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Novel sorbent materials for environmental remediation via depolymerization of used tyres

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ABSTRACT

The present study describes the production of activated carbon (AC) from end of life tyres (ELT), by pyrolysis and physical activation, suitable for pesticide adsorption. ELT pyrolysis was conducted at 800°C in a fixed bed reactor. For the production of AC, the pyrolytic char was activated under a mixture of steam and CO_2 for 2.5 h in a bench scale reactor at 970°C. The produced AC was characterized by ultimate analysis and N_2 BET surface area. The surface area of the AC was found to increase up to 432 $m^2\ g^{-1}$ at a burn-off level of 62.5 wt.%, while SEM analysis confirmed the presence of mesopores and macropores. The produced AC was used for Bromopropylate adsorption from aqueous solutions. Adsorption kinetics and equilibrium isotherms were investigated. The maximum removal reached almost 100% in 60 min. Experimental data of BP adsorption fitted best to the pseudo-second-order kinetic model and Langmuir isotherm. The produced AC from used tyres proved effective for water purification from pesticides.

Keywords: Tyres; Activated carbon; Bromopropylate; Adsorption; Kinetics; Pesticide removal; Water treatment

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