DESCRIPTION FOR THE GENERAL PUBLIC

Organosilicon compounds are of great and profound significance in modern world and may be found in many aspects of our daily life, whereas silsesquioxanes are their specific derivatives. It is vast group of compounds of diverse architecture, that is described as hybrid systems, i.e. of dual nature, combining organic and inorganic features of present segments. Functionalized silsesquioxanes are a group of compounds that are now recognized to have an enormous potential as building blocks and synthons for a variety of advanced materials, and their popular applications can be found, i.a. in the areas of catalysis, material science, bioscience and medicine. Interesting and specific physical and chemical properties, e.g. very good thermal stability, good solubility, non-flammability, oxidation resistance, good mechanical and optical characteristics and many other features allow their application. Research and industrial laboratories are focused on development of selective and effective synthetic procedures for obtaining of the abovementioned compounds. In recent years, the number of reports on the synthesis of hybrid materials with variety of applications has been growing rapidly, however, it still meets unknown perspectives.

The project is focused on the selective synthesis of novel, tetrafunctional double-decker type of silsesquioxanes (DDSQ-4Si), in which the Si-O-Si core is a scaffold for organic reactive groups (FG). The uniqueness of methodologies proposed lies not only in exploitation of new, tetrafunctional DDSQ-based compounds but also in elaboration of catalytic systems for their further modifications that have never been applied in the transformations of these group of silsesquioxanes. The type of the process applied will depend on the kind of FG anchored to the DDSQ core. As a result, a wide range of new molecular DDSQ-4Si-derivetives will be developed within the project's research tasks that will serve as precursors for further transformations, incl. determination of their properties and reactivity. They will be researched in possibility to form macromolecular DDSQ-4Si-based organic-inorganic frameworks, for *d*-block metal complexes immobilization and also chemistry of dendrimers. Results of the research work within this project contribute to the extension of knowledge on the methodology for functionalization of DDSQ silsesquioxanes, as platforms in the synthesis of new hybrid materials of unique architecture and interesting physical properties as highly specialized materials, so-called. „*fine-chemicals*".