Microbial electrochemical monitoring of volatile fatty acids during anaerobic digestion - DTU Orbit (08/11/2017)

Microbial electrochemical monitoring of volatile fatty acids during anaerobic digestion

Volatile fatty acid (VFA) concentration is known as an important indicator to control and optimize anaerobic digestion (AD) process. In this study, an innovative VFA biosensor was developed based on the principle of a microbial desalination cell. The correlation between current densities and VFA concentrations was firstly evaluated with synthetic digestate. Two linear relationships were observed between current densities and VFA levels from 1 to 30 mM (0.04 to 8.50 mA/m2, R2=0.97) and then from 30 to 200 mM (8.50 to 10.80 mA/m2, R2=0.95). The detection range was much broader than that of other existing VFA biosensors. The biosensor had no response to protein and lipid which are frequently found along with VFAs in organic waste streams from AD, suggesting the selective detection of VFAs. The current displayed different responses to VFA levels when different ionic strengths and external resistances were applied, though linear relationships were always observed. Finally, the biosensor was further explored with real AD effluents and the results did not show significance differences with those measured by GC. The simple and efficient biosensor showed promising potential for online, inexpensive and reliable measurement of VFA levels during AD and other anaerobic processes.

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