# High-Efficiency Printable Polymer Solar Cells Introducing Novel Functional Materials

Kwanghee Lee, Hongkyu Kang, Junghwan Kim, and Sooncheol Kwon

Heeger Center for Advanced Materials, Research Institute of Solar & Sustainable Energies, Gwangju Institute of Science and Technology, Gwangju 500-712, South Korea
E-mail: klee@gist.ac.kr

We present high-performance inverted polymer solar cells (I-PSCs) introducing novel functional materials, such as nonconjugated/conjugated polyelectrolytes and n- or p-doped sol-gel metal oxides, as efficient interfacial layers. Our functional layers are inserted between the photoactive layer and electrodes via solution processing and low annealing temperature below 80°C, and induce significant functions in the I-PSCs as follows: (i) work function tunning of the electrodes, (ii) selective contact for charge carriers, (iii) transparent optical spacer, (iv) protection of the active layer, and (v) determination of the device polarity. As a consequence, our I-PSCs exhibit a power conversion efficiency ($\eta_e$) approaching $\eta_e \sim 7\%$ under AM1.5 irradiation (100 mW/cm$^2$). In addition, we also successfully incorporate our novel functional layers into all-printed PSC modules with $\eta_e \sim 4\%$ fabricated using various printing techniques, such as slot-die, ink-jet, and electro-spray printing methods.

## References

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