

Accepted Manuscript

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PII: S1385-8947(17)31927-7
DOI: <https://doi.org/10.1016/j.cej.2017.11.016>
Reference: CEJ 17987

To appear in: *Chemical Engineering Journal*

Received Date: 22 September 2017
Revised Date: 2 November 2017
Accepted Date: 2 November 2017

Please cite this article as: T. Tian, S. Qiao, C. Yu, J. Zhou, Bio-electrochemically assisting low-temperature anaerobic digestion of low-organic strength wastewater, *Chemical Engineering Journal* (2017), doi: <https://doi.org/10.1016/j.cej.2017.11.016>

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low-organic strength wastewater**

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ABSTRACT

This study provides a new approach by using bio-electrochemical systems (BES) to improve the performance of anaerobic digestion (AD) for treating low-organic strength wastewater and recovering energy in the form of CH₄. The BES had a relatively higher capability for temperature shock. At an applied voltage of 0.4 V, the BES significantly enhanced both the chemical oxygen demand (COD) removal and CH₄ yield efficiency compared with those of the control at operational temperatures of 20, 12, and 8 °C. Energy balance evaluation indicated that the net energy obtained from the BES was higher than the energy recovered from the control, suggesting that operation of BES was economically available. Analysis of microbial physiological characteristics elucidated that electrochemical effects stimulated the production of extracellular polymeric substances, suggesting a faster metabolic activity of biomass in the BES. 16S rRNA sequencing showed that genera of H₂-utilizing methanogens, *Methanobacterium*, *Methanoregula*, and *Methanospirillum*, dominated the consortia at low temperatures. On the surfaces of cathodes, considerable enrichments of

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