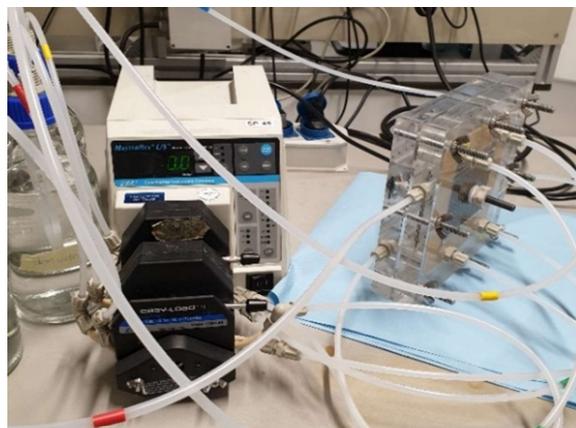


## Summary

# Ammonia Recovery from Wastewater



### Target age

Age 14 and over

### Level of difficulty

High



### Key words:

*Ammonia recovery, Electrochemical System, Membranes, Circular economy, Eutrophication, Titration*



### Abstract of the activity:

In this toolkit students are working on a method to remove and recover ammonia from (waste)water. Ammonia ends up in our wastewater via our urine. It is important to remove the ammonia from the wastewater, otherwise too much nitrogen will end up in our surface water which can cause eutrophication.

Methods used nowadays by Wastewater Treatment Plants, like Anammox, cost a lot of energy. At Wetsus we research ammonia recovery via an electrochemical system (ES). In an ES, all the reactions are uniquely electrochemical, meaning an easily operation of the system. Additionally, ESs can support higher current densities than bio-electrochemical systems and work with streams at an extreme pH. An ESs including compartments (anode, feed, concentrate and cathode) can be used for ammonia recovery.

*In this toolkit the students will first build the electrochemical system and prepare the solutions (Module 1). Next they will perform the experiment in*

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which they concentrate ammonia, and they will analyse the increase in concentration via titration (Module 2). In the research of Wetsus the pure ammonia is recovered using a gas permeable membrane, however this is not included in the toolkit.

### Learning Goals



- Obtain understanding about the nitrogen/ammonia problem
- Learn about solutions to this problem
- Learn how an electrochemical system works and how to perform an experiment with it
- Learn how to analyse their own samples via titration;
- Learn which chemical processes happen during the experiment and titration.

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



- Explain why ammonia recovery is necessary;
- Build their own electrochemical cell and perform ammonia recovery with it;
- Analyse their own samples via titration;
- Explain which chemical processes happen during the experiment and titration.

### Cross-curricula Links



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

### Prerequisites - Knowledge and skills necessary for carrying out the activity



- pH
- Basics of titration
- Preparing solutions
- Be able to calculate with mols/grams/molecular weight

## Summary



### Time requirement

Active:

15h

Passive (experiment runs overnight):

20h

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



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

**RM**  
Ambassadors

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