THE POPULAR-SCIENCE SUMMARY OF THE PROJECT

The worldwide research tendency is to move-away from the use of precious metal catalysts. The prices of noble metals have always been high, what is likely to be unchanged. Therefore, the catalytic processes requiring these metals usually are extremely expensive and only few of them have been used on an industrial scale. What is more, a lot of such processes feature harsh reaction conditions and long-time of the synthesis. In the meantime, this situation stimulated broad interest in the search for novel complexes that would contain more abundant, lower-cost metals (e.g., cobalt, manganese, iron and etc.), and would catalyze reactions in shorter time under milder conditions. And that seeking is one of the greatest challenges for current homo- and heterocatalysis.

Recently, the development of complexes having in its structure pincer-type ligands has received great attention. They are synthesized not just for their eye-catching structures or for scientific interest, but for their real application in the catalysis. These complexes are extraordinary stable in a wide-range of temperatures. Their coordination sphere prevents metal dissociation, which makes their decomposition very difficult. The possibility to control electronic and steric properties of ligands has also become highly important. This possibility resulted in designs of a large number of complexes with numerous functional groups. Most of them are outstandingly active and selective in catalysis. They are applied in the synthesis of molecular or macromolecular organic and organometallic compounds.

The idea of the project is to use the inexpensive and easily accessible cobalt complexes in the cross-coupling processes of unsaturated organosilicon and organogermanium compounds. Furthermore, the new catalysts are planned to be used in the hydroelementation reactions, that represent the atom economic addition of compounds containing E-H bonds (E = Si, B and Ge). The possibility of successful addition of mentioned compounds will allow design of novel synthetic procedures that would lead to a wide-range of unique and targeted chemicals or materials. Such compounds are in high demand as pharmaceuticals and fine-chemicals (or their precursors). Most of them are currently synthesized by using extremely expensive catalysts based on precious metals (e.g., ruthenium, rhodium, palladium, platinum and etc.).