Let’s imagine objects thousand times smaller than human hair. This is the size of nanoparticles. Thousands of laboratories are working on their synthesis and applications. Mimicking nature as usual, where nanoobjects are ubituquous, for example as volcanic ashes. Nowadays production of nanoparticles and other nanoobjects is reaching thousands hundreds tons and more frequently they appear in everyday products. For example perfect white of white paints is due to the presence of the suspended nanoparticles of titanium dioxide. Facial ream jar may be left opened longer due to the presence of silver nanoparticles. Numerous applications of nanoparticles in industrial products results in their increasing appearance in soil, water and atmosphere, namely in our environment. We are not able to notice their presence, because they are thousand times smaller than diameter of human hair. Their diameters are ranging from few to few hundreds nanometers. Are they safe? Shall we treat them as „regular” elements or chemical compounds? We do not know yet, but scientists are working on it. For sure we would like to know what type and number of nanoparticles are present in our environment. For this purpose simple and reliable analytical methods are highly desirable.

In order to detect the presence of some nanoparticles one may immerse the electrode into their suspension in electrolyte solution and apply the appropriate potential using the equipment called potentiostat. It turns out that it is possible to record changes in electric current resulting from the collisions of nanoparticles with the electrode surface. Some nanoparticles, prepared from noble metals accelerate (catalyse) some electrode reactions. When the substrate of such reaction (for example hydrated protons or glucose) is present in their suspension, reaction takes place (and current flows), when nanoparticles are in direct contact with the electrode. When silver nanoparticles will be contact with the electrode at specific potential, they will dissolve and the electric current will flow. If the nanoparticles or their fragments will be able to be oxidised or reduced, their contact with the electrode can be also detected in the form of electric current. If nanoparticles suspension will be stirred or the electrode will rotate around its axis (so called rotating disc electrode) the recorded current will be larger than in the case of quiescent nanoparticles suspension with motionless electrode.

Our project is related to such processes to so called forced convection conditions. We would like to know, what affects magnitude of the current. How to optimise experimental conditions in order to detect as small number of nanoparticles as possible, in other words to increase the sensitivity of the electrochemical method. What is the mechanism of the electrode reaction in nanoparticles suspension? In order to increase the sensitivity of the electrochemical method we will modify the electrode surface in a way to keep nanoparticles in contact with the electrode as long as possible, to produce nanoparticles trap. We expect that not only the fundamental questions will be answered, but also we will create basics for the development of analytical procedures helping to estimate the release of nanomaterials to environment. Perhaps potentiostat with three electrodes immersed into solution containing nanomaterials sample positioned on magnetic stirrer will be in some cases appropriate solution.