

Optimisation of Acid Yellow Dye Decolourisation using CNS Carbon: A Response Surface Methodology Approach with Exploratory Data Analysis in Jupyter Notebook

Vinithaa Raguram¹ and Rajalakshmi Padmanaban²

B. Tech Chemical Engineering, Botminds.ai, Chennai, India¹

M. Tech Chemical Engineering, Anna University, Chennai, India²

Corresponding author – vini291990@gmail.com

rajalakshmiactau@gmail.com

Abstract: *The current research is focused on the need to develop an efficient adsorbent with low-cost effectiveness and high potentiality for removal of dye from waste water. Cashew nut shell, a solid waste generated in the cashew nut industry is taken as the adsorbent for the decolorization of acid yellow synthetic dye solution. Batch adsorption studies were carried out with the consideration of factors/variables such as dye concentration, adsorbent dosage and contact time. A comparative decolorization study has been done with both commercial activated carbon (CAC) and Cashew nut shell carbon (CNSC). The factors were optimized statistically using Central Composite Design (CCD) in response surface methodology. The characterization of the adsorbent was analyzed in FTIR, SEM and XRD. In recent years, the use of interactive computing environments has significantly improved the efficiency of data analysis workflow. This study investigates the effectiveness using Jupyter notebooks in facilitating exploratory data analysis and reproducible research practices. Using the datasets, we conducted a comprehensive analysis involving data cleaning, visualization, and statistical exploration, leveraging Python libraries such as numpy, pandas, seaborn, and matplotlib*

Keywords: Acid yellow dye, Adsorption, Commercial Activated Carbon, Cashew nut Shell, Central composite design, Jupyter notebooks

