eCS(S)I - electrochemical sensing and soft interfaces for food quality control

Food colorants (FCs) are one among a few groups of chemical substances, the presence of which in the food products composition is often controversial. FCs can be divided into two main groups, first occurring naturally whereas the second is of synthetic origin. In Europe, their presence in food is regulated by a directive of the European Parliament and the Council of the European Union. Food additives are marked with the E symbol. Despite the green light for their use in the European Union, many FCs are classified as potentially harmful to human health. The presence of some FCs in food products is strictly prohibited in the United States. The potentially harmful dyes are: quinolone yellow (E104), azorubine (E122), amaranth (E123), and patent blue V (E131). Nowadays, the terms "food fraud", "food crisis", "dangerous product", "recalled product" or "counterfeit product" are not only popular phrases in web browsers. These slogans are related to a serious social problem. Food products released for sale are often withdrawn from store shelves due to improper composition or exceeded chemical additives levels. This practice is not only a problem for producers and traders. People at the end of the food chain - the consumers - are largely affected by this issue. Frequently, these are consumers who are exposed to potentially harmful substances in a food product that has been irresponsibly approved for sale. The problem of dishonest producers who are on the market is undoubtedly one of the biggest problems of the food industry in the 21st century. Due to all above reasons, quality control and food safety assessment should be performed not only in analytical laboratories, but also by consumers. This project aspires to create a significant portion of fundamental knowledge that will affect the development of tools that have the potential to be used for rapid detection of chosen chemicals in food samples by the non-expert part of society.

Electrochemistry at the liquid-liquid interface (LLI) is a technique in which an electrical voltage is applied to two immiscible, interconnected, conductive liquid phases (water | oil), and the resulting system can be used as an analytical tool. This project assumes the production of gelled liquid phases with the 3D bioprinting technology and their application as innovative FCs sensors detected directly in food samples. The main purpose and innovation of this research idea is to bring together printable gelled platforms (with appropriate and optimized composition), electrified LLI and optical profilometry (see Fig. 1) We plan to employ the latter technique for rapid evaluation of the printable gelled as we expect to find the correlation between print-out shape and its electroanalytical performance. Fully understood platforms may aspire to be applied in consumer food quality control.

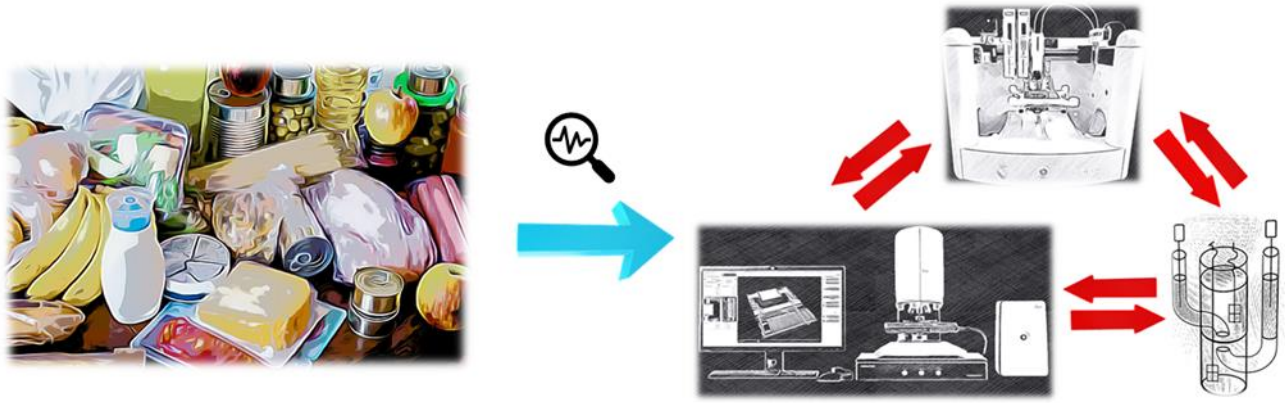

Fig. 1. Diagram showing the analysis of food products assumed in the project with the use of 3 cooperating techniques (3D bioprinting, electrochemistry at the LLI, and 3D optical profilometry).