Laboratoire de l'Intégration du Matériau au Système CNRS UMR 5218

POSTDOCTORAL FELLOWSHIP – UNIVERSITY OF BORDEAUX

NEAR INFRARED ORGANIC PHOTODETECTORS

The demand for **Human Machine Interfaces (HMI),** i.e. devices used to connect the digital (or virtual) world to the real world, is growing and is likely to continue. Indeed, the introduction of new features and the cut of production costs will certainly contribute to sustain this demand.
The aim of the project is to develop new HMI using the emerging **printed electronics technology**.
A promising application of HMI in the sector of health industry would require non-contact systems, in order to avoid the spread of pathogens. Sensors based on organic photodiodes are one of the most innovative technologies addressing this market, at a very competitive cost.
The introduction of flexible Near Infra Red (NIR) photodetectors, on large areas and at low cost will instead revolutionize and democratize HMI. This new concept of HMI brings the ability for medical applications to limit the contact with object and to keep the ability to interact with the machine. The goal is to limit pollution and the transmission of disease. **A solution is to shift the working wavelengths to the NIR as the majority of HMIs use human hand as interactive object.**

The objective of the study is to optimize the lab scale NIR photodetectors technological process. Technological facilities of IMS platform will be used for device fabrication. Standard advanced opto-electronic characterizations will be carried-out as well as modeling the optical and electrical device properties, in order to identify the main performance bottlenecks and propose device level solutions.

- ***Standard characterization*** will be performed to optimize the integration of the new semiconductors. It consists in the determination of the *responsitivity*, *detectivity*, spectral range and *frequency cutoff*. Current voltage in dark and under illumination will also be carried out to determine the On/Off ratio.
- ***Advanced electro-optical characterizations*** will be performed to deeply study charge transport and recombination processes in these new materials. Hence, temperature dependence current voltage, in dark and under illumination as well as transient open circuit voltage and current will be carried out. Low frequency noise will also be investigated since it determines the *detectivity* and can also give information on the presence of traps
- ***Experimental results will be used for the optoelectronic modeling*** of the detectors. Simulations will be used to design the ideal devices, in term of geometry (thickness of each layers), quality (levels of defects acceptable), and architecture (direct versus inverted bulk heterojunction, bilayer versus bulk heterojunction, introduction of blocking layers to reduce the dark current).

The candidate will be embedded in the organic electronics group of the IMS lab and she/he will participate to the TAPIR ANR funded project, which gathers five academic partners and one company. He will benefit from the experience of the full team at IMS and from the TAPIR project consortium.

Candidate's Profile:
For this study, a physicist or material scientist is expected. Strong knowledge in the physics of the semi-conductor is mandatory. Good experimental skills are also required.

Starting date:
Postdoctoral position is opened starting for early 2018 for 13 months.

Fellowship:
2 000 €/month (neto)

Localization:
The candidate will be located in the « Laboratoire de l'Intégration du Matériau au Système (IMS – CNRS UMR 5218) », in Bordeaux, France. He/She will be working in the Organic electronics group http://oembordeaux.cnrs.fr/.

Application:
Applications have to be sent by mail at:

- Dr. Lionel HIRSCH (Research Director at CNRS): lionel.hirsch@ims-bordeaux.fr

The application will include a complete CV, a motivation letter, a copy of the PhD manuscript and PhD diploma, references and 2 recommendation letters.