Abstract

The increase in global Carbon Dioxide (CO 2) emissions is causing climate change, which in turn is poised to trigger disastrous consequences. To curtail the rising industrial CO 2 emissions and avert its associated effects, various measures ranging from technological advancements to policies are being considered. Microbial Electrosynthesis (MES) is one of the emerging technologies for the conversion of CO 2 into multi-carbon chemicals. MES utilizes microbes as catalysts for the electricity-driven conversion of CO 2 to useful chemicals and fuels in bioelectrochemical systems. Although it offers several advantages over other CO 2 utilization approaches, difficulty in the production of high carbon chain length and thus high-value chemicals is one of the key challenges. In order to increase the value of chemicals being produced from CO 2 , two strategies, Viz., genetic engineering or synthetic biology and interlinking of different processes, are being considered. In this work, we demonstrate that high-value chemicals such as Sclareol (C 20) could be produced from CO 2 (C 1) by interlinking MES with the yeast-based processes. In the first process, CO 2 was converted to acetate by using Clostridium ljungdahlii via MES. Up to 478.25 mg/L organics production at the rate of 0.442±0.0512 g/L/day was achieved in bioelectrochemical systems. The acetate containing spent media was then fed to the genetically modified Saccharomyces cerevisiae as the sole carbon and energy source. Although this yeast grew slowly with acetate, it produced up to 6.364 mg/L sclareol. Further optimization studies of both the MES and yeast-based processes are needed to increase the production of acetate and sclareol, respectively.