PhD position at the LMGP/LGP2 Laboratories in Grenoble

Transparent electrodes based on silver nanowires-nanocellulose: from fundamental aspects to device integration

Job description:

A phD position is offered between LMGP and LGP2 laboratories. The appointment has a fixed duration of 36 months, starting 01/10/2019.

You will be hired in the framework of a Regional project (2018-2023) called “Eternité” and dealing with research and development devoted to optically transparent materials and electrical conductors that has attracted growing interest in recent years for many applications. These are a key technological element for a large number of devices such as solar cells, efficient lighting (LEDs, OLEDs), touch screens, smart windows, transparent heating films, etc. The objectives of the ETERNITY project are to design and develop transparent electrodes that are: i / **efficient** (i.e. the most transparent and conductive possible); ii / **stable** through the production of nanocomposites via an innovative thin film deposition technique (either a thin oxide layer or the use of nanocellulose); iii / **flexible** (thanks to the use of metal nanowires (MNW) and nanocellulose which are ductile) on flexible substrates (especially polymers), iv / **low cost** and finally v / **integrable** within devices whose economic potential is strong and in full development and for which many industrial partners are present at both regional and national levels. The partners LMGP and LGP2 have independently developed in recent years specific expertise on stable and efficient electrodes based on silver nanowires (LMGP [1,2]) and AgNW/nanocellulose hybrids composites (LGP2 [3,4]). The combination of these two complementary laboratories will allow a good synergy to obtain efficient and durable transparent electrodes and thin films whose integration will easily be the object of collaborations with the industrial sector. The actions carried out in this PhD project concern the development of materials for the fabrication of these nanocomposites, their characterization and their physical modelling. Their integration into real devices will also be performed. This Thesis offers a good trade-off between fundamental and experimental aspects. The candidate will get precious knowledge and skills in physics, nanomaterial sciences and nanocellulose. The LMGP/LGP2 house state of the art experimental equipment to fabricate AgNW networks and nanocellulose with adapted tools for their physical characterizations.

Related references:

[1] T. Sannicolo, M. Lagrange, A. Cabos, C. Celle, J.-P. Simonato, D. Bellet, ***Small***, 12 (2016) 6052;
[2] T. Sannicolo, N. Charvin, L. Flandin, S. Kraus, D. T. Papanastasiou, C. Celle, J. Simonato, D. M. Rojas, C. Jiménez, D. Bellet, ***ACS Nano*** (2018), 12, 4648;
[3] F. Hoeng, A. Denneulin, G. Krosnicki, J. Bras, ***J . of Mat. Chem. C*** 46 (2016) 10945;
[4] F. Hoeng, A. Denneulin, N. Reverdy-Bruas, G. Krosnicki, J. Bras, ***Applied Surf. Science*** 394 (2017) 160.

Research profile & skills (required / highly desirable): We are looking for a highly motivated student with a master degree in materials science or physics/chemistry, and who is interested to work in an inter-disciplinary project. Interpersonal skills, dynamism, rigor and teamwork abilities will be appreciated. Candidates should be fluent in both oral and written English.

Scientific environment: The candidate will work within the LMGP (Materials and Physical Engineering Laboratory) in the FunSurf group and the LGP2 (Laboratory of Pulp and Paper Science and Graphic Arts) in the MatBio and FunPrint groups. Located in the heart of an exceptional scientific environment, both LMGP and LGP2 offer the applicant a rewarding place to work.

LMGP Web Site: http://www.lmgp.grenoble-inp.fr/ **LGP2 Web Site:** http://pagora.grenoble-inp.fr/en/research

Salary: Pay scale of a fixed term post as a G-INP Researcher: 2315 €/month (gross salary, net salary: - 20%)

Application procedure: Please send motivation letter, CV, list of scientific publications and the contact information of a reference person (with e-mail & phone number) to:

Daniel Bellet: daniel.bellet@grenoble-inp.fr (04 56 52 93 37); Julien Bras : julien.bras@grenoble-inp.fr (04 76 82 69 15) ; Aurore Denneulin: aurore.denneulin@grenoble-inp.fr (04 76 82 69 28) ; David Muñoz-Rojas : david.munoz-rojas@grenoble-inp.fr (04 56 52 93 36).

Closing date for applications: 22th of April 2019