Spécialité de Master « Optique, Matière, Plasmas »

Stage de recherche (4 mois minimum, à partir de début mars 2011)

Proposition de stage pour l'année 2010-2011 (ne pas dépasser 1 page)

Date de la proposition : 20/10/10

Responsable du stage / *internship supervisor*:

Nom / *name*: Pitchford — Prénom/ *first name* : Leanne

Tél : 05 61 55 64 81 — Fax :

Courriel / *mail*: pitchford@laplace.univ-tlse.fr

Nom du Laboratoire / *laboratory name*: LAPLACE

Code d'identification :UMR 5213 — Organisme : CNRS and Univ of Toulouse

Site Internet / *web site*: www.laplace.univ-tlse.fr

Adresse / *address:* 118 route de Narbonne, 31062 Toulouse

Lieu du stage / *internship place*: Bat 3R2, Université Paul Sabatier (Toulouse III)

Titre du stage / *internship title*: Modeling non-thermal, atmospheric pressure plasma "microjets"

Résumé / *summary*

Non-thermal plasmas can be easily generated and maintained at *low* pressure, but it is much more difficult to do so at *high* pressure where instabilities leading to a catastrophic transition to a thermal plasma arc are hard to control. Techniques have been developed for delaying or preventing the onset of instabilities and these include external circuit control (short excitation pulses), dielectric barriers (essentially blocking capacitors), and confinement of the discharge in small geometries ("microdischarges"). Recently, stable, non-thermal plasmas at atmospheric pressure have been observed in another configuration. These so-called microjets are initiated in small, cylindrical dielectric barrier discharges operating with a fast flow of helium and excited by low frequency, nanosecond voltage pulses. The microjet appears as a thin (<< 1 mm), stable plasma column, extending a few centimeters from the main discharge into ambient, atmospheric pressure air. Time-resolved images reveal a complex structure consisting of "plasma bullets" which are not at all well understood at this point.

Microjets and the possibility of generating and controlling the propagation of non-thermal plasmas in air at atmospheric pressure are generating considerable interest, especially in the area of biomedicine, an area where plasma-based technologies are at their infancy. This interest stems from the fact that microjets provide a means of delivering reactive plasma species (radicals, positive or negative ions, electrons, UV radiation) to a target located some centimeters away from the main discharge zone. Other applications of microjets can be imagined, particularly in the area of plasma-surface interactions, where the possibility of operating in open air (no closed chamber, no vacuum pumps) is extremely attractive.

The subject of the internship proposed here is to make detailed comparisons between predictions of the microjet model recently developed by the GREPHE team at LAPLACE and experimental results. The aim is to validate the model and/or identify its shortcomings. The numerical model is two-dimensional, runs on a PC, and is based on solutions of electron and ion continuity equations coupled to Poisson's equation. Plasma chemistry, gas heating and gas flow are included in the model, although in simplified forms, and a graphical interface has been developed for convenient visualization of the results. Our experimental partners are the MPP team at LAPLACE, LPGP (Orsay), GREMI (Orléans), and LSP (Grenoble).

Ce stage pourra-t-il se prolonger en thèse ? *Possibility of a PhD* **? : yes**

Si oui, financement de thèse envisagé/ *financial support for the PhD*: **ANR projet blanc PAMPA**

Lasers et matière		Lumière, Matière : Mesures Extrêmes	
Optique de la science à la technologie		Physique des plasmas	**x**

Fiche à transmettre (fichier pdf ***obligatoirement****) sur le site http://stages.master-omp.fr*