Evaluation on the microbial interactions of anaerobic ammonium oxidizers and heterotrophs in Anammox biofilm - DTU Orbit (28/09/2019)

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Anaerobic ammonium oxidation (Anammox) is a cost-effective new process to treat high-strength nitrogenous wastewater. In this work, the microbial interactions of anaerobic ammonium oxidizers and heterotrophs through the exchange of soluble microbial products (SMP) in Anammox biofilm and the affecting factors were evaluated with both experimental and modeling approaches. Fluorescent in situ hybridization (FISH) analysis illustrated that Anammox bacteria and heterotrophs accounted for 77% and 23% of the total bacteria, respectively, even without addition of an external carbon source. Experimental results showed the heterotrophs could grow both on SMP and decay released substrate from the metabolism of the Anammox bacteria. However, heterotrophic growth in Anammox biofilm (23%) was significantly lower than that of nitrifying biofilm (30–50%). The model predictions matched well with the experimental observations of the bacterial distribution, as well as the nitrogenous transformations in batch and continuous experiments. The modeling results showed that low nitrogen surface loading resulted in a lower availability of SMP leading to low heterotrophic growth in Anammox biofilm, but high nitrogen surface loading would lead to relative stable biomass fractions although the absolute heterotrophic growth increased. Meanwhile, increasing biofilm thickness increased heterotrophic growth but has little influence on the relative biomass fractions.

General information
Publication status: Published
Organisations: Department of Environmental Engineering, Environmental Chemistry, Technical University of Denmark
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Pages: 4645-4652
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Water Research
Volume: 46
Issue number: 15
ISSN (Print): 0043-1354
Ratings:
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 5.15 SJR 2.914 SNIP 2.44
Web of Science (2012): Impact factor 4.655
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
Original language: English
Keywords: Anammox, Microbial interactions, Biomass fractions, Heterotrophic growth, Biofilm, Soluble microbial products,
Model
DOIs:
10.1016/j.watres.2012.06.016
Source: dtu
Source ID: n:oai:DTIC-ART:elsevier/367043968::18254
Research output: Contribution to journal – Journal article – Annual report year: 2012 – Research – peer-review