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Impact of chemical activation on selected adsorption features of powdered activated carbon

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ABSTRACT

The use of activated carbons both in research and in the design or optimization of many industrial processes is connected with the need for continuous improvement of their quality. Improvement of their production methods, surface activation or modification plays a significant role. The aim of our study was to evaluate the effect of chemical and physical activation on the parameters of powdered activated carbon (PAC). Additionally, we wanted to identify further processes directed at stabilizing the activated carbon features. Carried out tests led to reach the final product which may be safely used in medicine to eliminate toxic micropollutants from the human gastrointestinal system. After raw charcoal material synthesis high-temperature, physical activation, as well as single and double chemical activation, has been carried out. Primary tests included only activated carbon processing. Then PAC was subjected to proper processes of combined physical and chemical activation. In order to determine the sorption efficiency, there was tested dye 3,7-bis(dimethylamino)-phenothiazin-5-ium chloride (NCBI), as an indicator of contamination of aqueous solutions. For our experiments, we did numerous adsorptive tests including porosity, the pH of zero charge point, specific surface area and microscopy observation of the PAC surface. The features of tested dye (NCBI), Methylene Number, extinction and pH of the aqueous extract were also evaluated. The reached result has proven that short chemical activation has hardly changed features of ground and powdered raw material. Conducted research on combined physical and chemical activation with CH_3COOH showed that high temperature and acid operation change activated carbon parameters, increase porosity and NCBI adsorption. Chemical activation also significantly corrected pores size. The best adsorption of NCBI with a positive charge was achieved at neutral pH.

Keywords: Powdered activated carbon; PAC modification (activation); Dye; Adsorption

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