

# PhD position: Hybridization of block copolymer thin films with plasmonic nanoresonators for optical metamaterials design

## Duration

36 months

## Job status

PhD position, full time. The salary complies with French standards.

## Description

The aim of this work is to develop the methodologies allowing the long range ordering of block copolymer thin films hybridized with nanoparticles. The block copolymer mesostructure will be used as guiding template for the precise localization and distribution of nanoparticles at the nanometer length scale.

The student will develop fabrication methodologies and competencies, which will be applied to the production of block copolymer thin films with controlled optical properties, within two research fields of AMADEus, namely the production of organic microelectronic devices and the development of optical metamaterials. Their production will include recent techniques - such as nanoimprint technique (available in the ElorPrintTech facility) or combination of top-down and bottom-up methodologies leading to long range order structures with nanometer-scale periodicities.

The first task of the student will be to develop the methodologies leading to the controlled ordering of block copolymer mesostructures in thin film configuration and to study the influence of the hybridization of the BCP structure with nanoparticles. Direct self-assembly methodologies will be used to control the block copolymer self-assembly (mesostructure, orientation) while the design of the block copolymer system will be adapted to favor the affinity between the nanoparticles and one of the block copolymer domains.

Within the metamaterials axis of the work, the nanostructured films hybridized with plasmonic nanoparticles will be probed as regards to their optical properties using variable angle spectroscopic ellipsometry. We have previously developed some capacity towards the extraction and the modelization of the effective dielectric permittivity tensor. We will analyze the dielectric permittivity and its anisotropy in relation with the nanostructure.

## Profile of applicant

Candidates should have (or be about to receive) a master degree, or equivalent, in the field of soft matter, polymer or colloids. Some experimental experience in block copolymer studies will be a plus, as well as a real interest towards pluridisciplinarity.

## Research labs involved

- Laboratoire de Chimie des Polymères Organiques (LCPO), UMR 5629, Université de Bordeaux/CNRS/INP Bordeaux, Allée Geoffroy St Hilaire, B8, CS50023 – 33600 Pessac, France
- Centre de Recherche Paul Pascal (CRPP), UPR 8641, 115 Avenue A. Schweitzer, 33 600 Pessac, France

### Co-Supervisors

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### How to apply

Please upload a letter of intent, including a list of potential reference scientists, and a full CV, through the AMADEus web platform <http://amadeus.labex.u-bordeaux.fr/en/Jobs/> (job offer ref.: 2015 AMADEus 041). The precise start date, not earlier than 1<sup>st</sup> October 2015, can be negotiated. Applications will be considered until the position is filled.

### Description of the cluster

The cluster of excellence AMADEus brings together teams belonging to 12 research laboratories of the University of Bordeaux. This cluster is expected to have a long-term structuring role in both the academic and economic spheres through the production and transfer of cutting-edge knowledge in emerging materials science and technologies.

The targeted research challenges of AMADEus include:

- Innovative components based on nanostructured metamaterials. Metamaterials form a new class of artificial materials with extraordinary electro-magnetic (EM) or acoustic properties, unknown to natural materials or previously developed technologies. Since the first realization of an EM metamaterial in the microwave regime in 2000, the field has been growing exponentially, bringing about some of the most fascinating results in fundamental science of the recent years and opening up new horizons for optics and electromagnetism, telecommunications and information technology.
- Organic electronics. The objectives of AMADEus teams for the next ten years and beyond are to address issues in energy, health, environment and well-being by working, among others, in the disruptive field of large area printed and flexible organic electronics regarding:
  - a) The conception, understanding, innovation of new materials and processes as well as their integration to devices and integrated systems.
  - b) The design, prototype fabrication, testing and process validation of new products as well as product introduction to markets.