DESCRIPTION FOR THE GENERAL PUBLIC (IN ENGLISH)

The aim of the project entitled "Study on the properties of iron and copper nanoparticles synthesized by means of catechin and gallic acid" is to develop a new and non-toxic method for producing nanoparticles on a laboratory scale, using natural compounds from the group of polyphenols as an alternative to toxic chemical reagents. Both catechin and gallic acid as antioxidants found in many plants have the natural ability to reduce oxidation, and thus to transform metal ions into metal atoms, and produce metal nanoparticles with diameters lower than 50nm. Therefore, polyphenols may replace the commonly used chemical reducing agents, such as sodium borohydride, whereby the synthesis of nanoparticles will become more environmental-friendly.

Nowadays, there are many reports in scientific literature relating to the production of nanoparticles with the application of natural plant extracts such as for example green tea extract instead of chemical reluctants. Such methods, however, are as many as plant extracts, and they so far has not been standardized. Thus, the physicochemical properties of such nanoparticles may vary depending on the extract composition, while there are biological compounds other than polyphenols present in a particular plant which may affect them. A large-scale implementation of the “green” production of iron and copper nanoparticles for specific applications in medicine and catalysis requires a number of basic studies for the development and investigation of new methods of synthesis of nanostructures with pure polyphenols as reductants. It can lead to the repeatability of their quality and quantity.

This study investigates the surface chemistry of nanoparticles synthesized with catechin and gallic acid and their impact on nanoparticle functionality due to forming a surface polyphenol corona. The polyphenol corona may be formed by either a complexation of metal ions with simultaneous reduction of their degree of oxidation, or the adsorption of antioxidants on the surface of nanoparticles. Thus, the growth rate and the shape of NPs are controlled by the presence and activity of polyphenolic compounds, leading to obtaining a narrow distribution of nanoparticle size and uniformity of their structures.

An important part of this study will be an application of ultrasound for crushing nanoparticles aggregates, and an evaluation of the effect of ultrasonic exposition time on the stability of nanoparticles and polyphenol corona.