



UNIVERSITÉ D'AVIGNON
ET DES PAYS DE VAUCLUSE
MINISTÈRE DE L'ENSEIGNEMENT
SUPÉRIEUR ET DE LA RECHERCHE

ANR



Avignon, January 25, 2017

Open position for a Postdoctoral researcher in Organic Chemistry

Fluorinated Surfactants for Membrane-Protein Research – (FLUOR)

Project Summary: Membrane proteins (MPs) play numerous vital roles in cellular communication and transport processes and represent the majority of drug targets. These proteins require a membrane-mimetic environment to keep them both soluble and active during *in vitro* investigations, which is typically accomplished with the aid of detergents, surface-active compounds that solubilise MPs and lipids. However, many MPs are inactivated when solubilised in detergents, that is, they lose their native structures and functions. This has motivated many efforts at replacing conventional detergents by milder alternatives, among which fluorinated surfactants appear particularly promising.

Objectives: The project FLUOR aims at developing fluorinated surfactants (FSs) for solubilising and stabilising MPs, thus avoiding their exposure to classical, harsher detergents at any time. We envision that tailored FSs can be used as mild detergents to directly extract MPs from the host membrane, thereby bypassing the need for conventional detergents and offering a decisive advantage over most other membrane-mimetic systems, which continue to depend on detergents for MP solubilisation and purification. We intend to synthesise a range of related compounds in which both headgroup and tail properties are modified rationally to characterise their physicochemical and biochemical properties with the aim of tailoring them to the specific needs of MP solubilisation, purification, and handling. We will also probe the potential of FSs for functional and structural studies on different challenging MP systems. The consortium associates synthetic chemists (Avignon) and structural biochemists (Grenoble) on the French side with membrane biophysicists (Kaiserslautern) and electron microscopy experts (Halle) on the German side.

The open position in Avignon will involve organic synthesis and colloidal characterization of new fluorinated surfactants.

To apply to this position, you should have

- Extensive and proven experience in organic synthesis of amphiphilic molecules.
- High-level competency in investigating self-aggregation properties of amphiphiles.
- Experience in biophysics and biochemistry of membrane proteins is helpful, but not essential.
- Creativity in experimental design.

You will join a dynamic research team housed in a well-equipped laboratory at the **University of Avignon**, which benefits from a state-of-the-art technology facility.

Keywords: organic synthesis, radical chemistry, sugar chemistry, fluorine chemistry, detergents, micelles, surface tension, light scattering, membranes, lipids.

Application should be sent in 1 single pdf file including:

- CV
- complete publication list
- copy of the PhD degree diploma
- short statement of research interests (1-2 pages)
- at least 3 references (name, company, e-mail address, and telephone number).

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Availability: As soon as possible for a period of 12 months. Possible extension for an extra 12-month period.

Some references from the group:

Hybrid Fluorinated and Hydrogenated Double-Chain Surfactants for Handling Membrane Proteins. Frédéric Legrand, Cécile Breyton, Pierre Guillet, Christine Ebel, Grégory Durand. *J. Org. Chem.*, 2016, 81, 681-688.

Springly Fluorinated Maltoside-Based Surfactants for Membrane-Protein Stabilization. Ange Polidori, Simon Raynal, Laurie-Anne Barret, Mohamed Dahani, Cherone Barrot-Ivolot, Colette Jungas, Erik Frotscher, Sandro Keller, Christine Ebel, Cécile Breyton, Françoise Bonnete. *New. J. Chem.*, 2016. 40, 5364-5378.

A Fluorinated Detergent for Membrane-Protein Applications. Erik Frotscher, Bartholomäus Danielczak, Carolyn Vargas, Annette Meister, Grégory Durand, Sandro Keller. *Angew Chem Int Ed Engl.*, 2015, 54, 1-6.

Micellar and Biochemical Properties of a Propyl-ended Fluorinated Surfactant Designed for Membrane-Protein Study. Maher Abl, Sebastian Unger, Sandro Keller, Françoise Bonnete, Christine Ebel, Bernard Pucci, Cécile Breyton, Grégory Durand. *J. Colloids Interface Sci.*, 2015, 445, 127-136.

Propyl-Ended Hemifluorinated Surfactants: Synthesis and Self-Assembling Properties. Maher Abl, Grégory Durand and Bernard Pucci. *J. Org. Chem.*, 2011, 76, 2084–2093.

Glucose-Based Surfactants with Hydrogenated, Fluorinated or Hemifluorinated Tails: Synthesis and Comparative Physical-chemical Characterization. Maher Abl, Grégory Durand and Bernard Pucci. *J. Org. Chem.*, 2008, 73, 8142-8153.