

ST-P003

### Soft X-ray Spectroscopy of CIAIPc/Pentacene/ITO Interfaces: Role of CIAIPc on Energetic Band Alignment

김민수<sup>1</sup>, 허나리<sup>1</sup>, 이상호<sup>1</sup>, 조상완<sup>1</sup>, Kevin E. Smith<sup>2</sup>

<sup>1</sup>연세대학교, <sup>2</sup>Boston University

The interfacial electronic structure of a bilayer of chloroaluminum phthalocyanine (CIAIPc) and pentacene grown on indium tin oxide (ITO) has been studied using synchrotron radiation-excited photoelectron spectroscopy. The energy difference between the highest occupied molecular orbital (HOMO) level of the pentacene layer and the lowest unoccupied molecular orbital (LUMO) level of the CIAIPc layer (EDHOMO - EALUMO) was determined and compared with that of C60/pentacene bilayers. The EDHOMO - EALUMO of a heterojunction with CIAIPc was found to be 1.4 eV, while that with C60 was 1.0 eV. This difference is discussed in terms of the difference of the ionization energy of each acceptor materials. We also obtained the complete energy level diagrams of CIAIPc/pentacene/ITO and C60/pentacene/ITO, respectively.

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**Keywords:** Pentacene, CIAIPc, XPS, XAS, Organic Solar Cells

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### Interfacially Controlled Hybrid Thin-film Solar Cells Using a Solution-processed Fullerene Derivative

남상길, 송명관, 김동호, 김창수

재료연구소, 표면기술연구본부, 소자기능박막연구실

We report the origin of the improvement of the power conversion efficiency (PCE) of hybrid thin-film solar cells when a soluble C<sub>60</sub> derivative, [6,6]-phenyl-C<sub>61</sub>-butyric acid methyl ester (PCBM), is introduced as a hole-blocking layer. The PCBM layer could establish better interfacial contact by decreasing the reverse saturation current density, resulting in a decrease in the probability of carrier recombination. The power conversion efficiency of this optimized device reached a maximum value of 8.34% and is the highest yet reported for hybrid thin-film solar cells.

**Keywords:** Hybrid thin-film solar cells, PCBM, Hole-blocking layer, Power conversion efficiency

