

Field: Environmental Technology

Location: Wetsus, European centre of excellence for sustainable water technology, Leeuwarden, The Netherlands

Type of project: Master Thesis or Internship

Duration: 5-9 months (preferably 9) starting in September/October 2020

Allowance: 175 €/month if no grant is obtained e.g. Erasmus/regional scholarships.

Project description: Biological activated carbon (BAC) is a well-known and effective technology where activated carbon (AC) is used as immobilization medium for biofilm growth (Figure 1). Its main applications are as a polishing treatment method in wastewater reclamation, in drinking water treatment, and in ultrapure water production^{1,2}. Nevertheless, as AC is a quite efficient adsorbent, BAC can combine two removal processes: adsorption of pollutants onto the pores of AC and biological degradation³. By the addition of oxygen in high quantities, other removal processes might also occur, such as advanced oxidation processes (AOP). In this project, we intend to assess how different components (O_2 , biomass, fresh or aged AC) contribute to the removal. This will help to understand the role of possible removal mechanisms (adsorption, AOP, biodegradation and precipitation). To do so, batch experiments (Figure 2) will be carried out, with and without biomass, virgin AC and aged AC, varying oxygen concentration, pollutant concentration and time. The solution, gas phase and AC granules will be characterized in the begin and in the end of each experiment in order to evaluate the removal of pollutants.



Figure 1 – Full-scale BAC filter at *Puurwater Fabriek*, Emmen, The Netherlands⁴.

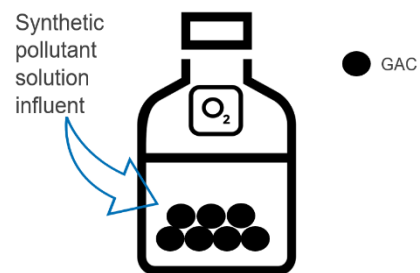


Figure 2 – Schematic representation of the batch experiments.

Your Tasks:

- Write experimental plan
- Prepare bottles;
- Perform physical/chemical analyses;
- Analyze the data.

Your Profile:

- Background in chemical engineering, environmental technology, biotechnology, or related fields.
- Currently enrolled in a master program.
- Preferably, EU citizen or international student registered at a Dutch university or technical high school.
- Laboratorial experience is a plus.
- Good English communication skills (spoken + written).

How to apply:

Interested students should send a motivation letter (max. 1 page) and CV (max. 2 pages) to Sara Ribeiro Pinela (sara.pinela@wetsus.nl)

¹ Korotta-Gamage, S.M., Sathasivan, A., 2017. A review: Potential and challenges of biologically activated carbon to remove natural organic matter in drinking water purification process. *Chemosphere*. 167:120-138

² Simpson, D.R., 2008. Biofilm process in biologically active carbon water purification. *Water Res.* 42:2839-2848

³ Gamal, M.E., Mousa, H.A., El-Nass, M.H., Zacharia, R., Judd, S., 2018. Bio-regeneration of activated carbon: A comprehensive review. *Sep. Purif. Technol.* 197:345-359

⁴ Retrieved from: <http://necokunststof.nl/projecten/item/18/puurwaterfabriek-emmen>