Highly doped conductive polymer electrode introduced in organic solar cells

Jaehoon Kim[1], Ashis K. Sarker[1,*], Boon-Hong Wee[2], Hyung-Jun Song[1], Yeonkyung Lee[1], Jong-Dal Hong[2] and Changhee Lee[1,*]

[1]Department of Electrical and Computer Engineering, Global Frontier Center for Multiscale Energy Systems, Seoul National University, Seoul 151-742, Republic of Korea

Tel: +82-2-880-9093, E-mail: chlee7@snu.ac.kr, ashischemru@gmail.com

[2]Department of Chemistry, Incheon National University, 119 Academy-ro Yeonsu-gu, Incheon 406-772, Republic of Korea

Organic solar cell is a promising device due to its numerous advantages such as low-cost, solution processability and flexibility. Transparent conductive electrodes (TCEs) are required in optoelectronic devices in order to harvest sunlight as well as to make electrical contacts. Currently indium tin oxide (ITO) is the most widely used TCE candidate due to its superior conductivity and transmittance. However, because of its high-cost and brittleness, other alternative TCEs have attracted much attention including graphene, metal nanowires, and highly conductive polymers.

In this work, a highly doped transparent poly(3,4-ethylenedioxythiophene):poly(styrene sulfonate) (PEDOT:PSS) thin film by a post film treatment with hydrogen iodide (HI) is used as a TCE for organic solar cell. Through the acid treatment, the sheet resistance was reduced to below 100 ohm/sq and conductivity was increased to over 11,000 S/cm. For further analysis, we conducted several film characterizations including atomic force microscopy, infra-red absorption spectroscopy, X-ray photoelectron spectroscopy and energy-dispersive X-ray spectroscopy. Therefore, we succeed in fabricating a polymer solar cell using HI treated PEDOT:PSS film as a TCE. This device showed a superior current generation and charge collection properties over the device based on pristine PEDOT:PSS electrode, showing power conversion efficiency of 5.9%, which is attributed to its high doping level.

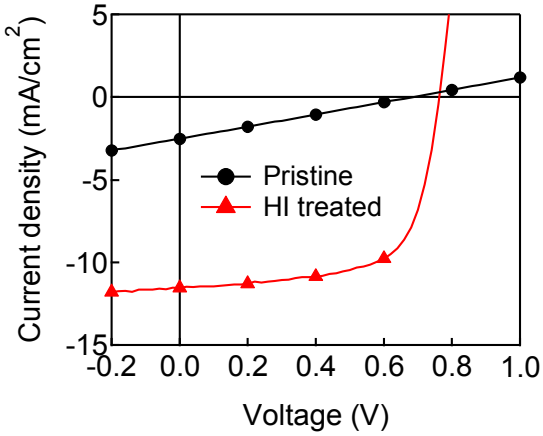

Fig. 1. Current density-Voltage curve of solar cell

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