Printing-Based Technologies for Organic Photovoltaic Cells

Hui Joon Park[1]

[1]Division of Energy Systems Research, Ajou University, Suwon 443-749, Republic of Korea
(huijoon@ajou.ac.kr)

This work is devoted to searching for solutions to realize low-cost, high efficiency and scalable organic photovoltaic (OPV) cells, and their versatile application. For this purpose, various nanostructures, which can be usable to maximize the performances of OPVs, and the effective printing-based technologies to achieve those nanostructures were demonstrated. Furthermore, novel device concept based on those nanostructures has been introduced. First part of this talk is about controlling the nanostructures in photoactive layers to develop more efficient OPV devices. A new process, named as ESSENCIAL, inducing superior bulk heterojunction (BHJ) morphology was developed. This process is applicable to high-speed roll-to-roll process without sacrificing high device performances. A new type of heterojunction nanostructure based on bilayer concept, of which internal quantum efficiency was approaching about 100%, was also introduced. As another effort to realize the ideal interdigitated donor-acceptor structures, nanoimprint lithography (NIL) and block copolymer nanotemplate-based sub-20 nm scale nanopillars were prepared. Secondly, various nanostructures such as plasmonic nanostructures and light trapping structures were developed to control the light in OPV devices. NIL-based transparent metal electrodes, applicable to large area roll-to-roll process will be also introduced. Lastly, the dual-function devices working as color filters and PV cells were demonstrated by applying photonic nanostructures to OPVs. This new conceptual device can recycle the wasted energy in color filter to generate the electricity for the revolutionary energy-saving e-media.