3D printing porous electrode with functional coating for CO_2 reduction

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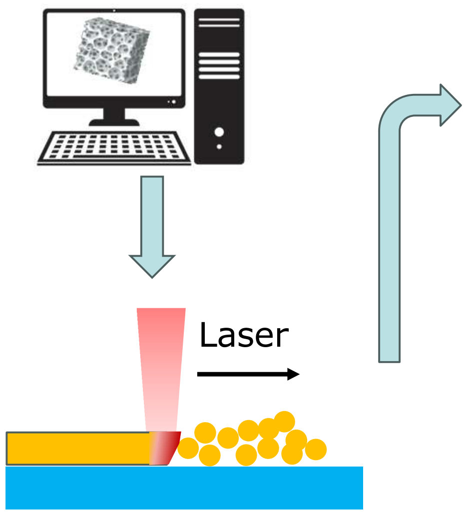
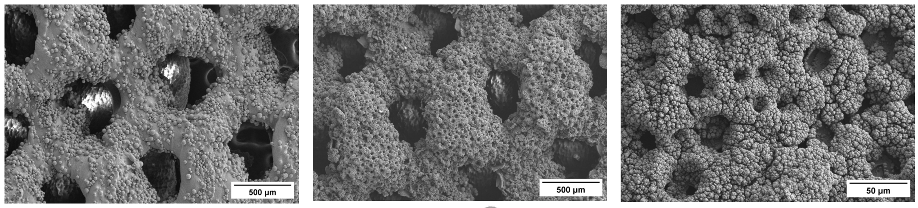
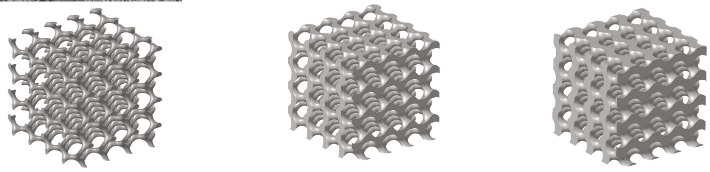
Background

- This research aim to combine 3D printing techniques with functional coating to improve the current/power densities CO_2 electrochemical conversion without sacrificing efficiency.
- Fundamental understanding of the impact of material architecture on overall faradaic efficiency, in particular mass transfer limitations.
- Improve the catalytic performance through the sophisticated precise tuning of plane porosity gradients, interconnected low-tortuosity pores, and multimodal pore size distributions.

Additive manufacturing: laser powder bed fusion (LPBF)

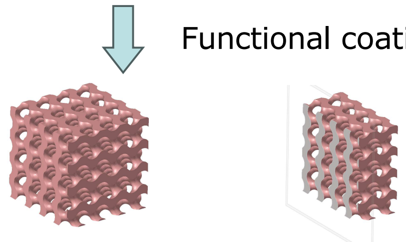




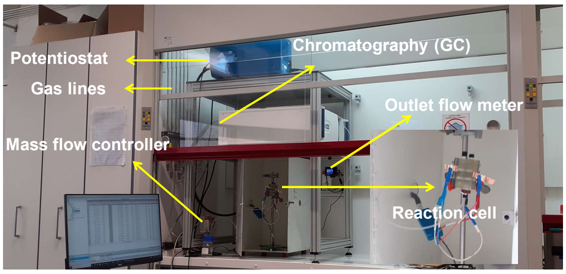


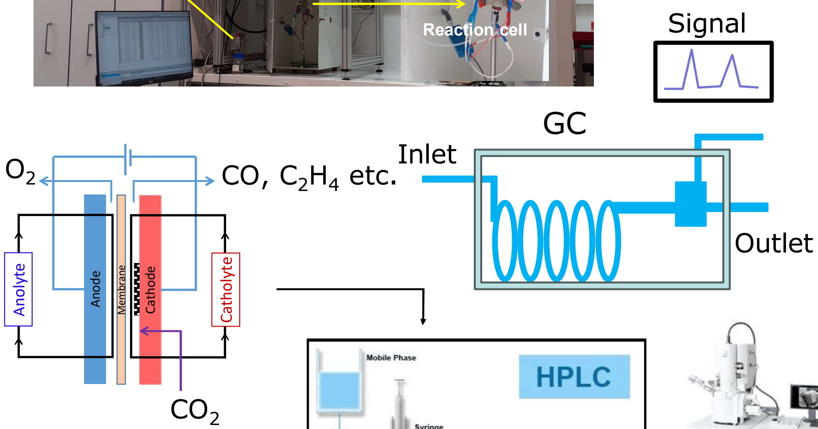
Porous materials with different pore sizes

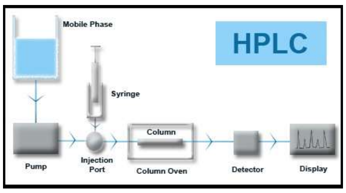
Functional coating decoration



Characterization and product analysis







Electrochemistry Product analysis SEM

Next step:

- Initially, Copper (Cu) nanoparticles will be deposited onto porous Ti alloy-based substrates through electroless deposition.
- Subsequent analysis will focus on elucidating the impact of varying pore sizes on the efficiency and resultant products of CO_2 reduction.
- These findings can facilitate understanding the effect of pore size and the simultaneous effect of co-catalysts on the product selectivity.

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