

46) ADSORPTIVE REMOVAL OF METHYLENE BLUE IN AQUEOUS SOLUTION ONTO MESOSTRUCTURED SILICA NANOPARTICLES

Ainul Hakimah, Karim¹, Aishah Abdul, Jalil^{2*}, Sugeng, Triwahyono¹, Nur Hidayatul Nazirah, Kamarudin², Nur Fatien Muhamad, Salleh² and Muhammad Arif Ab, Aziz².

¹Department of Chemistry, Faculty of Science,

²Institute of Hydrogen Economy, Faculty of Chemical Engineering,
Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor, MALAYSIA.

*Corresponding Author: aishah@cheme.utm.my

Abstract

Mesostructured Silica Nanoparticles (MSN) have become increasingly important owe to their high surface area, thermal and mechanical stability, highly uniform pore distribution, tunable pore size, and unique hosting properties. This special feature is crucial to be adopted as effective adsorbents to adsorb wide range of organic dye solution. In this work, MSN was prepared through a facile preparation method and characterized by X-Ray Diffraction (XRD), N₂ Physisorption and Transmission Electron Microscopy (TEM). The adsorption behavior of methylene blue in aqueous solution onto synthesized MSN was studied in a batch system at different pH (2–11), MSN dosage (0.1–0.5 g L⁻¹), initial MB concentration (5–100 mg L⁻¹) and temperature. The equilibrium data were evaluated using Langmuir and Freundlich isotherms, while the adsorption kinetics was assessed by the pseudo-first and second order model, along with thermodynamic aspect. The MSN obtained was believed to optimize the adsorption process with shorter time. The results indicate the potential of this material as an effective adsorbent for methylene blue dye.

Keyword: mesostructured silica nanoparticles, methylene blue, adsorption, isotherm, kinetics.