MARIE SKŁODOWSKA-CURIE POSTDOCTORAL FELLOWSHIPS 2021

EXPRESSION OF INTEREST FOR HOSTING MARIE CURIE FELLOWS

HOST INSTITUTION

NOVA University Lisbon | School of Science and Technology
CENIMAT|i3N

RESEARCH GROUP AND URL

Advanced Functional Materials for Micro and Nanotechnologies (AFMMN)
https://www.cenimat.fct.unl.pt/rd-id-teams/materials-electronics-optoelectronics-and-nanotechnologies/advanced-functional-materials-micro-and-nanotechnologi

SUPERVISOR (NAME AND E-MAIL)

Joana Vaz Pinto
jdvp@fct.unl.pt

SHORT CV OF THE SUPERVISOR

Joana Vaz Pinto (J.V. Pinto) is a researcher at NOVA School of Science and Technology (FCT NOVA), one of the three most prestigious schools of Engineering and Sciences in Portugal. Joana graduated in Physics Engineering in 2001 and was awarded with her PhD degree in Applied Physics in 2008 from NOVA-FCT where she gained expertize in the use of ion beam techniques to characterize and modify the magnetic and electrical properties of metal oxide materials. In October 2008, J.V. Pinto joined CENIMAT with a PostDoc position aiming at the development Field Effect Transistors and Devices for biosensing applications (ISFETs) where she exploited microelectronic fabrication methodologies and implementation of thin film devices.
Since 2015 she is an Invited Assistant Professor at the Materials Science Department of FCT NOVA, teaching mainly Microelectronics processes and characterization of nanostructured materials, being responsible for the exploitation of XRD and AFM advanced characterization techniques at CENIMAT|i3N research Centre.
Her current research is focused on patterning methodologies and development of thin film devices in ultra thin parylene membranes for conformable electronics and bioelectronics. She has been exploiting this polymer in its wide range of applications as substrate, dielectric and encapsulation layers for different devices, like TFTs, capacitive/resistive sensors, RFID antennas solar cells and electrochromic displays. Her main objectives are pursuing the integration on parylene ultra-thin membranes of devices to achieve self-powered sensing platforms combining the group's expertise in fabrication and circuit design. The integration on flexible substrates rely on both on system-level integration and of-shell integration of ICs and different patterning and processing techniques are being explored as laser ablation and conventional photolithography. She has supervised more than 20 Msc thesis in the last 6 years and has currently a PhD student in the same thematic.
She 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.

5 SELECTED PUBLICATIONS

- Neto, J.P.; Costa, A.; Vaz Pinto, J.; Marques-Smith, A.; Costa, J.C.; Martins, R.; Fortunato, E.; Kampff, A.R.; Barquinha, P. **Transparent and Flexible Electrocorticography Electrode Arrays Based on Silver Nanowire Networks for Neural Recordings**. *ACS Appl. Nano Mater.* **2021**. https://doi.org/10.1021/acsanm.1c00533

- Martins, J.; Kiazadeh, A.; Pinto, J. V; Rovisco, A.; Gonçalves, T.; Deuermeier, J.; Alves, E.; Martins, R.; Fortunato, E.; Barquinha, P. **Ta2O5/SiO2 Multicomponent Dielectrics for Amorphous Oxide TFTs.** *Electron. Mater.* **2021**, *2*. **https://doi.org/10.3390/electronicmat2010001**

- 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

- 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

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 and even the human skin. In order to achieve this multifunctional sensing membrane, 3 main goals are expected: i) Development of active matrix arrays of sensors in 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 Parylene 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)
Life Sciences (LIF)