

Interface Energy Level Alignments for Understanding Characteristics of OLEDs and Related Devices

Yongsup Park

*Department of Physics and Research Institute for Basic Sciences,
Kyung Hee University, Seoul 130-701, Korea*

The electronic energy levels and their alignments at the interface are playing a crucial role in the operation of organic light-emitting diodes (OLED) and related devices. In an effort to make the correlations between the energy levels measured by ultraviolet photoelectron spectroscopy (UPS) technique and the performance of real devices, we investigate the energy levels at HAT-CN/NPB and pentacene/Alq3 interfaces with UPS and compare the results with the performance of OLEDs containing these interfaces.

For HAT-CN/NPB case, the excellent hole injection properties of HAT-CN/ITO interface was investigated and we found that the energy level alignment at the NPB/HAT-CN interface is playing a key role rather than that at HAT-CN/ITO interface. We found that the electron and holes are generated at the organic/organic interface and the HAT-CN is actually transporting the electrons rather than holes.[1] In the case of an inverted OLED structure employing pentacene/Alq3 electron injection interface, we have found that not only the energy level alignment but the relative carrier mobilities of organic material must be taken into account to explain observed device performance enhancement.[2]

[1] Y.-K. Kim, J. W. Kim and Y. Park, Appl. Phys. Lett. 94, 063305 (2009).

[2] C. Yun, H. Cho, H. Kang, Y. M. Lee, Y. Park, and S. Yoo, Appl. Phys. Lett. 95, 053301 (2009).