

NOVEL NANOMATERIALS BASED STRATEGIES FOR INNOVATIVE SENSING SYSTEMS APPLIED IN SAFETY AND QUALITY CONTROL OF NATURAL JUICE

Goal of the project

The main goal of the project is to contribute greatly exploratory research in developing new electrode materials with advanced properties linked to the original exploitation of certain electroanalytical techniques envisaging smart strategies for food quality control and safety.

Short description of the project

This research proposal envisage an important contribution to food quality control and safety through elaboration of new strategies for qualitative and quantitative evaluation of the potentially harmful compounds (residues of pesticides and preservatives) from natural juices, by involving well-controlled nanomaterials in the development of innovative detection systems with improved electroanalytical performances. Detection systems will be based on new glassy carbon sensors modified with carbon nanostructures and metallic nanoparticles that will allow the elaboration of selective/simultaneous detection protocols for preservatives and pesticides, potentially present in juices. Sensor surface modification with membrane will permit selective access of target analytes only to carbon nanostructures, allowing a specific concentration on the electrode surface.

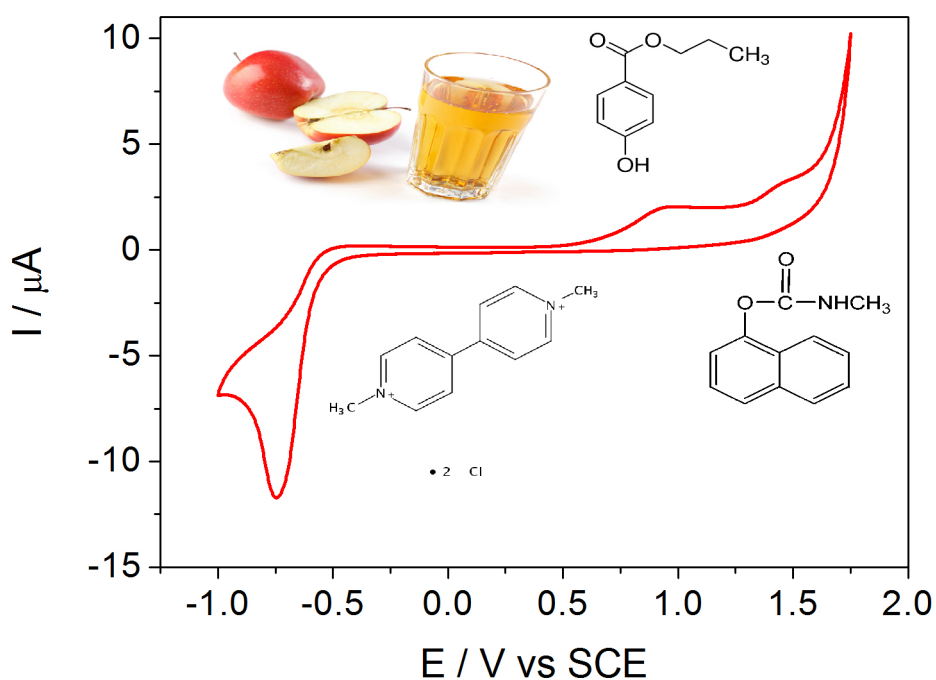
Expected performance of detection strategies proposed by project open the perspective of practical applications in the direction of their use by regulatory bodies for food quality control or even by natural juices producers, either before processing of the potentially contaminated fruits with pesticide residues, either on the production flow or final product quality evaluation/monitoring.

Project implemented by

Faculty of Industrial Chemistry and Environmental Engineering

Implementation period

01.10.2015 - 30.09.2017



Main activities

- i. Obtaining new sensors based on nanostructured carbon by modifying classic glassy carbon (GC) electrode with CNT/CNF/graphene/fullerene characterized by structural, morphological and electrochemical specific properties suitable for electrochemical detection applications.
- ii. Sensors functionalization with metallic nanoparticles (Cu/Ag/Au/Pt) by advanced electrochemical (multiple-pulsed amperometry – MPA, chronoamperometry – CA and cyclic voltammetry - CV) with morpho-structural and electrochemical properties characteristic to the electrochemical detection applications.
- iii. Elaboration of procedure/detection schemes for target analytes from preservatives and pesticide residues categories based on obtained new sensors and their optimization.
- iv. Development of detection techniques with intermediate preconcentration step on electrode surface for harmful compounds at trace levels from test sample, exploiting adsorbent properties of nanostructures carbon.
- v. Elaboration of simultaneous and/or selective detection procedures/schemes of selected target analytes, by sensors modification with selective membranes.
- vi. Procedures checking through detection strategies elaboration for specific applications in juices quality control and safety.

Results

- New sensors modified with nanostructured carbon (carbon nanotubes (CNT), carbon nanofibers (CNF), fullerenes and graphene) and/or metallic nanoparticles (Cu / Ag / Au / Pt) for natural juices safety and quality control applications.
- Protocols for selective/ simultaneously detection of preservatives and pesticides potentially present in natural juices.

Applicability and transferability of the results

New sensors modified with nanostructured carbon (carbon nanotubes (CNT), carbon nanofibers (CNF), fullerenes and graphene) and/or metallic nanoparticles (Cu / Ag / Au / Pt) for natural juices safety and quality control applications.

Protocols for selective/ simultaneously detection of preservatives and pesticides potentially present in natural juices.

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