IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 1, December 2025
Impact Factor: 7.67

Preparation and Utilization of Rice Husk-Based Activation Carbon for Dye Removal

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Abstract: *The present study focuses on the preparation of activated carbon (AC) from rice husk waste, an abundant agricultural by-product, using chemical activation with potassium hydroxide (KOH). The developed rice husk activated carbon (RHAC-KOH) was utilized for the adsorptive removal of Bismarck Brown dye from aqueous solutions. The process involved two major steps—carbonization of rice husk at controlled temperature, followed by chemical activation using KOH to enhance surface porosity and adsorption efficiency. The prepared adsorbent was characterized by its surface texture, pore structure, and color removal efficiency, confirming successful activation. Batch adsorption experiments were conducted by varying parameters such as contact time, dye concentration, and adsorbent dosage. The adsorption data were analyzed using kinetic and isotherm models, and results indicated that the process followed the pseudo-second-order kinetic model, suggesting chemisorption as the dominant mechanism. The maximum adsorption efficiency of RHAC-KOH for Bismarck Brown dye was observed at neutral pH (≈7) and a contact time of 150 minutes, demonstrating the potential of rice husk-based activated carbon as a low-cost, eco-friendly, and effective adsorbent for dye- contaminated wastewater treatment.*

Keywords: Rice Husk , Activated Carbon , Adsorption , pH , Potassium hydroxide (KOH) , Response surface methodology , dye removal

DOI: 10.48175/IJARSCT-30102