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FABRICATION OF ECO-FRIENDLY NANOPARTICLES EMBEDDED FILM USING FRUIT PEEL INDUCED SILVER NANOPARTICLES AND APPLICATION FOR CATALYTIC DEGRADATION

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Abstract

The wide-ranging applications of nanoparticles have driven extensive research into the development of novel synthesis methods. Addressing the challenge of wastewater pollution has created an urgent demand for innovative and sustainable strategies. Nanofilms, which are robust and tightly bound structures commonly associated with nanoparticles on surfaces, hold great promise in this regard. In the present study, an eco-friendly, non-toxic, and cost-effective approach was employed for the synthesis of silver nanoparticles using extracts of *Citrus sinensis*. The synthesised nanoparticles were characterised through UV–visible absorption spectroscopy, FESEM–EDX, and FTIR analyses. The UV–visible spectra revealed distinct absorption peaks corresponding to varying concentrations, while FESEM images confirmed the presence of nanoparticles with diverse shapes and sizes. These nanoparticles were subsequently incorporated with sorbitol, pectin, and Tween 80 to fabricate nanofilms. Experimental design methodology was then applied to model and optimise the operational parameters for the photocatalytic degradation of methylene blue using the nanofilm. Two factors such as adsorbent dosage (grams) and reaction time (minutes), were investigated as independent variables. This study demonstrates a green route for nanofilm fabrication and provides valuable insights into their mechanisms, applications, and potential in sustainable wastewater treatment.

Keywords: Nanofilm, Response Surface Methodology, Dye Degradation, ANOVA