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Research Article

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The development of technology of obtaining sorbent from grape seed meal

Bayan Sagyndykova, Rabiga Anarbayeva, Asylova Nesipkul, Seitova Zhanerke, Abdulla Issakov, Ashirov Murat and Rakhymbaev Nurgali

Department Drug Technology and Engineering Disciplines, South Kazakhstan State Pharmaceutical Academy, Shymkent, Kazakhstan

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ABSTRACT

Presented research on the development of a method for producing activated carbon (sorbent) from grape seed meal. Meal is a product of the third stage of complex processing of grape seeds. The sorbent is obtained by activation at different temperatures. Activating the meal at a temperature of 573K to 673 K allows to obtain sorbent with a large volume of micropores and moderately advanced transition porosity provides intensive diffusion of the adsorbate into the grain of the adsorbent. This method makes it possible to obtain high quality sorbent capable of isolation from an organism various toxic substances.

Keywords: activated carbon, sorbent, grape seeds, meal, activation.

INTRODUCTION

Development and the search for effective, relatively cheap sorbents are of great scientific and practical interest. Sorbents based on activated carbons have a high porosity, strength and reusable. Known method of producing activated carbon from secondary raw materials almond shell and olive pits [1- 3], walnuts [4], seeds of plum [5] and grape seed [6].

The pore form of adsorbents (active carbon) largely depends on the starting material used for producing an adsorbent, and perhaps the method of activation.

Activating the carbon materials is the main stage of the formation and development of the porous structure of sorbents [7, 8, 9, 10].

Practical work researching secondary products of grape seeds production has been conducted at the department of dosage form technology, in South Kazakhstan State Pharmaceutical Academy. Developed the technology of complex processing of grape seed in order to allocate biologically active substances. From the meal which obtained after the separation of oil [11] and dry extract [12] from grape seeds we have received a sorbent. Sorbent is a product of the third stage of complex processing of grape seeds.

The aim of this research – is obtain a sorbent from grape seed meal.

EXPERIMENTAL SECTION

The sorbent was prepared by the method of activation. Activating agents are, in most cases, carbon dioxide or steam, thus, the reaction product is carbon monoxide.

Activation of grape seed meal was carried out in a quartz oven at temperatures 573, 673, 773, 873, 973, 1073 K delayed at each temperature for 1 hour. Sorbent obtained from grape seed meal is shown in Figure 1.

Figure 1. Sorbent from grape seed meal

Thermally treated samples grape seed meal before measuring their adsorption properties were maintained under conditions guaranteeing their integrity.

Parameter estimation of a microporous structure of activated carbons (AC) is the theory of volume filling of micropores. According to this theory, the equilibrium adsorption besides the physicochemical properties of adsorbed substances and conditions of absorption is determined by structural parameters of the AC, which characterizes the distribution of pore sizes of the adsorbent. To determine these parameters experimental adsorption isotherms of benzol vapor are often used [3].

Parameters of the porous structure of the activated carbon obtained by thermal activation are shown in table 1.

Table 1-Parameters of the porous structure of activated carbon

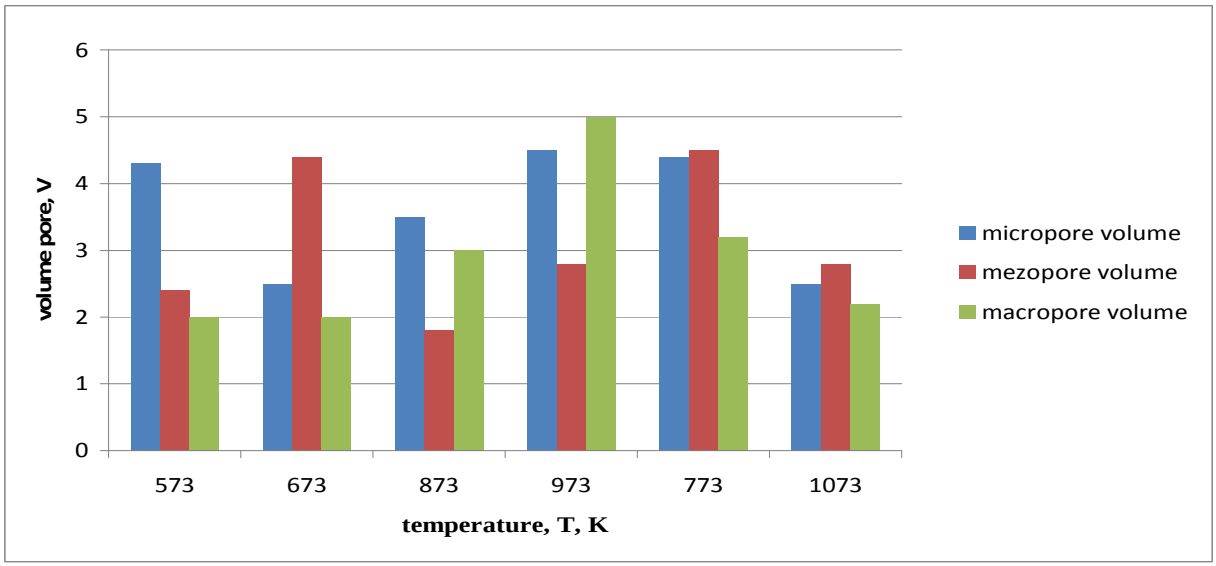
Activation temperature T,K	Time of activation, hour	Total pore volume V_t.10^{-4} m^3/kg	Micropore volume V_{mi},*10^{-4} m^3/kg	Mesopore volume V_{me},* 10^{-4} m^3/kg	Macropore volume V_{ma}, 10^{-4} m^3/kg
573	1	11,0	4,0	5,7	1,3
673	1	11,0	5,5	4,0	1,5
773	1	10,0	3,0	5,0	2,0
873	1	9,0	3,0	4,5	1,5
973	1	8	3,0	4,2	0,8
1073	1	4	1,0	2,5	0,5

RESULTS AND DISCUSSION

Effect of temperature on the activation of the AC pore size can be shown graphically by the following way (Figure 1), wherein the pore size is taken as $V \cdot 10^{-4}$ m^3/kg.

Increasing the activation temperature from 573 K to 673 K is accompanied by an increase of the pore volume to the maximum value ($11.0 * 10^{-4}$) m^3/ kg. Further increase in temperature from 673 K to 1073 K adversely affected to the quality of activated carbon because contained hydrocarbon resin and decompose to form inactive carbon deposited on the carbon surface, and then causes the sintering.

Table 2 shows the main characteristics of microporous structural constants B and W_0 equations of the micropore volume filling. Constant B characterizes the size of the micropores, W_0-limiting volume of the adsorption space. The table shows that at small values of Bvalue of the constant W_0 is close to the volume of micropores. The difference in the values of total pore volume and statistical activity by benzol explained to the presence of small pores inaccessible to large molecules of benzol.



Picture 1. Influence of temperature on the pore size of the activated sorbent

Table 2 - Main characteristics of the sorbent

Activation temperature T,K	Activation time, hour	Total pore volume Vt,*10^{-4} m^3/kg	Statistical activity by benzene a_s ,*10^{-4} m^3/kg	Structural constants	
				W_0,*10^{-4} m^3/kg	B *10^{-6}
573	1	11,0	2,8	4,8	0,71
673	1	11,0	3,1	5,8	1,08
773	1	10,0	2,9	5,4	1,05
873	1	9,0	2,7	4,8	0,84
973	1	8,0	2,1	3,8	0,57
1073	1	4,0	1,8	2,5	0,27

CONCLUSION

Thus, these experimental results show the effectiveness of heat treatment of grape seed meal to produce a sorbent with different pore volumes. Activation meal at a temperature of 573 K to 673 K allows obtaining a sorbent with a large volume of micropores and moderately advanced transition porosity provides intensive diffusion of adsorbate into the adsorbent grains. This method makes it possible to obtain high quality adsorbent capable to excretion from an organism various toxic substances.

REFERENCES

[1] Linares-Solano A., Rodges-Gonzalez J. de D., **1984**. *Journal of Adsorpt. Sci.and Tehnol*.1(3):233-234.
[2] Lopez-Car zon E.J., Moreno-Castilla G., Guerrerro-Ruis A., Rodrigues-Reinoso F., Lopez-Gonzalez J., **1984**. *Journal of Adsorp.Sci.and Tehnol*.1(1):103-109.
[3] Rodrigues-Reinoso F., Lopez-Gonzales J. de D., Berenguer C., **1984**. *Journal of Carbon*. 22(1):13-18.
[4] Kutics K,,Kotsis L., Szolesfnyi P., Arguelan J., **1984**. *Hung. J. Ind. Chem*. 12(3):319-327.
[5] Rodriquwz-Reinoso F., Matiniez J., M. Molino-Sabio, Perez-Lleodo, Prado-BurgueteC.A.,**1985**. *Journal of carbon*.23(1):19-24.
[6]V.P. Georgievsky, S.I. Dihtyarev, Yu.I. Gubinet, **1999**.. *Journal Farmakom*.3-4: 39.
[7] Efremov A.A., Pavlova E.S., Offan K.B., Krotova I.V., **1998**. *Journal Chemistry of plant raw material*. 3: C.87-91.
[8] Offan K.B., Petrov V.S., Efremov A.A., **1999**. *Journal Chemistry of plant raw material* .2:61-64.
[9] V.V. Samonin, M.S. Chentsov, V.V. Kudenko, A.Yu. Shevkina, **2005**. *International Scientific Journal for Altemative Energy an Ecology ISJAEE*. 8(28):84-87.
[10] Mukhina O.Y., **2003**. Obtain and research of fibrous materials with different porous structure: the Abstract diss ... Candidate of Science.
[11] B.A. Sagindykova, R.M. Anarbaeva, I.A. Martynova, **2006**. *Journal Science and Education South Kazakhstan*. 3 (52) :149-151.
[12] B.A. Sagindykova, R.M. Anarbaeva, **2008**. *Journal Pharmacy of Kazakhstan*. 6:28-29.