Nano-enhanced electrochemical green technology for advanced integrated water treatment and quality control

Goal of the project:
The main goal of the project is to develop the electrochemistry application field in water treatment and quality control, by creating the right framework for achieving the high research level.
This project aims to explore potential use of nanoenhanced electrochemical dual green technology to improve access to clean water.

Short description of the project:
Starting with the results obtained in our previous studies for the oxidation of pollutants in aqueous solutions for their degradation and/or their detection on the carbon-based electrodes, the specific project objectives are:
1. Elaboration and manufacturing of some new electrodes types based on nanostructured carbon and Ag/Cu/TiO_2 modified zeolite with enhanced electro(photo)-catalytic activity;
2. Manufacturing, design and geometry conditions of electrodes for degradation and monitoring applications;
3. Setting-up the optimal conditions for the degradation and mineralization of priority organic pollutants (POPs) from water;
4. Elaboration of the electrochemical detection scheme;
5. Integration of the electrochemical detection methods within the control of the degradation and the mineralization of POPs in aqueous solutions.
6. Development of a new nano-enhanced electrochemical green dual technology for integrated water treatment and control.

Fields of interest: Water treatment and water quality monitoring

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Main activities:
1. Elaboration of new composite materials based on carbon nanotubes (CNT)/carbon nanofibres (CNF) in epoxy matrix as electrode materials for oxidation of POPs from water;
2. Characterization of new composite materials based on carbon nanotubes (CNT)/carbon nanofibres (CNF) in epoxy matrix and electrode design;
3. Composite electrode obtaining and selection for application in degradation and/or detection of POPs from water;
4. Assessment of electro(photo)catalytic performance of the selected electrodes in advanced degradation/mineralization of POPs from water;
5. Assessment of the electroanalytical performance of the electrode in detection of POPs from water. Optimization of the electroanalytical method;
6. Integration and optimization of the electrode materials and electrochemical techniques in water treatment and process control.

Results:
1. Series of composite electrodes using epoxy matrix with different compositions based on CNT/CNF and natural or synthetic zeolite doped with Ag/ Cu/TiO2 in epoxy matrix;
2. Application of the new electrodes in advanced water treatment process; published papers;
3. Procedure for the electroanalytical detection of POPs from water;
4. Elaboration of nano-enhanced electrochemical green dual technology for water treatment and process control;

Research team: Florica Manea-director, Rodica Pode-senior researcher, Aniela Pop-researcher, Dr. eng. Anamaria Baciu-researcher assistant, Sorina Motoc-researcher assistant.

Research centre for Environmental Science and Engineering

Contact information:
Assoc. Prof. Dr. Eng. Florica Manea
florica.manea@chim.upt.ro

"Water is the driving force of all nature."
Leonardo da Vinci