

Accepted Manuscript

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PII: S0960-8524(17)31999-5
DOI: <https://doi.org/10.1016/j.biortech.2017.11.025>
Reference: BITE 19175

To appear in: *Bioresource Technology*

Received Date: 14 September 2017
Revised Date: 7 November 2017
Accepted Date: 9 November 2017

Please cite this article as: Berkessa, Y.W., Yan, B., Li, T., Tan, M., She, Z., Jegatheesan, V., Jiang, H., Zhang, Y., Novel anaerobic membrane bioreactor (AnMBR) design for wastewater treatment at long HRT and high solid concentration, *Bioresource Technology* (2017), doi: <https://doi.org/10.1016/j.biortech.2017.11.025>

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Novel anaerobic membrane bioreactor (AnMBR) design for wastewater treatment at long HRT and high solid concentration

Yifru Waktale Berkessa^{1,2,4}, Binghua Yan^{1*}, Tengfei Li^{1,5}, Ming Tan¹, Zonglian She⁵, Veeriah Jegatheesan³, Heqing Jiang⁶, Yang Zhang^{1,4*}

¹ Lab of Waste Valorization and Water Reuse, Qingdao Institute of Bioenergy and Bioprocess Technology, Chinese Academy of Sciences, 189 Songling Road, Laoshan District, Qingdao 266101, PR China

² State Key Laboratory of Petroleum Pollution Control, Beijing, 102206, PR China

³ School of Engineering, RMIT University, Melbourne VIC 3000, Australia

⁴ University of Chinese Academy of Sciences, No.19A Yuquan Road, Beijing 100049, PR China

⁵ College of Environmental Science and Engineering, Ocean University of China, 266100, Qingdao, PR China

⁶ Lab of membrane separation and catalysis group, Qingdao Institute of Bioenergy and Bioprocess Technology, Chinese Academy of Sciences, 189 Songling Road, Laoshan District, Qingdao 266101, PR China

Corresponding author e-mail: zhangyang@qibebt.ac.cn

Abstract

Performance of two novel designed anaerobic membrane bioreactor (AnMBRs) for wastewater treatment at long hydraulic retention time (HRT, 47 days) and high sludge concentration ($22\text{g}\cdot\text{L}^{-1}$) was investigated. Results showed steady chemical oxygen demand (COD) removal ($>98\%$) and mean biogas generation of $0.29\text{ LCH}_4\cdot\text{g}^{-1}\text{COD}$. Average permeates flux of $58.70\text{ L}\cdot\text{m}^{-2}\cdot\text{h}^{-1}$ and $54.00\text{ L}\cdot\text{m}^{-2}\cdot\text{h}^{-1}$ were achieved for reactors A and B, respectively. On top of reactor configuration, long HRT caused biofilm reduction by heterotrophic bacteria *Chloroflexi* resulting in high membrane flux. Mean total membrane resistances ($2.23\times 10^9\text{ m}^{-1}$) and fouling rates ($4.00\times 10^8\text{ m}^{-1}\cdot\text{day}^{-1}$) of both reactors were low suggesting better membrane fouling control ability of both AnMBRs. Effluent quality analysis showed the effluent soluble microbial products (SMP) were dominated by proteins compared to carbohydrates, and specific ultraviolet absorbance (SUVA) analysis revealed effluent from both reactors had low aromaticity with $\text{SUVA} < 1\text{ (L}\cdot\text{mg}^{-1}\cdot\text{m}^{-1})$ except for the first ten days.

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