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Novel adsorbent from sago-grafted silica for removal of methylene blue

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Abstract

Eco-friendly and low-cost adsorbent prepared from sago waste was investigated for the removal of methylene blue. Sago “hampas,” an abundant waste from sago industries, was transformed into activated carbon followed by chemical grafting with silica from activated rice husk in the presence of 3-(triethoxysilyl)-propylamine to afford sago-grafted silica 80:20 (wt/wt%) and 50:50 (wt/wt%). The physicochemical properties of the adsorbents were characterized, and their effectiveness in removing methylene blue was studied based on initial concentration (2–10 mg/L), adsorbent dosage (0.02–0.1 g and 0.1–0.5 g), and temperature (30 °C, 40 °C, 50 °C). Sago-grafted silica 80:20 showed excellent mesoporous properties and better adsorption capacity (86.43%) compared to sago-activated carbon (74.78%) and sago-grafted silica 50:50 (39.56%). The adsorption of methylene blue employing both sago-activated carbon and sago-grafted silica 80:20 was following pseudo-second-order kinetics model with Langmuir isotherm regression coefficient > 0.9, which indicate a monolayer adsorption. The maximum adsorption capacity of sago-activated carbon and sago-grafted silica 80:20 were 7.69 mg/g and 10.31 mg/g, respectively. Sago-grafted silica 80:20 is a potential low-cost natural sorbent which works best in the removal of methylene blue from environment.

Keywords

Sago hampas Rice husk activated Langmuir isotherm Mesoporous Adsorption

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Electronic supplementary material

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Notes

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Supplementary material

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Supplementary material 1 (DOCX 921 kb)

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