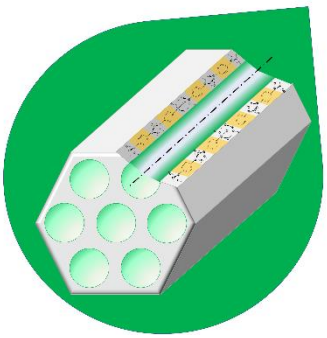
Institut de Physique de Rennes
https://ipr.univ-rennes.fr
Bâtiment 11E, Université de Rennes
263 av. Général Leclerc
35042 Rennes cedex France
T. +33 2 23 23 69 84
F. +33 2 23 23 67 17
UMR 6251

PhD thesis offer:
« *Deep Eutectic Solvents : Properties Induced by Nanometric Confinement* »

CNRS - University of Rennes - France

Domains: Physics, Physical Chemistry, Material Sciences or equivalent
Key-words: New solvents, Sustainable chemistry, Physics of liquids, Nanoporous confinement
Location : Institute of Physics of Rennes, CNRS, University of Rennes, France
Doctoral school : S3M Sciences of Mattter, Molecules and Materials
Funding : Doctoral grant from University of Rennes



Description: Nowadays, **Deep Eutectic Solvents** (DES) are the matter of tremendous interest. They exhibit exceptional functional properties, making this emerging class of solvents a very promising new candidate among 'green' alternatives to classical solvents.
Compared to conventional solvents, most DESs present **atypical physico-chemical properties** such as marked non-ideal character, nanodomains and dynamical heterogeneity, related to the specific association of their molecular and/or ionic species by electrostatic and Hydrogen bonds [1,2].
For several targeted applications, DES will not be considered in their bulk liquid state, but on the **surface of solids** or in **membranes and mesoporous materials**. Nanometric confinement and interface effects could then profoundly modify their behavior.
To understand these phenomena, this thesis will study the evolution of the physico-chemical properties of DES when they are introduced into the **nanochannels** of model mesoporous matrices. Their phase diagram and their stability will be studied by **calorimetry** [3] and confronted with **thermodynamic models** [4]. The formation of supramolecular entities, spatial homogeneity and DES-substrate interactions will be studied by **Raman vibrational spectroscopy, NMR** and **neutron diffraction**. Finally, the dynamic properties (dipolar relaxation, transport by diffusion and ionic conduction) will be studied by **quasielastic neutron scattering**, and **impedance and dielectric spectroscopy** [5,6]. This project will thus make it possible to better understand the fundamental properties of DES at the nanometric scales, which is an issue of central interest.

Profile: We are looking for an enthusiastic candidate, having obtained a master's degree in the fields of Physics, Physical Chemistry, Materials Science or equivalent. Academic knowledge or previous experience in any of the experimental methods indicated in the project would be appreciated, but is not mandatory.

Conditions: Doctoral contract from the University of Rennes for 3 years starting on October 1, 2023. Gross salary: €2044, revalued annually according to ministerial decree. The project will be hosted at the Institute of Physics of Rennes, a joint CNRS-University research unit. As part of their project, the doctoral student will be trained in the use of all the experimental techniques made available to the project, and will benefit from complete personalized training in research activities. We are committed to promoting equal opportunity and diversity in science.

Application: Application sent by e-mail, and open until June 1, 2023, must include a CV, a cover letter highlighting the elements in line with the project, a short description of the Master's internship, transcripts and the contact information of two references.

Contact: Denis Morineau, Research Director CNRS, Department of Materials and Nanoscience, Institute of Physics of Rennes
denis.morineau@univ-rennes1.fr
https://perso.univ-rennes1.fr/denis.morineau/

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