PERSONA CIÈNCIA EMPRESA
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Synthesis of zwitterionic conductive polymer nanosuspensions for inkjet-printed biosensors

1 Master research project (6-9 month)

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Summary:

Protein adhesion on biosensor surfaces plays a pivotal role in their functionality and performance. Ensuring optimal protein adhesion is crucial for accurate and reliable sensing when targeting specific proteins or biomolecules. Non-specific binding of proteins can lead to false-negative or false-positive results, compromising the accuracy and reliability of the sensing system. To address this issue, we propose a project focused on the development of polymeric nanosuspensions based on polyaniline/polypyrene/polythiophene polymers modified with zwitterionic groups. These nanosuspensions will serve as the foundation for fabricating conductive electrodes, which are critical components of the biosensor system. The zwitterionic moieties incorporated into the polymer system will play a dual role: firstly, they will exert control over protein adhesion on the polymeric substrate, reducing non-specific binding. Secondly, they will act as dopant agents, enhancing the electrical conductivity of the electrodes. To achieve this, the nanosuspensions will be specifically formulated for inkjet printing, enabling the fabrication of flexible electronic electrodes, which will serve as the primary sensing elements in the biosensor. This project aims to comprehensively study the developed nanosuspensions, focusing on critical aspects such as nano-suspension characterization (e.g., size, zeta potential, stability), electrical conductivity evaluation, and the processability of these nanosuspensions through inkjet printing techniques. Collaborative efforts with the Microelectronics National Center (CNM) will facilitate the fabrication of a prototype flexible electrode and enable the study of its printability. The successful completion of this project will provide valuable insights into controlling protein adhesion on biosensor surfaces while enhancing electrode conductivity. The utilization of inkjet printing technology will allow for the scalable and cost-effective production of biosensor electrodes, demonstrating their potential for widespread application in the fields of medical diagnostics, environmental monitoring, and beyond.