

Spécialité de Master « Optique, Matière, Paris »

Stage de recherche (4 mois minimum, à partir de début mars)

Proposition de stage

Date de la proposition :

09/10/2015

Responsable du stage / internship supervisor:			
Nom / name:	MARLIERE	Prénom/ first name :	Christian
Tél : 01 6915 7511	06 70 53 21 90	Fax :	
Courriel / mail:	christian.marliere@u-psud.fr		
Nom du Laboratoire / laboratory name: ISMO (Institut des Sciences Moléculaires d'Orsay)			
Code d'identification :	UMR 8214	Organisme :	CNRS / Univ. Paris-Sud / Univ. Paris Saclay
Site Internet / web site:	http://www.ismo.u-psud.fr/		
Adresse / address:	Avenue Jean Perrin F-91405 Orsay Cedex		
Lieu du stage / internship place:	Centre Universitaire d'Orsay – Bâtiment 350		

Titre du stage / internship title:
Surface density of charge of bio-membranes: new investigation at nanometric scale and in liquid environment.
Résumé / summary
<p>The scientific aim of this research is to improve the fundamental understanding of the first steps of bacterial adhesion on solid surfaces by studying, <i>in-situ</i> and at sub-micrometric scale, electrical phenomena –as variation of local charges, ionic fluxes- at the membranes of bacteria of interest. For this purpose, a unique combination of experimental approaches based on microscopy techniques is proposed: (1) Scanning probe microscopy, AFM (Atomic Force Microscopy) and its derived electrical modes as Scanning Electro-Chemical mode (SECM) or the new Electro-Mechanical Scanning Microscopy mode (EMSM, see below) recently discovered. They will be used to quantify biomolecules adhesion forces and discriminate electrostatic interactions; (2) up-to-date fluorescence imaging techniques with ultrahigh spatial resolution as TIRF (Total Internal Reflection Fluorescence) set-up for optimal imaging of the bacteria/sample interface and quantification of bio-adhesion to solid surfaces. The stress will be put on the improvement of the new method of measurement of local electric charges and ionic transfers by an electro-mechanical AFM mode –EMSM- (<i>Nanoscale</i>, (2015), 7, 8843, <i>An in vivo study of electrical charge distribution on the bacterial cell wall by AFM in vibrating force mode</i>). The main aims will be: (i) the full characterization and optimization of the performances of this EMSM mode; (ii) the study of the local heterogeneities of membrane's surface charges and their temporal changes during the modification of the contact interface between bacteria and the solid surface as studied by TIRF; (iii) the study of the cross-linked coupling between physicochemical properties of membranes and cellular metabolism during colonization of the solid surface by bacteria and formation of bacterial network: aggregates, biofilms.</p> <p>This multidisciplinary research (molecular physics, optics, chemistry, photobiology, microbiology) will be done through strong interactions with several research groups specialized in microbiology and chemical functionalization of surfaces (INRA-AgroParisTech, université de Rouen, etc).</p>
Keywords :
Scanning Force Microscopy; Fluorescence microscopy; AFM; SECM; TIRF; biomolecule adhesion;

Ce stage pourra-t-il se prolonger en thèse ? Possibility of a PhD ? : OUI			
Si oui, financement de thèse envisagé/ financial support for the PhD: Allocation Doctorale			
Lumière, Matière, Interactions	X	Lasers, Optique, Matière	X