MARIE SKŁODOWSKA-CURIE POSTDOCTORAL FELLOWSHIPS 2024

EXPRESSION OF INTEREST FOR HOSTING MARIE CURIE FELLOWS

HOST INSTITUTION

NOVA School of Science and Technology, NOVA University Lisbon

RESEARCH GROUP AND URL

CENIMAT/I3N, https://www.cenimat.fct.unl.pt/

SUPERVISOR (NAME AND E-MAIL)

Luis Pereira, lmnp@fct.unl.pt

SHORT CV OF THE SUPERVISOR

Luis Pereira is an Associate Professor at the School of Science and Technology - NOVA University Lisbon and currently CTO of the AlmaScience Colab. The versatility and initiative demonstrated throughout his scientific career have been very important in building up his expertise in different fields, complementary or distinct from where he began his career. He was involved in the first demonstration of oxide transistors using paper ad dielectric and substrate. This resulted in a family of 14 patents.
He has coordinated and participated in several R& D projects under different funding schemes, including industry direct funding ones. He has been granted in 2015 a Starting Grant of the European Research Council (ERC) on the development of cellulose nanocomposites for paper electronics (New-Fun, project 640598). Recent research interests were on the design and synthesis of 1D, 2D and 3D inorganic and hybrid nanostructures, chiral cellulose nanocomposites, functional micro and nanofibers and their integration on chromogenic, electronic and electrochemical devices. Luis Pereira has published more than 180 papers and has an h-index of 57 with more than 14000 citations (Google Scholar)
In 2020 he became CTO of AlmaScience Colab (https://almascience.pt/) a tech transfer and incubation institution for smart and sustainable solutions based on cellulose and other natural materials. This means that for the last two years, Luis Pereira has been involved in applied research projects led and promoted by industrial partners, highly market-oriented.

5 SELECTED PUBLICATIONS

- “Multifunctional flexible and stretchable electrochromic energy storage devices”, Libu Manjakkal, Luis Pereira, Eric Kumi Barimah, Paul Grey, Fabiane F Franco, Zhengyu Lin, Gin Jose, Richard A Hogg (2024) Progress in Materials Science, 101244
- “Sustainable electrochemical energy storage devices using natural bast fibres”, Libu Manjakkal, Amrita Jain, Suman Nandy, Sumita Goswami, José Tiago Carvalho, Luis Pereira, Chan H See, Suresh C Pillai, Richard A Hogg, (2023) Chemical Engineering Journal, 465, 142845
- “Smart IoT enabled interactive self-powered security tag designed with functionalized paper, Guilherme Ferreira, André Opinião, Shubham Das, Sumita Goswami, Luís Pereira, Suman Nandy, Rodrigo Martins, Elvira Fortunato” (2022) Nano Energy, 95, 107021
- “Simone Siccardi, Julia Amici, Samuele Colombi, José Tiago Carvalho, Daniele Versaci, Eliana Quartarone, Luis Pereira, Federico Bella, Carlotta Francia, Silvia Bodoardo”, UV-cured self-healing gel polymer electrolyte toward safer room temperature lithium metal batteries (2022) Electrochimica Acta, 433,141265
- “Porous PDMS conformable coating for high power output carbon fibers/ZnO nanorod-based triboelectric energy harvesters, Raquel Barras, Andreia dos Santos, Tomás Calmeiro, Elvira Fortunato, Rodrigo Martins, Hugo Águas, Pedro Barquinha, Rui Igreja, Luís Pereira” (2021) Nano Energy 90, 106582

PROJECT TITLE AND SHORT DESCRIPTION

Low intrusion novel sensor architectures for multi-sensing in battery cells: The posdoc work plan aims to develop a multi-sensing concept at the battery cell level based on printed LC-circuits that can be implemented at the cathode and/or anode, demonstrating the capability of measuring temperature, strain, state of charge (SoC) and estimating the state of health (SoH) in the battery cell in a non-invasive way and operando mode. The overall objective is supported by a set of specific objectives (SOs) targeting the successful development of the sensing system inside (the printed electrodes) and outside (signal collection, local analysis with edge computing, and remote analysis) of the battery cell.

SO.1: Develop and realize a ground-breaking sensor architecture, composed of arrays of printed resonant circuits made of coils and capacitors (LC passive resonant sensors), capable to monitor different phenomena inside a battery cell in a non-invasive way.

SO.2: Develop electronics and advanced signal processing algorithms, required for error-free identification, transferred to the external control electronics and an emulated BMS.

SO.3: Develop, integrate, and train robust machine learning algorithms with historical data from literature and a unique combination of data augmentation strategies, based on advanced characterization techniques, separating the contribution from the different phenomena and their correlation.

SO.4: Implement the sensor architecture in a 1Ah test cells of an industrial-relevant NMC based composition.

SCIENTIFIC AREA WHERE THE PROJECT FITS BEST*

ENG

***Scientific Area where the project fits best** – Please select/indicate the scientific area according to the panel evaluation areas: Chemistry (CHE) • Social Sciences and Humanities (SOC) • Economic Sciences (ECO) • Information Science and Engineering (ENG) • Environment and Geosciences (ENV) • Life Sciences (LIF) • Mathematics (MAT) • Physics (PHY)