Synthesis of new functionalized polyolefins

Polymeric materials have become a permanent part of everyday life and are its an indispensable element. Currently, more than about 150 million tons of polyolefins are produced worldwide per year, the majority with the help of catalytic reactions. Containing only carbon and hydrogen atoms, polyolefins such as polyethylene (PE), polypropylene (PP) are sustainable materials, light in weight and of a wide variety of applications. However, scientists are still working on the synthesis of new materials of tunable properties, for application in special materials.

The above-mentioned polyolefins contain only C-C and C-H moieties, which significantly limits the possibilities of their further modifications. Therefore, the aim of the proposed project is to develop an effective method for the synthesis of functionalized saturated polymeric hydrocarbons. The project is particularly directed towards the synthesis of new types of polymers which, in their structure will include attractive functional groups such as amine, chloroalkyl, fluoroalkyl, epoxy or alkoxysilyl. The goal of the project can be achieved by using of sequence of catalytic reactions, in which each of the processes will fulfill a different function in the discussed synthetic pathway. Moreover, in order to reduce the cost of synthesis, reactions will be performed in *one-pot* protocol, in the presence of one type of catalyst, which will promote all planned transformations.

Properties of obtained polymers will be examined and the results will be compared with those of the reference polymers without functional groups. This will allow us to study the influence of the introduced groups on the properties of the final materials. Moreover, incorporated groups will be responsible for the formation of chemical bonds to the surface of inorganic material (glass or metal or ceramic) and would allow further modification by the co-polymerization, substitution or crosslinking.

Development of a simple, high yield and selective methodology for the synthesis of functionalized polyolefins will be a breakthrough in polymer chemistry, and thus will be crucial in the synthesis and designing of new materials. The project fits in the ambitious challenges of catalysis and material chemistry (highly efficient and selective synthesis functional precursors for synthesis of new materials) and is expected to contribute to the knowledge of modern methods of chemical synthesis.