Micro-patterned membranes constructed on the basis of heat-shrinkable polymeric films as innovative electrified liquid-liquid interface supports for sensing applications

In this project, new type of cheap and easily obtainable microsensors, based on polymeric films that reduce their dimensions upon heating, will be constructed and applied for biogenic amines (BA) detection in food products. The BA are natural ingredients present in humans and animals diet. These substances are necessary for the proper functioning of living organisms and the course of many metabolic processes. The BA participate in the synthesis of hormones, proteins, nucleic acids and alkaloids, DNA replication, thermoregulation, have a significant impact on blood pressure stabilization, brain activity and finally permeability of cell membranes. Despite many vital functions, their inadequately balanced amount in the human diet can lead to poisoning, impairment of metabolic pathways, and even cause the development of cancer. Increased content of the BA in food may be caused by a number of factors: excessive activity of endogenous enzymes, microbial decarboxylation of amino acids occurring during spontaneous or controlled fermentation, reductive amination or aldehydes and ketones transamination, among other. Factors related to high content of BA in food include inadequate storage, processing and distribution.

In recent years, many analytical methods have been developed to enable the determination of biogenic amines in food products. Chromatographic techniques are among the most wide-spreaded, highly acclaimed and are still irreplaceable in certified laboratories. They are, however, burdened with a number of shortcomings: high equipment costs, require dedicated laboratory space, have to be subjected to frequent maintenance, utilization is possible only with expert knowledge, consume high volumes of organic solvents to mention only few. The alternative and/or complement for these techniques comes with electrochemistry. During electrochemical measurements the chemical information is directly translated into electrical signal that can be related with amount and type of an investigated chemical entity. Experiments themselves are cheap, fast, easy to perform and when properly designed meet all analytical standards. Electrochemical techniques can be successfully used as a reliable tool in the quantitative analysis of drugs, pesticides, antibiotics and other substances requiring constant monitoring. Electrochemistry at the oil – liquid or liquid – liquid interface (LLI) found a number of applications, along with the electrochemical sensing. The analytical signal at LLI measurements is frequently related to the ions (charged chemical species) crossing two liquid phase junction. Miniaturization brings a number of benefits to many scientific fields, including analytical electrochemistry. The emergence of new microsensors have enabled not only electronic development, but also opened new horizons in medicine, chemistry or biology. Some examples of miniaturized electrochemical sensors enable *in vivo* detection of bio-important species and even monitoring their levels during surgical operations.

The goal of this project is the use of constructed microsensors for the determination of selected biogenic amines in food samples. Project aims at creating novel knowledge holding highest societal importance. Anticipated outcomes combine unconventional LLI based electroanalytical system with new microfabrication approaches. To prevent food spoiling and unwanted health impact, developed platform will be used to study BA present in food products.