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## Efficient, low cost organic optoelectronic devices with highly conductive polymers

**Yong Hyun Kim**

Pukyong National University, South Korea

The development of transparent electrodes is of great importance for realizing the full advantages of organic photovoltaic cells (OPV cells) and organic light emitting diodes (OLEDs) such as being cheap and flexible. The commonly used indium tin oxide (ITO) as a bottom electrode remarkably increases device costs due to limited indium supply and the inherent brittleness of the material which hinders the applications in flexible devices. Therefore, alternative electrodes are extensively investigated to replace ITO. Among various alternative electrodes, poly (3, 4-ethylenedioxythiophene) poly (styrenesulfonate) (PEDOT: PSS) is regarded as an especially promising alternative electrode due to its high conductivity and transmittance, excellent flexibility and low-cost processing. We have prepared highly conductive, transparent PEDOT: PSS films for use as an electrode in organic solar cells. By the addition of solvent, the conductivity of the thin films increases and by the additional solvent post treatment method, the conductivity increases; further attributed to the removal of PSS from the PEDOT:PSS layer. The highest conductivity of 1418 S/cm has been obtained for a single layer PEDOT:PSS film. Multilayered PEDOT: PSS films show low sheet resistances ( $<65 \Omega/\text{sq.}$ ) with high transparencies ( $>80\%$ ). Based on the post treated PEDOT: PSS electrodes, we could produce OPV cells with a comparable efficiency to that of an ITO based cell. Furthermore, we report efficient transparent OLEDs with improved stability based on conductive, transparent PEDOT:PSS electrodes. Based on optical simulations, the device structures are carefully optimized by tuning the thickness of doped transport layers and electrodes. As a result, the performance of PEDOT:PSS based OLEDs reaches that of ITO based reference devices.

### Biography

Yong Hyun Kim is an Associate Professor at Pukyong National University. He has completed his PhD degree from Technical University Dresden, Germany, in the Institut für Angewandte Photophysik (IAPP). He had also worked as a Post-Doctoral Associate at University of Minnesota and later was promoted to Professor. His research focuses on wearable electronics, alternative transparent electrodes and light trapping/extraction systems for organic solar cells and organic light emitting diodes.

yhykim113@pknu.ac.kr

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