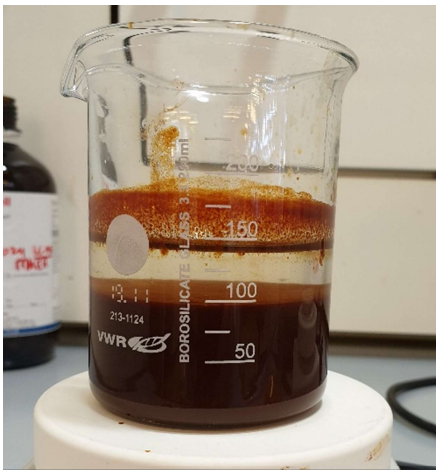
Summary

Preventing eutrophication by phosphate adsorption from wastewater



Target age

Age 15 and over

Level of difficulty

X Medium

Key words:

Phosphate recovery, Adsorption, Iron oxides, Circular economy, Eutrophication, Spectrophotometry

Abstract of the activity:

In this toolkit students are working on a method to remove and recover phosphate from (waste)water. As our demand for food is increasing, so is the demand for fertilizers. Plants need phosphate to grow, and so the fertilizers must contain phosphate. Right now calciumphosphate is mined from mines outside of Europe. The mines are depleting and so this could cause a problem for Europe if these countries decide to stop the export of this phosphate. And so we need to focus on ways to recover phosphate and work on a circular economy.

Besides this, there is another problem with phosphate: Humans use the phosphate in plants as a nutrient for e.g. bones and DNA. A part of the phosphate we eat, ends up in our urine and eventually at the Waste Water Treatment Plants. Here large part of the phosphate is removed, but not all of it. The rest of phosphate ends up in our surface water and can cause eutrophication.

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Summary

At Wetsus we focus on techniques with which we can solve both problems: remove phosphate at WWTP, also in small amount, and recover the phosphate so it can be reused again.

In this toolkit the students focus on a technique that is used to remove and recover small amounts of phosphate to get a more concentrated stream. They do so via adsorption: They make their own adsorption compound, iron(hydr)oxide (module 1), and use this to adsorb phosphate from a solution (module 2). Next they will desorb the phosphate again (module 3) and measure spectrophotometrically the concentration of phosphate (module 4).

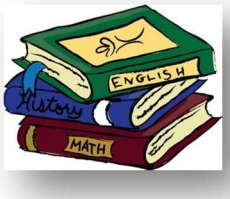
Learning Goals

- Obtain understanding about the phosphate problem
- Learn about solutions to this problem
- Learn phosphate adsorption and desorption
- Get familiar with different separation concepts of precipitation, filtration and adsorption
- Get familiar with spectrophotometry

Specific Abilities - *At the end of the activity the student will be able to:*

- Produce their own iron oxide adsorbents
- Precipitate, filtrate and adsorp
- Use a spectrophotometreto measure concentrations

Cross-curricula Links-



- Ecology/Environment
- Biology
- Chemistry: i.e. redox reaction, analytical techniques,…..
- Geography
- Technology
- Politics

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Summary

Prerequisites of knwoledge

- pH
- Basics of filtration and precipitation
- Be able to calculate with mols/grams/molecular weight

Time requirement

☐ 20-25 h (distributed over 5 days)

Learning and Teaching Support Materials - What you can find in the toolkit

1. Lab Procedure/s- Modules 1-4
2. Students' Cards (1-4)
3. Background info
4. Evaluation form

RM Ambassadors

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