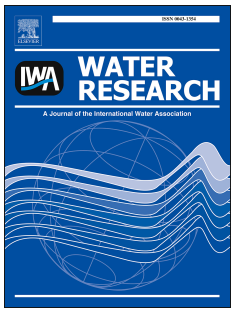
Accepted Manuscript



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PII: S0043-1354(18)30375-0

DOI: 10.1016/j.watres.2018.05.013

Reference: WR 13778

To appear in: *Water Research*

Received Date: 4 December 2017

Revised Date: 9 May 2018

Accepted Date: 9 May 2018

Please cite this article as: Regueira, A., González-Cabaleiro, R., Ofițeru, I.D., Rodríguez, J., Lema, J.M., Electron bifurcation mechanism and homoacetogenesis explain products yields in mixed culture anaerobic fermentations, *Water Research* (2018), doi: 10.1016/j.watres.2018.05.013.

Electron bifurcation mechanism and homoacetogenesis explain products yields in mixed culture anaerobic fermentations

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ABSTRACT

Anaerobic fermentation of organic wastes using microbial mixed cultures is a promising avenue to treat residues and obtain added-value products. However, the process has some important limitations that prevented so far any industrial application. One of the main issues is that we are not able to predict reliably the product spectrum (i.e. the stoichiometry of the process) because the complex microbial community behaviour is not completely understood. To address this issue, in this work we propose a new metabolic network of glucose fermentation by microbial mixed cultures that incorporates electron bifurcation and homoacetogenesis. Our methodology uses NADH balances to analyse published experimental data and evaluate the new stoichiometry proposed. Our results prove for the first time the inclusion of electron bifurcation in the metabolic network as a better description of the experimental results. Homoacetogenesis has been used to explain the discrepancies between observed and theoretically predicted yields of gaseous H_2 and CO_2 and it appears as the best solution among other options studied. Overall, this work supports the consideration of electron bifurcation as an important biochemical mechanism in microbial