

Characterization of empty fruit bunch biochar pyrolyzed at different temperatures with respect to activated carbon and their sorption capacities for pentachlorophenol

ABSTRACT

Pentachlorophenol (PCP) has been used extensively in the wood preservation industry. It is highly persistent in the environment and toxic to living organisms. The present study investigated the effectiveness of an oil palm empty fruit bunch biochar (EFBB) pyrolyzed at 350, 550 and 650°C in adsorbing PCP as compared to a commercial activated carbon (AC). The ash content, surface area and aromaticity increased while the pore volume, cation exchange capacity, O/C and (O+N)/C molar ratios decreased as the pyrolysis temperature increased. Only the EFBB pyrolyzed at 350°C and the AC adsorbed the PCP while no PCP adsorption was observed on the EFBBs pyrolyzed at 550°C and 650°C. The Langmuir maximum adsorption capacity (Q_{max}) values was 6.035 mg g⁻¹, and 126.582 mg g⁻¹ for the 350°C EFBB and the AC, respectively. The higher porosity and more oxygenated functional groups of the EFBB pyrolyzed at 350°C EFBB could be the reason for its ability to adsorb the PCP compared to the other EFBBs. The high PCP sorption by the AC on the other hand, could be attributed to its high surface area and microporous structure.

Keyword: Entachlorophenol; Biochar; Pyrolysis temperature; Activated carbon; Adsorption