Powering Jets with CO_2: How Ready Are the Electrocatalysts?

Grace Chidimma James*, Sudhagar Pitchaimuthu, and M. Mercedes Maroto-Valer

Research Centre for Carbon Solutions (RCCS), School of Engineering and Physical Sciences, Heriot-Watt University, Edinburgh, EH14 4AS, United Kingdom
*Email: gj2012@hw.ac.uk

1 Background & Motivation

The aviation industry contributes ~2% of global CO_2 emissions [1].

Sustainable Aviation Fuels (SAFs) reduce emissions. However, only <0.1% of jet fuel (C_8–C_{16}) currently comes from SAFs [1].

Power-to-Liquid (PtL) utilises captured CO_2, green hydrogen and clean electricity to produce SAFs.

Catalysts drive the PtL process through Electrochemical CO_2 Reduction Reaction (ECO_2RR) [2-7].

2 Research Gaps

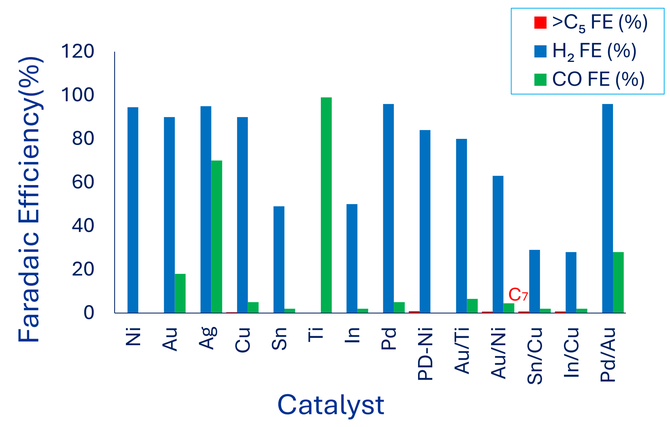


Fig. 1. *Faradaic Efficiencies of monometallic and bimetallic catalysts for ECO_2RR, showing trade-offs between H_2, CO, and $>C_5$ hydrocarbons. Data compiled from [2–7].*

- Hydrogen Evolution Reaction competes with multi-carbon product formation.
- Most ECO_2RR catalysts only yield $>C_5$ hydrocarbons at <1% Faradaic Efficiency (FE).
- The best-performing catalyst (Sn/Cu) produced C_7 products with low selectivity.
- C_8–C_{16} selectivity remains unreported in the ECO2RR literature.

3 Research Aim

To develop efficient, low-cost electrocatalysts for converting CO_2 into chemicals and SAFs through the PtL process.

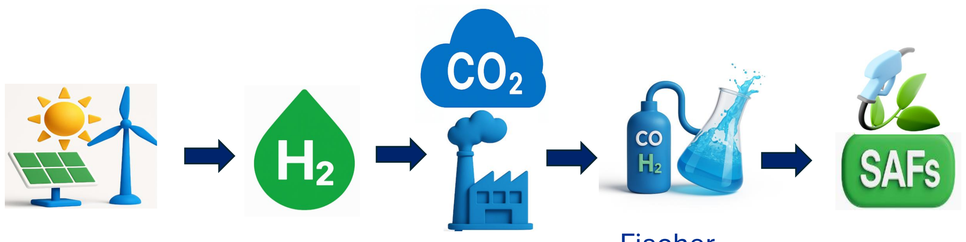
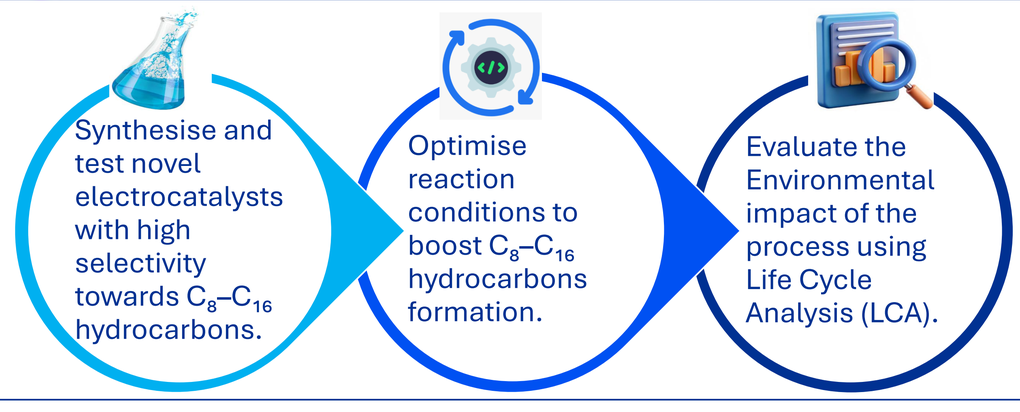
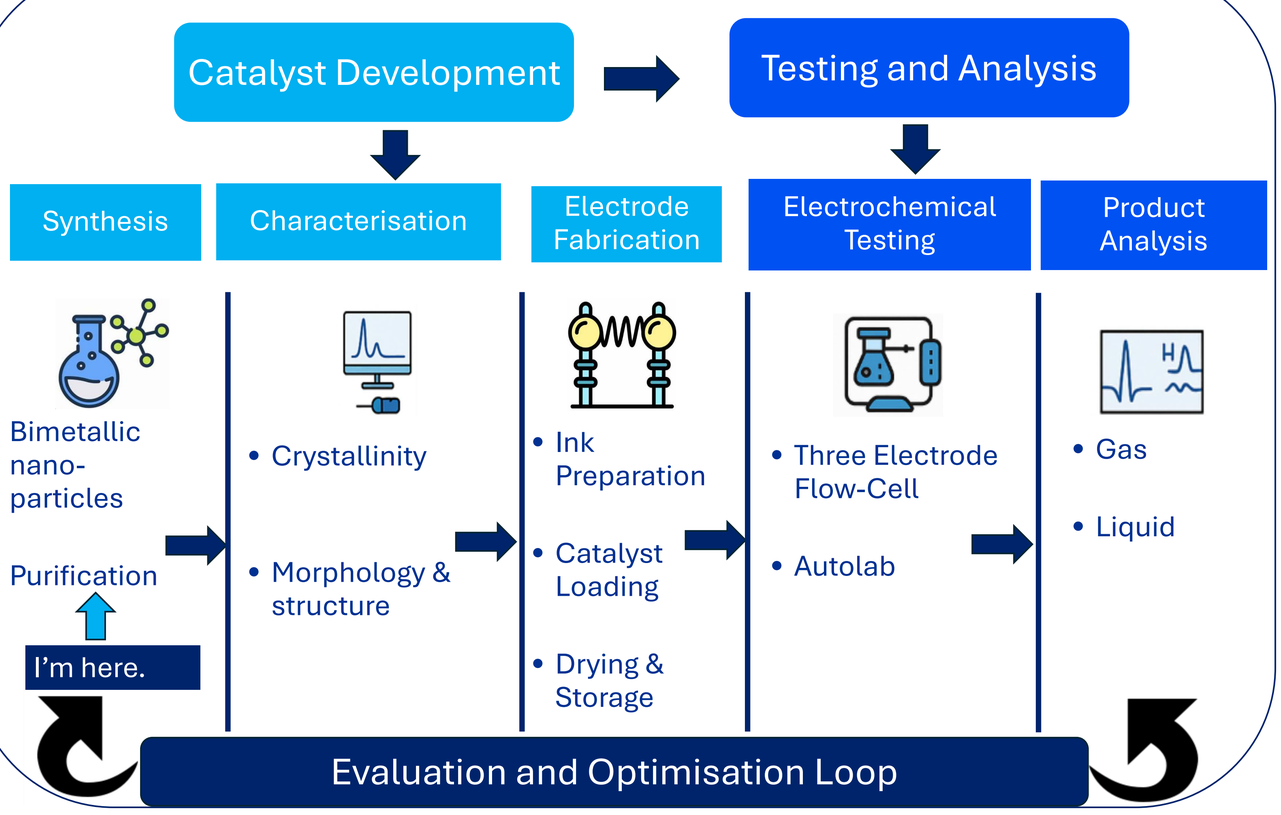


Fig. 2. *The PtL process for SAF production.*

4 Key Research Tasks



5 Proposed Methodology Workflow



6 Real-World Impacts

Advancing Research in Electrochemical CO_2 Conversion.

Selective catalysts simplify processing, lowering production costs for SAFs.

Enabling Net-Zero Aviation through SAF production.

Supports National and Global Climate Targets.

7 Takeaway Points

- Producing Jet fuels from CO_2 begins with the right catalysts.
- The PtL process can decarbonise aviation by utilising CO_2 and green hydrogen to produce SAFs.
- Efficient electrocatalysts are crucial for scaling up the process.
- Future work would focus on developing and testing highly selective electrocatalysts for SAF production.

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Acknowledgement

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