

INFLUENCE OF HEATING CONDITIONS ON TEXTURE PARAMETERS
AND ADSORPTION PROPERTIES OF APRICOT KERN
SHELL CARBONIZATES

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Some results of a comparative analysis of the textural parameters and sorption characteristics of carbonizates obtained by microwave and traditional heating of apricot kernel shells are presented. It has been shown that sorbent samples obtained by microwave carbonization of shells, in comparison with sorbents obtained by traditional heating, are characterized by a more uniform distribution of pore sizes, greater adsorption capacity and low fractal dimension of the surface.

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Keywords: shell carbonizates, microwave carbonization, carbon sorbents, texture parameters, fractal surface dimension.

Introduction. The processes of adsorption and ion exchange, along with traditional areas of application, are now widely used in the food industry, medicine and other areas of the national economy – for the purification of various biological fluids from toxins, wastewater treatment and in the production of medicines [1, 2]. Currently, many methods have been developed for producing various carbon sorbents, including so-called hybrid ones (having various organic functional groups on the pore surface). Among them, a special place is occupied by sorbents obtained from plant raw materials and having high sorption capacity and selectivity in relation to certain adsorbents. Considering that with the global deterioration of the environmental situation and environmental pollution by various man-made emissions – pesticides, heavy metals compounds and other toxins, the demand for new cheap and highly selective sorbents has sharply increased, issues regarding the development of new multifunctional carbon highly selective sorbents are in the sphere of interests not only of research chemists, but also other food specialists, pharmacists, ecologists, etc.

Previously, some results of a study of the texture and sorption properties of carbon hybrid sorbents, obtained by us by microwave carbonization of apricot kernel shells was presented [3]. This report provides a comparative analysis of the textural

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properties of carbon sorbents obtained by carbonization of apricot kernel shells obtained by traditional and microwave heating methods.

Experimental Part. Carbonization (charring) of apricot kernel shells (AKS), pre-washed with water, dried at a temperature of 120°C and crushed to a particle size of about 1 mm, was carried out by direct heating in an electric oven in a rotating quartz reactor in a stream of nitrogen (flow rate 0.1–0.5 L/min with a programmed heating mode at a speed of 50°C/h, in the temperature range 200–500°C) [4], and in a microwave oven (“CE1073AR”, Samsung), specially modified to carry out chemical processes in a flow of air, nitrogen or other gas [3].

Results and Discussion. The table shows the main test parameters of AKS carbonizates obtained by traditional and microwave heating methods in a nitrogen stream.

The main physicochemical characteristics of AKS carbonizates, obtained in a nitrogen stream at 500°C

Characteristics	Carbonization method	
	traditional	microwave
Specific surface area to Aranovich, m^2/g	215 ± 5	280 ± 5
Average pore diameter, nm	18 ± 3	12 ± 1
Pore volume in water, cm^3/g	0.35 ± 0.05	0.48 ± 0.05
Mechanical crushing strength, kg/cm^2	40 ± 3	52 ± 3
Fractal dimension of a surface	2.59 ± 0.95	2.01 ± 0.15
Bulk density, kg/m^3	380 ± 5	415 ± 5
Sorption capacity for iodine, mg/g	25 ± 3	35 ± 2
Sorption capacity for methylene blue, g/g	12 ± 2	17 ± 3
Ash content, %	2.5 ± 0.2	2.1 ± 0.2

Based on the data obtained, we can conclude that carbon sorbents obtained by microwave carbonization of plant raw materials, in particular fruit and berry seed shells, are not only characterized by better physical, mechanical and sorption properties, but are also easily susceptible to surface oxidation as conventional oxidizing agents and oxidation by electrochemical method [3, 4], but are also characterized by a very low fractal dimension of the surface.

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ՏԱԶԱՑՄԱՆ ՊԱՅՄԱՆՆԵՐԻ ԱԶԴԵՑՈՒԹՅՈՒՆԸ ԾԻՐԱՆԻ ԿՈՐԻՉԻ
ԿԵՂԵՎԻՑ ՍՏԱՑՎԱԾ ԿԱՐԲՈՆԱՑՄԱՆ ԱՐԳԱՍԻՔՆԵՐԻ
ՏԵԶՍՏՈՒՐԱՅԻՆ ԵՎ ԱԴՍՈՐԲՈՒՄԱՅԻՆ ՀԱՏԿՈՒԹՅՈՒՆՆԵՐԻ ՎՐԱ

Ներկայացված են ավանդական և միկրոալիքային տաքացմամբ ստացված ծիրանի կորիզի կեղևների կարբոնացման արգասիքների տեքստուրային և սորբումային առանձնահատկությունների համեմատական վերլուծության որոշ արդյունքներ: Ցույց է տրված, որ կեղևների միկրոալիքային եղանակով տաքացմամբ ստացված կարբոնացման արդյունքները, համեմատած ավանդական եղանակով տաքացմամբ ստացված սորբենտների հետ, բնութագրվում են ըստ չափերի ծակոտիների առավել նեղ բաշխվածությամբ, մեծ տեսակարար մակերեսով և ծակոտիների մակերևույթի ցածր ֆրակտալային չափողականությամբ:

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ВЛИЯНИЕ УСЛОВИЙ НАГРЕВАНИЯ НА ТЕКСТУРНЫЕ ПАРАМЕТРЫ
И АДСОРБЦИОННЫЕ СВОЙСТВА КАРБЕНИЗАТОВ ИЗ СКОРЛУПЫ
АБРИКОСОВЫХ КОСТОЧЕК

Представлены некоторые результаты сравнительного анализа текстурных параметров и сорбционных особенностей карбенизаторов, полученных микроволновым и традиционным нагреванием скорлупы абрикосовых косточек. Показано, что образцы сорбентов, полученные микроволновой карбенизацией скорлупы, по сравнению с сорбентами, полученными традиционным нагреванием, характеризуются более однородным распределением пор по размерам, большей адсорбционной емкостью и низкой фрактальной размерностью поверхности.