

Egg-shell treated oil palm fronds (EG-OPF) as low-cost adsorbent for methylene blue removal

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ABSTRACT

A new adsorbent (egg-shell treated oil palm fronds (EG-OPF)) prepared from wastes was evaluated for methylene blue (MB) removal. Optimization among three significant variables (initial concentration (X_1), initial pH (X_2), and adsorbent dosage (X_3)) were executed using response surface methodology (RSM). The most excellent performance was marked at $X_1 = 291.7$ mg/L, $X_2 = \text{pH } 5$, and $X_3 = 1.82$ g/L, with MB removal of 80.26 %. The kinetic study was fitted perfectly with the pseudo-second-order model ($R^2 > 0.990$), indicating the chemisorption process. The isotherm study was found to follow the Langmuir isotherm model ($R^2 = 0.999$), with maximal adsorption magnitude of 714.3 mg/g, implying the monolayer adsorption on a homogenous adsorbent surface. The reusability study affirmed the feasibility of EG-OPF in MB removal, credited to its excellent performance during reusability studies. The present study successfully discovered a new low-cost adsorbent (EG-OPF) for MB removal.

KEYWORDS:

Adsorption; Low-Cost Adsorbent; Optimization; Methylene Blue