OBTAINING ADSORBENTS BY CARBON ACTIVATION AND THEIR APPLICATION

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ANNOTATION: *Today, due to the rapid development of production, the pollution of the environment, water and air is also increasing. The role of adsorbents in reducing these amounts is incomparable. Thermally stable, chemically resistant and mechanically strong adsorbents are widely used in various industries due to their high sorption properties.*

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Sorbents (lat. Sorbens - absorbent) - solid substances or liquids used to absorb gases, vapors or dissolved substances. Sorbents are activated carbon, silica gel, aluminum oxide, ion exchange resins, etc.; adsorbents are highly dispersed natural or artificial materials that adsorb substances from gases or liquids in contact with them. The most important adsorbents: activated carbon, silica gels, aluminosilicate gels, oxides and hydroxides of some metals, sponge metals, natural minerals; activated carbon (AC) is a porous carbon adsorbent with a developed internal surface (from 500 to 2000 m 2 / g).

Carbon adsorbents are organic, high-molecular solid dispersed materials with an enhanced specific surface area and the ability to effectively and selectively absorb substances in various environments [1]. The heterogeneous mass formed from amorphous carbon determines the specific structure of activated carbons.

Activated carbon is primarily made from carbon-rich natural materials such as coal, wood, coconut shells, or peat. The manufacturing process includes the following steps, but the exact chemicals used differ depending on the manufacturing method [2]:

1. Carbonization: The raw material is heated to a very high temperature (600-900°C) in an oxygen limited environment, this process is called carbonization. This drives off volatile compounds and decomposes organic matter, resulting in a carbonized material called char.

2. Activation: The char is then activated to create a highly porous structure that gives the activated carbon its adsorption properties. There are two main activation methods:

a) Chemical activation: In this method, coal is treated with a chemical agent that reacts with the carbon structure of the material to form internal pores. Common chemicals include phosphoric acid, potassium hydroxide, or zinc chloride.

b) Physical activation: the char is reheated, usually around 800-1000°C, in a controlled atmosphere. This activates the carbon by gasifying the organic compounds and leaves a porous structure. Steam or carbon dioxide can be used in this process.

3. Washing and drying: Activated carbon is washed or rinsed with water to remove impurities or residual chemicals from the activation step. It is then usually dried to reduce moisture.

Activated carbon is a specially processed carbon that heats organic raw materials (rice husk, coal, wood, etc.) in the absence of air to reduce non-carbon components (this process is called carbonization) and then react with gas, the surface is corroded to form a microporous structure (this process is called activation). Because the activation process is a microscopic process, the surface erosion of a large number of molecular carbides is point erosion, and a large number of small holes appear on the surface of the activated carbon.

The diameter of the micropores on the activated carbon surface is mainly between 2-50nm. Even a small amount of activated carbon has a large surface area. Each gram of activated carbon has a surface area of 500-1500m2. Activated carbon showed significant industrial production in the early 20th century. Around 1910, plants began mass production of activated carbon to decolorize and refine food products, including sugar. In World War I, activated carbon was widely used in gas masks and saved countless lives from gas poisoning. Activated carbon is now found in almost every hospital and clinic, it is used in food purification, chemical purification, pharmaceuticals, etc. [3].

A method of processing wood residues (bark and sawdust) into an effective sorbent - activated carbon with a highly developed specific surface area due to the presence of micro- and mesopores and low cost compared to known analogues [4]. Most often, carbon sorbents are obtained from organic substances of biological and plant origin. As raw materials, various types of wood, peat and peat semi-coke, peat with small ash, stone coals at different stages of metamorphism (lignite, bituminous coal, anthracite), semi-coke and cokes based on them and other materials with carbon are used [5.6.7]. A number of manufacturers obtain activated carbon from coconut shells. Typically, the shells are first carbonized using rotary kilns and then activated with steam. The resulting granular activated carbons are characterized by high strength and very fine pores. They are primarily used for gas protection.

High-quality activated carbon adsorbents with high adsorption properties are widely used in various industries. Activated carbon adsorbents are mainly used in various technological processes for cleaning the main products from additional substances in the state of gas and liquid aggregates.

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