

CO₂ Gas fermentation: Opportunities and Technical Challenges

Jean-Luc DUBOIS
Arkema France

CO₂ conversion using microbial platforms is attractive as it is expected that the microorganism would be able to deliver high value products. But this type of technology, which is not mature yet, has some challenges which are going to impact the process design and the cost of the conversion.

A first challenge of the up-scaling of the technologies is the heat management. The reaction of CO₂ with Hydrogen is thermodynamically exothermic. From the heat of reaction, we derived the adiabatic temperature rise for several titres and different products, assuming that the reactor/fermenter works in adiabatic mode, that we have a very efficient microorganism/process conditions with which high productivities are possible and that a commercial plant can be built. In an adiabatic unit, only low titres can be managed. Thermophilic microbes are a better choice. The alternative technologies would be to have internal or external cooling in the fermenters with increased complexity. The heat generated at a world scale plant, can correspond to the energy consumption of several thousands of EU citizens, so the problem deserves some attention and several solutions, addressing also the gas solubility issue, will be presented.

The fermentation conditions also affect the choice of fermenter technology and the capital cost, and a first benchmark will be discussed.

This work has received funding from the European Union’s Horizon 2020 research and innovation programme under Grant Agreement no. 761042 (BIOCON-CO₂) and Grant Agreement no. 760431 (BioRECO2VER).