UNIVERSITÀ DEGLI STUDI DI PADOVA

DiSC

Venerdì **31 maggio 2019** alle ore **14:30** presso l'aula **G**

il **Dott. Stefano Casalini**

Nanochemistry Laboratory, Institut de Science et d'Ingéniere Supramoléculaire
Strasbourg, France

terrà il seminario dal titolo:

The role of some relevant interfaces within the Organic Thin-Film Transistors (OTFTs)

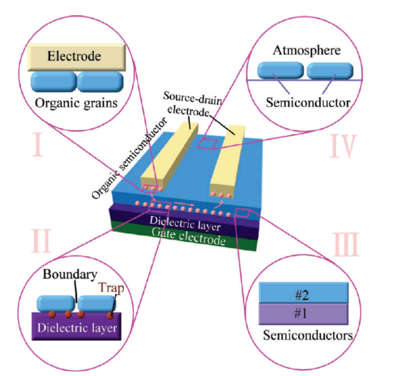

Figure 1 Relevant interfaces in OTFTs.

OTFTs are three-contact systems, whose architecture relies on an active material (*e.g.* organic semiconductor, conductive polymer etc.) that bridges electrically source and drain electrodes. The gate electrode is crucial for tuning the charge carriers density into the conductive channel. Since OTFTs are composed by many passive components (*viz.* source, drain, gate, gate dielectric and the active material), their interfaces are pivotal in terms of final performance (Fig.1).[1] As a result, these electronic transducers can be alternatively defined as "**interfacial devices**". This intriguing definition has attracted the scientific interest of many researchers, who have gained fundamental insights upon the OTFTs working mechanism in the last decades.

Here, three main case studies will be reported, as follows: i) the investigation of the charge carriers injection/withdrawal at the interface between source/drain and the active material; ii) the use of two-components blends to achieve high performance devices; iii) the surface functionalization of the gate electrode in liquid-gated transistors for the development of novel (bio-)chemical sensors.

The first case study is solely focused on the interface between the Au source/drain electrodes and pentacene (as organic semiconductor).[2] The objective was to unravel the effective role of thiolated self-assembled monolayers (*viz.* a homolog series of commercial and non-commercial thiols have been exploited) during the charge carriers injection/withdrawal from/to the metal contacts.[3a,b]

The second case study does not only deal with the previously mentioned interface, but also with the one between the two components of the blend and, furthermore, its outer surface. In particular, it shows an extensive use of semiconducting blends. The type of deposition method (*viz.* bar-assisted meniscus shearing) as well as the fine-tuning of the organic solvent, casting temperature and rate of deposition enabled to achieve unprecedented performances[4] and unexpected sensing features towards Hg^{2+} ions.[5]

Finally, the third case study focuses its attention on the interface between the gate and its dielectric. Since liquid-gated transistors have been used, an aqueous solution acted as gate dielectric. Dopamine and some interleukins[6] have been selected and successfully detected in benchmark solutions.

La presenza della S. V. sarà molto gradita

Prof. Mauro Sambi

Il Direttore del Dipartimento
Prof. Michele Maggini

---

[1] Di, C. *et al. Acc. Chem. Res.* **2009**, *42* (10), 1573–1583.
[2] Stoliar, P. *et al. J. Am. Chem. Soc.* **2007**, 129 (20), 6477–6484.
[3] (a) Casalini, S. *et al. Org. Electron.* **2013**, *14* (7), 1891–1897. (b) Casalini, S. *et al. Org. Electron.* **2012**, 13, 789–795.
[4] Zhang, Q. *et al. Sci. Rep.* **2016**, 6, 39623.
[5] Zhang, Q. *et al. Adv. Funct. Mater.* **2017**, 1703899, 1–7.
[6] (a) Casalini, S. *et el. Org. Electron.* **2013**, *14* (1), 156–163. (b) Casalini, S. et al. *ACS Nano* **2015**, *9* (5), 5051–5062.