

Evaluation of malachite green and methyl violet dyes removal by 3A molecular sieve adsorbents

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ABSTRACT

This work was aimed at evaluating cationic dyes adsorption properties of 3A-molecular sieve adsorbents. Two cationic dyes, namely malachite green and methyl violet were used to probe the adsorbent performance. The adsorbents were characterized for surface functional groups, thermal stability, and specific surface area. The unmodified 3A-molecular sieve showed a surface area of $0.195 \text{ m}^2/\text{g}$, whereas the value decreased upon sodium hydroxide treatment. The kinetics data fitted well into the pseudo-first-order model, suggesting a physical adsorption process via diffusion-limited transport mechanism, whereby cation-exchange and electrostatic attraction are the possible removal mechanisms. The modified adsorbent revealed better removal capacities for both dyes at 136 and 186 mg/g for methyl violet and malachite green, respectively. The Langmuir model adequately described the equilibrium data, indicating a homogenous nature of monolayer adsorption. The 3A-molecular sieve adsorbents could be effectively used as adsorbent for cationic dyes removal.

Keywords: Adsorption; Malachite green; Methyl violet; 3A-molecular sieve

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