



UNIVERSITÉ  
LAVAL

Faculté des Sciences et de Génie  
Département de physique,  
de génie physique et d'optique

## PROJECT OFFER FOR DOCTORAL STUDENT

### DEVELOPMENT AND PRODUCTION OF FUNCTIONALIZED BIOMEMBRANES FOR WATER FILTRATION

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*We are looking for a motivated person to undertake postgraduate studies on an applied and interdisciplinary research project in the wastewater recovery sector at Université Laval.*

#### CONTEXT

In some regions of the world, climate change, associated with demographic expansion, industrial development and limited infrastructure, are causing major problems in the protection of water resources, which are likely to intensify in the future. Conventional lagoons used for wastewater treatment are particularly sensitive to the impacts of climate change. There is an urgent need for resilient wastewater treatment infrastructure to ensure sustainable production of food and water for future generations. This research aims to develop an advanced and sustainable municipal wastewater treatment system allowing the reuse of treated water for non-potable purposes.

A three-stage water treatment system suitable for northern communities is proposed, which consists in a primary treatment using existing lagoons, in a secondary treatment using a membrane bioreactor system and in a tertiary treatment using hybrid ion exchange nanotechnology (HIX-Nano).

#### RESEARCH PROJECT

This project offer for doctoral studies aims at the development of the membrane bioreactor module which will be developed for the second stage of the water treatment system. This module is based on the use of functionalized biomembranes produced from nanocellulosic fibers for the elimination of organic compounds and bacteria. The biomembranes will first be functionalized in order to meet the targeted quality criteria, then integrated into the treatment system developed and tested at the laboratory scale with synthetic water. Subsequently, the biomembranes will be produced in large quantities according to an optimal design and the module will be integrated into the pilot-scale filtration system which will be evaluated in real time in a village in the north.

#### SUPERVISION

Prof. Younès Messaddeq from the Department of Physics, Physical Engineering and Optics at Université Laval and researcher at the Center for Optics, Photonics and Lasers (COPL) will supervise the successful candidate. The successful candidate will be part of an interdisciplinary and international research team collaborating with the private sector, and led by Dr. Céline Vaneeckhaute from the Chemical Engineering department at Université Laval.



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## QUALIFICATIONS AND SKILLS

- Hold a master's degree in Chemistry, Chemical Engineering, Physics, Physical Engineering, Materials Science, Biochemistry or other related discipline
- Present an excellent academic record
- Autonomy and leadership
- Demonstrate good oral and written communication skills, as well as strong interpersonal skills to work well in a fair, diverse and inclusive research environment.

## APPLICATIONS

For more information on the project, please contact Julie Fréchette ([julie.frechette.6@ulaval.ca](mailto:julie.frechette.6@ulaval.ca)).

Those interested in applying are invited to submit by email their CV, a brief description of their motivation for this research subject, a copy of their academic file and the names of three references to Mr. Younès Messaddeq:

[younes.messaddeq@copl.ulaval.ca](mailto:younes.messaddeq@copl.ulaval.ca) (cc: [julie.frechette.6@ulaval.ca](mailto:julie.frechette.6@ulaval.ca)).

Funding is available for 3 years: \$ 21,000 / year.

Only people whose application has been selected will be contacted.

**Start of the project : From January 2021**