catCHy

EUROPEAN TRAINING NETWORK

Novel catalysts for CO_2 Hydrogenation and Electro-reduction

DTU

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Supervisor: Jakob Kibsgaard Co-supervisor: Christian Damsgaard

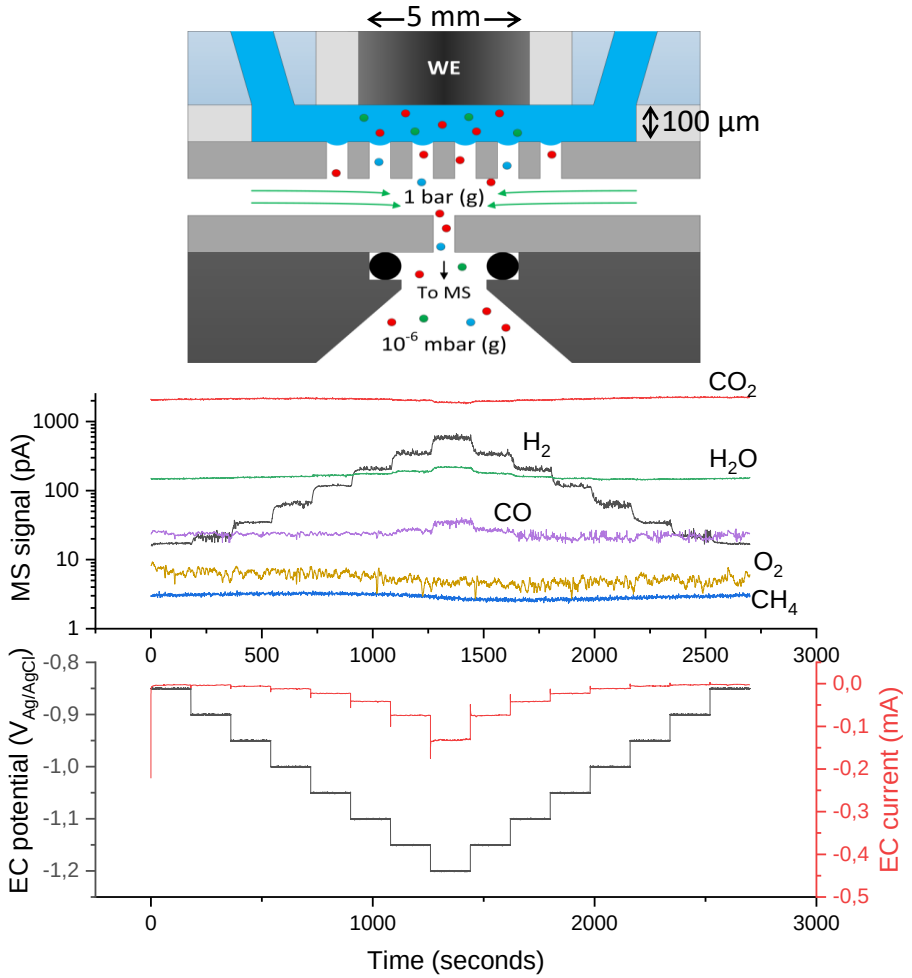
Testing activity of small clusters for electrochemical CO_2 reduction

Material chemist with previous experience in

- Synthesis of mesoporous zeolites
- Synthesis and testing of MoS_2 catalysts for HER
- Step-Scan FTIR for photocatalytic transient materials
- Set-up of European collaborative research projects

WP5
Catalyst Testing and Prototyping

Research progress



WP5. Catalyst Testing and Prototyping

- **Optimization** of the electrochemical cell coupled to mass spectrometer **for CO_2 reduction experiments** (change of MS for selective ionization, defining how to analyse liquid products)
- Electrocatalytic tests for CO_2 to CO reaction with monometallic and bimetallic clusters (Au based)
- Testing samples produced at DTU and at KU Leuven

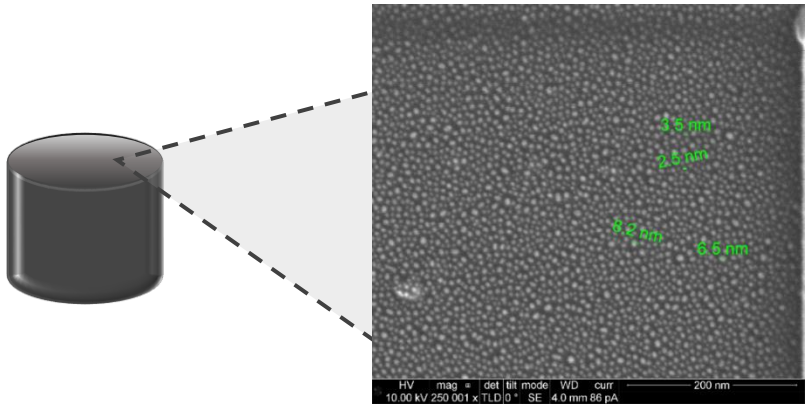
Research progress

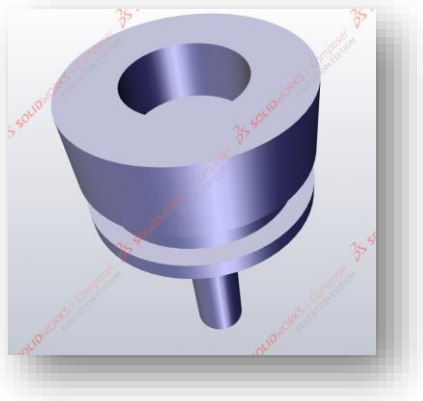
WP1. Cluster deposition

- Deposition of Au nanoparticles with sputter chamber to train in the EC-MS setup
- Study of compositions of interest for optimization of CO2R
- Learn about different types of cluster sources, mass selection techniques and sputtering systemes

WP2. Characterization of deposited clusters

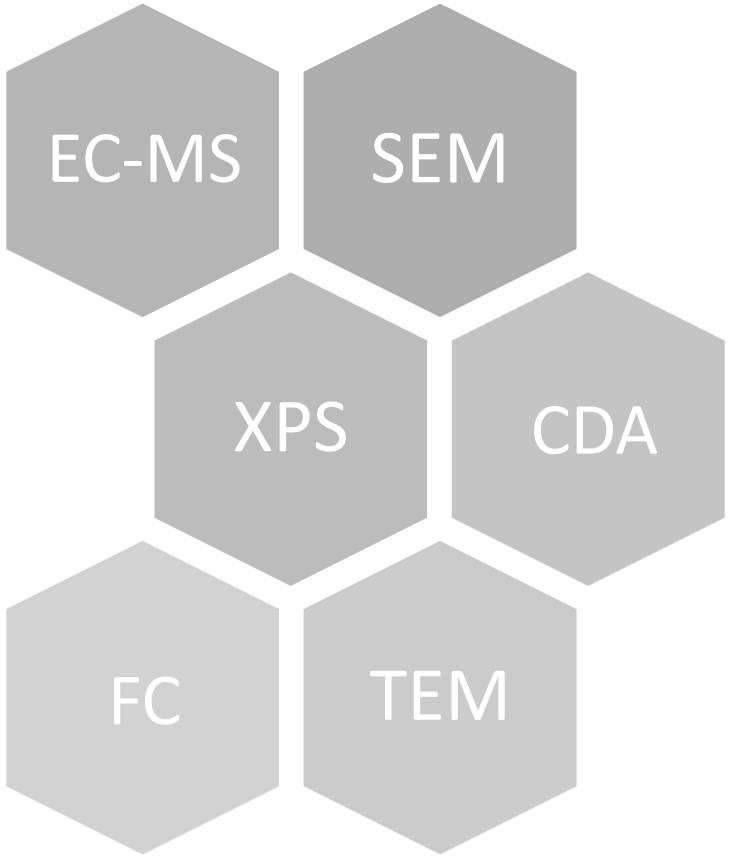
- Imaging of samples before and after electrochemical test by Scanning Electron Microscopy (SEM)
- Design and fabrication of SEM sample holder to avoid contamination





Past training

- At DTU: EC-MS setup with special protocol for clusters, sputter chamber for nanoparticle deposition, SEM for imaging of samples, introduction to XPS
- During my secondment at KU Leuven: laser ablation and magnetron sputtering setups for cluster deposition, introduction to electrochemical cells for scaling up at VITO, introduction to Transmission Electron Microscopy at EMAT
- Courses: Surface Science course (10 ECTS) and Journal Club (5 ECTS)



Plan for next months

Tasks	2022												2023
	J	F	M	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	
Cluster testing													
Improvement of EC-MS data treatment													
Training on the GC-MS for liquid products													
Cu clusters for CO_2R (size-selectivity studies)													
GRC conference (poster)													
Secondment at PSI													
Au clusters for CO_2 to CO (size-selectivity studies)													
Surfcat School (DTU)													
First bimetallic clusters for CO2R and COR (Cu based)													
Paper writing													