Rosa Anna Nastro, J Pollut Eff Cont 2022, Volume 10

Use of bioelectrochemical systems improve CO2 assimilation in Clostridium spp. and Ralstonia euthropha

Rosa Anna Nastro

University of Naples Parthenope, Italy

In this work, we tested the ability of Clostridium saccharoperbutylacetonicum and Ralstonia euthropha to capture CO2 in two-chamber Microbial Fuel Cells (MFCs), under different operational conditions. We used a co-culture of Shewanella oneidensis MR1 and Pseudomonas aeruginosa PA1430/CO1 to form an anodic consortium and verify if it was able to sustain CO2 capture at the cathode by the test microorganisms, in absence of any external source of potential. In order to reduce the start-up period of the Bio Electrochemical Systems (BESs), we cultured both C. saccharoperbutylacetonicum and R. euthropha firstly in a complex culture medium, followed by a gradual transition to mineral base media with sodium bicarbonate as sole carbon and energy source. When compared to the control cultures, R. euthropha showed the highest CO2 capture rate (73%) when BESs were connected to a 1000 Ohm external resistor, while C. saccharoperbutylacetonicum achieved the maximum CO2 assimilation (78.6 %) when the BESs were kept at maximum power (i.e. no external potential applied). In both cases, the reducing power at the cathode was provided by the sole Shewanella/Pseudomonas consortium. The products of CO2 assimilation were Poly Hydroxyl Butyrates (PHBs), acetate, butyrate, and butanol. Furthermore, as we used glycerol as carbon and energy source for the anodic consortium, we also obtained biosurfactants. BESs demonstrated to effectively improve the assimilation of CO2 by the test strains, and the ability to provide renewable energy to drive the electro synthesis of platform chemicals from inorganic carbon and glycerol [Figure 1].

Keywords: Electrosynthesis, Microbial fuel cells, Pseudomonas consortium, Ralstonia euthropha, CO2.

Biography

Rosa Anna Nastro, Associate Researcher in Environmental Microbiology at the Department of Science and Technology, University of Naples "Parthenope", Italy. As a microbiologist, she have worked in the field of food and environmental microbiology, exploring microbial biofilm formation dynamics, antimicrobial and antibiofilm properties of secondary metabolites produced by a Bacillus amyloliquefaciens strain isolated in a hospital environment. Since 2012, she focused her interest on Microbial Electrochemical Technology (MET) based on a renewable source of energy (the microbial metabolism) and its application to liquid and solid waste treatment, the remediation and detoxification of water, soil and sediments polluted with Polycyclic Aromatic Hydrocarbon (PAHs) and other compounds. Her current research activities focus on electro synthesis from carbon dioxide through Microbial Electrochemical Systems (MESs). Since February 2022, she joined the PHOENIX COST action (CA-19123)-Protection, Resilience, Rehabilitation of damaged environment (PHOENIX).

Received: August 18, 2022; **Accepted**: August 25, 2022; **Published**: November 20, 2022