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Acknowledgements for assistance with work or financial support (optional).

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1. Nanda S., Golemi-Kotra D., McDermott J.C., Dalai A.K., Gokalp I., Kozinski J.A. Fermentative production of butanol: Perspectives on synthetic biology. *New Biotechnol.*, 2017, **37**, 210-221.
2. Uytbroek M., Van Hecke W., Vanbroekhoven K. Sustainability metrics of 1-butanol. *Catal. Today*, 2015, **239**, 7-10.
3. Zheng J., Tashiro Y., Wang Q., Sonomoto K. Recent advances to improve fermentative butanol production: Genetic engineering and fermentation technology. *J. Biosci. Bioeng.*, 2015, **119**, 1-9.
4. Gabriels D., Hernandez W. Y., Sels B., Van Der Voort P., Verberckmoes A. Review of catalytic systems and thermodynamics for the Guerbet condensation reaction and challenges for biomass valorization. *Catal. Sci. Technol.*, 2015, **5**, 3876-3902.
5. Patent US 8779216 B2. Wick A. and Mahnke E.U. Method for producing guerbet alcohols. 2014.
6. Patent US 20130068457 A1. Thach S., Shong R., Dwarakanath V., Winslow G. Method of manufacture of guerbet alcohols for making surfactants used in petroleum industry operations. 2013.
7. Patent WO 2013120757 AI. Thach S., Shong R., Dwarakanath V., Winslow G. Alcools de guerbet en tant que substitués de la Vaseline. 2013.
8. <http://www.iza-structure.org/databases/>
9. Khalameida S. et al. Effect of mechanochemical modification on properties of powder tin(IV) oxide and oxohydroxide. *Chemistry, Physics and Technology of Surface*, 2017, **8**(3), 271-288. [in Ukrainian].
10. Wu T. et al. Photoassisted degradation of dye pollutants. V. Self-photosensitized oxidative transformation of Rhodamine B under visible light irradiation in aqueous TiO₂ dispersions. *J. Phys. Chem. B*, 1998, **102**(30), 5845-5851.

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Література

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2. Brazhnyk D.V., Zaitsev Yu.P., Bacherikova I.V., Zazhigalov V.A., Stoch J., Kowal A. Oxidation of H₂S on activated carbon KAU and influence of the surface state. *Appl. Catal. B.*, 2007, **70**(1-4), 557-566.
3. Діюк О.А., Зажигалов В.О. Спосіб одержання нанесеного ванадій-фосфорного оксидного (VPO) каталізатора окиснення н-бутану в малеїновий ангідрид. *Пат. 121051 Україна, Патент на корисну модель (власник Інститут сорбції та проблем ендоекології НАН України)*. Опубл. 27.11.2017р., бюл. № 22.

References

1. Brei V.V., Shchutskyi I.V., Pidsadyuk I.M. New domestic HPPOa technology for propylene oxide production. *Visnyk of the National Academy of Sciences of Ukraine*, 2022, 1, 63-68 [in Ukrainian].
2. Brazhnyk D.V., Zaitsev Yu.P., Bacherikova I.V., Zazhigalov V.A., Stoch J., Kowal A. Oxidation of H₂S on activated carbon KAU and influence of the surface state. *Appl. Catal. B.*, 2007, **70**(1-4), 557-566.
3. Diyuk O.A., Zazhigalov V.O. Sposib oderzhannya nanesenogo vanadii-fosfornogo oksidnogo (VPO) katalizatora okisleniya n-butana v maleinovyi anhydride. Pat. 121051 Ukraina, Patent na kotysnu model'. *Vlasnyk Instytut sorbcii to problem endoekologii NAN Ukrainy*. Opubl. 27.11.2017, bul. N 22. [in Ukrainian].

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Vapour phase Guerbet condensation of ethanol to 1-butanol on CsX zeolite

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Nowadays, the conversion of ethanol into valuable chemical products is getting wider application. One of such promising processes is Guerbet condensation of alcohols, which permits the obtaining of 1-butanol from renewable raw materials that are alternatives to petroleum ones. Oxide systems combining acid and basic sites in their composition are promising catalysts for such a transformation. In this study, the efficiency of the magnesium-aluminum oxide and zirconium-oxide catalysts was compared to the activity of the cesium form of X-type zeolite produced by hydrothermal ion exchange in the condensation of ethanol to 1-butanol. The integrity of the zeolite structure was confirmed by using the XRD and XRF analysis, as well as by the IR spectroscopy. The depth of exchange of native sodium for cesium was 82 %. It was also found that cesium cations are localized only in ion-exchange positions of faujasite, in places SIII (supercages) and SI' (sodalite cages). CsX zeolite acid to basic sites ratio was found to be close to optimal for this reaction. Cesium-containing zeolite at 300 °C shows ethanol 35-55 % conversion and 20-25 % selectivity for 1-butanol, which is higher than the same characteristics for zirconium samples, but slightly inferior to magnesium-aluminum oxide catalysts. The obtained results indicate the promising use of zeolites of a similar nature in the process of condensation of ethanol to 1-butanol.

Keywords: ethanol condensation, 1-butanol, acid sites, basic sites, 1-butanol yield, process selectivity

Introduction

1-Butanol is widely used as a solvent, extractant, and raw material for the production of methacrylates and butyl acrylate for coatings, enamels, and varnishes [1, 2]. A relatively new field of application for 1-butanol is its addition to gasoline instead of ethanol [2-5]. ...

Experimental

Catalyst synthesis

X-type zeolite ($\text{SiO}_2/\text{Al}_2\text{O}_3 = 2.3$, TU 38.102168-85, static capacity for water vapor: $0.30 \text{ cm}^3/\text{g}$, for benzene vapor: $0.29 \text{ cm}^3/\text{g}$, fraction 0.5-1 mm) was subjected to a two-time exchange for cesium cations from a 1 N aqueous solution of nitrate (chemically pure, TU 6-09-437-83) for cesium form synthesis. ...

Results and Discussion

Catalyst characterization

Based on the X-ray fluorescence analysis data, the SiO_2 to Al_2O_3 ratio in the zeolite framework and the degree of cesium exchange were calculated to be 2.5 and 82 %, respectively. Therefore, during the ion exchange procedure, the chemical composition of the aluminosilicate framework of the zeolite undergoes only minor changes.

Table 1. Characteristics of porous structure of zeolite samples according to low temperature nitrogen

Sample	S_{BET} , m^2/g	S_{micro} , m^2/g	V_{micro} , cm^3/g	V_{t} , cm^3/g	$V_{\text{micro}}/V_{\text{t}}$	R, nm
NaX	689	669	0.279	0.323	0.86	0.9
CsX	345	329	0.140	0.180	0.79	1.0

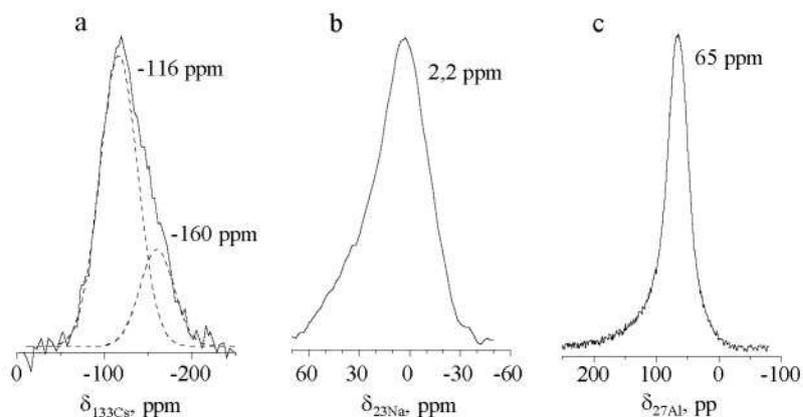


Fig. 1. ^{133}Cs (a), ^{23}Na (b), and ^{27}Al (c) NMR spectra for CsX sample

Conclusions

According to the results of X-ray diffraction and X-ray fluorescence analysis, NMR, and IR spectral studies, the CsX zeolite synthesized by ion exchange with a high degree of sodium to cesium exchange retained its crystalline structure. In particular, in the ^{133}Cs NMR spectrum of zeolite, there are two signals of chemical shifts, -116 and -160 ppm, reflecting cesium cations in supercages and sodalite cages (sites SIII and SI', respectively). ...

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References

1. Ndaba B., Chiyanzu I., Marx S. n-Butanol derived from biochemical and chemical routes: A review. *Biotechnol. Reports*, 2015, 8, 1-9.
2. Rajesh Kumar B., Saravanan S. Use of higher alcohol biofuels in diesel engines: A review. *Renew. Sustain. Energy Rev.*, 2016, 60, 84-115.
3. Roberto W., Trindade S., Gonsalves R., Santos D. Review on the characteristics of butanol, its production and use as fuel in internal combustion engines. *Renew. Sustain. Energy Rev.*, 2016, 69, 642-651.

Парофазна конденсація етанолу до 1-бутанолу за Гербе на цеоліті CsX

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Перетворення етанолу у цінні хімічні продукти набуває все ширшого застосування. Одним із таких перспективних процесів є конденсація спиртів за Гербе, що дозволяє отримувати 1-бутанол із альтернативної нафтовій відновлювальної сировини. Багатообіцяючими каталізаторами такого перетворення є оксидні системи, що поєднують у своєму складі кислотні та основні центри. У даній роботі оцінено активність у конденсації етанолу до 1-бутанолу цезієвої форми цеоліту типу X, одержаної гідротермальним іонним обміном, а також проведено порівняння її ефективності з магній-алюміній-оксидними та цирконій-оксидними каталізаторами. Цілісність цеолітної структури підтверджено методами рентгенофазового та рентгенофлуорисцентного аналізу, а також ІЧ-спектроскопії. Ступінь обміну натрію на цезій склав 82 %. Знайдено також, що катіони цезію локалізовані лише у іонообмінних позиціях фожазиту - в місцях SIII (великі порожнини) та SI' (содалітові комірки). Встановлено, що цеоліт CsX має близькі до оптимального для даного перетворення співвідношення між кількістю кислотних та основних центрів. Цезійвмісний цеоліт за 350 °C демонструє 35-55 % конверсію етанолу та 20-25 % селективність за 1-бутанолом, що є вищим за показники для цирконієвих зразків, але дещо поступається магній-алюмінієвим каталізаторам. Одержані результати свідчать про перспективність використання цеолітів близької природи у процесі конденсації етанолу до 1-бутанолу.

Ключові слова: конденсація етанолу, 1-бутанол, кислотні центри, основні центри, вихід 1-бутанолу, селективність процесу