Synthesis of Organosilicon Compounds - From Classical Catalysis to Electrocatalysis

In general, the catalysis enables more effective progress of desired chemical processes by lowering their activation energy. The typical catalysts in organosilicon chemistry, regardless of their nature (homo- or heterogeneous), are usually associated with the compounds of the 4d/5d metals (*e.g.*, Pt, Pd, Rh, Ru, *etc.*). This follows, in particular, from their properties such as electronic structure, ease in changing the oxidation states, the activation of reacting molecules, as well as the possibility of introducing specific ligands which ensure the widely understood selectivity. The dynamic development of knowledge on the catalysts' properties has contributed to the progress of synthetic and material chemistry, thereby allowing the introduction of several innovative solutions in the chemical industry. It also enables a better understanding of the mechanism of the reaction.

The progress of knowledge which has taken place in the field of chemical sciences has also influenced chemical synthesis in terms of environmental protection and sustainable development. Such an approach is contrary to common catalysis based on precious noble metals including palladium, platinum, or rhodium. Consequently, scientists boldly tend to use Earth-abundant species such as coordination compounds of 3d metals. Thereby, an increasing number of methods has been developed where these complexes can even outperform their 4d/5d metal counterparts. Moreover, given a period of increased prices on precious chemical additives and oxidants, electrochemical approaches are currently experiencing a genuine renaissance. Thereby, metalla-electrocatalysis and electrosynthesis set the stage for molecular synthesis with unique levels of resource economy (*e.g.*, chemicals, wastes, energy, *etc.*).

In view of the above, this project seeks to expand the knowledge about organometalloidal synthesis by using catalytical methods (coordination compounds of copper or nickel), as well as electrochemical approaches (electrosynthesis and electrocatalysis), which generally means a fresh impetus for the whole organosilicon synthesis. The notified project envisaged the synthesis of a wide range of functionalized organosilicon derivatives connecting the organic and inorganic fragments into a single hybrid entity of unique properties. It is to be expected that a deeper insight into the utilization of 3d metal complexes and electrochemistry will be a crucial step toward more sustainable chemical synthesis.