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## Utilization of tire pyrolytic char as a potential adsorbent for the removal of methylene blue

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The objective of this study was to investigate the feasibility of using tire pyrolytic char (TPC) as a potential adsorbent of coloured species present in wastewater. The removal of methylene blue dye (MB) from an aqueous solution by TPC was studied as the initial step. Low-quality TPC is discarded as solid wastes in many tire pyrolysis plants, and its disposal is problematic. TPC was demineralized by dilute solutions of acids and bases and the demineralized tire char (DTC) was characterized by elemental analysis, thermogravimetric analysis (TGA), X-ray diffraction (XRD) and scanning electron microscopy (SEM) to determine the chemical, thermal and surface characteristics. SEM analysis of DTC showed that the adsorbent has a rough texture with a porous surface. According to XRD analysis, DTC indicated a minimum amount of wurtzite and sphalerite crystal phases. The effect of process parameters such as adsorbent dosage, contact time, pH and temperature on the adsorption of MB by DTC was investigated by using a 20 ppm MB solution. It revealed that 0.30 g of DTC can reduce 99 % MB concentration of this 50 mL of 20 ppm solution by stirring for 20 minutes at 40 °C and pH 6. The equilibrium adsorption was the best fit with Langmuir isotherm model indicating monolayer adsorption with a maximum adsorption capacity of 46.51 mg/g for non-activated DTC. It is a promising result for the activation of DTC by using a suitable activating method which may show higher adsorption properties comparative to the commercial activated carbon black. Reactivation of used DTC by heating at 500 °C for 1 hour in a nitrogen-filled muffle furnace shows the same activity for the removal of MB for more than six cycles.

**Keywords:** Tire pyrolytic char, Demineralization, Methylene blue, Reactivation

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