NANOMATERIALS AS ENZYME MIMETICS THEIR PREPARATION AND COLORIMETRIC DETECTION OF DISEASE BIOMARKERS

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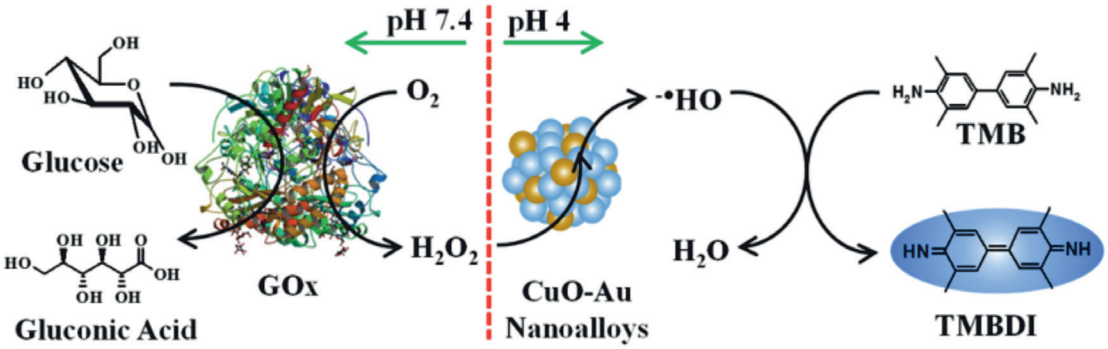
Nanomaterials have at least one dimension between 1 – 100 nm and they possess intrinsic peroxidase-like properties [1-3]. As artificial enzymes, nanomaterials overcome various natural and synthetic enzyme limitations (such as biological enzymes inherent instability in extreme environmental conditions). Metallic nanomaterials, on the other hand, have high efficiency as artificial nanoenzymes and this is attributed to low cost of preparation, stable to biodegradation, and are less prone to environmental denaturation [3]. Nanomaterials can withstand extreme pH conditions and temperatures that affects natural enzymes [4, 5]. Several nanomaterials have been prepared and investigated their enzymatic properties. The prepared nanoenzymes consist of metal oxides and bimetallic nanoparticles (as alloys) for the colorimetric detection of disease biomarkers such anti-P53 antibodies for lung cancer diagnosis and glucose for diabetic monitoring. The synthesized nanomaterials are based on copper oxide-gold nanoalloys (for glucose detection) and silica nanoparticles gold-palladium nanoparticles for the detection of anti-P53 antibodies (lung cancer biomarker). Scheme 1 shows the use of copper oxide-gold nanoalloys for the detection of glucose using glucose oxidase (GOx) enzyme. These systems provide both qualitative and quantitative analytical capability and can be used in determining the analytical parameters such as analyte concentrations so that timeous medical interventions can be undertaken. The presentation will cover the synthesis, characterization and enzyme mimetic studies of various nanomaterials and their use in the detection of glucose and anti-P53 antibodies.



Scheme 1: Enzymatic detection of glucose using GOx based on the CuO-Au nanoalloys. The colorimetric assay utilized TMBDI (3,5,3′,5′-tetramethylbenzidinediimine) as coloured product.

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