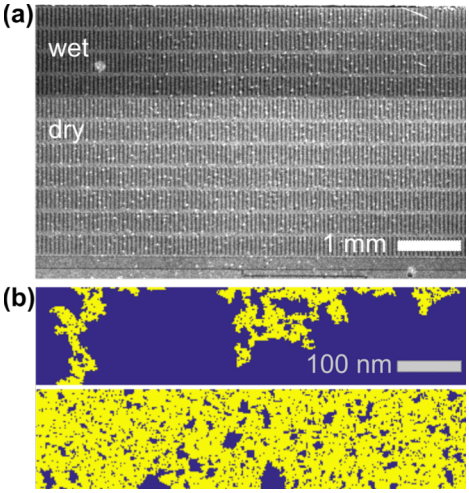
Post-doc offer

Wetting and dewetting of nanocomposites for energy harvesting (H/F)

Contact: Olivier VINCENT
CNRS Researcher, team "Liquids and Interfaces", Institut Lumière Matière (ILM), Lyon, France
(olivier.vincent@univ-lyon1.fr, http://ilm-perso.univ-lyon1.fr/~ovincent)

Keywords: nanomaterials, surface phenomena, confined liquids, optics, capillary flows, phase transitions

CONTEXT. Understanding and controlling water content in porous materials is crucial in various contexts (plants, soil, construction materials, membranes, electrodes, etc.). In many situations, water confined in these materials contains solutes, and salt in particular. Here, we aim at understanding how model nanomaterials (ordered/disordered, multiscale, self-organized or designed by photolithography etc.) containing salt wet and dewet when subject to thermodynamics driving forces (temperature/humidity variations), as a function of their geometry, surface properties, salt concentration etc. Particular attention will be paid to the conditions that trigger wetting/dewetting, and to the physics governing the patterns and timescales that emerge. Coupling between surface phenomena, entropic (colligative) effects, transport and nucleation (crystallization, cavitation, etc.) make this problem rich and poorly explored. This fundamental study is part of a larger project funded by the European Union aiming at designing new materials for energy harvesting using industrial humidity cycles from waste heat.



(a) Water invasion in a micro/nano composite with periodic ordered microstuctures resulting in a ultra-sharp imbibition front. (b) Percolation-induced clustering of salt solution pockets during evaporation in a disordered nanoporous material (simulation).

PROJECT & TASKS. The postdoctoral researcher will be in charge of a series of experiments investigating wetting/dewetting in these nanomaterials with optical techniques (image analysis, interferometry, holography, etc.) and will participate in the fabrication of the materials in a cleanroom. Complementary experiments (ellipsometry, cyclic voltammetry, X-ray diffraction/tomography) might also be involved, as well as modelling approaches. Implication into the European project (communication with consortium, help with organizing meetings etc.) and participation in various international scientific events (conferences, workshops, etc.) are also expected.

PROFILE. We are looking for a motivated candidate holding a PhD in experimental physics (or related discipline: physical chemistry, materials science, chemical engineering, mechanical engineering etc.), and who is able to run independent scientific investigations in a collaborative context. Specific knowledge in at least one of the following domains is required: micro/nano-fabrication, optical measurements (microscopy, interferometry, image analysis etc.), physics of liquids, physical chemistry of interfaces, solution chemistry, porous media. Skills in Python (and/or Labview, Matlab) and in version control (git) will be considered favorably. Proficiency in English and oral scientific communication are mandatory due to the international and collaborative aspects of the project.

ENVIRONMENT & SUPPORT. The position is funded by a FET-Open project of the European Union involving an international multi-disciplinary consortium. The postdoctoral researcher will be part of the Liquids and Interfaces team of the Light & Matter Institute (CNRS & Univ. Lyon 1, Lyon, France) and will interact with professors, researchers, engineers and students in the team working on strongly related projects. Regular interactions with other members of the consortium will also take place through project meetings and travel for short-term scientific stays.

MORE INFORMATION. Interested candidates should apply on the CNRS hiring portal (https://bit.ly/3woytM7) and attach a CV, a brief cover letter and contact information of at least 2 references for recommendations. Expected start date is Summer-Fall 2021, for a duration of 1.5 years, with possibilities of extension.