New Nanoparticles with Superparamagnetic Properties as Heterogenic Palladium Catalysts for Reactions Performed in Water.

Have you ever wondered how are the pharmaceuticals produced? Why some of them are very expensive? Excluding copyright and margin, the cost of the chemical process is the one which heavily influence the price of a drug. The majority of chemical reactions which are used in drug industry require utilization of catalysts. Catalyst is a substance which is added to a chemical reaction in order to increase its rate. Without it the reaction is less efficient or do not occur at all. Notwithstanding the small amount of catalyst which is used in the reaction, usage of it is in general expensive. For the purpose of lowering the costs of drug production the reusability of catalyst can be considered (since they are not consumed during reaction). It is expected that catalyst should have the same catalytic activity after the recycling, furthermore the rapid and easy separation procedure from reaction mixture is required.

This project is focused on improvement of some properties of catalysts. It is planned to immobilize the catalyst on the surface of magnetic nanoparticles – particles which are even smaller than bacteria. The nanosize of particles (*i.e.* solid phase) is very important because the greater size of solid phase the activity of immobilized substance is lower. Additionally, magnetic nanoparticles can be attracted by magnet which leads to fast and efficient separation. On the other hand, it is also a good idea to utilize a cheap and efficient technique for immobilization of catalyst on the surface of nanoparticles. Taking that under consideration the polymerization reaction is the best candidate. The polymeric materials are commonly used and are easy to prepare. This approach will allow introduction of plenty of catalyst moieties into the surface of solid phase. As a consequence, prepared material should exhibit good catalytic activity and be easily separable from the reaction mixture. The activity and reusability of obtained catalysts will be tested in very important chemical reactions i.e. C-C coupling reactions. These reactions provide making new carbon-carbon bonds and are broadly used in drug synthesis and chemical industry.

Additionally in this project ecological aspects of proposed new catalysts is considered. It is planned to test catalytic activity in water of obtained material. Water is non-toxic, abundant and the cheapest solvent. Its usage in synthesis will help lowering costs of chemical processes but only if all of impurities (after providing a reaction) will be separated from it. Concept of modern catalyst, which is herein proposed, describes stable and active in water catalytic system. Usage of magnetic solid phase catalyst and emulsion stabilizers will be separated from reaction mixture thus water will be purified from reaction residuals.

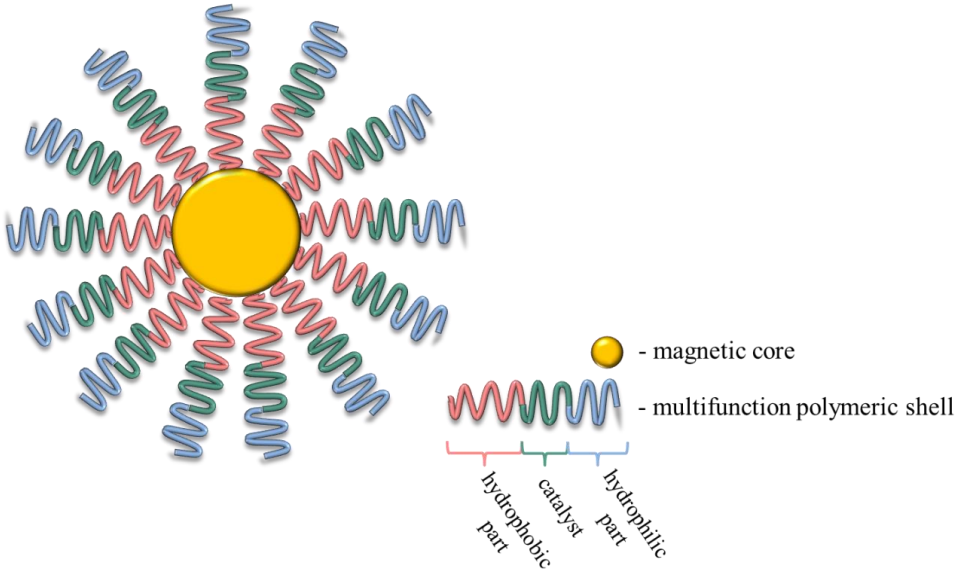

Figure 1: Concept of modern catalyst, active and stable in water.