Activated Carbon

I. Working Process

Activated carbon is a porous carbonaceous adsorbent material that relies on both physical and chemical adsorption to remove pollutants. It is manufactured from high-quality carbonaceous raw materials through two core processes: high-temperature carbonization and activation.

Raw materials such as coconut shells, nut shells, coal, and wood chips are first carbonized at high temperatures in an oxygen-free environment to decompose impurities and volatile components, forming a preliminary carbon skeleton. The material is then subjected to high-temperature activation using steam, carbon dioxide, or chemical agents to create extensive micropores, mesopores, and macropores within the carbon molecules, forming a well-developed three-dimensional pore structure that greatly enhances specific surface area and adsorption capacity.

During purification, contaminants such as volatile organic compounds, odor molecules, pigments, and harmful gases in exhaust air or liquids are strongly adsorbed and retained by van der Waals forces when they contact the activated carbon pore surfaces, thereby achieving purification, deodorization, and refinement of air or liquids. For special operating conditions, further processing such as silver loading and surface modification can enhance targeted adsorption of specific pollutants. The entire process involves no secondary chemical reactions and releases no harmful substances, making it an eco-friendly purification consumable suitable for exhaust gas treatment, water treatment, air purification, and many other purification scenarios.

II. Key Parameters

Activated carbon is available in multiple types including coconut shell carbon, nut shell carbon, coal-based carbon, cylindrical carbon, honeycomb carbon, and powdered carbon. Core parameters comply with national purification consumable standards, allowing flexible selection based on purification scenarios and pollutant concentrations.

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The key parameters for standard industrial-grade and air purification-grade products are stable and controllable.

The core indicator iodine value ranges from 800 mg/g to 1,200 mg/g, with high-adsorption grades reaching 1,300 mg/g or above. A higher iodine value indicates more micropores and stronger adsorption of organic exhaust gases and small-molecule impurities. The methylene blue adsorption value is ⩾8 ml/g, demonstrating excellent adsorption of pigments and odor molecules. The specific surface area can reach 800 m^2/g to 1,500 m^2/g, with well-developed pores ensuring high-efficiency adsorption capacity.

In terms of standard morphological parameters, cylindrical activated carbon diameters are 1.5 mm, 3 mm, 4 mm, and 6 mm, with lengths of 3 mm to 15 mm. Honeycomb activated carbon standard sizes are 100 mm × 100 mm × 50 mm and 200 mm × 200 mm × 50 mm, with pore sizes of 1 mm to 3 mm. Coconut shell granular carbon particle sizes range from 4 to 30 mesh, with bulk density of 0.45 g/cm^3 to

0.65 g/cm^3; moisture content ⩽5%, ash content ⩽10%, operating temperature range -20 ° C to 120 ° C; standard models are suitable for

ambient temperature purification conditions. High-temperature modified grades can handle higher-temperature exhaust gas treatment. After adsorption saturation, certain grades can be regenerated through high-temperature desorption for repeated use, reducing costs.

III. Instructions for Use

Before use, activated carbon must be stored in sealed packaging to prevent premature exposure to air, moisture absorption, and saturation. Prior to installation, clean the interior of purification equipment, filter boxes, or adsorption towers to remove impurities and dust, ensuring smooth airflow or liquid flow with no short-circuiting, air leakage, or liquid leakage.

For air purification, activated carbon should be evenly loaded into adsorption boxes or filter cabinets. The filling thickness should be adjusted according to pollutant concentration, generally not less than 50 mm, to ensure uniform airflow through the activated carbon layer and avoid deflection or excessive gaps that would cause purification failure. Pre-filtration with primary and medium-efficiency filter media is required at the front end to intercept dust, paint mist, and other particulates, preventing blockage of activated carbon pores and extending service life.

For water treatment, select the appropriate particle size of activated carbon based on water quality conditions, fill it into filter tanks, control the water flow rate, and ensure sufficient contact time between the water and activated carbon to achieve the desired purification effect.

During daily operation, no additional maintenance is required. Periodically monitor pollutant concentrations and odor levels at the air outlet or water outlet. When purification effectiveness decreases, odors rebound, or resistance increases, this indicates that the activated carbon is saturated and must be replaced promptly. Under normal ambient temperature conditions, the replacement cycle is 3 to 6 months; in high-concentration pollution environments, this should be shortened to 1 to 3 months.

Store in a dry, well-ventilated, cool location away from fire sources, water sources, and oily substances. Avoid crushing under heavy loads. Spent saturated activated carbon must be disposed of in accordance with environmental regulations; industrial spent carbon must be handled as hazardous waste and must not be discarded arbitrarily.

IV. Product Advantages

Activated carbon features a well-developed pore structure and an extremely large specific surface area with powerful adsorption capacity. It can simultaneously adsorb various pollutants including volatile organic compounds, odors, harmful gases, and pigments, providing broad purification coverage. It effectively removes common pollutants such as formaldehyde, benzene compounds, TVOCs, malodorous gases, and sulfides, meeting purification needs for complex pollutant mixtures.

Made from premium raw materials with mature manufacturing processes, the product exhibits stable physical and chemical properties. It is insoluble in water and common solvents, non-corrosive, and odorless. No secondary pollution is generated during use, ensuring high environmental safety. It is suitable for food, pharmaceutical, residential, and other scenarios with strict environmental requirements.

A complete range of grades and specifications is available, with customizable forms and adsorption properties for different operating conditions. Honeycomb carbon has low airflow resistance and is suitable for high-volume exhaust gas treatment; granular carbon has large adsorption capacity and is ideal for water treatment and low-volume air purification; cylindrical carbon is highly durable and well-suited for continuous industrial purification, offering excellent versatility. Installation and use are

simple, requiring no complex equipment or power sources — purification is accomplished using the inherent momentum of the airflow or liquid flow. Replacement is straightforward, maintenance costs are low, and certain grades are regenerable, significantly reducing long-term operating costs.

Compared to chemical purification methods, activated carbon purification is a physical adsorption process that requires no energy consumption, produces no noise, and needs no chemical additives during operation. It is safe, reliable, and broadly applicable, performing well under various complex conditions including ambient temperature, normal pressure, and humid environments, with outstanding cost-effectiveness.

V. Applicable Industries

With its high-efficiency adsorption and eco-friendly safety properties, activated carbon is widely used in air purification, exhaust gas treatment, water treatment, food and pharmaceutical processing, industrial production, and many other fields. It is a core consumable for purification, deodorization, refinement, and decolorization.

In the environmental exhaust gas treatment industry, it is suitable for organic exhaust gas purification in coating workshops, printing plants, chemical plants, furniture factories, and plastics factories, removing VOCs, paint odors, and chemical malodors. It can also be used for odor removal and purification at sewage treatment plants and waste transfer stations, combined with exhaust gas treatment equipment to achieve compliant emissions.

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