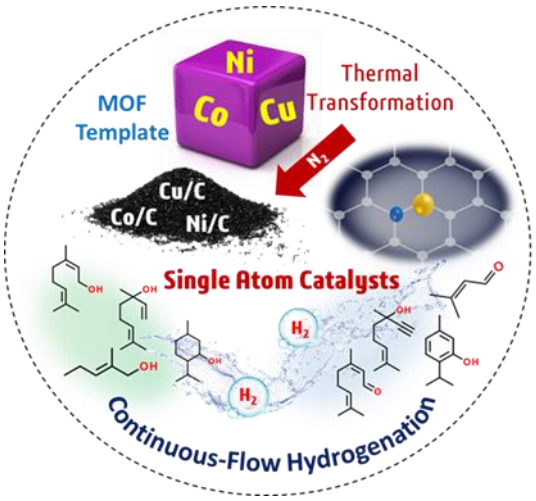

The focus of catalysis research is on achieving 100% selectivity for the desired product. It is especially important in the synthesis of fine chemicals and medicines. These processes often require sharp chemical transformations, suppressing side paths while being selective to particular functional groups in multi-functionalized molecules. This principle shall also apply to catalytic hydrogenation (HD) which is very important methodology used in production of fine and pharmaceutical intermediates. It is estimated that 25% of chemical transformations involve at least one hydrogenation step, so it is not surprising that HD is one of the most studied topics in catalysis. The diamond in the crown of **catalytic hydrogenation** transformations is the **chemoselective** hydrogenation of C=C or C=O double bond in the substrate, which contains two or more functional groups like unsaturated ketones, aldehydes, or esters. Therefore, **the main goal** of the proposed project is to create a fundamental basis for the **synthesis** of novel and economical **Cu, Co or Ni single-atom catalysts ,** active in **continuous-flow hydrogenation** of the precursors of relevance to the **fine and pharmaceutical industries**. This project is pioneer in two aspects: the synthetic part and the development of selective continuous-flow hydrogenation reactions catalysed by proposed materials.

The implementation of the project includes successively the synthesis of the new class of catalysts to obtain nitrogen-doped porous carbon materials containing single-atom (Cu, Co, and Ni), investigation their activity and selectivity in continuous-flow hydrogenation of α,β-unsaturated aldehydes. Our research will be focused on chemoselective hydrogenation of **prenal** to **prenol** (unsaturated alcohol, *an intermediate to pharmaceuticals and fragrances synthesis*), chemoselective hydrogenation of **cinnamaldehyde** to cinnamyl alcohol (*an important intermediate in cosmetics production*) and chemoselective hydrogenation of **citral** towards **citronellol** (*widely used fragrance used in cosmetics, and as a fragrance additive to washing powders and other cleaning agents*) or to isomers: **geraniol** (*chemical with antimicrobial, antioxidant, anti-inflammatory properties, suggested also to represent a new class of chemoprevention agents for cancer*) and **nerol** (*widely used in perfume synthesis*).

The planned research will allow to create a relationship between the structure, morphology, and physicochemical properties of new catalysts to optimize their performance for applications in continuous-flow hydrogenation. We are convinced that the proposed goals have a **high potential for success**, and the outcomes will **be pioneering** and of great significance for practical applications and fundamental science. This project is a part of the current global trend in **green chemistry** research, which is concentrated on affording simplified workup and large-scale synthesis (scalability), handling of various substrates in sequence with the same catalyst, and reduction of catalyst amount.