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**SYNTHESIS AND CHARACTERIZATION OF CHITOSAN MODIFIED
ORANGE PEEL EXTRACT FOR ADSORPTION OF REACTIVE BLACK 5
DYE**

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OF REACTIVE BLACK 5 DYE**

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ABSTRACT

SYNTHESIS AND CHARACTERIZATION OF CHITOSAN MODIFIED ORANGE PEEL EXTRACT FOR ADSORPTION OF REACTIVE BLACK 5 DYE

Chitosan, a non-toxic and biodegradable biopolymer, is commonly used as an adsorbent for pollutant removal, including dyes, from wastewater. However, its low adsorption capacity and solubility in acidic media limit its application. To address these limitations, it can be modified both physically and chemically to enhance its physicochemical properties. In this study, chitosan was modified using orange peel extract (chitosan-OPE) to enhance its absorptivity towards the removal of Reactive Black 5 (RB5). The results showed that the optimum conditions for preparing chitosan-OPE were 2.89 g of chitosan, 33.33 mg/l of OPE and 1 hour of impregnation time. The adsorbent then was characterised using Fourier Transform Infrared Spectroscopy (FTIR), Field Emission Scanning Electron Microscopy (FESEM), Brunauer-Emmet-Teller (BET), and Point Zero Charge (PZC) analysis. The best adsorption conditions in a batch system were 30 minutes of contact time, initial dye concentration of 50 mg/l, adsorbent dosage of 0.01 g, temperature of 27 °C and solution pH of 3, with the percentage removal of 89.91 %, and adsorption capacity of 224.78 mg/g. The adsorption data in the batch system fitted well to the pseudo-second order model, indicating chemisorption process. For isotherm study, the data followed by Langmuir model with the maximum adsorption of 579.76 mg/g. A thermodynamics analysis showed that the adsorption was exothermic, spontaneous and feasible. In conclusion, chitosan-OPE was successfully synthesised using green materials with simple preparation methods. Thus, demonstrated significant potential as an effective adsorbent for RB5 removal, offering a promising solution for wastewater treatment.