

Synthesis and Functionalization of Silver Doped Iron Oxide Nanostructures with Ionic Liquid as Colorimetric Biosensor for Detection of Hydrogen Peroxide Biomarker in Diabetes Mellitus

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Abstract

Hydrogen peroxide is a byproduct of oxidase catalyzed reactions, that serves as a signaling molecule and can cause protein and DNA damage which increase our susceptibility towards various kind diseases of such as diabetes mellitus and hypertension etc. In the present work ionic liquid-coated silver doped iron oxide nanostructures were used for the colorimetric detection of H₂O₂. Ionic liquid have having characteristic properties of aromaticity and conductivity were coated on to the surface of silver doped iron oxide nanostructures to further enhance the their properties. Ag-Fe₂O₃ NPs were synthesized by green synthesis approach, and the prepared nanoparticles were characterized via FTIR, EDX, SEM, and XRD. The functionalized Ag-Fe₂O₃ NPs and TMB solution were used for the colorimetric detection of H₂O₂. To find the optimal performance of Ag-Fe₂O₃NPs/IL different reaction conditions have been optimized for the proposed sensor, such as (a) amount of Ag-Fe₂O₃NPs/IL (b) TMB, (c) pH, (d) H₂O₂ concentration, and (e) incubation of time. This sensor showed a wide linear range 1×10^{-9} – 3.2×10^{-7} M; low limit of quantification 3.20×10^{-7} M, low limit of detection 1.07×10^{-8} M and an R² value of 0.9996. The selectivity of the proposed sensor was compared with the potential interfering species. The incubation time was estimated to be just 5 min for the proposed sensor. Additionally, the sensor was effectively applied for the detection of hydrogen peroxide in the urine samples of diabetes mellitus patient.

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Biography

Muhammad Asad from Pakistan. Cuurently he is a PhD student. He have completed his Master in chemistry

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