Acclimation to extremely high ammonia levels in continuous biomethanation process and the associated microbial community dynamics

Acclimated anaerobic communities to high ammonia levels can offer a solution to the ammonia toxicity problem in biogas reactors. In the current study, a stepwise acclimation strategy up to 10 g NH4+-N L−1 was performed in mesophilic (37 ± 1 °C) continuously stirred tank reactors. The reactors were co-digesting (20/80 based on volatile solid) cattle slurry and microalgae, a protein-rich, 3rd generation biomass. Throughout the acclimation period, methane production was stable with more than 95% of the uninhibited yield. Next generation 16S rRNA gene sequencing revealed a dramatic microbiome change throughout the ammonia acclimation process. Clostridium ultunense, a syntrophic acetate oxidizing bacteria, increased significantly alongside with hydrogenotrophic methanogen Methanoculleus spp., indicating strong hydrogenotrophic methanogenic activity at extreme ammonia levels (>7 g NH4+-N L−1). Overall, this study demonstrated for the first time that acclimation of methanogenic communities to extreme ammonia levels in continuous AD process is possible, by developing a specialised acclimation AD microbiome.

General information
Publication status: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering, Zagazig University, IMDEA Energy
Pages: 616-623
Publication date: 2018
Peer-reviewed: Yes

Publication information
Journal: Bioresource Technology
Volume: 247
ISSN (Print): 0960-8524
Ratings:
BFI (2018): BFI-level 2
Scopus rating (2018): CiteScore 7.08 SJR 2.157 SNIP 1.824
Web of Science (2018): Indexed yes
Original language: English
DOI: 10.1016/j.biortech.2017.09.148
Source: FindIt
Source-ID: 2390266196
Research output: Contribution to journal › Journal article – Annual report year: 2018 › Research › peer-review