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## Doping mechanism in organic devices: Effects of oxygen molecules in poly(3-hexylthiophene) thin films

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### Abstract

The electrical properties of poly(3-hexylthiophene) (P3HT) are very sensitive to the presence of oxygen, as well as in contact with several metals and oxides that are used as electrodes in organic devices. Such atoms and molecules have deleterious impact on the devices performance, normally causing the diminishing of their efficiency and operation lifetime. Therefore, understanding how those molecules, especially the oxygen, interact with the active layer is mandatory to prevent device degradation. Here we performed CELIV and dark Time-of-Flight measurements in a simplified diode structure ITO/P3HT/Ag before and after exposing the device to ambient air. The results analysis give evidence of a slow intake of oxygen molecules by diffusion, a deliberate filling of the generated oxygen traps by electrons and, consequently, a shift of the P3HT Fermi level toward the HOMO of P3HT. Finally the dynamics of hole extraction during CELIV measurements and their recovery are also discussed.

Keywords: Poly(3-hexylthiophene), p-doping, oxygen diffusion, interfacial effects, dark-CELIV.

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