

Project 3.1. Supramolecular catalysis on the surface of colloidal particles

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Background:

Enzymatic catalysis has always been the Holy Grail for chemists. Although thousands or even millions of synthetic catalysts have been developed so far, they are still inferior to the activity and selectivity of their natural counterparts. This is primarily due to the primitive structure that impedes the molecule undergoing chemical transformation, the so-called substrate, to fit the active site of the catalyst. Another issue that is often troublesome is the selective supply of substrates and the removal of products from areas where a chemical reaction occurs. In our project, we want to improve the processes described above based on the mechanisms available in nature. Using simple organic molecules and inorganic particles, we look forward to creating dynamic catalytic systems that are comparable in size and activity to enzymes. We hope that such catalysts, due to the dynamic nature, will not only be able to rival but also surpass enzymes, demonstrating differentiated selectivity for substrates or products depending on their structure and local chemical environment.

Aim:

The candidate's task will be to investigate the catalytic activity of macrocyclic compounds confined on the surface of inorganic nanoparticles. Briefly, the successful candidate will perform the synthesis, characterization, binding studies, and catalytic experiments, as well as will be responsible for the processing (data analysis) and dissemination of the obtained results (writing reports and publications).

Requirements:

- the successful candidate shall have a university degree in chemistry, and the professional title of magister (or equivalent) obtained no earlier than two years before the application.
- the successful candidates shall have a background in organic chemistry, preferably in supramolecular chemistry; publication record and experience in the synthesis of nanoparticles are welcome; good command of English is required.