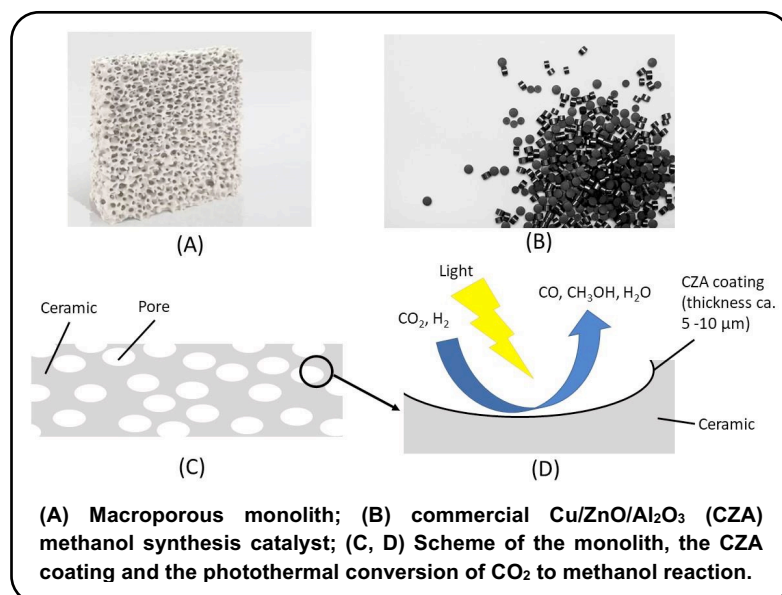


Preparation and characterization of monolithic Cu/ZnO/Al₂O₃ catalysts for photothermal CO₂ conversion



The master thesis will be a cooperation between the Erlangen Center for Interface Research and Catalysis, led by Prof. Dr. M. Hartmann, and the group of Prof. Dr.-Ing. Ulrich Ulmer at the Technische Hochschule Nürnberg. Direct supervisor will be Florian Wisser.

Photothermal catalysis exhibits potential advantages compared to traditional heterogeneous or photochemical catalysis: Reaction rates can be increased, and product selectivity can be stimulated by

opening photochemical pathways. The result is a significant reduction of the activation energy as compared to the reaction in the absence of light.

The master project will involve the preparation of monolithic catalyst supports (silica- or alumina based) and the subsequent deposition of a Cu/ZnO/Al₂O₃ (CZA) catalyst from suitable sol-gel precursors on the laboratory scale. Synthesis parameters will be optimized to obtain catalyst supports with a high degree of macroporosity. The chemical surface structure will be thoroughly investigated by various analytic characterization techniques, including infrared and solid-state NMR spectroscopy, while phase composition shall be studied by powder X-ray diffraction. *In situ* and *operando* analytic techniques (infrared spectroscopy, X-ray diffraction, UV-Vis spectroscopy, solid-state NMR spectroscopy) will give insight into the catalyst structure and behaviour under operating conditions. In parallel to the master project, the catalyst shall be investigated in a photothermal test stand at the Technische Hochschule Nürnberg.

We are looking for an interested and independently working student (m/f/d) from chemical engineering or chemistry with preliminary experience in material synthesis. Preparation of the materials and characterization will cover 50 % of the practical work each. A thorough work approach and a good grasp of scientific literature in English are assets. The thesis can be written in English or German. First possible starting date is August 1st 2023. If you are interested, please contact Florian Wisser (florian.wisser@fau.de).