

Research Topic for the ParisTech/CSC PhD Program

Subfield: Chemistry, Physical Chemistry, Materials Science, Plasma processing

ParisTech School: Chimie ParisTech (Paris, France ; <https://www.chimie-paristech.fr>) / Institut Pierre-Gilles de Gennes (Paris, France ; <http://www.institut-pgg.com>)

Title: Smart functional material

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Short description of possible research topics for a PhD: (10 lines in English + optional figure)

Our groups are involved in different aspects of the interface between material chemistry and physical chemistry from fundamental to applied research. Smart functional surfaces are increasingly important in many fields such as in medicine (e.g. implantable medical devices...), aircrafts or automotive industry.... In this project, we propose to design and create innovative smart surfaces with controlled surface properties (with specific physical and chemical characteristics) taking advantage atmospheric pressure plasma process.

Our main interest is the synthesis of new polymeric or hybrid polymer/mineral material obtained by radical polymerization through both rational design and combinatorial chemistry. Different architectures will be investigated for their ability to modify surface properties (plastics, metals). The synthesized thin films and coatings will be analyzed in detail with respect to their chemical composition, structure and properties in order to ensure the suitability for the desired functionality and subsequently create smart functional materials for a broad range of applications (e.g. biomedical ..).

Required background of the student: (Which should be the main field of study of the applicant before applying)

Chemistry, Chemical Engineering, Organic Chemistry or Polymer Chemistry.

2-3 representative publications of the group: (Related to the research topic)

- [1] "Deposition of Organic Coatings at Atmospheric Pressure from Liquid Precursors" Tatoulian M., Arefi-Khonsari F., Borra J.P. *Plasma Process. Polym.* **2007**, *4*, 360-369.
- [2] "Facile and Efficient Control of Bioadhesion on Poly(dimethylsiloxane) by using a Biomimetic Approach" Mussard W., Kebir N., Kriegel I., Estève M., Semetey V., *Angewandte Chemie Int. Ed. Engl.* **2011**, *50*, 10871-10874.
- [3] "A Versatile Approach to Design on Demand Self-Assembled Monolayer on Glass using Thiolene Chemistry" Oberleitner B., Dellinger A., Déforet M., Galtayries A., Castanet A.-S., Semetey V. *Chemical Communications* **2013**, *49*, 1615 - 1617.
- [4] "Preventing biofilm formation and associated occlusion by biomimetic glycocalyx-like polymer in central venous catheters" Chauhan A., Bernardin A., Mussard W., Kriegel I., Estève M., Ghigo J. M., Beloin C., Semetey V. *The Journal of Infectious Diseases.* **2014**, *210*, 1347-56.