




# Master Thesis in Chemistry and Chemical Technology

## Design of experiment in optimization of constituents in high entropic oxides for CO<sub>2</sub> hydrogenation to methanol

We are seeking skilled and motivated young scientists willing to work on future proof topics dealing with sustainability and circular economy. You will be a part of a multi-disciplinary team and acquire first-hand information on your selected topic and beyond. We are offering positions for students with finished BSc degree in the field of Chemistry, Polymer or Process Engineering for pursuing their diploma/master's thesis on a part-time basis (10 to 20h/week), limited to 12 months. The expected monthly salary is EUR 2.407,00 (on a basis of 40h/week).

This thesis focuses on the synthesis and optimization of high-entropy oxides (HEOs) as heterogeneous catalysts for CO<sub>2</sub> hydrogenation to methanol. First, a novel shaping and synthesis method for HEO catalysts will be investigated, followed by a structured design of experiments (DoE) approach. An initial coarse DoE will be conducted to screen and evaluate the influence of each constituent, simplifying the vast compositional space. Based on these findings, a refined DoE will then target the most impactful constituents for further optimization. Once an optimal composition is determined, activation protocols will be studied to enhance catalytic performance in CO<sub>2</sub> hydrogenation.

For further details see next pages 



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## CHASE your future

You will contribute to the following tasks:

- Develop a shaping and novel synthesis process for high entropic oxide catalysts.
- Perform a design of experiment for the composition of a selected high entropic oxide.
- Evaluate the catalytic performance of high entropic oxides in the hydrogenation of CO<sub>2</sub>.
- Study catalyst activation protocols to further optimize the catalysts.

Your expertise:

- Proficiency in statistics and setting up and analyzing DoE
- Background in characterization of materials including surfaces and crystal structures
- Hands-on skills in operating pressurized catalytic reactors
- Good analytical and problem-solving skills
- Independent and structured workflow
- Effective communication skills in both English and German



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## CHASE your career

We are committed to providing a framework for your professional growth:

- Engage in cutting-edge research to develop heterogeneous catalyst for the hydrogenation of CO<sub>2</sub> and contributing to carbon circularity.
- Earn a competitive salary while researching CO<sub>2</sub> abatement strategies.
- Work alongside academic professionals and industry partners building your expertise in heterogeneous catalysis, materials science and sustainability.



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