



“Gheorghe Asachi” Technical University of Iasi, Romania



MICROWAVE-ASSISTED PREPARATION OF ACTIVATED CARBONS FROM POMEGRANATE PEELS: APPLICATION FOR REMOVAL OF RED BEZACRYL DYE FROM WASTEWATER

Amel Azizi, Naima Belhaneche-Bensemra*

Laboratoire des Sciences et Techniques de l'Environnement, Ecole Nationale Polytechnique, BP 182 El-Harrach, Alger, Algeria

Abstract

In the present study, activated carbon derived from pomegranate peel (ACPP) was successfully prepared using ZnCl₂-assisted microwave activation and evaluated as a low-cost adsorbent for the removal of Red Bezacryl (RBZ) dye from aqueous solutions. The raw precursor (PP) and the prepared activated carbon (ACPP) were characterized using proximate and ultimate analyses, ATR/FTIR spectroscopy, scanning electron microscopy (SEM), Brunauer–Emmett–Teller (BET) surface area analysis, and point of zero charge (pHPZC) determination. BET analysis revealed a significant enhancement in the textural properties of the activated material, with a specific surface area of 745.75 m²/g and a total pore volume of 0.398 cm³/g. Batch adsorption experiments were conducted to investigate the effects of initial dye concentration, adsorbent dosage, contact time, solution pH, and temperature, using a low adsorbent amount (10 mg in 50 mL of solution). The prepared ACPP exhibited optimum adsorption performance at pH 7.0, achieving a maximum adsorption capacity of 75 mg/g and a removal efficiency of 98% at 313 K after 120 min of contact time. Rapid dye uptake was observed during the first 30 min, while the adsorption capacity increased with increasing initial RBZ concentration. The results of equilibrium isotherms in batch adsorption process were analysed according to the Langmuir and Freundlich models and the corresponding characteristic parameters were determined. The isotherms are well fitted by Freundlich model indicating heterogeneous adsorption behavior. Overall, the obtained results show that ACPP is an efficient, sustainable, and economically attractive adsorbent for the removal of RBZ dye from aqueous media.

Key words: adsorption, microwave irradiation, pomegranate peels, RBZ dye, wastewater

Received: February, 2026; Revised final: June, 2026; Accepted: July, 2026

* Author to whom all correspondence should be addressed: E-mail: naima.belhaneche@g.enp.edu.dz; Phone: 213 (0) 23 85 22 40; Fax: 213 (0) 23 82 85 29