# Chlorinated phenol removal from aqueous media by tea (Camellia sinensis) leaf waste tailored activated carbon

## ABSTRACT

In this study, activated carbons (ACs) were prepared from tea leaves by using a two-stage self-generated atmosphere method. The process was done by semi-carbonizing the precursor at 300 o C for 1 h, followed by the impregnation of the resulting char at 85 oC for 4 h and finally activation at 500 o C for 2 h. The semi-carbonised samples were impregnated with different ratios of zinc chloride (ZnCl2) and their physicochemical effect was studied. The prepared ACs underwent several aspects of both, chemical and physical characterizations, such as the percentage of yield, moisture content, ash content, pH, porosity, adsorption capacity of 2,4-dichlorophenol (2,4-DCP), surface area, porosity, morphology and surface chemistry studies. It was found that sample AC2, with an impregnation ratio of 2:1 was the best AC produced in this study. The maximum Brunauer, Emmett and Teller surface area of AC2 was found to be 695 m2/g. Langmuir, Freundlich and Temkin isotherm models were used to examine the experimental isotherms while the kinetic data was analyzed using the pseudo-firstorder, pseudo-second-order and intraparticle diffusion kinetic models. The 2,4-DCP adsorption isotherm results complied well to the Langmuir isotherm for the equilibrium data while the adsorption kinetic data fitted well to the pseudo-second order model, indicating that chemisorption by valency forces via the sharing (covalent bond) or exchanging of electrons between the AC and the 2,4-DCP molecules were mainly responsible for the adsorption process. From these findings, it is concluded that tea leaves can be used as a low cost precursor for the removal of 2,4-DCP in aqueous medium.