ST-P003

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

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The interfacial electronic structure of a bilayer of chloroaluminum phthalocyanine (ClAlPc) 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 ClAlPc layer (EDHOMO − EALUMO) was determined and compared with that of C60/pentacene bilayers. The EDHOMO − EALUMO of a heterojunction with ClAlPc 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 ClAlPc/pentacene/ITO and C60/pentacene/ITO, respectively.

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Keywords: Pentacene, ClAlPc, XPS, XAS, Organic Solar Cells

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

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We report the origin of the improvement of the power conversion efficiency (PCE) of hybrid thin-film solar cells when a soluble C_{60} derivative, [6,6]-phenyl-C_{61}-butyric acid methyl ester (PCBM), is introduced as a hole-blocking layer. The PCBM layer could establish better interfacial contact by decreasing the reverse ark-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