in display devices. They gave the matter of PhD degree. Since 1994, he was engaged in project cooperation between Southeast University and Philips Company. He had designed a few new electron guns for cathode ray tubes, and he also investigated the method to improve the sensitivity of deflection coil. Now, his research fields covers the nano materials for photonic detectors, field effect transistor based on nano wires, 3D display technologies, and micro-displays. He has published more than 150 hundred papers in the scientific journals, and give more than 30 invited talkings and oral presentations in the conference. Besides this, he has got 28 patents. Since 1995, he has finished 22 collaborative projects between university and industries.

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