**ENS / IISER collaboration**

***Internship subject form***

To be sent back by January 31st, 2020

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| Name of the institution | Ecole normale supérieure Paris-Saclay |
| Name of the host laboratory | Supramolecular and Macromolecular Photophysics and Photochemistry (PPSM) |
| Website of the host laboratory | http://ppsm.ens-paris-saclay.fr/ |
| Research group | Nano SystèmesElectroactifs, Matériaux pour la Biologie, la Lumière et l'Energie (ENSEMBLE) |
| Internship number | CHEM 2 |
| Internship subject (title) | Mechano-responsive fluorescent surfaces |
| Prerequisites | organic synthesis, UV-Vis and fluorescence spectroscopy. Depending on the progress of the project, mechanical stimulation at the nanoscale using the AFM coupled to fluorescence microscope can be envisioned. |
| Internship proposal: description and expected training outcomes (15 lines max.) | Context: this project is part of the MECHANO-FLUO ERC project which general objective is to develop mechanofluorochromic materials to measure forces using fluorescence  Fluorescent materials, designed through appropriate molecular engineering, are able to signal different stimuli with a high sensitivity. In particular, a material is called “mechanofluorochromic” when its fluorescence emission changes upon mechanical stimulation (pressure, shearing force…). Mechanofluorochromic compounds have attracted a rapidly growing interest for the last five to six years, in particular for their possible use as mechanical sensors, [1] and several series of new molecules have been synthesized. [2] We are interested in a multiscale study of this phenomenon [3], with the long term objective of developing mechanical forces sensors based on mechanofluorochromic dyes.  The goal of this internship will be to prepare mechano-responsive fluorescent surfaces, by covalent functionalization of a glass surface by a dense layer of mechanofluorochromic molecules. The first step will be the organic synthesis of the molecule: we will choose a difluoro-boron diketonate complex, already studied by our group [4] and others [5] for its mechanofluorochromic properties and we will functionalize it by a triethoxysilane moiety to allow covalent grafting on glass surface. In a second step, the grafting conditions will be optimized in order to observe a good mechanofluorochromic response (high fluorescence intensity before and after mechanical stimulation and significant emission colour change upon mechanical stimulation). In a last step, the quantification of the mechanofluorochromic response will be attempted.  **References:**  [1] D. A. Davis, A. Hamilton, J. Yang, L. D. Cremar, D. Van Gough, S. L. Potisek, M. T. Ong, P. V. Braun, T. J. Martinez, S. R. White, J. S. Moore, N. R. Sottos, Nature 2009, 459, 68-72  [2] Y. Sagara, S. Yamane, M. Mitani, C. Weder, T. Kato, Adv Mater 2016, 28, 1073-1095  [3] L. Polacchi, A. Brosseau, R. Métivier, C. Allain, Chem. Commun., 2019, 14566-14569  [4] M. Louis, A. Brosseau, R. Guillot, F. Ito, C. Allain, R. Métivier, J. Phys. Chem. C 2017, 121, 15897-15907.  [5] G. Zhang, J. Lu, M. Sabat, C. L. Fraser, J. Am. Chem. Soc. 2010, 132, 2160-2162. |