

Stage 2 – Project Results Summary/2023

Optimisation of sensor array and validation against classical analysis techniques and chemometrics.

Task 2.1: Optimisation of sensor networks. Partner P1 – IMT produced electrochemical transducers based on nanocrystalline graphene, which were used by the coordinator, INCDSB, as electrochemical sensors to determine the purity of olive oil samples. Impedance, cyclic voltammetry and square wave voltammetry were used to optimise the electrochemical sensor network. After applying electrochemical methods, the NNCG1 type p and NNCG3 type p sensors were found to have the most active surfaces and were optimised for the determination of specific compounds in olive oil.

Task 2.2: Evaluation and validation of "e-tongue" using chromatographic techniques. In order to support the creation and optimisation of the sensor network so that it can be successfully applied to real samples, it is necessary to validate it against a classical, established technique for determining the content of active ingredients, namely liquid chromatography with a fluorescence detector. After testing the olive oil samples with the two methods, a correlation coefficient of 0.9982 was found between the results obtained with the two methods.

Task 2.3: Validation on the basis of prediction models. The aim of this work is to find classification models for olive oils and predictive models to indicate the concentrations of markers associated with oil adulteration based on the electrochemical fingerprint. The electrochemical data was subjected to analysis of variance (ANOVA) to ensure statistical significance and to check for normal distribution of data, presence of outliers, etc. Values of $p < 0.05$ were considered statistically significant. The normalised and validated input data were used for classification and regression.

Task 2.4: Dissemination of the results. The results obtained in this phase were disseminated at three international conferences and through the publication of an article in a journal in the Q₂ quartile.