UFR CHIMIE & BIOLOGIE Université Grenoble Alpes

Master in Chemistry

Sujet de stage de Master 2 (1 page max.)

Laboratoire : IBS/i2SR
Directeur : Winfried Weissenhorn

Intitulé de l'équipe : pixel **Responsable :** Dominique Bourgeois
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Parcours de Master 2 (*Rayer la/les mention(s) inutile(s)*) :

Chemistry for Life Sciences (CLS)
~~Polymers for Advanced Technologies (PTA)~~
~~Organic Synthesis (SOIPA)~~

Titre du sujet : Study of phototransformable fluorescent proteins photoreactions as a function of the local physicochemical environment.

Objectifs visés du stage (5 lignes max) :
Kinetic and energetic characterization of primary photoreactions (fluorescence, intersystem crossing, electron transfer) of green fluorescent protein type biomarkers. These reactions are impacted by the nanoenvironment and impact in turn the performance of the markers for biological applications.

Intérêts pédagogiques et compétences visées (5 lignes max) :
Get acquainted with and contribute to the development of a modern research environment: interaction of biologists (sample production) and physicists (optical setup handling) with the common aim to develop better biomarkers. Basic understanding of biology and physics is required but work will be mainly data acquisition and treatment in a multidisciplinary context.

Résumé :
In the Pixel team at IBS, we study the photophysics of a sub-class of Green Fluorescent Proteins (GFPs), which can change their fluorescence properties under the action of light. These so-called „photo-transformable“ fluorescent proteins (PTFPs) play an essential role as fluorescent markers for super-resolved optical microscopy, a key technique for integrated structural cell biology, as applied at the IBS. Our structural studies of PTFPs by crystallography and their functional studies by microscopy are complemented by time resolved studies by optical microspectroscopy – both absorption and fluorescence. Absorption and fluorescence optical spectroscopies provide information on the different electronic states of the photo-switchable entity, the „chromophore“, located at the centre of the fluorescent protein beta-barrel scaffold and shielded by it against the bulk solution. On the other hand, subtle movements of this protein cage can have major impact on the chromophore's photochemistry.
To be able to observe absorption and fluorescence spectra simultaneously under controlled environmental conditions (such as temperature, solvent viscosity, pH, oxygen level), we have developed the so-called Cal(AI)2doscope – a unique microspectrometer dedicated to the study of fluorescent proteins.

Approches & matériels utilisés (5 lignes max) :
Micropipetting, Microspectroscopy, laser excitation, millisecond time resolution, cryotechnology, data treatment, physico-chemical modelling
Domaines de compétences souhaitées du candidat (3 lignes max):
Chemistry, biology, physics, hardware programming (labview)

Dates du stage : premiere semestre 2022