



TÉCNICO
LISBOA

Projeto Integrador de 2ºCiclo – MEFT 2024/2025

Design and Modeling of a Plasma Reactor for the production of O₂ from the conversion CO₂

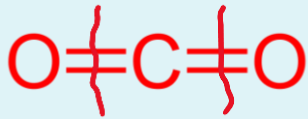
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Workshop MEFT

Project layout – Motivation and methodology

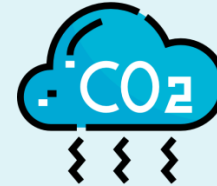
Problem

- High atmospheric concentrations of CO₂, leading to intensification of the greenhouse gas effect,
- High energy of the CO₂ molecular bonds.



Solution

- Use plasma discharges to promote the splitting of the CO₂ molecule, producing CO, CO and O₂,
- Couple with oxygen-conducting membranes, to isolate the oxygen and produce pure oxygen fluxes.

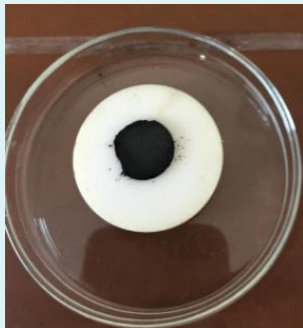


MIEC membrane production

LCCF



- Co-precipitation



LSCF



- Mechanical pressing

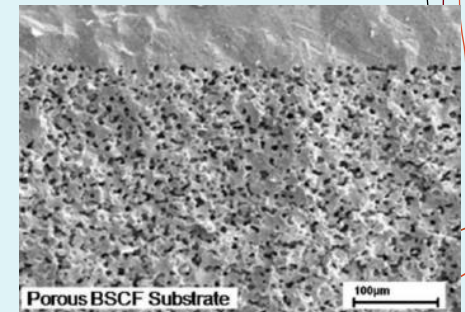
- Sintering at different temperatures,
- Production of various samples,
- Structure analysis using SEM



BSCF



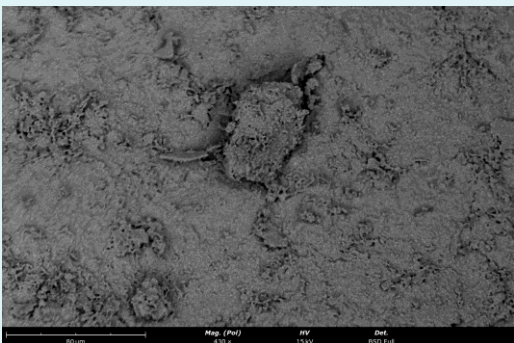
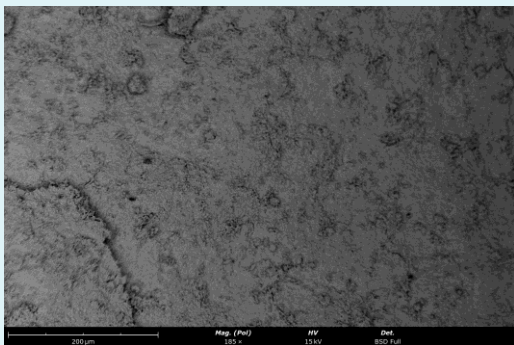
- Tape-casting using terpineol and ethylcellulose



Membrane characterization – SEM and XRD

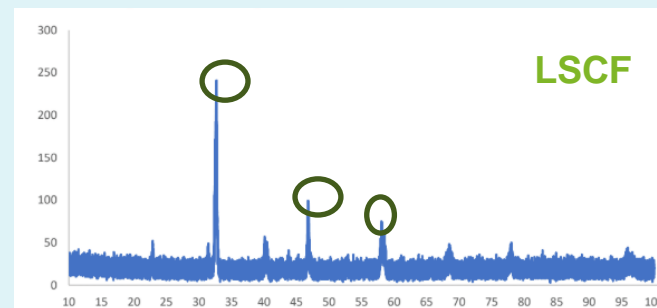
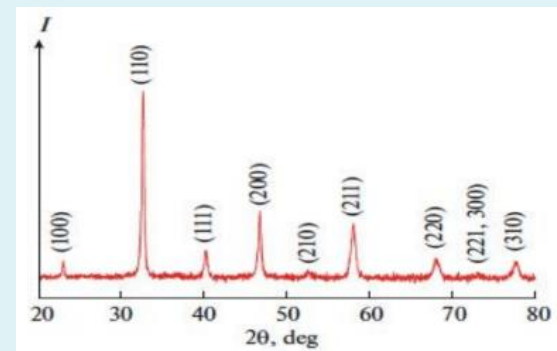
SEM

- To identify surface morphology and solid diffusion,
- For LSCF, no solid diffusion could be identified:



XRD

- To identify the formation of the desired chemical composition:



Plasma reactor prototype - CTN

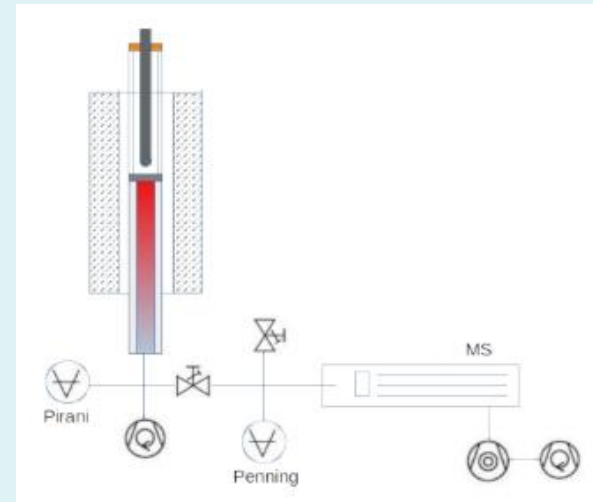
Progress

- At CTN:



- Assembly and testing of the vacuum system,
- Adhesion of a disk-shaped membrane to the quartz tube,
- Repair of the mass spectrometer.

Next steps



- Complete reactor simulation using Elmer FEM,
- Test new membrane compositions and reduce membrane diameters,
- Complete the assembly of the experimental set-up,
- **Make oxygen flux measurements.**



Thank you!

Any questions?