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Department of Mechanical and Materials Engineering

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Rochester, New York

Metal-Oxides Hole Injection Layer in Organic Semiconductor Devices

In our research we have investigated the counter intuitive phenomenon of inserting a metal oxide layer to improve hole injection or extraction in organic semiconductor devices using ultraviolet photoemission, x-ray photoemission, and inverse photoemission spectroscopy (UPS, XPS and IPES). We observed that metal oxides, such as MoO3 and WO3, substantially increase the work function when deposited on indium-tin-oxide (ITO). The increase lifts up the highest occupied molecular orbital (HOMO) of the hole transport layer, therefore reduces the energy barrier between the HOMO and the Fermi level of the anode. The uplift creates an interface band bending region that results in a drift electric field that encourages the collection of holes at the anode.
The optimum thickness for the oxide layer is estimated to be 2 nm. We have also investigated the effects of ambient or O2 exposure of MoO3.

Our observations have shown that while most of the electronic energy levels of the oxide remain largely intact, the work function reduction is significant. The consequence of the reduction and effect of annealing will also be discussed.

Friday, April 20 - 3:30 pm
Room 110, Jorgensen Hall

Host:
Dr. Jinsong Huang
Department of Mechanical and Materials Engineering

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