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TEXTURE CHARACTERISTICS OF ZINC ACETETATE CATALYST

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ABSTRACT
The article first studied the properties of carbon sorbents obtained on the basis of FC modified with acetic acid or hydrogen peroxide as carriers for zinc acetate catalysts of vinyl acetate synthesis. It was found that the adsorption process in modified coal is strongly dependent on the hydrodynamic regimes, the adsorption transfer temperature, the initial salt concentration and the initial value of the pH solution. Adsorption isotherms were obtained on the surface of the modified FC, which belongs to the lengmuir type of adsorption isotherms. On the surface of the modified sorbents (T = 50°C, solution rotation speed 15 + 2 cm / sec, initial values pH = 5.5-6.0 and = 20% mass.) Optimal conditions of zinc acetate immobilization corresponding to catalytic activity were established. The obtained catalysts were studied by small-angle scattering of X-rays, scanning electron microscopy, and X-ray microanalysis methods.

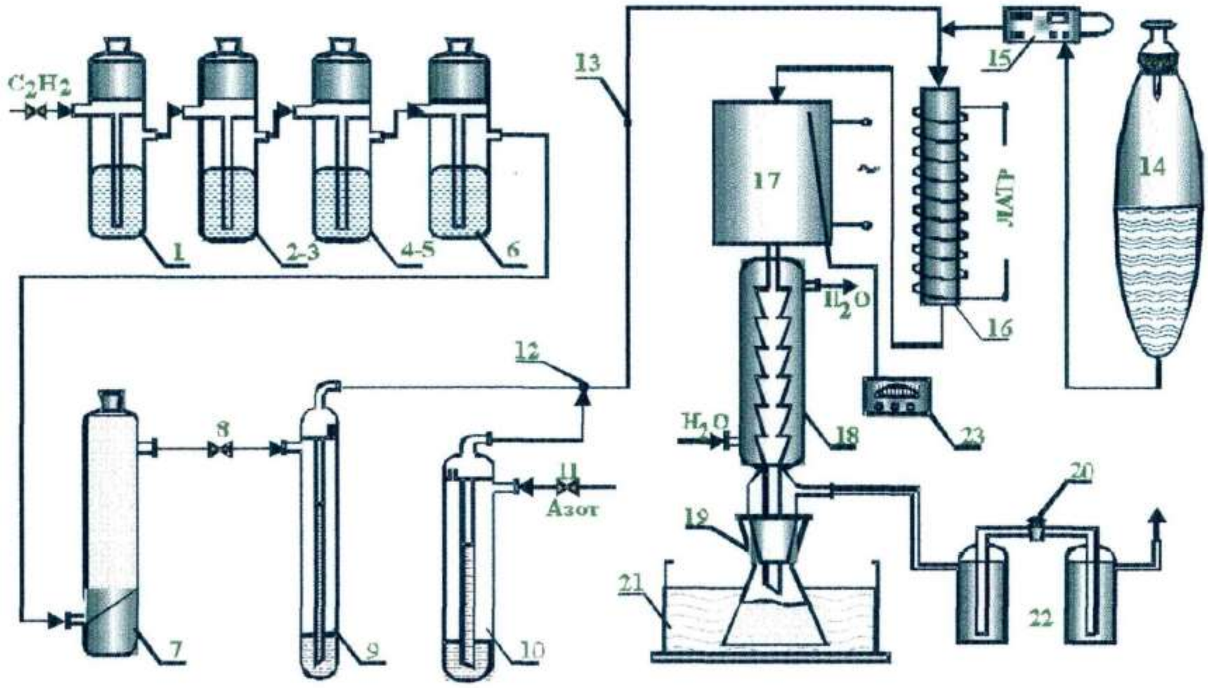
The aim of the work is to study the texture characteristics of zinc acetate catalyst prepared by soaking in activated carbon in different ways.
KEYWORDS: *activated carbon, zinc acetate, surface, Dubinin-Radushkevich equation, vapor adsorption.*

INTRODUCTION

In recent years, one of the directions of catalyst development for the acetylation reaction of acetylene with acetic acid is the preparation of catalysts with high catalytic activity and efficiency using carbon as a carrier [1-6]. Carbon materials have several important advantages: a large surface area, the ability to regulate the size distribution of pores, and the ability to recover active metals from spent catalysts by burning carbon. An important advantage of carbon as a catalyst carrier is the immobility of the surface, which excludes the occurrence of unwanted side reactions [7-12]. Carbon catalysts are resistant to the coke layer [13-19]. The carbon materials used as carriers are different in nature. They can be activated carbon, technical carbon and compositions based on it. The advantages of technical carbon-based compositions, for example, Sibunite [20-25], are their chemical purity (content of C is not less than 99.5%), high strength and spherical shape of granules compared to activated carbon [26-28]. The creation of materials with hierarchical porosity is one of the fastest growing areas of material science today. Due to the improved transport properties of the porous structure, such materials are widely used as carriers of sorbents, catalysts. The template method for the preparation of hierarchical porous materials is distinguished among other approaches in the creation of hierarchical structures by its simplicity, versatility compared to the previous ones used and the ability to strictly control texture properties, and as a result, the resulting material is mechanically strong. In this study, the use of polymer microspheres was preferred as a cheap and easy-to-measure method for their synthesis, as well as a removable template due to its ability to accurately set particle diameters from 50 nm to 1000 nm. It should be noted that monodispersed polymer microspheres with different functional groups and sizes of 5 μm are valuable research objects for themselves. Up to a quarter of a billion tons of hydrocarbons, including heavy hydrocarbons, are mined in the country every year, but the depth of their processing is about 70%. [20-28].

EXPERIMENTAL PART

The general scheme of the laboratory device of vinyl acetate synthesis is shown in Figure 1.



1-6 scrubbers	14-UK burette	19-capacitor receiver
7-cylinders for drying	15-UK dispensers	21-chamber cooler
8.11 - cranes	16 evaporator	22 outlet glasses
9,10-rheometers	17- reactor 18- refrigerator	23-thermocouple
12-mixer		
13-20-gases tests		

Figure 1. Laboratory device for the synthesis of vinyl acetate

The study of the activity and stability of zinc acetate catalyst samples is carried out in a flow reactor made of heat-resistant glass. The reactor is a silicone oil-filled tube with a length of 130 mm and an inner diameter of 11 mm, equipped with a shield for heating. The temperature in the reactor is maintained using a relay and a contact thermometer. There is a channel for thermocouple to measure the temperature more accurately in the reaction zone. Temperature measurement accuracy +1°C.

The quality control of the prepared catalysts was carried out in a cyclic mode, the essence of which is the repeated repetition of the activity measurement at the three temperatures of catalysis.

The experiments are carried out at 175, 205, 230°C at circulating levels not exceeding 50% of acetic acid. The transfer rate of the gas mixture is 722c-1. Relative. Catalyst activity on vinyl acetate is calculated according to the following formula [29-37]:

$$\eta = X \cdot m / v_k \cdot t; \qquad g/l \cdot hour$$

here: X – the mass composition of vinylacetate (VA) in the test;

m–test mass, g;

v_k – catalyst capacity, l; $v_k = 6\ cm^3$

t – sampling time interval, hours.

EXPERIMENTAL RESULTS AND THEIR DISCUSSION

All the obtained isotherms of adsorption are given in the coordinates of the Dubinin-Radushkevich equation used to calculate the structural parameters of the pores. An example of a calculation based on the Dubinin-Radushkevich equation is shown in Figure 2.

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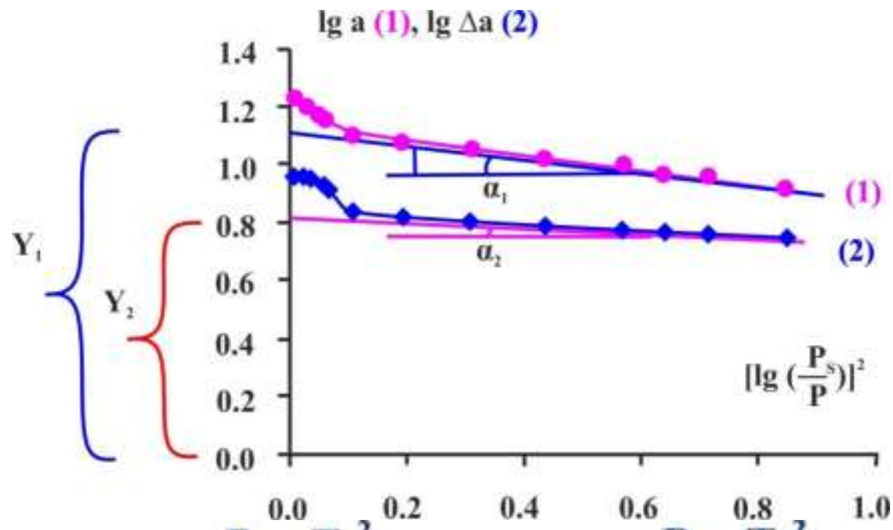

$$tg\ \alpha_1 = \frac{B_1 T^2}{\beta^2} \qquad tg\ \alpha_2 = \frac{B_2 T^2}{\beta^2}$$

$$Y_1 = \lg \frac{W_0^1}{V^*} \qquad Y_2 = \lg \frac{W_0^2}{V^*}$$

Figure 2. Vapor adsorption isotherms in the coordinates of the Dubinin-Radushkevich equation.

Specific properties of vapor adsorption differential heat measurement. It is possible to determine the adsorption heat of vapors on the adsorption isotherms of vapors, but reliable determination of the isosteric heat of adsorption from the isotherms is possible only if the isotherms are thermodynamically equal and reversible.

As can be seen from Figure 3, the dependence of the specific surface temperature on the discharge temperature of zinc acetate from aqueous solutionsasses through T≈50°C in activated carbon**.**

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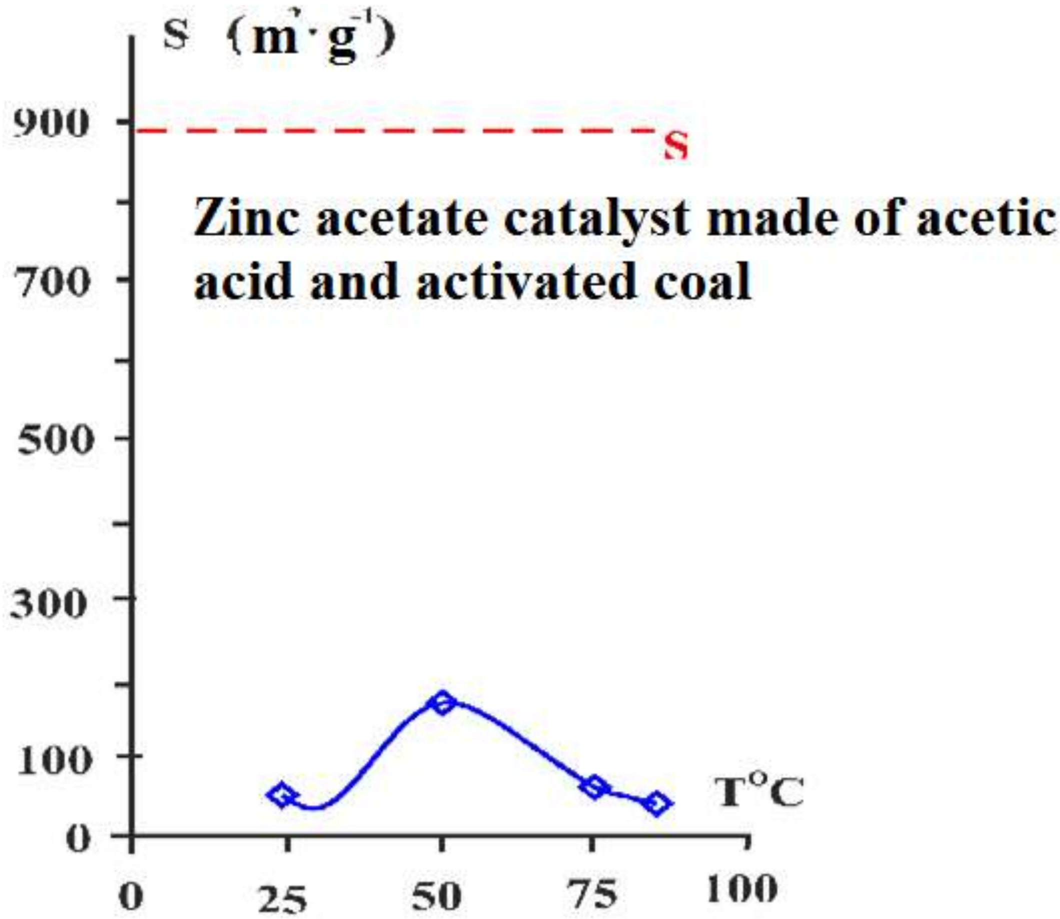

Figure 3. Dependence of the specific surface area of catalysts on the drying temperature of the solution.

All of the hydrogen peroxide-treated and acetic acid-treated catalysts described above were dried at 150–160°C for 3 h after zinc acetate was reduced. It is known that the drying mode significantly affects the distribution of the saline component and may be reflected in the activity of the catalyst. To determine the effect of the drying mode, we changed the rate of temperature rise by further drying at 150°C for 2 h (0.3°C per minute).

Thus, a comparison of the disperse structures of the catalysts under consideration shows the superior effect of the method and conditions of formation on the state of the salt component in their composition.

The presented results of X-ray studies of catalysts are reconciled with SEM and RMA data. Electronic microphotographs obtained at a maximum magnification (x20000) for this method show only the morphological structure of the activated charcoal, which has a well-branched system of carriers - pores. Particles of activated carbon have a corpuscular structure formed by irregularly shaped bubbles and a globular structure belonging to amorphous carbon. The structure of the salt component is not reflected in these magnifications.

Quantitative analysis of the lateral and internal surfaces of the granules of catalyst samples was performed to obtain information on the specific properties of the distribution of the saline component.

CONCLUSIONS

Thus, for the first time, the properties of carbon sorbents obtained on the basis of FC modified with acetic acid or hydrogen peroxide as carriers for zinc acetate catalysts of vinylacetate synthesis were systematically studied.

REFERENCES

1. *Gaffney T.R. Porous Solids for Air Separation// Current Opinion in Solid State and Materials Science. 1996. Vol. 1. No. 1. P. 69-75.DOI: 10.1016/S1359-0286(96)80013-1.*
2. *Fuertes A.B. Fuertes, Centeno T.A. Carbon Molecular SieveMembranes from Polyetherimide// MicroporousandMesoporous Mater. 1998. Vol. 26.P.23-26.*

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3. *Wahby A., Wahby A., Silvestre-Albero J., Sepulveda-Escribano A., Rodriguez-Reinoso F. CO2Adsorption on Carbon Molecular Sieves // Microporous and Mesoporous Materials. 2012. Vol. 164. P. 280-287.DOI: 10.1016/j.micromeso.2012.06.034.4.KouichiM., Junichi H., Kenji H. Production of Molecular Sieving Carbon through Carbonization of Coal Modified by Organic Additives//Carbon. 1991. Vol. 29. Issue4-5. P. 653-660.DOI: 10.1016/0008-6223(91)90133-4.*
4. *Toda Y., Yuki N., Toyoda S. Change in Pore Structure of Active Carbon with Heat-Treatment //Carbon. 1972. Vol. 10. Issue1. P. 13-18.*
5. *KugatovP.V., Bashirov I.I., Zhirnov B.S., Akhmetova I.I., PoroshinA.S. Production of Molded Activated Carbon from Carbon Black and Petroleum Pitch by Alkaline Activation//Russian Journal of Applied Chemistry. 2016. Vol. 89. P. 886-890. DOI: 10.1134/S1070427216060069.*
6. *Jasienko-HalatM.,KedziorK.Comparison of Molecular Sieve Properties in Microporous Chars from Low-Rank Bituminous Coal Activated by Steam and Carbon Dioxide //Carbon. 2005. Vol. 43. Issue5. P. 944-953. DOI: 10.1016/j.carbon.2004.11.024.*
7. *Henning K.D., Schäfer S.Impregnated activated carbon for environmental protection//Gas Separation & Purification. - 1993. - Vol. 7, issue 4. P. 235–240. 27*
8. *Мансуров З.А. Углеродные наноструктурированные материалы на основе растительного сырья. - Алматы: Қазақ университеті, 2010. – 301 с.*
9. *Тарковская И.А. Сто профессий активного угля. - Киев: Наукова Думка, 1990. - 200 с.*
10. *Azat S., Rosa Busquets, Pavlenko V.V., Kerimkulova A.R., Raymond L.D Whitby, Mansurov Z.A. Applications of activated carbon sorbents based on greek walnut//Applied Mechanics and Materials. - 2014. – Vol. 467. – P. 49-51.*
11. *Файзуллаев Н.И., Мусурмонов Н.Х.,Оманов Б.Ш.Бифункционал катализаторларда ацетиленнинг каталитик ўзгаришлари. //Монография. Самарқанд. 2019. 136 бет. ISBN 978-9943-5375-9-0*
12. *Оманов Б.Ш., Файзуллаев Н.И., Туробжонов С.М. Винилацетат синтези реакторини моделлаштириш ва жараённи мақбуллаштириш. //ТошДТУ хабарлари.- Тошкент. 2018 йил, №1. 129-136 бет. (02.00.14; № 11).*
13. *Оманов Б.Ш., Файзуллаев Н.И., Жуманазаров Р.Б., Норқулов У.М. Винилацетат ишлаб чиқаришнинг ихчамлаштирилган технологияси. //СамДУ илмий ахборотномаси.- Самарқанд. 2018 йил, №1.107-114 бет. (02.00.14; №9).*
14. *Оманов Б.Ш., Файзуллаев Н.И., Туробжонов С.М. Винилацетат ишлаб чиқаришнинг такомиллаштирилган технологияси. //ТошДТУ хабарлари.-Тошкент. 2018 йил, №2. 147-153 бет. (02.00.14; № 11).*
15. *Omanov B.Sh., Fayzullayev N.I, Khatamova M.S.Vinylacetate Production Out of Acetylene//International Journal of Advanced Research in Science, Engineering and Technology. ISSN: 2350-0328. Vol. 6, Issue 12, December 2019. pp.12011-12017. (№2. Journal Impact Factor,№6. International Impact Factor Services,№16. Directory Indexing of International Research Journals-CiteFactor, №23. Scientific Journal Impact Factor).*
16. *Omanov B.Sh., Fayzullaev N.I., Musulmonov N.Kh., Xatamova M.S., Asrorov D.A. Optimization of Vinyl Acetate Synthesis Process. //International Journal of Control and Automation.ISSN: 2005-4297. Vol. 13, No1, (2020), pp. 231 – 238. (№3. Scopus, № 18. Ulrich's Periodicals Directory).*
17. *Omanov B.Sh., Fayzullaev N.I., Xatamova M.S. Vinyl Asetate Production Texnology. //International Journal of Advanced Science and Technology. ISSN: 2005-4238. Vol. 29, № 03. 2020.pp. 4923-4930. (№3. Scopus, № 17. Open Academic Journals Index, № 18. Ulrich's Periodicals Directory.).*
18. *Omanov B.Sh., Fayzullaev N.I., Xatamova M.S.Catalytic synthesis of acetylene ut of vynil acetate and texture characteristics of catalysts. //«Asian journal of multidimensional research. ISSN: 2278-4853. Special Issue, March, 2020. pp. 234-241.Impact Factor: SJIF 2020 = 6.882. (№ 12. Index Copernicus, № 35. CrossRef).*
19. *Оманов Б.Ш., Файзуллаев Н.И., Хатамова М.С. Технологии производственные винилацетат. // Инновационная наука. Международный научный журнал. Уфа. 2020. №3. 10-12 стр. (№ 12. Index Copernicus, № 35. CrossRef).*
20. *Оманов Б.Ш., Файзуллаев Н.И. Параметры технологического режима синтеза винилацетата. // Universum: «Химия и Биология». Научный журнал. Москва. 2020. Выпуск: 4(70). Апрель. 45-48 стр. (02.00.00; № 2)*
21. *B.Sh. Omanov, N.I. Fayzullaev, K.A. Ernazarov, M.S.Xatamova. Production of Vinyl Acetate from Acetylene. //Academicia: An International Multidisciplinary Research Journal.ISSN: 2249-7137 Vol. 10, Issue 6, June 2020 pp.1030-1037. Impact Factor: SJIF 2020 = 7.13. (№5. Global Impact Factor,№23.Scientific Journal Impact Factor, №25. Directory of Open Access Journals).*
22. *Omanov B.Sh. Approval of the process of vinyl acetate synthesisfrom acetylene.//Academicia: An International Multidisciplinary Research Journal.ISSN: 2249-7137 Vol.10, Issue 9, Sept 2020 pp. 236-243. Impact Factor: SJIF 2020 = 7.13. (№5 Global Impact Factor,№23.Scientific Journal Impact Factor,№25. Directory of Open Access Journals).*