Conditions of obtaining porous carbon materials from pyrolyzed wood wastes by chemical activation of H_3PO_4

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The purpose of this publication is to search for alternative materials – food industry wastes; valuation of it's use in the production of porous carbon materials (PCM) for use in water treatment systems.

Pyrolyzed wood waste (PWW) of the meat processing industry as raw material for the production of sorbents. Chemical activation of PWW by orthophosphoric acid.

Using the adsorption-desorption methods of nitrogen, the porous structure was determined at 77 K; mesopore distribution by size and mesopore's volume – by BJH-method; distribution of micropores by size – using QSDFT-method; volume of micropores – by Dubinin-Radushkevich method; subnanopor's volume – by QSDFT-method.

The microporous structure has the following characteristics: pore diameters are in the range of D_{mi}=0,60-2,5 nm, mostly represented by pores with a diameter of 0,87; 1,56 nm; volume of micropores – V_{mi}=0,091 cm^3/g; differential pore volume dV_{mi}/dD=(0,021-0,166) 10^{-2} cm^3/g; micropores are about 49 % of the total pore volume. According to the breakdown of micropores by size we can identify the range of values of D_{mi}=0,5-2,5 nm with two peaks: at ~ 0,9 nm and at ~ 1,6 nm.

Mesoporous structure has the following characteristics: pore diameters are in the range of D_{me}=3,3-50,0 nm, most represented pores are with a diameter of 3,69 nm; mesopore's volume varies in the range of V_{me}=0,005-0,049 cm^3/g; pore surface area is S_{me}=5,7-28,0 m^2/g; differential pore volume: dV_{me}/dD=(0,06-2,58) 10^{-4} cm^3/g; differential pore area: dS_{me}/dD=(0,001-0,305) m^2/g; fraction of mesopores in the total pore volume is 3-26%. Curves of pore's differential volume and differential area of pore's surface at the interval of D=15,3-50,0 nm are located at the static area.

Maximum located at the area of the smaller pore's diameter at the differential pore volume dV_{me}/dD=2,58 10-4 cm^3/g is observed at the point of 3,69 nm at the interval D=2,5-15,3 nm. The most number of mesopores located at the range of D=2,5-15,3 nm. The cited data shows that the proposed method allows to get PCM with a high output of 87,6%. The obtained PCM has a low rate of specific surface are S_{BET}=257,0 m^2/g and pore space. Total pore volume is V_{Σ}=0,187 cm^3/g.

Conclusion. An energy-saving method is proposed for the production of PCM from secondary «renewable» resources – PWW, for use in water treatment systems.