

Reusability of adsorbent and regeneration solution for phosphate removal

Period: ≥4.5 months.

Allowance: conform with educational level, travel costs can be discussed.

Supervisors: Raimonda Buliauskaitė, Pim de Jager

Analytical equipment that will be used during the internship includes modern Thermo Scientific iCAP PRO ICP-OES, ion chromatography and brand new spectrophotometer DR3900 HACH.

Project Description

Excess amounts of phosphorus lead to eutrophication of surface waters and biofouling/biogrowth issues in industrial water systems. Adsorption has the potential to reduce phosphate (PO_4^{3-}) levels in waters below 10 $\mu\text{g P/L}$ which could help to prevent eutrophication and undesirable biofouling/biogrowth. Furthermore, phosphorus is also an essential nutrient for all life forms and is a finite resource that makes phosphorus recovery very important. Adsorption is a reversible process that allows for the adsorbent reuse via regeneration with NaOH and thereby allowing for phosphate recovery (reuse as a fertilizer). In order to improve the economic efficiency of adsorption technology reusability of adsorbent and a regeneration solution for phosphate removal needs to be studied and optimized.

The work will take place at Aquacare, which is located in Den Bosch, the Netherlands. Aquacare has 30+ employees and is specialized in water treatment of cooling towers and condensers and is currently investing more in research and development, with the ambition of broadening its business. Aquacare is actively collaborating with Wetsus research institute for many years already regarding this topic. You will be working within the R&D team, which is responsible for new product development and improvement. Lab and workspace will be provided. For more company information: www.aquacare.nl.

Research questions

1. How many times can adsorbent be reused? Validation of multiple regenerations. Developing understanding about stability of adsorbent and competing ions.
2. How to minimize regeneration solution (OH^-) loss during regeneration of the adsorbent?
3. How many times can we reuse regeneration solution (OH^-)?
4. Can regeneration solution (OH^-) be concentrated further using nanofiltration for PO_4^{3-} separation?
5. Can separated PO_4^{3-} from regeneration solution be reused as a fertilizer?
6. Investigating different application areas of adsorption technology: WWTP effluent polishing, surface waters, recirculation water of cooling towers, saline wastewaters, wastewaters from various industries.

Requirements

We are looking for a student with a background in Chemistry, Chemical Engineering, Environmental Engineering, with already experience with work in a chemical lab. The student has to be fluent in English, highly motivated and enthusiastic. The student will have to write a report and make a presentation about the findings. Listed research questions are a part of the big long-term project, therefore, if you are interested ask us about ongoing and planned research.

Interested?  Email your CV and motivation to pdjager@aquacare.nl

