PN-III-P2-2.1-PED-2021-3693; 607PED/2022

Project general information

Title of the project:

Electrochemical platforms based on nanocomposite materials for the detection of biologically active compounds

Acronym: **MATSENSBIO**

Contractor: University “Politehnica” of Bucharest

Director of the project: Prof. Dr. HDR Stelian LUPU

Partner Institution: Institute of Physical Chemistry „Ilie Murgulescu” from Bucharest

Principal Investigator: C.S. II Dr. Cecilia LETE

Duration of the project: 24 months

Starting date: 27.06.2022

Ending date: 26.06.2024

Main objective

The main objective of the project consists in the development of electrochemical sensors for health monitoring based on conventional electrodes, such as glassy carbon electrode, screen-printed electrodes and metal electrodes, modified with nanocomposite materials consisting of conductive polymers and metal/inorganic nanoparticles.

Funding Agency: Executive Agency for Higher Education, Research, Development and Innovation Funding Program (UEFISCDI): https://uefiscdi.gov.ro

Team members – Coordinator UPB

Prof. Dr. Cristian Matei

Dr. Ioana Diaconu

PhD Student Sorina-Alexandra Leau

Abstract Project MATSENSBIO

The project MATSENSBIO is aiming to develop sensitive and selective electrochemical sensing platforms based on nanocomposites materials for the analysis of relevant biologically active compounds like neurotransmitters and antioxidants. The monitoring of neurotransmitters and antioxidants is of paramount importance in the early diagnosis and the management of various diseases. Therefore, the main objective of the project is aiming to address these societal needs related to the development of electrochemical sensors for health monitoring. The electrochemical sensors are developed by the modification of conventional electrode substrates, glassy carbon, screen printed and metal electrodes (Pt, Au) with nanocomposites materials consisting of conducting polymers (CP) and metal/inorganic nanoparticles (MeNPs). The CPs-MeNPs materials combine two or more characteristic properties featured by the components, namely good electrochemical stability, favorable immobilization matrix and microenvironment brought by the CPs like poly(3,4-ethylenedioxythiophene), poly(3,4-ethylenedioxypyrrole), with high electrocatalytic activity of MeNPs (Au, Pt, Ag) and inorganic ones like Prussian blue. The CPs-MeNPs materials will be prepared via in situ electrodeposition onto electrode substrates by using innovative procedures based on sinusoidal currents and voltages. The electrochemical sensors will be tested and validated in laboratory environment toward the detection of benchmark neurotransmitters, epinephrine and serotonin, and relevant antioxidants, lipoic acid and quercetin. The CPs-MeNPs materials preparation procedures (methods) and the electrochemical sensors (products) are the main outcomes of the project. The use of commercially available electrode substrates (GC, Pt, Au, ITO), including SPEs for single-use sensors, is intended to provide the basic supports upon which the nanocomposite materials will be deposited to develop the electrochemical sensors.

Estimated results

The experimental parameters of the electrochemical preparation procedures for composite materials. Figures of merit of the analytical performance of the electrochemical sensors: limits of detection and quantification, sensitivity, linear response range, repeatability, selectivity.

2 papers in ISI journals

2 contributions at national/international conferences