Spectroscopic and Colorimetric Sensors for Dual Monitoring of Dopamine by Bismuth Sulfide Nanoflowers as Nanozyme Exhibiting Peroxidase-Mimic Property

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In recent years, functional nanostructured materials with high catalytic stability, low cost, and tunable catalytic properties have become excellent alternatives to natural enzymes used as biological catalysts in colorimetric applications. These nanomaterials, referred to as nanozymes, are artificial enzyme mimics with enzymatic catalytic properties, and are more resistant to environmental conditions than natural enzymes. Additionally, nanozymes can be prepared in desired sizes and morphologies, enabling the determination of various chemical species. The aim of this project is to develop a Bi2S3 nanozyme-based spectroscopic/colorimetric sensor system for the quantitative determination of dopamine. Bi2S3 NF will be prepared via a simple and rapid hydrothermal synthesis approach, and dopamine determination will be performed based on their peroxidase mimic properties. Measurements will be performed using both a UV-Vis spectrophotometer and a smartphone based colorimetric system. In the experimental procedure, dopamine's inhibitory effect on the oxidation reaction was based on the formation of ox-TMB from TMB, where a decrease occurred in the characteristic absorption signal of ox-TMB, allowing for quantitative determination of dopamine. Recovery studies will be conducted using artificial urine samples to evaluate the applicability of the developed method, and its accuracy will be validated. Additionally, MTT analysis will be performed to evaluate cell viability at different doses of Bi2S3 NF, and the results will indicate nanomaterials toxic effects if exist.

Awards Won:
Fourth Award of $600