FACULTY OF BIOSCIENCE ENGINEERING

The Chancellor of Ghent University has the honour of inviting you to attend the public defence of the doctoral dissertation of

Eleftheria Ntagia

Title of the doctoral dissertation:

Waste gas valorisation via electrochemical sulfide (H_2S) oxidation and biological carbon fixation

The public defence will take place virtually on Thursday the 27th of May 2021, at 17:00. To join, please click here. Please select "Listen only" or mute your microphone, and do not share your video or screen. Questions can be asked via chat after the presentation.

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Abstract of the doctoral research

Industrial waste gases fermentation can pave the way for the de-fossilization of the chemical industry. Carbon dioxide (CO_2) and hydrogen sulfide (H_2S) are concomitantly emitted from several industrial sectors. The first can serve as a carbon source for commodity chemicals production through fermentation, whereas the second is a potential inhibitor of such bioproduction processes, as well as a corrosive agent.

In this thesis, we placed electrochemical treatment at the core of a three process treatment train, to enable efficient H_2S removal while unlocking the full potential of CO_2. First, we proposed the connection of an alkaline H_2S absorption unit with an electrolysis unit for simultaneous HS^- removal, by oxidation to S^0, and NaOH recovery. Next, we studied the impact of the electrode catalyst choice on the activity towards HS^- oxidation and the stability under high sulfide and alkaline conditions. Following, we applied the proposed electrochemical system for the treatment of an industrial sulfidic spent caustic stream (SCS), in order to verify industrial relevance and scalability. To identify the extent of gas pre-treatment required prior to H_2/CO_2 fermentation, we studied sulfide inhibition of the fermenting microbial communities, first in flask experiments and then, in a 10-L scale fermentation, boosted by electrolytically-produced H_2.

We concluded that electrochemical treatment has the potential to enable bioproduction from fouler industrial gas emissions, while simultaneously providing the treatment concept with on-site recovery of commodity chemicals, such as NaOH and H_2.

Brief Curriculum Vitae

Eleftheria Ntagia was born and raised in Greece. In 2012 she received her Diploma in Environmental Engineering from the Democritus University of Thrace (DUTH). She moved then to Leeuwarden, the Netherlands, where in 2015 she obtained her MSc in Water Technology, offered by Wetsus, and the universities of Wageningen, Groningen and Twente. She has spent four months in Luxemburg in the summer of 2015, as an intern in the Luxembourg Institute of Science and Technology (LIST), involved in the "Value from Urine" project. In January 2016 she moved to Ghent and started her position as an assistant and PhD student in the Center for Microbial Ecology and Technology (CMET).

During her PhD, Eleftheria (co-)supervised five master students during their thesis projects and guided multiple others through their mass balances, set for treating water and recovering resources. She authored three A1 publications and a book chapter and presented her work in six international conferences. She had the pleasure to co-organize the first and second Women in Science days in the Faculty of Bioscience Engineering, while being a member of the Be4Diversity team. She is the proud grower of two loquat trees that she brought in Ghent in 2017, as seeds in her pocket, from Fez, Morocco.