

**EREM 80/4**

Journal of Environmental Research,  
Engineering and Management  
Vol. 80 / No. 4 / 2024  
pp. 92–100  
10.5755/j01.erem.80.4.37236

**The Removal of Azo Dyes from an Aqueous Solution  
Using NaOH-Activated Carbon from Phenolic Resin**

Received 2024/05

Accepted after revisions 2024/08

<https://doi.org/10.5755/j01.erem.80.4.37236>

# The Removal of Azo Dyes from an Aqueous Solution Using NaOH-Activated Carbon from Phenolic Resin

Shaima Albazzaz<sup>1\*</sup>, Janaen Y. Al-Saeedi<sup>2</sup>, Anwar A. Abbood<sup>1</sup>,  
Harith Y. Mahmood<sup>3</sup>, Rusul Naseer Mohammed<sup>1</sup>

<sup>1</sup> Department of Chemical Engineering, College of Engineering, University of Basrah, Iraq

<sup>2</sup> Department of Biology, College of Science, University of Basrah, Iraq

<sup>3</sup> Department of Physiology and Chemistry, College of Veterinary, University of Basrah, Iraq

\*Corresponding author: shaima.shueayb@uobasrah.edu.iq

Liquid dyes are discharged usually from different industries, such as textile factories, into water bodies. They are toxic compounds that can cause significant harm to humans, animals, and aquatic life due to increased water pollution. For this reason, removing dyes from wastewater is of great importance to control their negative impact and meet the standards of water quality. In this study, activated carbons were produced from phenolic resin through a chemical activation process with NaOH at high temperatures. The sample that had highest porosity and pore volume was used to adsorb two types of azo dyes Remazol Brilliant Blue R (RBBR) and Remazol Yellow dye (RY) from an aqueous solution under different conditions, i.e., changing contact time, pH, dosage, initial concentration, and temperature. The maximum removals of RBBR and RY were recorded separately at low concentration (10 ppm), acidic condition (pH < 7), adsorbent dose of 0.3 g, temperature of aqueous solution 20°C and contact time of 120 min. The Freundlich adsorption isotherm model, with its higher correlation coefficient, provided a better fit for the equilibrium data compared with the Langmuir isotherm model. The activated carbon derived from phenolic resin, which is chemically activated with NaOH at 850°C, is a promising adsorbent for the removal of azo dyes from aqueous solutions. The optimum conditions can increase the efficiency of the adsorption process.

**Keywords:** wastewater treatment, azo dyes, adsorption, activated carbon.

## Introduction

With the dawn of civilization, people have painted and coloured a variety of items, including clothing and some types of pottery, using dyes. All colorants that

were utilized came from naturally occurring sources, including lichens, fungi, insects, and plants (Ardila et al., 2021). The quantity and quality of artificial dyes