MARIE SKŁODOWSKA-CURIE INDIVIDUAL FELLOWSHIPS 2020

EXPRESSION OF INTEREST FOR HOSTING MARIE CURIE FELLOWS

HOST INSTITUTION

FCT NOVA | School of Science and Technology
Research Unit: CENIMAT

RESEARCH GROUP AND URL

i3N / CENIMAT
URL: https://www.cenimat.fct.unl.pt/

SUPERVISOR (NAME AND E-MAIL)

Joana Vaz Pinto
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SHORT CV OF THE SUPERVISOR

Joana Vaz Pinto graduated in Physics Engineering from Universidade Nova de Lisboa (FCT-UNL) and completed a PhD degree in Applied Physics from the same University in 2008.

In October 2008, J.V. Pinto joined CENIMAT with a Postdoctoral research grant focused to the development of Field Effect Devices for biosensing applications. She is currently an Invited Professor at the Materials Science Department (since 2015), teaching mainly *Microelectronics Processing, Characterization of Nanostructures,* and *Memory based devices* and has supervised more than 15 MSc dissertations within these topics.

Joana has published more than 50 papers in peer review journals and develops her research activities in a multidisciplinary field collaborating in many different areas from materials science to biotechnology and heritage and conservation studies. She is also one of the responsible for the exploitation of XRD and AFM advanced characterization techniques of the research Centre (CENIMAT|i3N). Her current research is focused on patterning methodologies and on implementing thin film microelectronic devices in ultrathin and conformable membranes of Parylene for conformable electronics and bioelectronics. She has been exploiting this polymer in its wide range of applications, from substrate to dielectric and encapsulation layers for the fabrication of different types of devices, from TFTs to capacitive/resistive sensors, solar cells and electrochromic displays.
For more information please

5 SELECTED PUBLICATIONS

- Centeno, P.; Alexandre, M.F.; Chapa, M.; Pinto, J. V; Deuermeier, J.; Mateus, T.; Fortunato, E.; Martins, R.; Águas, H.; Mendes, M.J. **Self-Cleaned Photonic-Enhanced Solar Cells with Nanostructured Parylene-C**. *Adv. Mater. Interfaces* **2020**, *2000264*, 1–9. https://doi.org/10.1002/admi.202000264

- Neto, J.P.; Costa, A.; Pinto, J.V.; Marques-Smith, A.; Costa, J.; Martins, R.; Fortunato, E.; Kampff, A.R.; Barquinha, P. **Transparent and flexible ECoG electrode arrays based on silver nanowire networks for neural recordings**. *bioRxiv* **2020**, https://doi.org/10.1101/2020.02.24.962878

- Veigas, B.; Pinto, J.; Vinhas, R.; Calmeiro, T.; Martins, R.; Fortunato, E.; Baptista, P.V. **Quantitative real-time monitoring of RCA amplification of cancer biomarkers mediated by a flexible ion sensitive platform**. *Biosens. Bioelectron.* **2017**, *91*, 788–795. https://doi.org/10.1016/j.bios.2017.01.052

- Kiazadeh, A.; Gomes, H.L.; Barquinha, P.; Martins, J.; Rovisco, A.; Pinto, J. V.; Martins, R.; Fortunato, **E. Improving positive and negative bias illumination stress stability in parylene passivated IGZO transistors**. *Appl. Phys. Lett.* **2016**, *109*, 051606. https://doi.org/10.1063/1.4960200

- Pinto, J. V; Branquinho, R.; Barquinha, P.; Alves, E.; Martins, R.; Fortunato, E. **Extended-Gate ISFETs Based on Sputtered Amorphous Oxides**. *IEEE/OSA J. Disp. Technol.* **2013**, *9*, 729–734. https://doi.org/10.1109/JDT.2012.2227298

PROJECT TITLE AND SHORT DESCRIPTION

Ultra-thin and conformable sensory membrane for smart surfaces

In recent years, we have been facing is a huge demand for healthcare monitoring devices that can monitor physical and chemical parameters in our ordinary day life activities. In this respect flexible electronics has emerged as a promising technology enabling the fabrication in large-area surfaces, and the development of low-cost devices to be used in wearable and skin electronics. Unlike rigid silicon-based electronic devices, flexible electronics exhibit high flexibility/bendability, conformality, and ultralight weight which enable new applications in fields like of healthcare devices, medical implants, wearables and internet of Things (IoT).

Flexible electronic is often based on thin-film amorphous semiconducting materials (amorphous silicon, metal oxides), that can be processed at low temperatures allowing the possibility of patterning arrays of sensors in large areas and on a variety of substrates like plastic, metal foil, or even paper. However no industrial commercially successful technology has been reported so far. The main reason relies mainly due to the absence of an integrated approach to the realization of a broadly applicable technology, with the high performance that today's electronic environment demands. The goal of our program is to advance practical architectures, circuits, and fabrication methods required for such a technology. In our opinion, a successful flexible electronic system technology must marry the advantages of large-area thin-film technology with the advantages of advanced complementary metal–oxide– semiconductor (CMOS) technology.

The main goal of this project is to develop hybrid conformal electronics sensing membranes suitable to be integrated and functionalize any surface. In order to achieve this multifunctional sensing membrane, 3 main goals are expected: i) Development of active sensor matrix arrays of conformable substrates, using thin film technology; ii) Modelling and simulation of thin film sensors (temperature, pressure and UV sensors) and TFTs, and, iii) Integration of high performance IC's in these conformable membranes to allow the signal acquisition and conditioning. Parylene membranes, able to be produced with thicknesses as low as 1 µm will be used as the main material, taking advantage of its excellent electrical properties, and for been also compatible with microelectronics processing technologies. Our team has confirmed experience in the development of thin film devices based on amorphous oxides such as TFTs, arrays, electrochromic devices, and also in the implementation of these devices as chemical and physical sensors. We have also been using arylene in its multiples roles (substrate, dielectric and encapsulation layer) showing the overall applicability of this material.

SCIENTIFIC AREA WHERE THE PROJECT FITS BEST

Information Science and Engineering (ENG) | Physics (PHY)