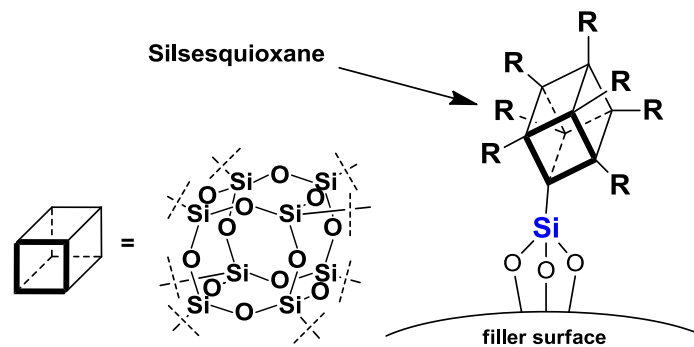


Synthetic materials are used in production of great variety of different products. Due to new compositions and method of manufacturing, polymer and composite elements become replacements for their metal equivalents. Polyethylene is a thermoplastic polymer most widely used for production of foils, packages, containers, cables and more. Polypropylene found its applications for production of fibers, filaments, coatings, medical equipment and more. Epoxy resins are used as adhesives, isolating coatings, varnishes, in production of electronic and moulded elements. Manufacturing of polymer products is associated with the costs of starting materials (polyolefins for thermoplastics or substrates for epoxy resins). To reduce the costs, fillers are added to polymers, to replace a fraction of mass (volume) of produced material-such produced compositions are known as composites. Besides cost reduction, fillers may fulfill some special functions, such as improvement of mechanical or thermal properties or colour change.

A limitation associated with the fillers usage is their ability of dispersing in polymers. Above specific content, they have a tendency of forming agglomerates or even particles that impair product utility and visual qualities, which is highly undesirable.

The goal of this project is development of new fillers based on simple inorganic materials (SiO_2 , TiO_2 , CaCO_3), modified with Polyhedral Oligomeric Silsesquioxanes (POSS). POSS are nanometric-size molecules, sometimes called „molecular silicas”. The core is surrounded by functional groups, which, properly selected, may react or interact with materials surface. In this case, properly modified POSS systems may play a role of Surface modifying agent for the fillers, which will improve their dispersion properties in the chosen polymers (polyethylene, polypropylene and epoxy resins). It will allow for higher dosage of the fillers into composite materials. Such obtained fillers and composites based thereof will be subjected to a series of mechanical, thermal spectroscopic and weathering experiments. It will provide the feedback on the impact of the prepared fillers on the parameters of the obtained composite materials.



The scientific subject of this project proposal has been chosen out of necessity of knowledge development on the topic of polymer and composite materials, finding new solutions for production of novel materials for special applications and reducing cost of materials production.