



Institut de recherches sur la catalyse et l'environnement de Lyon

Development of nitride nanocatalysts for the hydrogenation of CO₂ to methanol

Contexte général

This internship will be carried out at IRCELYON, in CDFA and ECI2D teams. The valorization of CO₂ is receiving a growing attention due both to environmental concerns and the potential of this molecule as an economical and renewable C₁ building block. The catalytic hydrogenation of CO₂ can generate invaluable fuels and chemical intermediates, such as methanol. Recently, transition-metal carbide and nitride catalysts have shown good performances for hydrogenation reactions. The aim of this project is the development of transition-metal nano-nitride catalysts for the hydrogenation of CO₂ to methanol.

Description du projet de recherche

Supported nitride catalysts will be prepared by impregnation of the metal (Mo, W) precursor onto an oxide support (TiO₂, ZrO₂, ZnO) at room temperature, followed by reduction and nitridation steps: the material is placed in a furnace and undergoes a gradual thermal treatment under a flow of 20% v/v N₂/H₂, followed by passivation with 1% v/v N₂/O₂. Nitrides can exhibit different phase structures and a number of preparation parameters can influence their structural and textural properties. The conditions of the treatment, such as gas composition, gas flow rate and temperature program will be varied in a systematic manner and their impact on the crystallographic phase will be investigated. The catalysts will be characterized by ICP, XRD and elemental analysis. The catalytic properties of the prepared materials will be evaluated for the gas-phase hydrogenation of CO₂ to methanol in a flow-fixed-bed high-pressure reactor equipped with an in-line micro gas chromatograph (μGC). With this project we want to investigate the influence of the synthesis procedure of nitride systems on the catalyst response.

Profil du candidat

Engineer or Master chemist or physical chemist. The student should have knowledge in heterogeneous catalysis and materials science. The student should be enthusiastic, methodical and show skills in problem solving when carrying out experiments.

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