

Mathematical modeling of the process of obtaining raw material for manufacturing sorbents of medical purpose

© Ilnar A. Valeev,⁺ Irina V. Zhukova,^{*+} and Azat A. Girfanutdinov
Kazan National Research Technological University (KNRTU).
Karl Marx St., 68. Kazan, 420015. Tatarstan Republic. Russia.
E-mail: zhukovka116@mail.ru

*Supervising author; ⁺Corresponding author

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Abstract

This article analyzes the production and use of affordable medical sorbents in the Russian and international markets. The analysis showed that there is a shortage of production of cheap specific activated carbon in Russia, due to insufficient expansion of the range. Today, the price of coal tends to increase, so many manufacturers are puzzled by the creation of an effective system for processing coal. It was suggested to use burnt charcoal from various types of wood, since it is one of the optimal types of sorbents, taking into account the economic aspect and the naturalness of the raw materials used for the production of activated carbon. An efficient and simple method of processing burnt coal-pyrolysis-was also proposed. Verification of the model's adequacy to the real process was performed by comparing the results of experimental studies with the results of theoretical calculations. The basic kinetic and thermophysical equations that are used today to study the kinetics of pyrolysis of activated carbon are studied. To find out whether a change in pressure can affect the course of the pyrolysis process, an experimental setup was developed and a series of experiments were conducted. Wood samples were used for experiments. 25x25x25 mm and humidity 10%. The volume of one-time loading was 50 g. The operating pressure in the pyrolysis chamber was recorded by a pressure gauge and set using ejector pumps (pressure reducers), whose performance was regulated and was 0.9, 0.8, 0.7, 0.6, 0.5 kPa, or a nitrogen cylinder (pressure increase) to the absolute pressure values 1, 2, 3, 4, 5, 6 kPa. A comparative analysis of mathematical calculations and a number of experimental data conducted on warty birch was also carried out. A mathematical model of the wood pyrolysis process is proposed, which takes into account pre-drying, kinetics, the amount of volatile products released, and cooling of the finished charcoal.

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