

Spécialité de Master « Optique, Matière, Plasmas »

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

Proposition de stage

Date de la proposition : 4/11/2014

Responsable du stage / internship supervisor:	
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Code d'identification :UMR7648	Organisme : UPMC/Ecole Polytechnique/CNRS
Site Internet / web site: www.lpp.fr	
Adresse / address: Jussieu-UPMC	
Lieu du stage / internship place: UPMC	

Titre du stage / internship title: Non thermal plasmas for bio medical applications
Résumé / summary
Context The use of non-thermal plasmas – also called electric discharges - for biomedical application can be considered has a revolution of the past fifteen years with major advances in the field of sterilization, wound and ulcers healing, skin treatment and dermatology, tumor treatment, plasma coagulator, biomaterials, dental surgery etc...The main feature of non-thermal plasmas (NTP) is that the gas temperature remains low whereas the electron temperature is in the range of 10^4 - 10^5 K. These high energetic electrons create radicals such as Reactive Oxygen Species (ROS), as well as ions and photons. The gas temperature being close to room temperature makes non-thermal plasmas compatible with biomedical application such as direct treatment of living organisms.
Research Project The thesis will is a multidisciplinary field between physics and biology and will focus on i) characterization and physical description of a NTP suitable for bio-medical applications, ii) understanding of cells and living tissues response under plasma exposure. NTP may be created either above the liquid media containing the cells or directly in contact with the skin. We will set-up two types of plasma sources, i) a Dielectric Barrier Discharge (DBD) and, ii) a plasma jet. Reasons for selecting these discharges are clear: NTP used for biomedical applications must be of simple use, operate easily at atmospheric pressure conditions, provide the distributed energy release with a negligible heating of the gas. We will develop and construct a safe transportable plasma device permitting direct skin treatment under various plasma working conditions and exposure. The physics of the generation of these plasmas in contact with murine skin as well as liquids of different conductivity will be studied. Measurements of deposited energy together with mapping of the discharge uniformity will allow comparison of the energy flux per surface for two types of discharges. The transfer of energy and charge particles to living tissues or cell culture media will be estimated. Electric field measurement for NTP will be made with the help of emission spectroscopy, with a nanosecond temporal resolution and with a spatial resolution up to a few mm in regime of signal accumulation
LPP expertise in the field of biomedical applications LPP has started working o this new field in 2011 in collaboration with Hopital St Louis. Two collaborations with biologists are currently going on, one with Corine Dupuy-Gustave Roussy, one with Lori Bridal-UPMC.

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: en discussion	
Lasers, Optique, Matière	Lumière, Matière, Interactions
Plasmas : de l'espace au laboratoire	X