FACULTY OF BIOSCIENCE ENGINEERING

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

ir. Tom Vandekerckhove

Title of the doctoral dissertation:

Technology for thermophilic nitrogen removal from wastewater: Developing combined nitrification/denitrification and proving anammox

The public defence will take place on Friday 7th December 2018 at 17:00 in
De Cirque, Bijlokesite-Louis Pasteurlaan 2, 9000 Gent.

There will be a contiguous reception to which you are heartily invited.
Please confirm your attendance before **November 30th** to: tomg.vandekerckhove@ugent.be

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Abstract of the doctoral research

Extremely warm environments, such as hot springs (>50°C), harbor the pioneers of life on Earth. Some of these so-called thermophiles make a living on converting inorganic nitrogen and organic carbon into nitrogen gas (N_2) and carbon dioxide (CO_2). These conversions are known as nitrification/denitrification and are exactly those needed to transform the pollutants in wastewater into ecologically harmless compounds. Current (waste)water treatment (<40°C) produces tremendous amounts of waste material, so-called sludge. The application of thermophiles would lower this considerably, entailing cost savings along with a lower burden to the environment. Additionally, existing treatment cannot always adequately inactivate pathogens present in wastewater. Thermophilic technology would greatly improve hygienization, rendering a treated water that is biologically safe. Prior to this study, the biotechnological potential of separate thermophilic nitrification, denitrification and aerobic carbon removal was shown.

This PhD research thoroughly investigated the stoichiometry and kinetics of these separate thermophilic conversions. The resulting information enabled the model-based integration and economic evaluation of nitrification/denitrification, implying potential economic advantages at 50°C compared to 30°C. In lab-scale reactors, a step-wise integration of nitrification and denitrification provided proof of principle that complete nitrogen removal can be obtained at 50°C in a single-sludge system. Finally, the first proof of long-term operation (>200 days) of a thermophilic anammox bioreactor, of which stoichiometry and kinetics was characterized, opened up opportunites for shortcut nitrogen removal..

Brief Curriculum Vitae

Tom Vandekerckhove was born and raised in Waregem, Belgium. After graduating in 2014 as a Master in Bio-Science Engineering: Environmental Technology, he obtained a IWT scholarship for a four year PhD on the development of technology for thermophilic nitrogen removal from wastewater at the Center for Microbial Ecology and Technology (CMET), University of Ghent. During his PhD, he (co-)mentored five master students and one intern, presented his work at conferences in Belgium, United States, Austria and Australia and (co-)authored several internationally peer-reviewed journal articles. Next to performing valuable research, Tom participated in the daily board of CMET where everyday decisions are made to improve the lab. He also helped organize the Benelux Young Water Professionals regional conference 2017 in Ghent. As a board member of the Center for Environmental Science and Technology (CES&T) and the Belgian branch of the International Water Association (B-IWA), he helps bridging the gap between scientists, stakeholders, policy makers and the broader public.