

Materials Science Department

Materials for Energy Conversion and Conservation

*CENIMAT-I3N and CEMOP/UNINOVA
Microelectronics and Optoelectronics Materials Group*



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PhD in 2002 “*Hydrogenated Silicon amorphous and nanocrystalline produced by HWP-CVD Technique*”, Professor of DCM/FCT-UNL since 1994, Associated Professor since 2012.
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Objectives

Development of new materials and devices for energy conversion and for energy saving. It includes research in the main topics of:

- 1) thin film batteries, paper batteries and biobatteries;
- 2) thermoelectric thin film materials and devices;
- 3) thermochromic materials;
- 4) improvement of thin film solar cells through plasmonics;
- 5) organic solar cells;
- 6) bio/electronic devices;

Methodology

- 1) Normal writing paper is used as proton exchange membrane between two thin film electrodes deposited on both sides of the paper. The biobatteries used the same concept but the paper is replaced by electrospun cellulose based membranes;
- 2) The thermoelectric properties of thin film metal oxides are investigated aiming the development of thin film thermoelectric modules for energy production and refrigeration of electronic components
- 3) The plasmonic properties of metallic nanoparticles have been studied as a solution to improve the efficiency of thin solar cells.

Expected Results

Recent publications

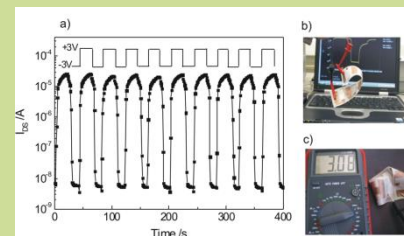
Javier Contreras, Luis Gomes, Sergej Filonovich, Nuno Correia, Elvira Fortunato, Rodrigo Martins, and Isabel Ferreira¹, "3D scanning characteristics of an amorphous silicon position sensitive detector array system", 13 February 2012 / Vol. 20, No. 4 / **OPTICS EXPRESS** 4583, 4 (20) (2012): 4583-4602.

Baptista AC, Martins JI, Fortunato E, Martins R, Borges JP and **Ferreira I**, Thin and flexible bio-batteries made of electrospun cellulose-based membranes, **BIOSENSORS & BIOELECTRONICS** 26 (2011) 2742–2745, IF=5.429

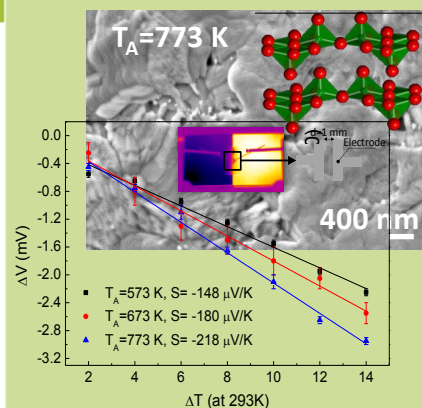
Ferreira I, Bras B, Martins JI, Correia N, Barquinha P, Fortunato E, Martins R, Solid-state paper batteries for controlling paper transistors, **ELECTROCHIMICA ACTA** Volume: 56 Issue: 3 Pages: 1099-1105 Published: JAN 1 2011

Funding: NanoTox-"Integrated evaluation of Nanomaterials: Determination and characterization of the environmental toxicology" _ PTDC/CTM/099446/2008 (2010-2012); Nanostructured ThermoElectric Systems for Green Transport & Energy Efficient Applications-**NanoTEG**_ ENIAC-2010-1 (2011-2014)

Paper batteries



Thermoelectrics Thin Films



Plasmonics

