



The Highest Methane Production Rate Ever by Electromethanogenesis Using Intact Anaerobic Granular Sludge as Biocathode

Zhou, Huihui; Xing, Defeng; Xu, Mingyi; Angelidaki, Irini; Zhang, Yifeng

Publication date:
2019

Document Version
Version created as part of publication process; publisher's layout; not normally made publicly available

[Link back to DTU Orbit](#)

Citation (APA):
Zhou, H., Xing, D., Xu, M., Angelidaki, I., & Zhang, Y. (2019). *The Highest Methane Production Rate Ever by Electromethanogenesis Using Intact Anaerobic Granular Sludge as Biocathode*. Abstract from 7th International Society for Microbial Electrochemistry and Technology (ISMET7) , Okinawa, Japan.

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

The Highest Methane Production Rate Ever by Electromethanogenesis Using Intact Anaerobic Granular Sludge as Biocathode

Huihui Zhou^{1,2}, Defeng Xing², Mingyi Xu¹, Irini Angelidaki¹, Yifeng Zhang¹

1. Department of Environmental Engineering, Technical University of Denmark, DK-2800 Lyngby, Denmark
2. State Key Lab of Urban Water Resource and Environment, School of Municipal and Environmental Engineering, Harbin Institute of Technology, Harbin 150090, China

Electromethanogenesis, in which carbon dioxide is reduced to methane by using electrical current at the biocathode, is one of the Power-to-Gas technologies capable of simultaneous wastewater treatment, CO₂ sequestration, and renewable energy production, [1]. Among others, development of effective biocathode with high catalytic ability and dense biomass is one of the key factors to the industrial application of electromethanogenesis [2]. In this work, intact anaerobic granular sludge (AGS) with high biomass level and unique layered spherical structure were fulfilled the cathode chamber to serve as biocathode in order to improve the performance of electromethanogenesis. The AGS based electromethanogenic system achieved a maximum methane production rate of around 130.34 L CH₄/m²cat_{proj}/d at 45 A/m² cat_{proj}, which is 2 times higher than the maximum value reported so far. The current to methane efficiency was over 90% (95.65%). The effect of buffer concentration, applied voltage, and bicarbonate concentration on methane production was elucidated. The stability of the AGS based biocathode under pH and oxygen interferences was also explored. This work was the first attempt for using intact AGS as an efficient and cost-effective biocatalyst in biocathode for electromethanogenesis.

References:

- Cheng S, Xing D, Call DF, Logan BE. Direct biological conversion of electrical current into methane by electromethanogenesis. *Environ Sci Technol*. 2009;43:3953-8.
- Lovley DR. Powering microbes with electricity: direct electron transfer from electrodes to microbes. *Environ Microbiol Rep*. 2011;3:27-35.