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Biosynthesis of SnO_2 from *Morinda Citrifolia*: Effects of Calcination Temperature

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Structured Abstract

Background: Nanoparticles have unique material characteristics, their small size and large reactive surfaces make them effective catalysts and adsorbents. However, the use of nanoparticles in environmental remediation has raised significant concerns. Therefore, the use of plant extracts in conjunction with the accelerated process was also viewed from the standpoint of green synthesis.

Methods: M. Citrifolia leaves are collected and washed using deionized water. Then it is boiled at 60°C until a homogenous coloured solution is formed. Then, it is filtered, dried, and stored at 40°C. 0.5M of $SnCl_4.H_2O$ are added to the leaf extract. Stirred at room temperature for 3 hours. Then, centrifuged, dried at 80°C for 2 hours. The calcination process is carried out at 350°C and 650°C. Characterization (FTIR, UV-VIS DRS, XRD, FESEM-EDX) are carried out with the prepared samples.

Results: XRD analysis confirmed the crystalline nature of the synthesised SnO_2 NPs, with a crystallite size of 3.3Å. SEM images revealed an even distribution of agglomerated spherical-like NPs. The EDX spectrum confirmed the presence of Sn and O as the main constituents. FTIR results exhibited functional groups relevant to the synthesised SnO_2 NPs. Notably, the UV-Vis DRS spectrum displayed a significant reduction in reflectance for the nanoparticles calcined at 650°C, indicating a lowered band-gap energy.

Conclusion: The SnO_2 NPs have been successfully synthesised by low/temperature method mediated by M. Citrifolia. It is observed that 650°C is an optimal temperature that would produce SnO_2 NPs in an effective state for photocatalytic use.

Keywords: Morinda citrifolia, calcination temperature, green synthesis, tin oxide nanoparticles, characterization

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