

### Wearable quantum dot light emitting diodes with excellent transparency and brightness

김동찬<sup>1,2</sup>, 김대형<sup>1,2,†</sup>

<sup>1</sup>서울대학교; <sup>2</sup>IBS

(dkim98@snu.ac.kr<sup>†</sup>)

Displaying information on transparent screens offer new opportunities for next-generation electronics such as smart surgical glasses, augmented reality devices, and smart windows. Achieving outstanding luminance and transparency is essential for ‘see-through’ displays to show vivid images over clear background views. Here, we report transparent quantum dot light-emitting diodes (Tr-QLEDs) with extreme brightness, high colour purity, and ultrathin form factors. Our Tr-QLEDs exhibit impressive luminance ( $>40,000 \text{ cd}\cdot\text{m}^{-2}$  at 9 V) and transmittance ( $>90\%$  at 515 nm) that are superior to other available transparent displays. These superb characteristics are accomplished by engineered electron transport layers (ETLs) and structurally-optimized nanocrystal quantum dots (QDs). The novel ETLs, zinc oxide nanoparticle assembly coated with thin alumina overlayers, protect QDs from the sputtering damage and balance the electron/hole injection into the QDs. Due to their ultrathin nature (total thickness  $\sim 3 \mu\text{m}$ ), these Tr-QLEDs can be conformally integrated on the various curved glassware. The Tr-QLEDs present a step forward to the next-generation display.