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Review-Three Dimensional Zinc Oxide Nanostructures as an Active Site Platform for Biosensor: Recent Trend in Healthcare Diagnosis (Article)

(Open Access)

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Abstract

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Morphology effect is one of the essential factors that influence the performance of electrochemical biosensors based on ZnO nanostructures. These nanostructures are characterized by anisotropic growth with different dimensionalities such as zero-dimensional, one-dimensional, and two-dimensional. More interestingly, when combining each dimension into another advanced dimensionality, i.e. the three-dimensional (3-D), exceptional properties can be generated that are not otherwise found in low dimensionalities. The outstanding popularity of 3-D ZnO stems from many factors, with one of the most important being its synergic advantages from its low dimensional sub-unit and the additional surface area of the 3-D structure due to an increased geometric volume. This review briefly describes the principles and growth mechanism factors of 3-D ZnO via solution-based approaches and additional advanced methods. The paper further expands on the latest advancement of research into the 3-D ZnO nanostructure-based electrochemical biosensors to detect biomolecules that harm humankind. We also discussed the analytical performance of these biosensors using different nanocomposite materials. Additionally, limitations and suggestions on particular sensing works are proposed. Lastly, the five-year progress in research into 3-D ZnO-based electrochemical biosensors' performance in healthcare diagnosis is compared and future challenges presented. © 2020 The Author(s). Published on behalf of The Electrochemical Society by IOP Publishing Limited.

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