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The Effect of Calcination Temperature to the Biosynthesis of SnO_2 Mediated by Glycine Max

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Structured Abstract

Background: Nanotechnology has emerged as the most promising topic of study. For instance, metal oxide nanoparticles may help in energy generation and storage, water treatment, and catalytic transformations. Nanotechnology controls size and shape since these factors are crucial in deciding nanoparticle performance, affecting qualities like reactivity, conductivity, and magnetic behaviour. However, the synthesis of nanoparticles by photocatalysis involves consumption of toxic chemicals and produced hazardous by-products which can be harmful to the environment. TiO_2, ZnO, and SnO_2 stand out among the most popular photocatalysts because of their affordability, non-toxicity, and chemical stability. SnO_2 has intriguing features, which have been enhanced with the manufacture of this substance in the nanoscale range. SnO_2 is an n-type semiconductor with a high band gap value (3.58 eV).

Methods: The leaves for about 80 g were collected and washed using deionized water. Boiled at 60°C until a homogenous coloured solution is formed. It is filtered, dried and stored at 4°C in the refrigerator. Followed by the addition of 0.5 M of SnCl4.5H2O to the leaf extract. Stirred at room temperature for 3 hours. Centrifuged, dried at 80°C for 2 hours. The calcination processes were carried out at 350°C and 650°C. Characterization was done with FTIR, XRD, FESEM-EDX and UV-Vis.

Results: FTIR examination confirmed the production of SnO2 by demonstrating the existence of the requisite functional groups, and XRD data has demonstrated the crystalline nature of SnO2 NPs. The FESEM image displays an even distribution with a spherical shape. EDX shows the presence of high purity of Sn and O. Finally, UV-Vis analysis confirmed the intensity of energy band gap of SnO2 which shows that the reflectance is directly proportional to the band gap energy.

Conclusion: The production of tin oxide nanoparticles mediated by Glycine Max were successful by using environmentally friendly and cost-effective methods. SnO2 NPs has been successfully synthesised at an optimal temperature of 650°C and gives more efficiency in photocatalytic action hence environmental pollution may be treated.

Keywords: Glycine max, biosynthesis, calcination temperature, SnO_2 NPs, characterization

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