



“Gheorghe Asachi” Technical University of Iasi, Romania



---

## RECOVERING OF INDIGO DYE FROM DENIM WASTEWATER WITH H<sub>2</sub>O<sub>2</sub> IN THE PRESENCE OF KI CATALYST

Yavuz Arıkan<sup>1</sup>, Nuran Celikci<sup>2</sup>, Cengiz Ayhan Ziba<sup>3</sup>, Mustafa Dolaz<sup>1,4\*</sup>

<sup>1</sup>Department of Environmental Engineering, Faculty of Engineering and Architecture, Kahramanmaraş Sutcu Imam University, Kahramanmaraş, Turkey

<sup>2</sup>Department of Material Science and Engineering, Institute of Science and Technology, Kahramanmaraş Sutcu Imam University, Kahramanmaraş, Turkey

<sup>3</sup>Kahramanmaraş Sutcu Imam University, Afsin Vocational School Chemistry Technologies, Kahramanmaraş, Türkiye

<sup>4</sup>Department of Environmental Engineering, Faculty of Engineering, Kyrgyz-Turkish Manas University, Bishkek, Kyrgyz Republic

---

### Abstract

Today, the textile industry, which is rapidly developing and growing in proportion to the human population, poses serious environmental and health problems in terms of waste. In the world, indigo dyes are widely used in the manufacturing of jeans fabrics especially in textile factories producing cotton fabrics. The overall objective of the present study is to recover indigo dye which is referred to as the pollutant released into the wastewater and to assess the removal of color via oxidation. For this purpose, denim wastewater containing solid particles and small size cotton fibers was filtered by the physical holding-separation process. Indigo dye which is dissolved in wastewater was then oxidized with H<sub>2</sub>O<sub>2</sub> in the presence of KI catalyst at room temperature, and precipitated with ethanol and filtered. While the maximum recovered indigo dye was obtained as 0.0234 g (coded IN-20) in 0.5 g KI and 100 ml ethanol medium. The reaction efficiency was recorded as 78.00% by recovering 0.024 grams of 0.030 g indigo dye in 250 mL wastewater. Whilst the color value of the denim wastewater was 3500 (Pt-Co), this value was recorded as 600 (Pt-Co) as a result of the oxidation method. The structure of the recovered indigo dyes has been characterized by <sup>1</sup>H-NMR, FT-IR and UV-Vis spectroscopic methods and compared with commercial indigo and literature. In the FTIR spectrum of recovered indigo dye, the vibration bands formed at 3264-3252 cm<sup>-1</sup> can be originated from the N-H group. In the proton NMR spectrum of Indigo, since the resonance of the N-H group in the indole ring was observed at a chemical shift of 10.44 ppm in the literature, these chemical shift values were observed in the same region, namely between 10.44 and 10.45 ppm in the recovered indigo dyes. The recovered indigo dyes showed maximum absorbance values at wavelengths of 300-335, 320-335 nm and 615-620 nm in the UV-Vis spectrums.

**Keywords:** denim wastewater, indigo dye, NMR, recovery

*Received: June, 2020; Revised final: February, 2021; Accepted: March, 2021*

---

\* Authors to whom all correspondence should be addressed: e-mail: [mustafa.dolaz@manas.edu.tr](mailto:mustafa.dolaz@manas.edu.tr), [dolazmustafa@gmail.com](mailto:dolazmustafa@gmail.com) ; Phone: +996312492788/1076, +996552660174; Fax: +996312541935