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Bio/KOH Ratio Effect on Activated Biochar and their Dye based WasteWater Depollution

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Highlights

- Potato peels based Biochar production using KOH- chemical double activation process and their environmental application.
- Removal of two kind of dangerous dye via recycling Potato peels in activated Biochar form obtained through KOH based new way chemical activation.
- AZ and MB based wastewater deppollution using mesoporous activated Biochar obtained from various Bio/KOH precursors ratio throught new chemical double activation process.

Abstract

Waste potato peels (WPP) were adopted as a Biomass in this investigation to produce highly porous activated Biochars. The carbonized-activation process was principally governed on double pyrolysis at 600 °C intercalated by intermediate thermal-chemical step for homogenous incorporation of KOH oxidation agent. The effect of CWPP/KOH precursors ratio and the second pyrolysis temperature were systematically carried out to study the activated Biochars physico-chemical properties (morphology, textural and chemical bands) using different techniques (XRD, FTIR, Raman, TGA/DTA, XPS, FESEM, EDX, CHNO/S, BET, Zeta potential). The obtained activated Biochars are in micro/nano-porous systems and have interesting SSA [580 – 2400 m²/g], pore volume [0.08 – 1.02 cm³/g] and average pores size < 4 nm depending to the activation conditions. Moreover, the second pyrolysis temperature has an effect on the carbon atoms structure reorganization which is proved through their high Raman and textural properties.

To demonstrate the double activation process effectiveness and the resulting Biochars properties, we have studied their adsorption behavior to remove two kinds of dyes (cationic MB and anionic AZ). The obtained adsorption capacities have reached 1246 mg/g and 315 mg/g with an equilibrium contact time around [5-10 min] and [30-40 min] for MB and AZ dyes, respectively. These values have never been reported before, especially using the very low activated Biochar adsorbent quantity of 8 mg (at each initial pH and 100 mg/l concentration of each dye solution).

Keywords

Potatos peels based Biochar; Activated carbon; Chemical activation; Adsorption process; Azorubine (AZ) and Methylene Blue (MB) dyes

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