



Low-cost adsorbents from banana peels to remove dyes from wastewater under continuous flow conditions

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ABSTRACT

The biomass of agricultural wastes can be used to fabricate adsorbents for the efficient removal of pollutants from wastewater [1]. Earlier batch sorption tests for a variety of bio-sorbents have revealed that the maximum removal efficiency of methylene blue (MB) from aqueous solutions is achieved by banana peels (BP) [2]. To evaluate the sorption capacity of BP under continuous flow conditions, flow tests of MB solutions through a fixed-bed column packed with grains of banana peels were performed. A systematic experimental parametric study was done with respect to the flow rate, the MB inlet concentration, and the height of the bed. Effluents collected from the column outlet were analyzed with UV-Vis spectroscopy to determine the MB concentration as function of time (breakthrough curve) and calculate parameters quantifying the MB removal efficiency and sorption capacity. A continuum-scale mathematical model was developed by coupling convective flow with hydrodynamic dispersion and a two-site, equilibrium & non-equilibrium, sorption model. The numerically simulated breakthrough curves were fitted to the experimentally measured ones to estimate the equilibrium (partition coefficient / sorption capacity), and non-equilibrium (sorption kinetic constant) model parameters. The results were fully compatible with the corresponding ones obtained from batch tests, and confirmed the efficient use of banana peels as low-cost adsorbent for the removal of dyes from industrial effluents, with the maximum MB removal efficiency to reach ~ 0.2 g/g-sorbent. It seems that the satisfactory removal of dyes from aqueous solutions is achieved with short beds at low flow velocity or long beds at high flow velocity

REFERENCES

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