

## Study of kinetic - thermodynamic aspects of phenol adsorption on natural sorption materials

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### Abstract

Phenol is one of the most toxic pollutants which get into the water ponds and streams with wastewater from chemical, petrochemical, pharmaceutical and other industries. The most effective method of wastewater treatment from phenol is its adsorption on activated carbon, but the disadvantages of this sorbent usage are its high cost, the necessity of regeneration and soot formation due to the brittleness of carbon atoms bonds. A new trend that has intensively developed in the practice of water treatment recently is the use of wastes of industrial and agricultural production as reagents for removing of pollutants from natural water and wastewater. Cellulose and keratin-containing wastes from processing of agricultural raw materials are of particular interest. The advantages of these reagents are available resource base, renewability, low cost, availability and ease of disposal. Therefore, in single-step static adsorption mode with the use of phenol solutions as the model systems the kinetics of phenol adsorption by natural materials, namely, wheat husk, rye husk, oat husk and barley husk was studied at different temperatures (25°C, 35°C and 45°C). Rye husk did not show any sorption properties in relation to phenol. For wheat, oat and barley husks the adsorption isotherms were constructed in coordinates:  $1/F = f(1/C)$ ,  $\lg F = f(\lg C)$ ,  $\ln F = f(\epsilon^2)$ . The equations which describe the processes of phenol sorption by wheat, oat and barley husks were calculated. It was found that processes of phenol adsorption by wheat, oats and barley husks can be better represented by the Dubinin - Radushkevich equation, although Langmuir equation can also be used to describe these processes with correlation coefficients more than 0,992. Also the thermodynamic constants and energy of phenol sorption by natural materials were determined.

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### Keywords

Adsorption isotherms, Barley husk, Oat husk, Phenol adsorption, Rye husk, Wheat husk