From highly efficient and selective CO_2 to CO conversion: as key step for Jet Fuel Production

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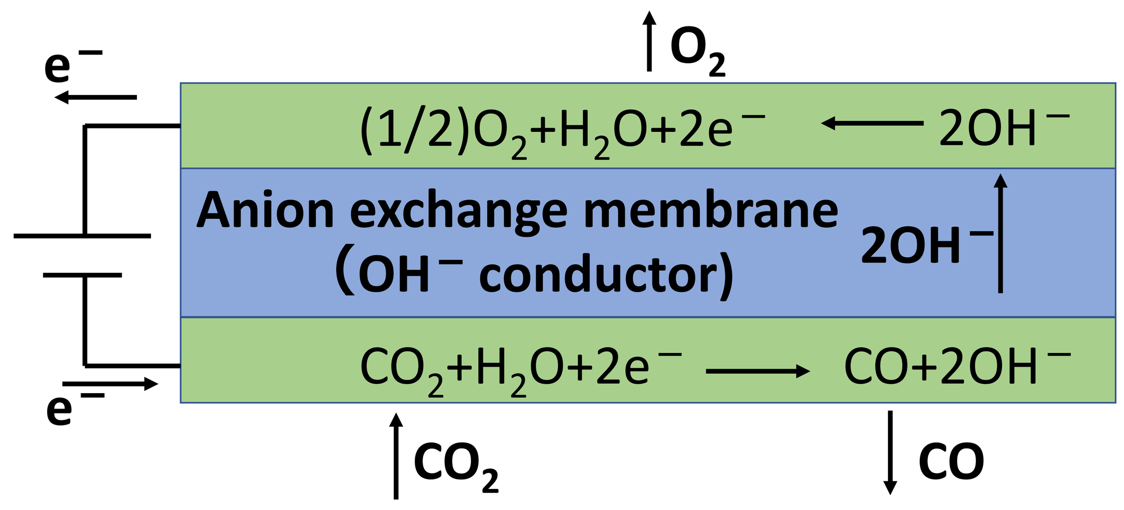
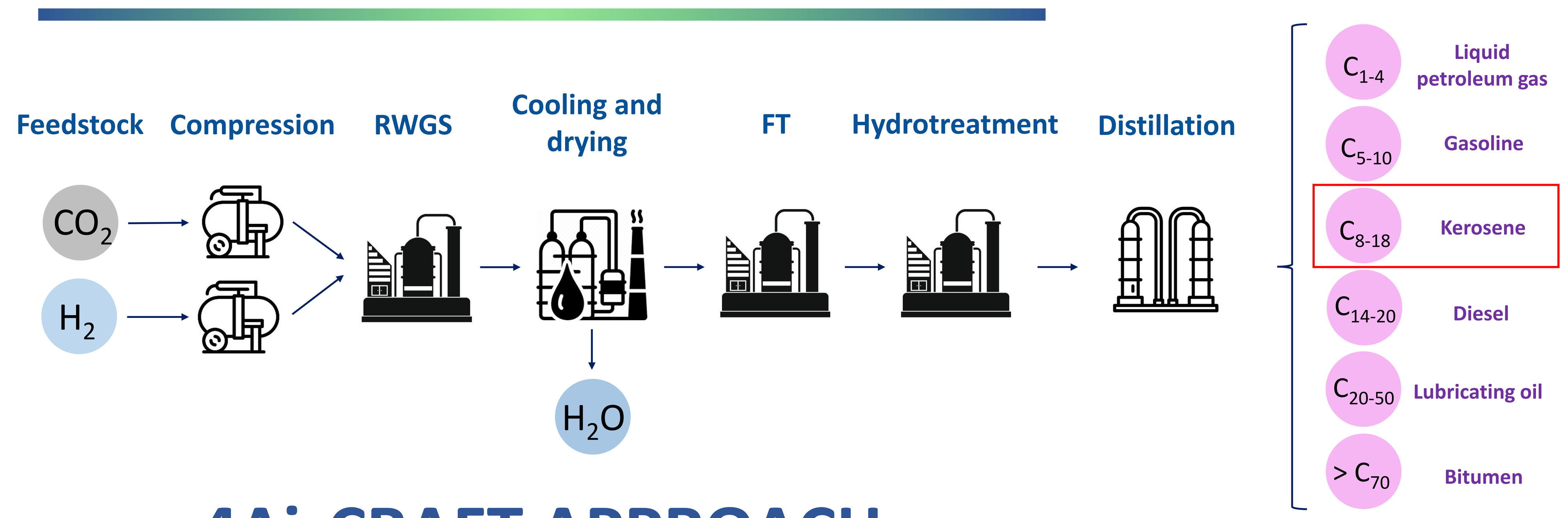
Introduction and Aim

Alternative fuels produced from CO_2 constitute a core element to reach out goals for making flying carbon neutral as well as Europe's independence on fossil energy carriers. To do so, the **EU-Japan-Brazil** funded 4AirCRAFT project creates a disruptive concept for production of **long-chain hydrocarbons at mild conditions** and will **proof the concept** by the validation of each individual module constituting the innovative cascade reactor.

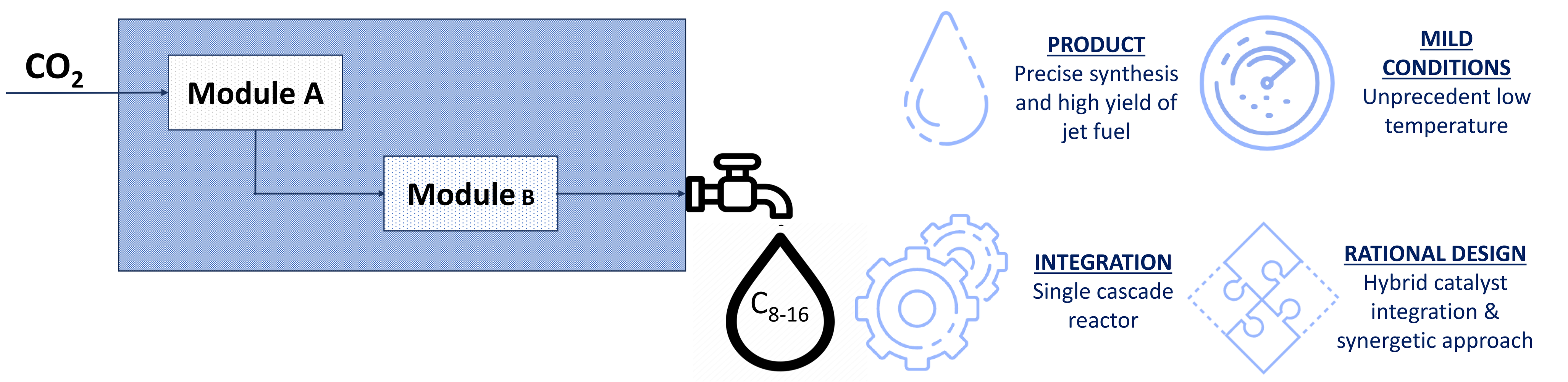
In particular the electrochemical reduction of CO_2 into CO is one the key steps within 4AirCRAFT cascade reactor.



TRADITIONAL APPROACH



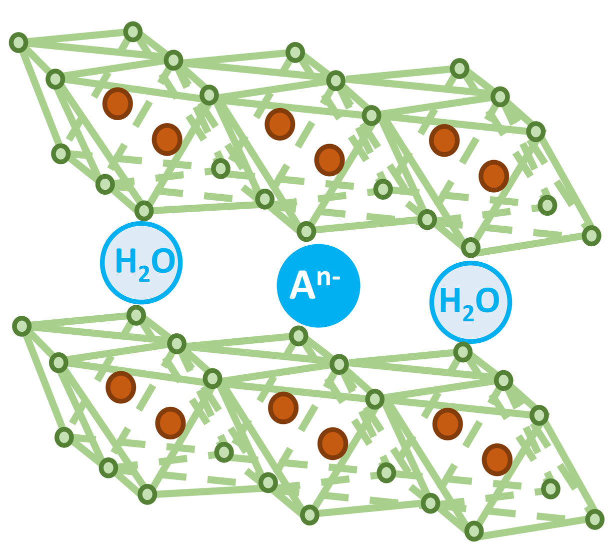
4AirCRAFT APPROACH

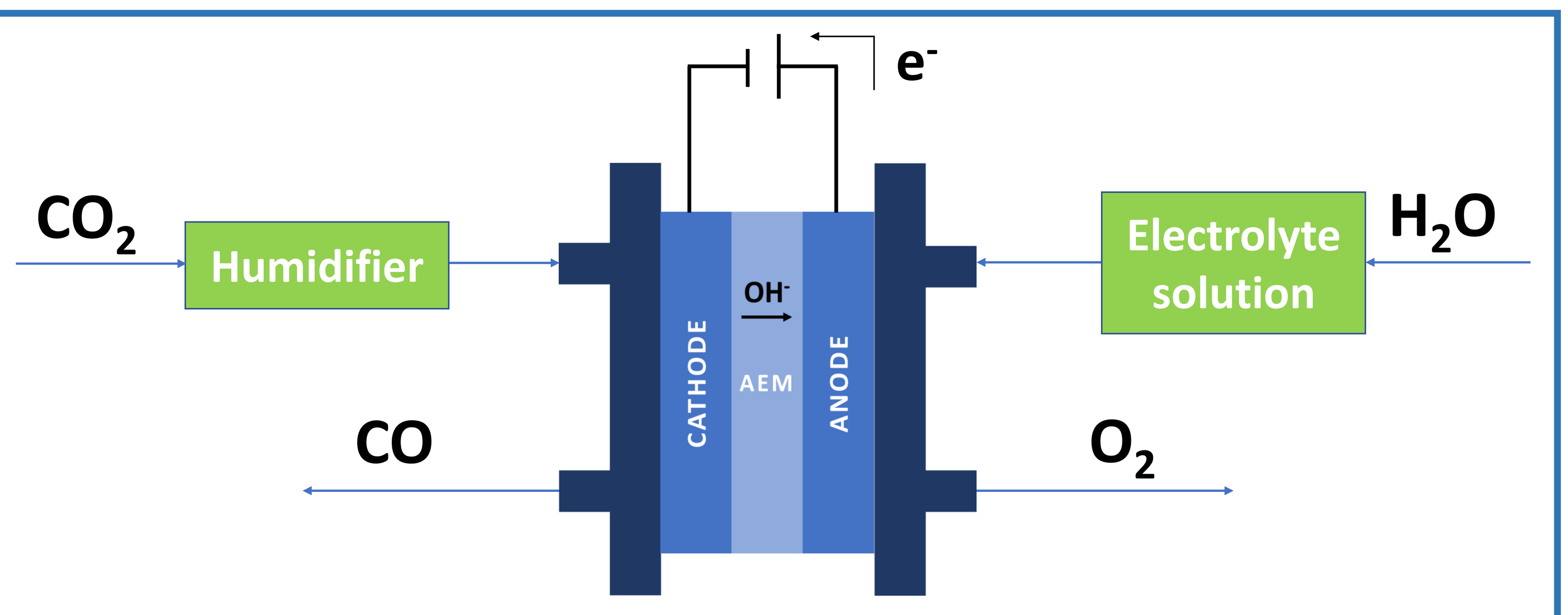


Materials and Experimental set-up

LDH-based electrocatalysts

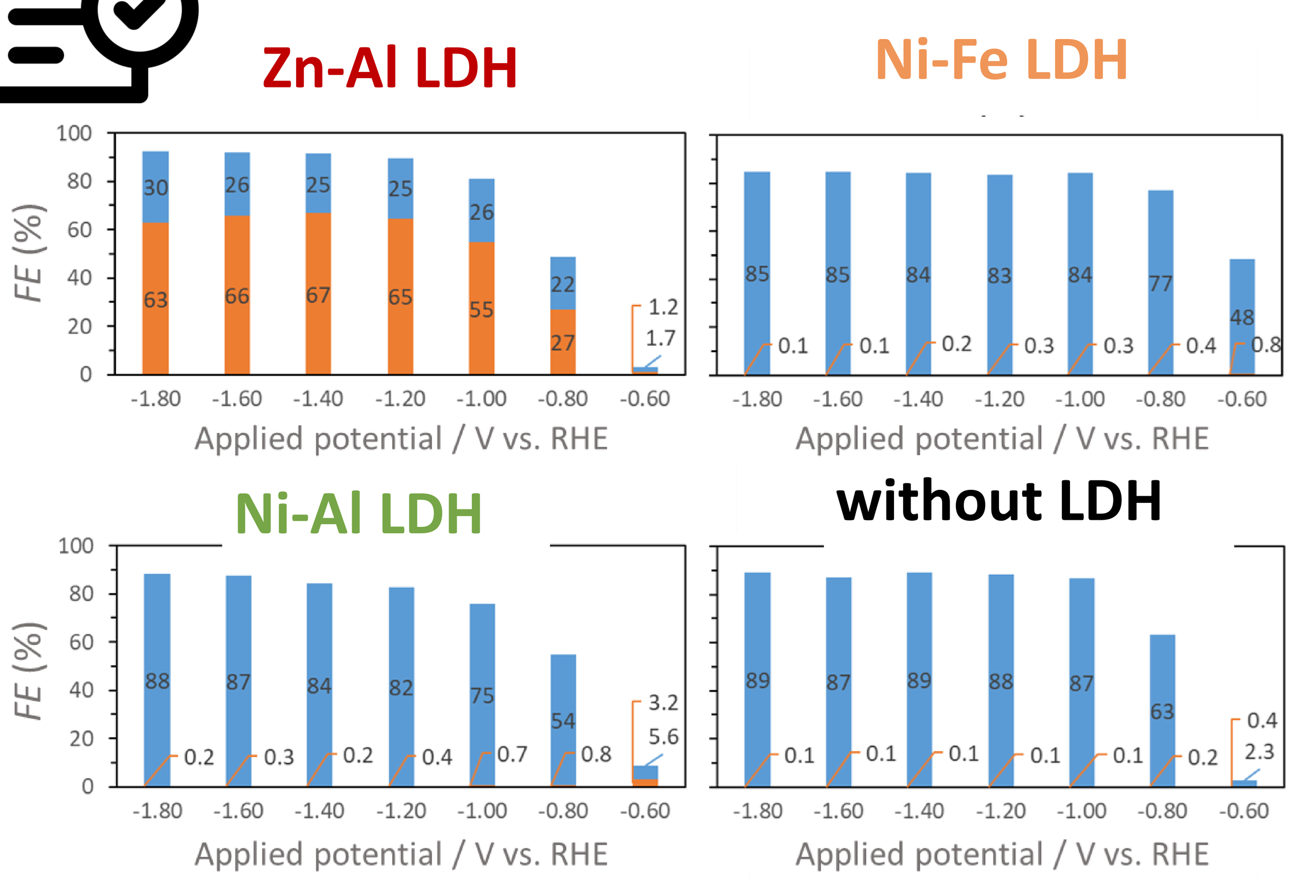
Three LDH with different chemical composition **Ni-Al** and **Ni-Fe** and **Zn-Al LDH** were synthesized and characterized and evaluated as potential electrocatalysts for CO_2 reduction into CO. [1]



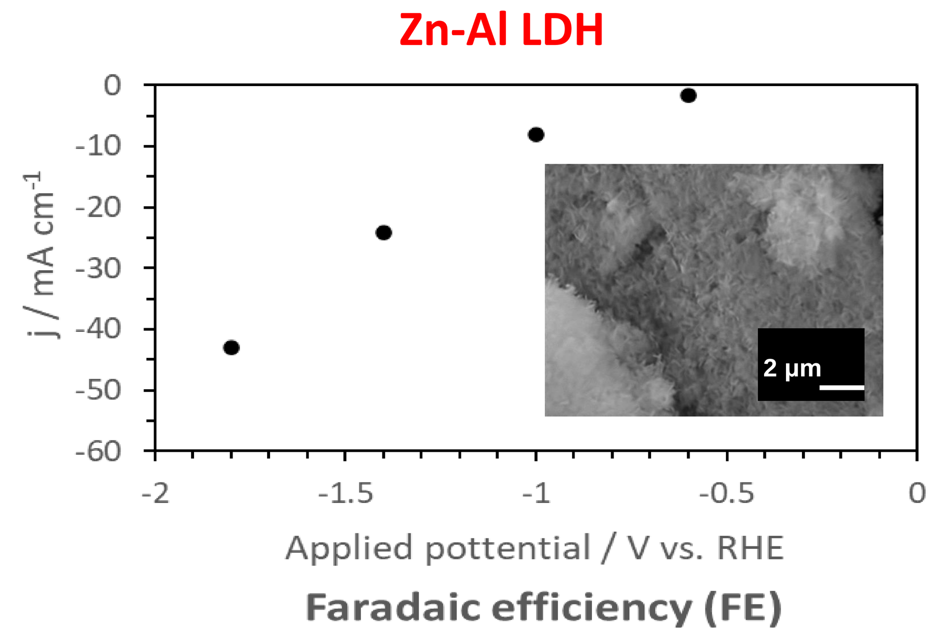


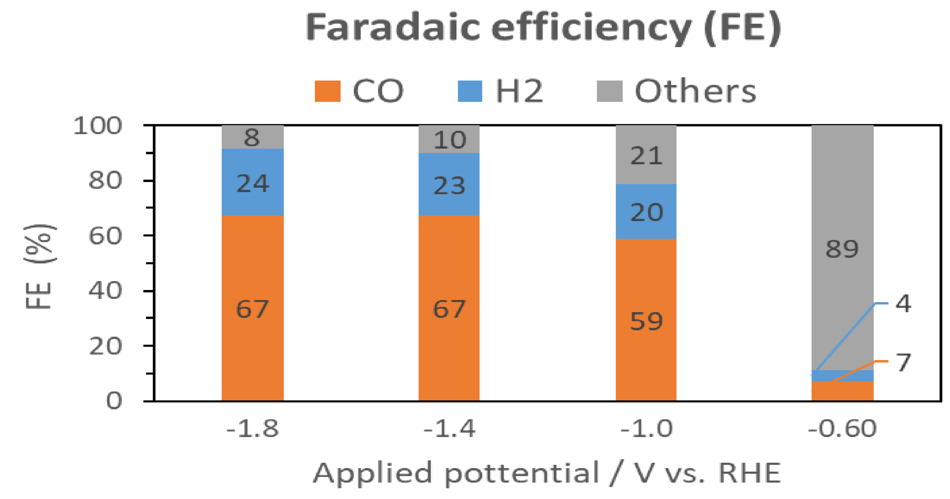
Electrocatalytic set-up reactor

Results



Zn-Al LDH shows a **67%** selectivity for **CO** and 92% selectivity for CO and H_2 at -1.4V vs. RHE with $KHCO_3$ as an electrolyte

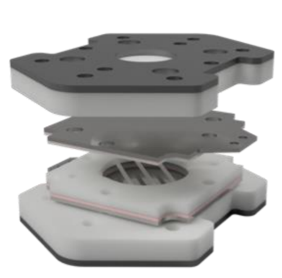




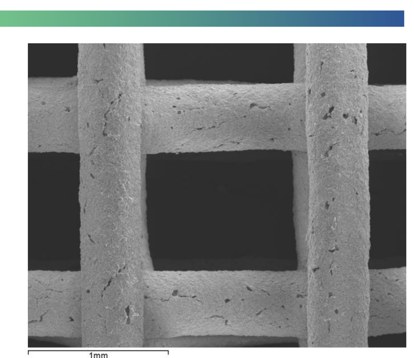
LDH (Layered Double Hydroxide)

- Variety of metal combination
- Large surface area
- High OH^- conductivity
- Stability in alkaline solution

Next steps...



- Electrocatalyst integrated in advanced catalyst carriers.
- Proof-of-the-concept.
- Life Cycle Assessment (LCA).



Conclusions

- The **Zn-Al LDH** is showing the best electrocatalytic performances with CO_2 affinity achieves up to 67% of selectivity for CO evolution**.**
- Preparation of a **customizable electrochemical cell**.
- Design and set up a test bench to carry out essays of CO2RR and monitoring carbon dioxide flues.

Acknowledgement and references

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[1] NAKAZATO, R., etl al. (2023). CO2 Electrochemical Reduction with Zn-Al Layered Double Hydroxide-Loaded Gas-Diffusion Electrode. Electrochemistry, 91(9), 097003-097003.