

Invited Seminar

Department of Energy Systems Engineering

2012 Second Semester

Recent Progress in High Performance Polymer Solar Cells

Advantages of polymer solar cells (PSCs) include low cost, ease of fabrication and the potential for flexible, large area solar cells. Recent progress for the past few years shows that the power conversion efficiency (PCE) has continuously increased to its current value over 8%. However, still lower efficiency and poorer long term stability than Si-based solar cells limits the commercialization of PSCs.

Therefore, further improvement in the device performance of PSCs is needed

To enhance the PCE, many approaches has been proposed: (i) synthesis of low bandgap conjugated copolymers to harvest the solar spectrum more effectively [1], (ii) synthesis of semi-conducting polymers with deep HOMO levels to enhance VOC [2], (iii) synthesis of planar conjugated polymers to afford high hole mobility [3], (iv) control of the vertical composition gradient across active layer to reduce the charge recombination and thus to increase the fill factor [4], (v) development of effective hole (or electron) transport layer-materials [5], (vi) synthesis of new fullerene derivatives as acceptor material, (vii) thermal and/or solvent annealing to induce crystallization with nanoscale morphology, (viii) addition of additives to control favorably phase-separation in active layer, and others.

Some efforts have been devoted to improve the long-term durability of PSCs:

(i) introduction of cross-linking in donor polymers of active layer to preserve nanoscale phase morphology, (ii) use of compatibilizer to control and suppress the macro-phase separation in active layer [6,7], (iii) use of deep HOMO materials to prevent oxidative degradation, and (iv) use of non-acidic or less acidic hole transport layer-material than PEDOT:PSS [5], and others. Particularly, it has been reported that the use of donor-acceptor type diblock copolymer as compatibilizer remarkably improves the long-term thermal stability of PSCs based on P3HT:PCBM [8].

Recently, the need to develop new fabrication method compatible with continuous solution process has also been emerged. Although spin coating is very useful for fabricating very thin and homogeneous film and successful for controlling the film thickness, the spin-coating process has several detrimental problems in its application to mass production. In order to overcome these problems, a novel coating process, roller printing, has recently been developed [9].

◀ Speaker

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◀ Host

Department of
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◀ Date

17:00~18:00, Thursday,
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◀ Venue

Room 302, Building 2, DGIST



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