

PROGRAMME BOOK

**THE 6TH NATIONAL
CONFERENCE FOR
POSTGRADUATE RESEARCH
(NCON-PGR 2022)**

"Advancing Technology for Community"

15TH NOVEMBER 2022

VIRTUAL CONFERENCE

ORGANIZER:



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ENGINEERING**

Applications of Nanomaterials for Biosensor Fabrication Based on Redox Enzyme and Protein: A Mini-Review

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Abstract

Redox enzyme and protein modified biosensors are commercially triumphant bioelectronic devices used in the point-of-care analysis. The use of nanotechnology derived nanomaterials during enzyme immobilization creates a synergistic effect by integrating enzyme's recognition and catalytic properties with the electronic properties of nanomaterials. This synergy improves the biosensor's sensitivity, conductivity stability, surface-to-volume ratio, selectivity, detection limit and other analytical features. This critical review focuses on the redox enzymes and proteins most frequently used in glucose and hydrogen peroxide sensing, such as horseradish peroxidase (HRP), glucose oxidase (GOx), hemoglobin (HB), and cytochrome C (Cyt c). Besides, we evaluate the state of art of this approach, selection of nanomaterials, preparation and immobilization mechanisms, their role and sensing applications. Besides advantages, we have discussed the pressing challenges of developing these sensors. This review will guide the research community to develop rational and highly efficient nanomaterial immobilized biosensors.

Keywords: Biosensor; Horseradish peroxidase; Glucose oxidase; Hemoglobin; Cytochrome C; Nanomaterials; Au NPs; MWCNTs.