

## Optimization of methylene blue biosorption and mass transfer resistance on *Gardenia carinata* activated carbon

Ezerie Henry Ezechi\*, Khalida Muda

School of Civil Engineering, Universiti Teknologi Malaysia 81310, Johor Bahru, Malaysia, Tel. +601139654522;  
email: honhenry2k5@gmail.com (E.H. Ezechi); Tel. +07-5531522; email: khalida@utm.my (K. Muda)

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### ABSTRACT

This study evaluated Methylene blue (MB) adsorption from dye effluent using a new activated carbon derived from *Gardenia carinata*. The derived *Gardenia carinata* activated carbon (GCAC) has a large surface area of 1,187.33 m<sup>2</sup>/g. Experiments were designed with the central composite design model of the response surface methodology. The interaction between independent variables (adsorbent mass, pH and initial MB concentration) was evaluated at pre-determined contact time of 30 min. Results show that MB adsorption decreased with increasing pH from 4 to 10 but increased with increasing adsorbent mass and initial concentration. MB adsorption exceeded 89% at optimum conditions. Kinetic examination indicated no mass transfer resistance with increasing MB concentration. The driving force (*B*) of MB transport increased from 3.621 to 4.906 mg/g with increasing MB concentration. Furthermore, the adsorbate/adsorbent attraction increased from 10.570 to 17.064 g/h/mg with increasing MB concentration. This study demonstrates that activated carbon derived from abundant waste materials such as *Gardenia carinata* can be useful in many significant ways.

**Keywords:** Adsorption; Adsorbent; *Gardenia*; Methylene blue; Response surface methodology; Central composite design; Mass transfer

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\* Corresponding author.