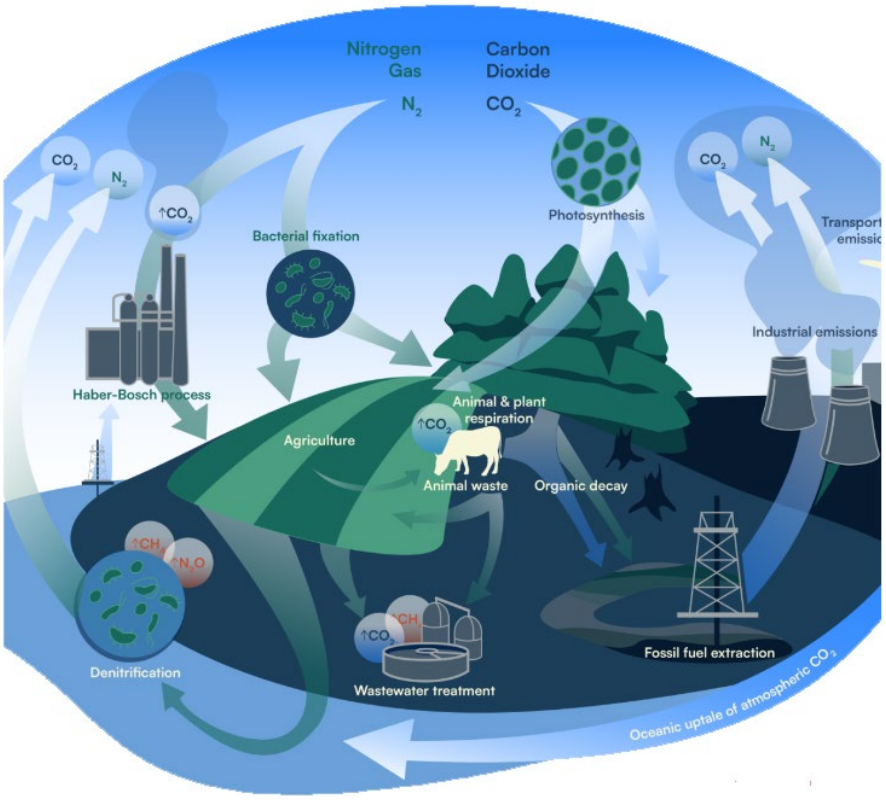
ICONIC: e-Conversion of Nitrate and Carbonate – 3 post-doc positions

The university and the institute

Delft University of Technology is a renowned research-university, located in the Netherlands. Its research efforts in Chemical Engineering and Mechanical Engineering are leading in Europe. The three post-doc positions advertised here will be carried out in different research groups, all part of the e-Refinery institute.

e-Refinery at TU Delft develops electrochemical conversion technology for the sustainable production of chemicals and fuels. The energy transition has far-stretching implications for chemical companies. The Delft e-Refinery institute brings researchers and industrial partners together in order to develop the required technologies and human capital. Researchers in the e-Refinery initiative focus their research on the electrochemical conversion of sustainable electricity, water and air into fuels and chemical building blocks, from the molecular scale to large-scale system integration. Implementing e-Refinery will serve three important challenges that the society is facing: CO_2 neutral fuels, seasonal energy storage and a defossilized chemical industry.



The research field

In today's ever-changing world, where sustainability and resource conservation are of utmost importance, innovative solutions to tackle environmental challenges have become essential. Seawater bicarbonates and nitrates are aimed to be converted into widely used chemicals for agriculture, such as urea, and other valuable carbon and nitrogen feedstocks. ICONIC (Integrated conversion of Nitrate and Carbonate streams) aims at exploring new electrochemical reactions, an integrated and scalable prototype will be developed.

Catalysts based on non-critical raw materials will be designed, and new reaction mechanisms for nitrate and carbonate activation and coupling will be explored, to sustainably produce urea and high-value chemicals. Direct co-electrolysis of CO_2 and nitrates from seawater is aimed to be achieved, a process that has never been reported to date. Moreover, it will be implemented on-site and powered by renewable energy sources. Advanced computational models and precise assemblies of high-performance electrodes will be deployed, demonstrating a scalable lab prototype suitable for the integrated remediation of polluted seawater into urea.

The post-doc positions

1. Electrochemical conversion of nitrate and carbonate streams
This post-doc will investigate different electrocatalytic materials for the reduction of carbonate and nitrate to urea and other C-N products, and implement these materials in an electrolyzer that can operate at high current densities. Moreover, we aim to use carbonate and nitrate from seawater, and are therefore interested in mitigating and negative effects from the other constituents in seawater such as chlorine.

2. Designing electrocatalysts using atomic layer deposition
This post-doc will investigate the use of atomic layer deposition (ALD) to make novel electrocatalysts for C/N-conversion, and approaches to use ALD to protect these catalysts and increase their lifetime. In collaboration with post-doc 1 the catalysts will be tested under realistic conditions.

3. LCA, TEA and market analysis
This post-doc will investigate the economic and environmental implications of the different C/N products from electrochemical conversion through the lens of process design, techno-economic assessment and life cycle assessment. We will do a market analysis for the various products.

You

- have an PhD in a relevant field – depending on the position – such as chem. engineering, chemistry, process engineering, materials science.
- combine creativity with a sound academic attitude.
- have – depending of the position you prefer – excellent experimental, and/or modelling skills.
- have excellent communication skills in English, and want to work in a multidisciplinary team.

Applying

You can find the vacancies via: https://www.tudelft.nl/careers
From that site you can apply online. Applications via e-mail are NOT considered.

In case you have additional questions, please contact:
Dr. Ruud Kortlever R.Kortlever@tudelft.nl (position 1)
Dr. Ruud van Ommen J.R.vanOmmen@tudelft.nl (position 2)
Dr. Ana Somoza Tornos A.SomozaTornos@tudelft.nl (position 3)

The vacancies remain open till latest August 25. However, the available position will be filled as soon as possible (i.e. once a suitable candidate has been found). This means that the selection of candidates will already start before the application deadline.