

## Value added product recovery and carbon dioxide sequestration from biogas using microbial electrosynthesis

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Issues like global warming and the associated climate change demand alternative green biofuel in place of the fossil fuel. Biogas, which mainly contains carbon dioxide and methane, is produced by anaerobic degradation of organic matter. Microbial electrosynthesis (MES), a novel type of bicelectrochemical systems (BES), can be used to improve the calorific value of biogas, and also to reduce the CO<sub>2</sub> content in the biogas, and thus increase the percentage of methane present in the biogas. In this study, MES has been used to sequester carbon dioxide present in biogas to produce electro-biocommodities like acetate, isobutyrate, etc. The biogas generated from an up-flow anaerobic sludge blanket (UASB) reactor treating sewage was fed into the cathodic chamber of MES cell, which consisted of carbon felt as a biocathode poised at  $-0.9$  V vs. SHE. The abiotic anode was also made up of carbon felt and phosphate buffer solution was used as anolyte. The electrotrophic microbiome present on the cathode produced acetate ( $52.4 \text{ mM m}^{-2} \text{ d}^{-1}$ ), isobutyrate ( $36.2 \text{ mM m}^{-2} \text{ d}^{-1}$ ), propionate ( $41.6 \text{ mM m}^{-2} \text{ d}^{-1}$ ), 2-piperidinone ( $26.7 \text{ mM m}^{-2} \text{ d}^{-1}$ ) and traces of methyl derivatives of these compounds. Thus, it demonstrated successful CO<sub>2</sub> sequestration from the biogas and synthesized multi-carbon organic compounds and in turn produced biogas with higher methane content in it.

**Keywords:** Acetate production, Biocathode, Bioelectrochemical system, Isobutyrate, Methane, Microbiome, UASB reactor