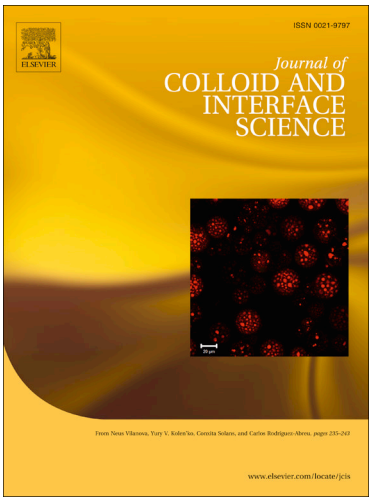


Regular Article

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# Enhancing adsorption capacity of Egyptian diatomaceous earth by thermo-chemical purification: Methylene blue uptake

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## Abstract

In the current study, calcination and thermo-chemical methods were applied in treatment of the processed diatomite fraction (< 45μm), which containing nearly 82.6 wt. % of the raw Egyptian diatomaceous earth. The untreated and modified diatomite fractions were characterized by optical microscopy (OM), X-ray fluorescence (XRF), X-ray diffraction (XRD), scanning electron microscopy (SEM) and Fourier transform infrared spectroscopy (FT-IR). Thermo-chemical purification produced the highest concentration of diatom frustules (> 92% $SiO_2$) without blocking impurities and created –Si–O–Si– active sites. These fractions were tested for Methylene blue (MB) adsorption at different pH solutions (2.0 – 10.0). The purified diatomite via thermo-chemical treatment (PD) gave the greatest adsorption capacity for MB compared to the untreated (UD) and calcinated (CUD) diatomite fractions. Effects of experimental parameters such as MB concentration (60–200 mg $L^{-1}$), contact time (5–480 min), adsorbent mass (50–250 mg) and temperature (30–55 °C) on MB uptake were investigated. Linear and non-linear forms of Langmuir, Freundlich and Dubinin–Radushkevich (D–R) models indicated that Langmuir model with a maximum adsorption capacity ($q_{max} = 105.03$ mg $g^{-1}$) fitted well the adsorption data.