



MARMARA UNIVERSITY
FACULTY OF ENGINEERING
ENVIRONMENTAL ENGINEERING DEPARTMENT
ENVE 4197/4198 ENGINEERING PROJECT PROPOSAL FORM (FALL 2023-2024)

Instructor : Prof. Bilge Alpaslan Kocamemi

Project Title: An Innovative Technology for Nitrogen Removal in Wastewater: Catabolic Reduction of Nitrate to Ammonium (DNRA) Process (**TÜBİTAK 2209-A**)

Number of Students : 3

Name of Students: Lara Gözde Çetinbaş, Senanur Yavuzarslan, Fevzi Süha Topçu

Scope of the Project :

It was recently discovered that an organotrophic Anammox genera (Ca. *Loosdrechtii*) is able to perform dissimilatory NO_3^- -N reduction to NH_4^+ -N (DNRA) with NO_2^- -N as intermediate using volatile fatty acids (VFA) as an electron donor. This new Anammox species could be a new alternative for the partial nitrification step in the partial nitrification/Anammox (deammonification) process. With the partial integration of the DNRA process into the Anammox process, the NO_3^- -N that will be formed as a result of nitrification can be reduced to NO_2^- -N and an electron acceptor is provided for the Anammox process.

This study aims to enrich Ca. *Loosdrechtii* species in lab-scale Reactor. Enrichment studies will be started in a lab-scale sequencing batch reactor by using seed sludge to be taken from various compartments (e.g., activated sludge, leachate treatment plant, anaerobic digester).

The study will be performed in a sequencing batch reactor system equipped with DO, pH and temperature monitoring probes. The reactor will be fed with synthetic wastewater containing nitrate and VFA. Process efficiency will be followed with daily influent and effluent organic carbon (COD), ammonium (NH_4^+ -N), nitrite (NO_2^- -N) and nitrate (NO_3^- -N) measurements. Enrichment will be evaluated by quantitative real-time polymerase chain reaction (qPCR) measurements. DNRA process kinetics will be examined through batch kinetic experiments.

Hardware/Software/Lab/Equipment Requirements:

- Plexiglass reactor (2L)
- DO, pH probes, temperature transmitter (Hach, Multi parameter)
- Peristaltic pumps (Prodoz PRS-7)
- Pressure Transducer (Endress Hauser)
- Magnetic stirrer (Heidolph MR Hei standart)
- Air pump (Risheng RS-200)
- Timers (Timer, Ledx)
- Dual injection (cation and anion) ion chromatograph (Schimadzu SIL-10AP)
- Thermoreactor

Development Plan:

The thesis will be managed according to the work schedule below. At the end of this thesis, it is expected to have experience in literature searching, laboratory experiments, and data analysis. time management, thesis writing, presentation, and teamwork.

Work - Time Table

Work	Time period (month)
Literature search, Training for SBR operation	2
Daily measurements, Batch kinetic experiments, Data Analysis	2-8
Thesis writing	8-12