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Catalytic vs. electrocatalytic reduction of CO₂ to added-value products

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The increase of CO₂ concentration in the atmosphere after industrial revolution plays a critical role in global climate changes. Therefore, to mitigate CO₂ emissions into the atmosphere, CO₂ can be exploited as a raw material to synthesize high added-value products (*i.e.* methanol) [1]. The electrochemical reduction of CO₂ is a sustainable and technologically interesting process that, driven by renewable energy sources, can be used to capture and store both renewable energy and CO₂ in the form of chemicals or fuels [2]. However, the main challenge is to find a suitable electrocatalyst to establish this technology at an industrial level. In such context, our group have exploited the basic knowledge of thermochemical catalysis to understand the synergies between these two processes (see Figure 1) and make faster progress in the development of an optimal electrocatalyst [3]. A commercial catalyst (*i.e.* CuO/ZnO/Al₂O₃) active for the thermocatalytic CO₂ reduction to CH₃OH at P = 25 bar and T > 200°C (with selectivity ≤ 20%), was tested for the electrocatalytic CO₂ reduction at atmospheric conditions, demonstrating different products in the C₁-C₃ range with an overall selectivity (faradaic efficiency) of about 70%. Our results paved the way to the development of new and highly efficient electrocatalytic systems for CO₂ capture and utilization by electrochemistry.

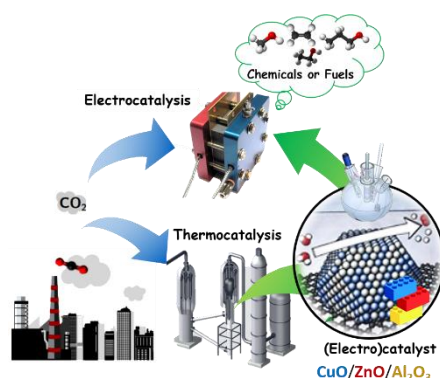


Figure 1. Synergies between thermo- and electro- catalysis for CO₂ conversion to added-value products.

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[2] I. Ganesh, *Renew. Sustain. Energy Rev.* **59** (2016) 1269-1297.

[3] A. Wieckowski, M. Neurock, *Advances in Physical Chemistry* (2011) 1-18.

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