

Project 3.9 New catalytical protocols of conductive polymer synthesis and application of these polymers in chemosensing

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www: <https://ichf.edu.pl/en/groups/functional-polymers>

Background:

Conductive polymers found numerous applications so far. There are used in numerous electronic devices including, actuators, organic diodes, field-effect transistors, photovoltaic cells and sensors. Of particular interest are conductive polymeric materials based on (benzo)thiophene monomers due to their excellent properties, and the numerous material- doping possibilities. Polythiophene may be synthesized by oxidation of proper monomers and subsequent polycondensation. So far, this process is being realized using chemical oxidation, i.e. with iron salts or by electropolymerization.

Both methods are very effective but they do not allow for a spatial control over the polymerization process. Moreover, it is worth mentioning that both methods require using harsh chemical conditions (strong oxidants) or a relatively high voltages applied to the electrodes (e.g. ≥ 1.7 V for simple thiophene). This can be disadvantageous in some applications, including entrapment of enzymes in polymer, imprinting of a fragile target molecules, etc. Therefore, new polymerization methods towards conductive materials that allow for milder conditions and spatial control are still highly demanded.

Aim:

The main goal is to propose novel catalytical processes of conductive polymers synthesis. For that purpose, new catalytical systems will be tested. We would like to find such system that will allow synthesis of conductive polymers in mild conditions. Finally, we will highlight usefulness of obtained conductive polymers by applying them in electrochemistry and selective chemosensing.

Requirements:

- Master in chemistry, physics, biotechnology (or similar sciences);
- good knowledge of organic synthesis, electrochemistry, photochemistry, catalysis or material chemistry will be welcome;
- proficiency in English.