Post-doctoral project:

Hybrid organic-inorganic silica monolith for supported catalysis in flow chemistry

Laboratory: iSm2 – Institut des Sciences Moléculaires de Marseille (France)

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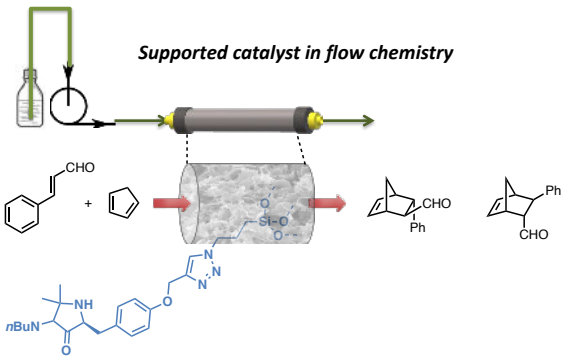
Context:

Nowadays, catalysis plays an increasingly important role in the chemical industry to meet the ever-increasing demand of environmental safety and energy efficiency. Homogeneous catalysis is the most efficient for yield and selectivity of the reactions. The problem with this type of catalysis is the difficulty in the separation of the catalyst from the reaction mixture, which could make the purification of the product very complicated and therefore the process longer and expensive. To solve this problem, supported catalysis is presented as a good alternative because it eases separation of the catalyst and its recycling.[1] The advantages of supported catalysts can be applied to flow chemistry,[2] and be combined with the advantages of the microreactors.[3]

The project will focus on the development of heterogeneous continuous flow chemistry using hybrid organic-inorganic monolith having hierarchically controlled porosity. ***The novelty of the project resides in the direct inclusion of these monoliths in a device that will allow the supported catalysis in the flow system***.

Functionalized silica monoliths are part of the family of nanostructured materials.[4] They are prepared by creating controlled hierarchical porosity at a micro, meso and macro scale,[5] which optimizes heat and mass transfer, enhances the accessibility to the active sites and decreases diffusion issues. When used in a flow system in catalysis, these materials exhibit a perfect plug-flow profile with excellent control of the contact time. Improvements in monoliths conditioning must be achieved. This casting expertise relies mostly on material engineering, but ***the implementation of new material formulation methodologies must be accompanied by a scientific approach to obtain fine-tuned hierarchically porous materials*** based on the expertise of the lab.[6]



Objectives:

- Optimization of sol gel conditions with various organosilanes mixtures.
- Casting of functionalized monolith within host reactor and characterization.
- Monoliths post-functionalization for catalysts preparation.
- Supported catalysis in flow system.

Keywords: organic synthesis, sol gel process, material characterization, (enantioselective) catalysis, flow chemistry

Duration: 12 months (renewable) starting in January 2024.
The project is in collaboration with the Galtenco Co.
Application to be sent to the coordinator before 1st December 2023.

References:

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