

Post-doctoral position LGC Toulouse-ANR JCJC PROJECT BIOCOM 2017-2020

## Surface modifications of polymeric membrane material using bioactive molecules to reduce biofouling during filtration processes

**Duration:** 12 months

**Starting date:** January – March 2019

**Keywords:** Polymer chemistry, surface modification, click chemistry, filtration, membrane, hydrogels

**Context:** The control of biofouling is required to improve membranes performances and to reduce high operational cost due to cleaning in membrane filtration processes. Biomimetic membranes represent the next generation of filtration membranes used for water treatment. The project BIOCOM<sup>1</sup> aims to provide innovative biomimetic membranes with anti-biofouling properties for water treatment by incorporating natural bioactive molecules that act as Quorum Sensing Inhibitors (QSI), such as vanillin and derivatives (Amara et al., 2010). The main objective of this project is to perform surface modification of membranes used for water filtration in order to limit adhesion of both bacteria and bacterial Extracellular Polymeric Substances and limit the bacterial activity (mainly the production of EPS).

The Membrane Process team<sup>2</sup> at the LGC (UMR CNRS 5503, INPT, UPS) has developed since many years a recognized knowledge in the modification and characterization of membrane surfaces and filtration performances (Goma-Bilongo et al., 2010; Emin et al., 2014). This expertise is implied in the development of new membrane materials with antifouling properties using approach inspired by biological mechanisms in particular (Benavente et al., 2015). Different strategies are currently applied for the modification on membrane material and biological molecules could be free or immobilized (Goddard and Hotchkiss, 2007; Yilmaz et al., 2011; Yu et al., 2011; Yu et al., 2014; Zhu et al., 2018). As a central point, it is expected that the biological activity of the molecules will be maintained and interfere in the production of Extracellular Polymeric Substances (EPS), limiting adhesion of bacteria on surfaces and biofilm formation. We want to develop and evaluate new strategies for the incorporation of the bioactive molecules at membrane surfaces, such as UV grafting, impregnation or embedding, click chemistry, ...

### Profile:

Applicants must have completed a Ph.D. in chemistry or polymer chemistry or related area. S/he must have experienced click chemistry for polymer surface modification and/or expertise in surface modifications in general and surface characterization. During the project, s/he will focus in particular on the functionalization of the polymeric<sup>3</sup> membrane surface prior grafting through chemistry (eg click chemistry, photo-grafting, ...). S/he will study the physico-chemistry of the membrane material at each step of modifications. Additional experience in filtration would be appreciated and at least s/he will have to demonstrate interest (and adaptability to) in filtration and chemical engineering issues, especially considering surface modification at larger scale<sup>4</sup> and on

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<sup>1</sup> <http://lgc.cnrs.fr/les-projets/projet-biocom/>

<sup>2</sup> <https://lgc.cnrs.fr/recherche/gimd/membranes/>

<sup>3</sup> Polysulfone, PvDF, PP, ...

<sup>4</sup> Tens of cm<sup>2</sup> to m<sup>2</sup>

different membrane geometry<sup>5</sup>. The successful applicant should have the skills, motivation and enthusiasm to lead the project from fundamental research to application. S/he should be able to work independently and as a member of a multidisciplinary team in collaboration with chemical engineers, chemists and biologists in the lab. S/he will work in collaboration with another post-doc working on the evaluation of the biological activity of those membrane in the project frame. S/he should have qualities to supervise a student (engineer or master). S/he would be brought to work in collaboration with academic French partners of the project (LBAE in Auch, LISBP and LAAS in Toulouse). The optimal candidate will be curious, creative and highly motivated as s/he will have to adapt and develop new approaches for the surface modifications and as well as new applications of materials. French spoken is a plus but not necessary.

### Application:

Interested and highly motivated applicant should forward a cover letter stating why the applicant is interested in this position, a complete CV with a publication list and 2 academic referees with address, phone number and email. Salary: 1806 €/month (NET).

### Contact:

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<sup>5</sup> Flat sheet or Tubular geometry