XPS study of the band alignment at ITO/oxide (n-type MoO3 or p-type NiO) interface

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Auteur	Bernède, Jean Christian [1], Houari, S [2], Nguyen, Duc Tuong [3], Jouan, P Y [4], Khelil, A [5], Mokrani, A [6], Cattin, Linda [7], Predeep, Padmanabhan [8]
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Mots-clés	band alignment [9], interfaces [10], Oxides [11], XPS [12]
Résumé en anglais	While they have different electronic properties n-type MoO_3 and p-type NiO are very efficient as buffer layers between the ITO anode and the organic electron donor in organic photovoltaic cells. While it is admitted that MoO_3 is n-type, its band structure is still under study. Here, the band alignment at the interface of an ITO/MoO_3 heterojunction is studied by X-ray photoelectron spectroscopy (XPS). The same study is realized on the structure ITO/NiO, NiO being a p-type semiconductor. The measurements have been performed on samples obtained under the same experimental conditions as those used to achieve organic photovoltaic cells. The MoO_3 (NiO) upper layer was 3 nm thick. The semidirect XPS technique used to measure the band offsets allows us to estimate the band discontinuities at the interface ITO/MoO_3: $\Delta E_v = 0.50$ eV and $\Delta E_c = 0.90$ eV, while at the interface ITO/NiO we have $\Delta E_v = -2.10$ eV and $\Delta E_c = -1.90$ eV. Therefore, n-type MoO_3 and p-type NiO, which are both very efficient anode buffer layers (ABLs), exhibit different band structure at the contact with ITO. However, the measurement, by means of a Kelvin probe, of the work functions of the structures ITO/NiO and ITO/MoO_3, shows that they are close and significantly higher than that of ITO alone.
URL de la notice	http://okina.univ-angers.fr/publications/ua12226 [13]
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Liens

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