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# Optimization and physico-chemical characterization of activated carbon derived from walnut shells

Mariem Ouled Mohamed[a], Leila khalfa[a], Noureddine Hamdi [b], Mohamed Bagané[a]

*a) National School of Engineers of Gabes, University of Gabes, Omar Ibn El Khattab Gabes, Tunisia.*

*b) Higher Institute of Water Sciences and Techniques of Gabes, University of Gabes, Zrig, Tunisia.*

E-mail : mariemouledmouhamed@gmail.com

## Abstract

The present work aims to valorize biomass waste into activated carbon with high microporosity through a pyrolysis process combined with chemical activation. The synthesis of activated carbon from walnut shells was optimized using a response surface methodology ; Box-Behnken experimental design (BBD). Several parameters were studied to optimize the activated carbon, including the impregnation ratio, carbonization time, and temperature, while the BET surface area was used as the main response. Design Expert predicted a carbonization temperature of 450 °C, a holding time of 90 minutes, and a 2 :1 w/w impregnation ratio as the optimal conditions for the development of activated carbon.

The activated carbon was characterized by a BET surface area of 875.58 $m^2/g$ and a total pore volume of 0.49 $cm^3/g$. The physicochemical characterizations of the activated carbon, including crystalline structure, surface area, morphology, and functional groups, were investigated using several techniques such as SEM, XRD, FTIR, $pH_{ZPC}$ measurement, and BET analysis.

**Keywords :** Biomass valorization, activated carbon, optimization, characterization.


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