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Adsorption of chlorophenoxy pesticides on activated carbon with gradually removed external particle layers

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ABSTRACT

In the work the role of porous structure of carbon adsorbent is considered taking into account adsorption equilibrium and kinetics of selected chlorophenoxy herbicides. In the study three fractions of activated carbon obtained in the process of gradual removing the external granule layers by abrasion (33 and 66% wt.) are used. Porosity of the obtained samples was characterized by low-temperature nitrogen adsorption. The adsorption isotherms of 4-chlorophenoxyacetic acid and 2-(4-chlorophenoxy)-2-methylpropionic acid from aqueous solutions were measured by using a static method. The kinetics of adsorption process was studied by applying UV-Vis spectrophotometer with a flow cell. The concentration *vs.* time and the adsorption *vs.* time profiles were calculated from the obtained spectra. The adsorption data were analyzed to discuss the influence of carbon properties and adsorbate properties on adsorption effectiveness and rate. Effect of carbon pore structure on adsorption rate was observed. The usefulness of various kinetic models and equations for analysis of the experimental data was studied. In terms of fitting quality and lack of systematic deviations the semi-empirical multi-exponential (m-exp) equation was found to be the best with the fractal-like mixed order equation (f-MOE) and McKay's pore diffusion model (PDMs) as second-