DESCRIPTION FOR THE GENERAL PUBLIC (IN ENGLISH)

An intense development of **nanotechnology** is followed by searching for new applications for nanoparticles, including **carbon nanoparticles**, which are being discovered or produced. They are mostly associated with possibilities for innovative electronics and the idea of their application for biomedical sciences are quite recent, similarly to the studies on their biological properties. Conducted studies are focused for example on the anticancer activity, employing them as a functional drug carriers or materials for scaffolds in tissue engineering, depending on the form of used nanoparticles. This results from the fact that carbon nanoparticles are made of various **allotropic forms of carbon**, such as **diamond**, **graphite** or **graphene**, what determines their different structure on the atomic level, and their different physicochemical properties and the behavior in biological systems as a consequence.

Nanoparticles of diamond, graphite and graphene oxide are generally considered biocompatible and they did not revealed toxicity on animal models, however, the safety of their employing depends not only on the direct impact on an organism, but also on the impact on metabolism of xenobiotics which reach the organism, like co-administrated drugs for instance. The mentioned physicochemical features, which is for example large active surface, which is rich in moving freely electrons, or the various amount of functional groups in particular nanoparticles, might induce non-specific interactions between the nanoparticles and some of proteins. It is an issue especially within the liver, where the nanoparticles are transported to, like most of the xenobiotics, since it is the liver which is the main site of their metabolism and **cytochrome P450 enzymes (CYPs)** are playing the main role here. Occurrence of the physical interactions between them the nanoparticles may lead to enzymes inhibition by blocking an active site of the access to it in the enzymes, resulting in changes in metabolism of its substrate. An effect can be visible as an unwanted increase or decrease of a drug or its metabolized form in the body fluids. **Interactions between the nanoparticles and CYPs have been barely studied yet**. To present day, among published works concerning carbon nanomaterials, there are only articles about carbon nanotubes, and there is no studies on diamond, graphene or graphite nanoparticles. The topic is novel and every basic research on the mechanism of such interactions are valuable and important.

Due to the lack of such studies, **the project will significantly contribute to broadening the interdisciplinary knowledge of nanotechnology, biomedical disciplines and physic chemistry**. The knowledge of the degree of interactions between CYPs and carbon nanoparticles, as well as the variance between the nanoparticles, which results from their different allotropic forms of diamond, graphite and graphene, **will facilitate the design of new drugs, carriers or transport systems, as well as it will allow to estimate the safety of nanoparticles employment simultaneously with drugs or other biologically active agents, which are substrates for CYPs.**