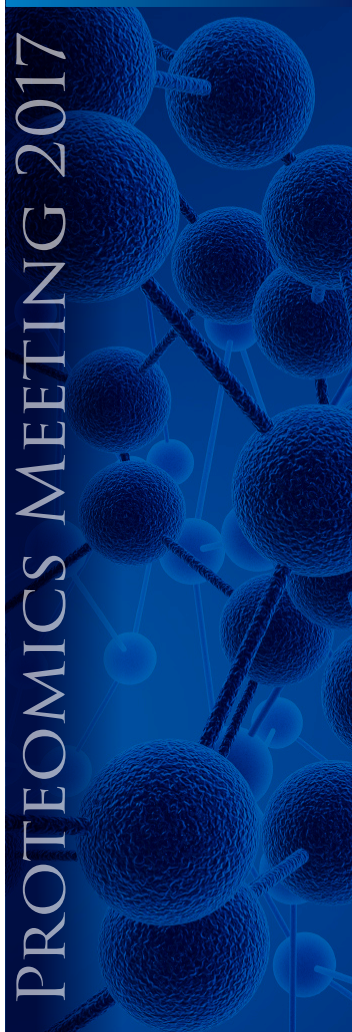


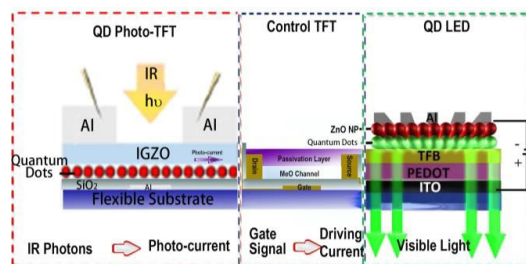
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Integration of quantum dots photo-sensor with quantum dots LED

Recently, the photo thin film transistor (TFT) with colloidal quantum dots (QD) has 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/m².


Figure-1: QD photo-TFT is integrated with QD LED.
Recent Publications

1. Q Q Huang, J Y Pan, Y N Zhang, J Chen, Z Tao, C He, K F Zhou, Y Tu and W Lei (2016) High-performance quantum dot light-emitting diodes with hybrid hole transport layer via doping engineering. *Opt. Express*; 24: 25955.
2. J Y Pan, J Chen, D W Zhao, Q Q Huang, Q Khan, X Liu, Z Tao, Z C Zhang and W Lei (2016) Surface plasmon-enhanced quantum dot light emitting diodes by incorporating gold nanoparticles. *Opt. Express*; 24: A33.

Biography

Wei Lei is a Professor in the Department of Electronic Engineering in Southeast University, China. 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 has also investigated the method to improve the sensitivity of deflection coil. His research fields cover the nanomaterials for photonic detectors, field effect transistor based on nanowires, 3D display technologies and micro-displays. He has published more than 150 hundred papers in the scientific journals and has got 28 patents.

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