Continuous energy recovery and nutrients removal from molasses wastewater by synergistic system of dark fermentation and algal culture under various fermentation types

Hong-Yu Ren, Fanying Kong, Jun Ma, Lei Zhao, Guo-Jun Xie, Defeng Xing, Wan-Qian Guo, Bing-Feng Liu, Nan-Qi Ren

PII: S0960-8524(17)32237-X
DOI: https://doi.org/10.1016/j.biortech.2017.12.092
Reference: BITE 19347

To appear in: *Bioresource Technology*

Received Date: 3 December 2017
Revised Date: 26 December 2017
Accepted Date: 27 December 2017

Please cite this article as: Ren, H-Y., Kong, F., Ma, J., Zhao, L., Xie, G-J., Xing, D., Guo, W-Q., Liu, B-F., Ren, N-Q., Continuous energy recovery and nutrients removal from molasses wastewater by synergistic system of dark fermentation and algal culture under various fermentation types, *Bioresource Technology* (2017), doi: https://doi.org/10.1016/j.biortech.2017.12.092

Continuous energy recovery and nutrients removal from molasses wastewater by synergistic system of dark fermentation and algal culture under various fermentation types

Hong-Yu Ren [1], Fanying Kong [1], Jun Ma, Lei Zhao, Guo-Jun Xie, Defeng Xing, Wan-Qian Guo, Bing-Feng Liu*, Nan-Qi Ren

State Key Laboratory of Urban Water Resource and Environment, Harbin Institute of Technology, Harbin 150090, China

Abstract

Synergistic system of dark fermentation and algal culture was initially operated at batch mode to investigate the energy production and nutrients removal from molasses wastewater in butyrate-type, ethanol-type and propionate-type fermentations. Butyrate-type fermentation was the most appropriate fermentation type for the synergistic system and exhibited the accumulative hydrogen volume of 658.3 mL L^{-1} and hydrogen yield of 131.7 mL g^{-1} COD. By-products from dark fermentation (mainly acetate and butyrate) were further used to cultivate oleaginous microalgae. The maximum algal biomass and lipid content reached 1.01 g L^{-1} and 38.5%, respectively. In continuous operation, the synergistic system was stable and efficient, and energy production increased from 8.77 kJ L^{-1} d^{-1} (dark fermentation) to 17.3 kJ L^{-1} d^{-1} (synergistic system). Total COD, TN and TP removal efficiencies in the synergistic system reached 91.1%, 89.1% and 85.7%, respectively. This study shows the potential of the

* Corresponding author. Address: State Key Laboratory of Urban Water Resource and Environment, Harbin Institute of Technology, P. O. Box 2614, 73 Huanghe Road, Harbin 150090, China. Tel./Fax: +86 451 86282008
E-mail addresses: rhongyu@126.com, rhy@hit.edu.cn (H.-Y. Ren); fanyingkong@163.com (F. Kong); lbf@hit.edu.cn (B.-F. Liu); rnq@hit.edu.cn (N.-Q. Ren)
[1] Both authors contributed equally to this paper.