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'Liquid-phase chemoselective flow hydrogenation over resin supported catalysts for synthesis of industrially relevant chemicals'

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The aim of presented work was to design and develop an integrated and comprehensive catalytic continuous-flow system applicable in chemoselective hydrogenation of polyunsaturated aldehydes; hence, in process of high relevance for chemical industry. In this transformation, α,β-unsaturated aldehydes are subjected to competitive C=O vs C=C saturation within the same molecule. Depending on which unsaturated bond is selectively hydrogenated over a catalyst, the reaction may yield various intermediates used in pharma and cosmetics.

Demonstrated methodology includes set of consecutive protocols thoroughly described in subsequent chapters of the dissertation. Each of those chapters is dedicated to constituent step, such as catalyst design and preparation, catalytic flow reactions and *in-situ* catalyst modification. Therefore, the work collates extensive strategy for optimization of catalyst performance in liquid-phase flow processing.

Catalyst was designed to meet demanding continuous flow conditions, as well as, to display high selectivity in above-mentioned reaction. As a result, novel Ni based catalyst was prepared by combining metal nanoparticles and functionalized polymeric resin support. The material was found highly selective towards alkenyl bond saturation and showed better product specificity than adequate Pd material. All catalytic reactions and reaction conditions optimizations were conducted in continuous-flow micro-reactor suitable for hydrogenation processes.

Application of continuous flow, as an alternative to conventional batch operating, introduces significant improvements in studies on catalytic system, leading to high process intensification. In this light, compact and intensified method for structure sensitivity investigation in flow micro-reactor was proposed. In this approach, resin supported catalyst can be modified in sequence with catalytic reaction, hence, it is possible to estimate the optimal catalyst morphology for a given process in short time with low expenditures.

To conclude, the dissertation presents unified strategy for intensified catalyst investigation in liquid-phase flow conditions. By following this methodology, new and efficient catalytic system was demonstrated for highly selective production of value-added chemicals relevant to pharma and cosmetics.