The Highest Methane Production Rate Ever by Electromethanogenesis Using Intact Anaerobic Granular Sludge as Biocathode

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The Highest Methane Production Rate Ever by Electromethanogenesis Using Intact Anaerobic Granular Sludge as Biocathode
Huihui Zhou\textsuperscript{1,2}, Defeng Xing\textsuperscript{2}, Mingyi Xu\textsuperscript{1}, Irini Angelidaki\textsuperscript{1}, Yifeng Zhang\textsuperscript{1}

1. Department of Environmental Engineering, Technical University of Denmark, DK-2800 Lyngby, Denmark
2. State Key Lab of Urban Water Resource and Environment, School of Municipal and Environmental Engineering, Harbin Institute of Technology, Harbin 150090, China

Electromethanogenesis, in which carbon dioxide is reduced to methane by using electrical current at the biocathode, is one of the Power-to-Gas technologies capable of simultaneous wastewater treatment, CO\textsubscript{2} sequestration, and renewable energy production, [1]. Among others, development of effective biocathode with high catalytic ability and dense biomass is one of the key factors to the industrial application of electromethanogenesis [2]. In this work, intact anaerobic granular sludge (AGS) with high biomass level and unique layered spherical structure were fulfilled the cathode chamber to serve as biocathode in order to improve the performance of electromethanogenesis. The AGS based electromethanogenic system achieved a maximum methane production rate of around 130.34 L CH\textsubscript{4}/m\textsuperscript{2} catproj/d at 45 A/m\textsuperscript{2} catproj, which is 2 times higher than the maximum value reported so far. The current to methane efficiency was over 90% (95.65%). The effect of buffer concentration, applied voltage, and bicarbonate concentration on methane production was elucidated. The stability of the AGS based biocathode under pH and oxygen interferences was also explored. This work was the first attempt for using intact AGS as an efficient and cost-effective biocatalyst in biocathode for electromethanogenesis.

References: