ICCDU XVI
27-30 August, 2018
Rio de Janeiro, Brazil

16th INTERNATIONAL CONFERENCE ON CARBON DIOXIDE UTILIZATION

Biofuels and RFNBOs: Exploring the Opportunities for CO_2-derived Fuels

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Keywords: CO_2-derived fuels, RTNBOs, Biofuel, Policy, industrial symbiosis

The challenges of climate change bring opportunities to explore new low carbon solutions for renewable sustainable transportation fuels. Sustainable fuels can be produced by many routes, both biological and non-biological, and the use of wastes to produce them is highly advantageous. Careful consideration must be taken however to ensure the fuels are genuinely delivering a lower carbon impact and are not simply shifting the problem.[1]

Renewable transport fuels can be categorized into two main categories; biofuels or renewable fuels of non-biological origins (RFNBOs). Biofuels are produced from biomass where as RFNBOs must be produced using renewable energy (not from biomass) in order to be classified as renewable. Some CO_2-derived fuels that are produced by a biological process (i.e. fermentation) have been wrongly being classed as a biofuel when they are in fact a RFNBO. However, CO_2-derived fuels can switch between being classified as a biofuel or a RFNBO depending on the energy sources used, which may have LCA and economic implications.

Here, we will discuss the opportunities to produce both biofuels and RFNBOs from carbon dioxide (CO_2) focusing on novel processes. A range of liquid and gaseous fuels can be made, but questions arise over sustainability and carbon reduction potential of CO_2-derived fuels and how CO_2-based fuels fit into current legislative models. As CO_2-dervied fuels emerge onto the market, fundamental questions regarding CO_2 avoided, energy integration, LCA and fit to policy mechanisms must be tackled.

Using the production of medium-chain alkanes produced *via* biochemical electrolysis of waste water and CO_2 coupled with SimCells (Figure 1) as a case study[2]; this paper discusses the prospects for deploying CO_2-based fuels in the UK at wastewater treatment facilities. Factors such as industrial symbiosis, LCA, TEA and policy integration are tackled to enable the early identification of barriers to deploying such technologies and engineering and policy solutions proposed.

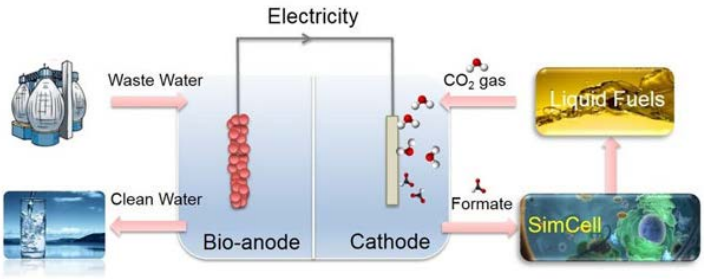

Figure 1. CO_2 to medium chain alkanes, by combined electrochemical and biological processes.

Acknowledgments
This project is funded by the EPSRC projects LifesCO2R, EP/N009746/1 and CO2Chem, EP/P026435/1

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