Catalytic Dehydrogenation of Isopropyl Benzene   S/020/60/132/02/27/067
                                                      B011/B002

is illustrated by Fig. 2. The points of these two dependences are lying on the
same curve. Hence the authors concluded that their experiments took place within
the kinetic range. From x_2 and x_3 the changes of the liberated energy ΔF, the
heat content ΔH and the entropy ΔS were calculated in the adsorption dis-
placement from the active centers of dehydrogenation. The degree of the dehydro-
genation of isopropyl benzene increases with rising temperature. At 580° and
607°, the yield in α-methyl styrene attains 70.5% and 83%, respectively (Table 1).
G. M. Marukyan is mentioned. There are 2 figures, 2 tables, and 8 references,
4 of which are Soviet.

ASSOCIATION: Institut organicheskoy khimii im. N. D. Zelinskogo Akademii nauk
             SSSR (Institute of Organic Chemistry imeni N. D. Zelinskiy of the
             Academy of Sciences, USSR)

SUBMITTED: February 8, 1960

Card 3/3

S/020/60/132/03/24/066
B011/B008

AUTHORS: Balandin, A. A., Academician, Teteni, P.

TITLE: On the Influence of the Nature of Metals on Their
                Catalytic Activity

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 132, No. 3,
                pp. 577-580

TEXT: In the paper under review the authors experimentally studied the
kinetics of the dehydrogenation of the isopropyl alcohol on metallic
silver, platinum, and palladium. The methods of the kinetic measurements
have been described previously (Refs. 10,11). The rate constants k
were calculated in accordance with equation

$$k = (z_2 + z_3)A_1 \ln \frac{A_1}{A_1 - m} - (z_2 + z_3 - 1)m \quad (1).$$ This equation was

obtained from the general kinetic equation which was derived by A. A.
Balandin (Ref. 19), with A_1 being the volume rate of the alcohol

Card 1/3

On the Influence of the Nature of Metals   S/020/60/132/03/24/066
on Their Catalytic Activity   B011/B008

passage, m the hydrogen volume separated within 1 min. and z_2 and z_3
the relative adsorption coefficients of the acetone and hydrogen. The
determination of z_2 and z_3 was necessary for the calculation of k. This
was done by means of the reaction-kinetic method (Ref. 20). For the
methods of the determination and calculation see Refs. 15 and 16. The
results are given in Tables 2 and 3. The authors carried out separate
experimental series at different temperatures and at a constant volume
rate in order to determine the activation energy ε of the dehydrogenation
of the isopropyl alcohol. The values A_1, m and $(z_2 + z_3)$ were inserted
in formula (1) for the calculation of the values of k. z_3 increases in
the case of the platinum catalyst with the rise of temperature (Table 3),
z_3 had therefore to be determined for the desired temperature with the
aid of interpolation from the dependence diagram log z_3 of 1/T. The true
activation energy was only determined on silver and platinum, since the
relative adsorption coefficients of the reaction products were only
available for these catalysts. For palladium, the approximate activation
energy was only determined from the tangent of the angle of slope of the
straight line in the diagram log m, 1/T. The values determined for ε are

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On the Influence of the Nature of Metals
on Their Catalytic Activity   S/020/60/132/03/24/066
                                               B011/B008

shown in Tables 4-6 and Fig. 2. The points come to lie on the straight
line by Arrhenius with sufficient accuracy (Fig. 2). Table 1 shows the
activation energies, also those taken from the papers (Refs. 15 and 16).
In the introduction, the authors explain the multiplet theory by A. A.
Balandin (Ref. 1) and the structural, as well as energetic correspondence
between the chemical compounds reacting in the substrate and in the
catalyst. They state, moreover, that the results mentioned in Table 1
have a sufficiently general character. The authors mention A. M.
Rubinshteyn, S. Z. Roginskiy, F. F. Vol'kenshteyn and N. D. Zelinskiy.
There are 2 figures, 6 tables, and 20 references, 11 of which are Soviet.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M. V.
               Lomonosova (Moscow State University imeni M. V. Lomonosov)

SUBMITTED: September 9, 1959

Card 3/3

PATRIKEYEV, V.V.; BALANDIN, A.A., akademik; KLABUNOVSKIY, Ye.I.; MARDASHEV, Yu.S.; MAKSIMOVA, O.I.

Selectivity towards optical isomers of adsorbents fromed in the presence of bacteria. Dokl.AN SSSR 132 no.4:850-852 Je '60.
(MIRA 13:5)

1. Institut organichoskoy khimii im. N.D.Zelinskogo Akademii nauk SSSR.
(Adsorbents)   (Isomers)

S.1190

AUTHORS: Tolstopyatova, A. A., Balandin, A. A., Academician,
Konenko, I. R.

TITLE: Catalytic Transformations of Alcohols and Cyclic Hydro-
carbons on Titanium Dioxide

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 133, No.1,
pp. 130 - 133

TEXT: Although titanium dioxide is easily available, it belongs to the
little investigated catalysts. The authors wanted to study its cata-
lytic properties with various modes of preparation, in reactions with
ethyl-, isopropyl, and n-propyl alcohol as well as with cyclohexane,
cyclohexene, and 1,4-cyclohexadiene. Moreover, they wanted to investi-
gate the kinetics of these reactions and the energies of the bonds of
C-, H-, and O-atoms with the TiO_2 surface. The method of the differen-
tial thermocouple is used for the study of the catalytic reactions.
Fig. 1 shows the position of the catalyst in relation to the thermo-
couple. The electromotive force (emf) was uninterruptedly recorded on

Card 1/3

the hydroxide from $TiCl_4$ with ... properties on four ... influence

Catalytic Transformations of Alcohols and
Cyclic Hydrocarbons on Titanium Dioxide

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B011/B003

water, No. 2 - the same with ammonia. No. 3 by oxidation of freshly pre-
pared Ti(OH)$_3$ (precipitated from TiCl$_3$ with ammonia) with air, and No. 4
by hydrolysis of orthoethyl titanate. It was established by X-ray struc-
tural analysis that anatase resulted in No. 1. Table 2 shows the reac-
tions studied in certain temperature ranges, the activation energies E
as well as K_o of the Arrhenius equation; furthermore, the degree of de-
carbonisation of each sample surface. It may be seen from these data and
Table 4 that the mode of preparation exerts a great influence on the
above-mentioned values and the binding energy. Table 3 shows the depen-
dence of the adsorption coefficient s on ΔH^o (heat content), the entro-
py ΔS^o, and the change in free energy ΔF^o. The binding energy values
were calculated for the first time (Table 4). There are 1 figure,
4 tables, and 11 references: 10 Soviet.

ASSOCIATION: Institut organicheskoy khimii im. N. D. Zelinskogo
              Akademii nauk SSSR (Institute of Organic Chemistry imeni
              N. D. Zelinskiy of the Academy of Sciences, USSR)

SUBMITTED: April 2, 1960

Card 3/3

$s/020/60/133/03/07/013$
$B016/B068$

AUTHORS: Balandin, A. A., Academician, Bogdanova, O. K.,
Shcheglova, A. P.

TITLE: Catalytic Dehydrogenation of Cyclohexanol

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 133, No. 3,
pp. 578 - 580

TEXT: It was shown by the authors in earlier publications (Ref. 1)
that several aliphatic alcohols can be dehydrogenated over a mixed
oxide catalyst without any noticeable formation of by-products due to
decomposition and dehydration. They showed in this publication that the
same catalyst may be also used to dehydrogenate cyclohexanol. This meth-
od of preparing cyclohexanone is being used in the production of syn-
thetic fibers in which cyclohexanone is applied as a good solvent. Ac-
cording to Ye. V. Tur, S. A. Anisimov, and M. S. Platonov (Ref. 2), the
cyclohexanone yield is up to 25.3% over finely disperse rhenium at
350°C. Benzene, cyclohexane, and other compounds form as by-products.
The cyclohexanone yield over a nickel-aluminum catalyst according to

Card 1/3

Catalytic Dehydrogenation of Cyclohexanol   S/020/60/133/03/07/013
B016/B068

Zelinskiy and Komarevskiy is about 37% at 380°C, with larger amounts
(about 48%) of benzene, and, in addition, phenol, cyclohexene, and
polymer products being formed. Moreover, the authors give data obtained
by German and Japanese researchers. They studied the kinetics of the
mentioned reaction, and determined the relative absorption coefficients,
the reaction rate constants together with the activation energies
(Table 3), the changes in free energy, heat content, and the entropies
found for the adsorptive displacement of the alcohol molecules from the
active dehydrogenation centers by cyclohexanone (Table 2). Finally, the
authors established the conditions of dehydrogenation which secure high
yields of cyclohexanone. The continuous method was applied for these
experiments. They were carried out in an apparatus described previously
(Ref. 8) and over a similar oxide catalyst sample. The conversion degree
of alcohol in cyclohexanone varies between 16 and 75.8% of theory
(Table 1). The results of further experiments carried out with binary
cyclohexanol - cyclohexanone mixtures (containing 24.6 mole % of the
latter) are shown in Table 2. From these results, it follows that the
relative adsorption coefficient of cyclohexanol is 3.03 at 281°C, and
drops to 0.91, if the temperature is raised to 336°. A logarithmic

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Catalytic Dehydrogenation of Cyclohexanol

S/020/60/133/03/07/013
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dependence holds between the adsorption coefficient and reciprocal temperature (Fig. 1). It can be seen from Table 2 that the values of the mentioned coefficients remain unaltered, if the temperature is kept constant and the rates of passage are varied. From Table 4, it can be seen that the conversion degree of alcohol increases from 67.9 to 88.2%, when the temperature is raised from 333 to 360°C and the rate of passage per hour is increased. There are 2 figures, 4 tables, and 10 references: 7 Soviet and 3 American.

ASSOCIATION: Institut organicheskoy khimii im. N. D. Zelinskogo Akademii nauk SSSR (Institute of Organic Chemistry imeni N. D. Zelinskiy of the Academy of Sciences, USSR)

SUBMITTED: March 18, 1960

Card 3/3

S/020/60/133/004/036/040XX
B016/B054

AUTHORS: Bogdanova, O. K., Balandin, A. A., Academician, and
             Belomestnykh, I. P.

TITLE: The Effect of the Conjugation Energy on the Rate of
             Catalytic Dehydrogenation of Alkyl-aromatic and Alkyl-
             hexahydro-aromatic Hydrocarbons

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 133, No. 4,
             pp. 841-842

TEXT: The authors report on their investigations of the dehydrogenation
of ethyl cyclohexane and isopropyl cyclohexane on mixed oxide catalyst.
They proceeded from the results of a previous paper (Ref. 1) which showed
that ethyl benzene and isopropyl benzene are well dehydrogenated on this
catalyst. The rate constant of the dehydrogenation of isopropyl benzene
with a ramified alkyl radical is twice that of ethyl benzene (Table 1).
Apparatus and methods used for the experiment are described in the paper
mentioned (Ref. 1). The amount of catalyst used was 10 ml, the temperature

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The Effect of the Conjugation Energy on the   S/020/60/133/004/036/040XX
Rate of Catalytic Dehydrogenation of Alkyl-   B016/B054
aromatic and Alkyl-hexahydro-aromatic
Hydrocarbons

was 550 - 600°C, the volume velocity of the hydrocarbon was 1000 ml/l · h
(equal to a rate of travel of 0.5 ml per 3 min). Afer every experiment,
the catalyst was blown through with vapor - air mixture and with air.
Cyclohexane was also used for the experiments; it can, however, not be
dehydrogenated under the above conditions. The dehydrogenation of ethyl
cyclohexane at 550° was poor (1% of vinyl cyclohexane was formed); the
same applies to isopropyl cyclohexane (2% of isopropylidene cyclohexane).
At 600°C, these yields were 3.8, and 6.7% respectively. At 600°C, methane,
ethane, and unsaturated hydrocarbons were formed by cracking. The authors
conclude from their results that the rate of catalytic dehydrogenation
depends on the structure of the hydrocarbons used, on that of their alkyl
radicals, and mainly on the possibility of formation of a conjugate bond
with the aromatic ring. The dehydrogenation of the alkyl group of the
hexahydro-aromatic ring is rendered difficult. There are 1 table and 7
references: 5 Soviet, 1 British, and 1 German.

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The Effect of the Conjugation Energy on the
Rate of Catalytic Dehydrogenation of Alkyl-
aromatic and Alkyl-hexahydro-aromatic
Hydrocarbons

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B016/B054

ASSOCIATION: Institut organicheskoy khimii im. N. D. Zelinskogo
Akademii nauk SSSR (Institute of Organic Chemistry imeni
N. D. Zelinskiy of the Academy of Sciences USSR)

SUBMITTED: April 13, 1960

Card 3/3

S/020/60/133/005/031/034/XX
B016/B060

5. 1190

AUTHOR: Balandin, A. A., Academician

TITLE: Structural Correspondence in Catalysis

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 133, No. 5,
            pp. 1073 - 1076

TEXT: As far back as 1929 (Ref. 2) the author had already defined the
principle of structural correspondence between catalyst and reacting
molecules. The evidence gathered in the course of time regarding the signi-
ficance of structural factors for catalysis, and especially the experimen-
tal results indicating a sextet model have been collected by the author in
Refs. 7 - 11. Since two years have already passed since the last-mentioned
work, the author now adds further results. Table 1, compiled on the basis
of the new (Ref. 12, 1958) detailed collection of interatomic distances,
includes only metals, viz., such as crystallize in simplest systems (A1,
A2, A3, and A4). This shows that the rule earlier established is also valid
for the new values of interatomic distances. The elements known as catalysts
of cyclohexane dehydrogenation actually belong to the metals with lattice

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Structural Correspondence in Catalysis

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types A1 and A3. These metals including rhenium have the shortest interatomic
distances d. The cyclohexane dehydrogenation by Re, predicted by the
multiplet theory, has been proved by the author jointly with Ye. N.
Karpeyskaya and A. A. Tolstopyatova (Ref. 13). The author further succeeded
in establishing a case of so-called irreversible catalysis of cyclohexene
on Re, which takes place more slowly than the dehydrogenation of cyclo-
hexane to benzene. This confutes the assumption contradicting the sextet
scheme, uttered by some authors (Ref. 14), according to which the dehydro-
genation of cyclohexane proceeds by way of irreversible catalysis. Accord-
ing to Table 1, also technetium belongs to the category of dehydrogenation
catalysts. This would have to be checked experimentally. Cu has proved to
be a catalyst of benzene hydrogenation (according to B. V. Yerofeyev and
N. V. Nikiforova, Ref. 15). Its weak activity is explained by other, not
structural factors. The low-temperature modification of manganese has a
complex lattice (A12) and is not given in Table 1. According to theory,
cyclohexane is not dehydrogenated on Mn (Ref. 16). The same holds for Fe.
The author believes that the data by I. E. Anderson and C. Kemball (Ref. 17)
do not contradict Table 1. The mechanism of dehydrogenation discussed here
has been checked from still another angle: the dehydrogenation of 7- and

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Structural Correspondence in Catalysis

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5-membered rings (I), giving rise to non-benzoid aromatic compounds (II) (Ref. 21). The sextet model is excellently confirmed by the fact that on Pd (Ref. 22) bicyclo-(0,3,5) decane is dehydrogenated to azulene (III) only in a small amount. Table 1 of the article under consideration is intended to replace the table given in the author's earlier paper (Ref. 2, 1929). It is also applicable in the case of other catalytic reactions on metals as, e.g., in the hydrogenation of olefins and aldehydes. Papers by A. Ye. Agronomov and V. N. Luzikov (Ref. 16), and by the author and I. I. Brusov (Ref. 20) are mentioned. There are 1 table and 26 references: 15 Soviet, 3 US, 1 British, 1 Swiss, and 1 German.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M. V. Lomonosova (Moscow State University imeni M. V. Lomonosov), Institut organicheskoy khimii im. N. D. Zelinskogo Akademii nauk SSSR (Institute of Organic Chemistry imeni N. D. Zelinskiy of the Academy of Sciences USSR)

SUBMITTED: April 29, 1960

Card 3/3

S/020/60/133/006/007/016
B016/B060

AUTHORS: Shoheglova, A. P., Bogdanova, O. K., Balandin, A. A.,
            Academician

TITLE: The Problem of Dehydrogenating Butane - Butylene Mixtures
            on an Aluminum Chromium Catalyst

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 133, No. 6,
            pp. 1350-1353

TEXT: The present investigation was carried out in 1950. The catalyst
was supplied by M. N. Marushkin (Ref. 6). The authors wanted to collect
data concerning the kinetics and mechanism of the dehydrogenation
mentioned in the title. The dehydrogenation rates of butane and its
binary mixtures with butylene (Table 2), butadiene, and hydrogen
(Table 3) were measured under optimum conditions. Since butylene and
butadiene are decomposed on this catalyst, the authors measured the
reaction rates in binary mixtures of these hydrocarbons with ethane in
order to determine the degree of decomposition. In fact, ethane occupies,

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The Problem of Dehydrogenating Butane - Butylene Mixtures on an Aluminum Chromium Catalyst

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on the active surface, a part equal to butane, but is neither dehydrogenated nor decomposed. Figs. 1 and 2 show the decomposition of butylene and butadiene, respectively, as dependent on temperature. Experimental results confirmed the assumption previously put forward by the authors, according to which coal and resins result from the dehydrogenation mentioned in the title, due to the decomposition of butylene and, even more, butadiene (Table 3). The authors state in conclusion that the following reactions take place: 1) dehydrogenation of butane to butylene; its rate is inhibited by the butylene that is present in the initial mixture; 2) dehydrogenation of butane and butylene to butadiene; 3) decomposition of butane; 4) decomposition of butylene into light hydrocarbons and coal; 5) decomposition of butadiene into light hydrocarbons, coal, and condensation products. Butadiene develops in low yields at atmospheric pressure. The catalyst is soon polluted with coal and requires frequent regeneration. A more selective dehydrogenation of butane to butylene can be attained (Refs. 1,6) at lower temperatures. Less light hydrocarbons and coal are thus formed.

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The Problem of Dehydrogenating Butane -
Butylene Mixtures on an Aluminum Chromium
Catalyst

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The authors draw the conclusion that the catalyst used is specific for
the dehydrogenation of saturated hydrocarbons (butane). There are 2
figures, 4 tables, and 6 Soviet references.

ASSOCIATION: Institut organicheskoy khimii im. N. D. Zelinskogo
               Akademii nauk SSSR (Institute of Organic Chemistry imeni
               N. D. Zelinskiy of the Academy of Sciences USSR)

SUBMITTED: March 26, 1960

Card 3/3

84577
S/020/60/134/001/036/038/XX
B004/B064

5. 1190 (1231 only)

AUTHORS: Balandin, A. A., Academician, Rozhdestvenskaya, I. D.,
              and Slinkin, A. A.

TITLE: Effect of the Treatment of Chromium Oxide Catalysts With
              Gases Under Various Conditions Upon Their Catalytic and
              Magnetic Properties

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 134, No. 1,
              pp. 110-113

TEXT: The authors wanted to find a relation between the magnetic sus-
ceptibility χ and the catalytic properties in the Cr_2O_3 catalyst treated
by various methods. The chromium hydroxide prepared from chromium nitrate,
degree of purity "pro analysi", was treated as follows:

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Effect of the Treatment of Chromium Oxide
Catalysts With Gases Under Various Condi-
tions Upon Their Catalytic and Magnetic
Properties

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B004/B064
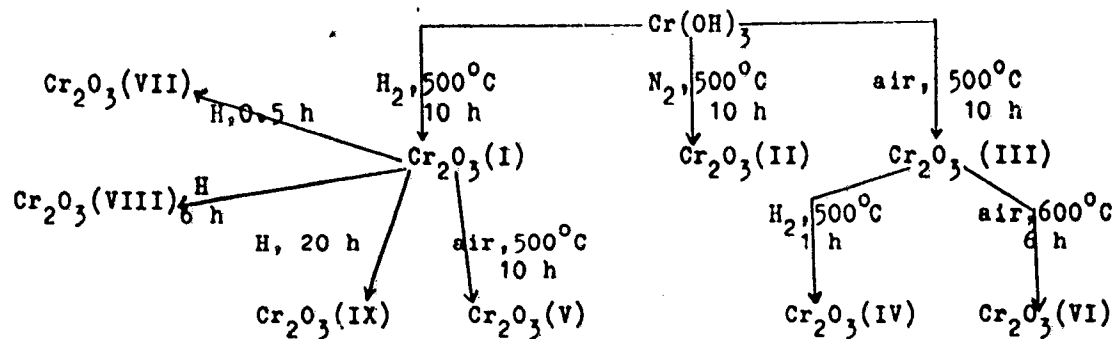
Cr_2O_3 was treated with atomic hydrogen in a special apparatus (Fig. 1).

H formed in vacuum at a voltage of 10,000 - 12,000 v and 1 - 2 mm Hg, and
was sucked through the Cr_2O_3 sample. Subsequently, catalysis was made in
the same apparatus under the exclusion of air. Table 1 shows the tempera-
ture dependence of χ for the various C_2O_3 preparations.

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Effect of the Treatment of Chromium Oxide   S/020/60/134/001/036/038/XX
Catalysts With Gases Under Various Condi-   B004/B064
tions Upon Their Catalytic and Magnetic
Properties

| No. of sample | $\chi \cdot 10^6$ | | | | Δ°,K | μ_B | No.of sample | $\chi \cdot 10^6$ | | | |
	20°C	50°C	80°C	160°C				20°C	50°C	80°C	160°C
I	24.0	25.3	24.4	23.3			VI	24.4	25.2	23.4	23.0
II	23.0	25.0	23.6	22.9			VII	92.0	-	-	-
III	340.0	-	-	-			Ia	96.0	-	--	-
IV	28.0	-	25.8	24.0	500	3.7	IIa	21.8	-	22.1	20.8
V	22.8	24.3	23.3	22.8							

The samples Ia and IIa were prepared from impure Cr_2O_3. The ferromagnetism
of sample Ia is caused by impurities. The ferromagnetism of III is, how-
ever, not due to impurities and occurs only when Cr_2O_3 is treated with

air at 600°C. The authors assume that CrO_2 forms in low yields. This new

phase could, however, not be confirmed by X-ray- and electron diffraction
pictures. Table 2 gives the results of the catalytic decomposition of
isopropanol and the dehydrogenation of cyclohexane by means of the samples.

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Effect of the Treatment of Chromium Oxide   S/020/60/134/001/036/038/XX
Catalysts With Gases Under Various   B004/B064
Conditions Upon Their Catalytic and Magnetic
Properties

Different activity, selectivity, and activation energy were found to exist.
The dehydrogenation of C_6H_{12} was reduced both in the ferromagnetic sample

III and the antiferromagnetic sample IX, and the dehydration of $i-C_3H_7OH$

increased. Herefrom, the authors infer the presence of hydroxyl groups
on the catalyst surface. Their origin is, for IX, explained by the chemo-
sorption of atomic H, for III by the interaction of CrO_2 with H_2 forming

at the beginning of the reaction. The inactivation of sample I by treat-
ment with water vapor and subsequent regeneration with H_2 at $500^\circ C$ con-

firmed the inhibiting effect of the OH group upon the dehydrogenation
of C_6H_{12}. The authors came to the result that it is not possible to draw

conclusions from the magnetic and electrical properties upon the surface
structure that determines the catalytical properties only. There are
1 figure, 2 tables, and 13 references: 5 Soviet, 5 US, 3 British, and
2 German.

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Effect of the Treatment of Chromium Oxide   S/020/60/134/001/036/038/XX
Catalysts With Gases Under Various   B004/B064
Conditions Upon Their Catalytic and Magnetic
Properties

ASSOCIATION: Institut organicheskoy khimii im. N. D. Zelinskogo Akademii
                 nauk SSSR
                 (Institute of Organic Chemistry imeni N. D. Zelinskiy of
                 the Academy of Sciences, USSR)

SUBMITTED: May 17, 1960

Card 5/5

AUTHORS: Vasserberg, V. E., Balandin, A. A., Academician, and
               Georgiyevskaya, T. V.

TITLE: Conjugate Dehydration of Alcohols in an Adsorbed Layer on
               Aluminum Oxide Catalysts

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 134, No. 2,
               pp. 371-373

TEXT: In studying the dehydration of alcohols in Al_2O_3 (Refs. 1-3) the
authors observed different reaction rates in catalysts which had been
prepared in different ways. In the present paper, they examined such
catalysts. No. 1: Al_2O_3 precipitated by means of NaOH at pH = 6.3;
No. 2: Al_2O_3 obtained by hydrolysis of aluminum isopropylate; No. 3:
precipitated from aluminate solution by means of CO_2 at $0°C$. First, the
different activities of the catalysts in the dehydration of C_2H_5OH and
iso-C_3H_7OH were confirmed. Furthermore, the dehydration of isopropanol in
the presence of ethanol was studied. Since the dehydration of isopropanol

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Conjugate Dehydration of Alcohols in an   S/020/60/134/002/039/041XX
Adsorbed Layer on Aluminum Oxide Catalysts   B004/B067

proceeds rapidly already at 120 - 150°C, whereas ethanol does not yet react at this temperature, the dehydration of isopropyl alcohol was studied on a catalyst whose surface was covered with ethanol which was considered an inert substance. Furthermore, water and methanol were used as inert substances. The effects of these inert substances were found to be different. Water, methanol, or ethanol adsorbed in equal quantities reduced the dehydration of isopropanol to a different degree, this reduction depending also on the method of catalyst preparation. Since this could not be explained by a blocking of the catalyst surface, the authors thoroughly studied the kinetics of the joint decomposition of isopropanol and ethanol. First, ethanol was adsorbed at 120 - 150°C, then isopropanol, and the pressure rise of the olefin formed was measured. It was found that the pressure $p_{\infty theor} = 0.6 - 0.7$ mm Hg calculated for a

100% decomposition of isopropanol was much higher $\left(p_{\infty exp} \approx 1.1 - 1.6 \text{mm Hg}\right)$

and increased in the course of reaction. Hence, the authors conclude that when ethanol and isopropanol are jointly adsorbed on the catalyst, a conjugate dehydration occurs. The dehydration of ethanol was strongly

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Conjugate Dehydration of Alcohols in an
Adsorbed Layer on Aluminum Oxide Catalysts

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accelerated (compared with that of pure ethanol), while that of
isopropanol was delayed. The authors therefore conclude that the complexes
adsorbed on the catalyst surface are not isolated but react with
neighboring molecules, and are capable of forming combined complexes
(ethanol-isopropanol and methanol-isopropanol complexes) which decompose
more slowly than the isopropanol complexes. There are 3 figures and 3
references: 2 Soviet and 1 German.

ASSOCIATION: Institut organicheskoy khimii im. N. D. Zelinskogo Akademii
nauk SSSR (Institute of Organic Chemistry imeni N. D.
Zelinskiy of the Academy of Sciences USSR)

SUBMITTED: May 17, 1960

Card 3/3

S/020/60/134/003/030/033/XX
B004/B064

AUTHORS: Balandin, A. A., Academician, Tolstopyatova, A. A., and
              Stshizhevskiy, V.

TITLE: The Catalytic Activity of Tungsten Pentoxide

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 134, No. 3,
              pp. 625 - 628

TEXT: The authors investigated the dehydration of ethanol, isopropanol,
t-butanol, cyclohexanol, methanol, and Tetralin with W_2O_5 under iso-
thermal conditions. Blue W_2O_5 was obtained from tungstic acid at
$350 - 400^\circ C$ in an air current. First, WO_3 was formed and then reduced to
W_2O_5 during the reaction with the alcohols at $200 - 300^\circ C$. The reaction
apparatus operated continuously, and the liquid substances were auto-
matically added. The gaseous products were collected in an automatic
Patrikeyev gasometer, and analyzed with a BTИ (VTI) apparatus or chroma-
tographically. In the liquid product of catalysis, the amount of

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The Catalytic Activity of Tungsten   S/020/60/134/003/C30/033/XX
Pentoxide   B004/B064

unsaturated hydrocarbons was determined by the method of Kaufman-Gal'-
pern. Since the endothermic effect of reaction affected the results of
measurement, the catalyst was diluted in a ratio of 2 : 3 with quartz
of the same grain size, the alcohol with water or with the corresponding
unsaturated hydrocarbon. Under these conditions, the process was iso-
thermal. By determining the apparent activation energy (Table 1) it was
found that the primary alcohols were dehydrated with the same energies
(approximately 30 kcal/mole), that the activation energy of the second-
ary alcohols was about 6 kcal/mole lower than that of the primary ones,
and that the activation energy of the tertiary alcohol was approximately
6 kcal/mole lower than that of the secondary ones. The reaction constant
and the relative adsorption coefficients z_2 and z_3 of water and the un-
saturated hydrocarbon were computed (Table 2) by Balandin's method
(Ref. 3) with reference to the adsorption coefficient of alcohol. Check-
ing by introduction of the experimental data into Balandin's equation
confirmed the validity of this equation (Table 3). Table 4 gives the
actual activation coefficients for isopropanol and n-butanol, which are
approximately 3 kcal/mole higher than the apparent ones. For the binding

Card 2/4

The Catalytic Activity of Tungsten
Pentoxide

S/020/60/134/003/030/C33/XX
B004/B064

H | C-C | H(CH$_3$)
H | | | H(CH$_3$)
H O H
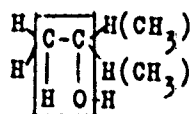
, they affect the binding energy between the C, H, and O
atoms and the catalyst. The authors mention a paper by
I. Ye. Adadurov and P. Ya. Krayniy. There are 5 tables
and 8 Soviet references.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M.V. Lomonosova
(Moscow State University imeni M.V. Lomonosov)

SUBMITTED: May 17, 1960

Card 4/4

S/062/60/000/03/02/007
B008/B006

AUTHORS: Freydlin, L. Kh., Balandin, A. A., Nazarova, N. M.

TITLE: Catalytic Alkylation of Isobutane by Ethylene at High
             Temperatures and Under Pressure

PERIODICAL: Izvestiya Akademii nauk SSSR. Otdeleniye khimicheskikh
             nauk, 1960, No. 3, pp. 409-412

TEXT: The alkylation of isobutane in the presence of aluminum oxide at
high temperatures was investigated. The experiments were carried out in
the continuous-flow unit described in Ref. 5. The reaction conditions,
degree of ethylene transformation, and alkylate yields are given in
Table 1. The characteristics of the various alkylate fractions obtained
in experiments No. 2 and 4 are shown in Table 2. The fractionation curve
of the catalyzate obtained in experiment No. 4 is represented in Fig. 1.
Experimental results show that ethylene and propylene react mainly with
the tertiary carbon atom of isobutane, and only to a lesser extent with
its primary carbon atoms. In these reactions, 2,2-dimethyl butane and

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Catalytic Alkylation of Isobutane by
Ethylene at High Temperatures and Under
Pressure

S/062/60/000/03/02/007
B008/B006

2-methyl pentane, respectively, are formed. An octane fraction was also
obtained, which was identified to consist mainly of an alkylation product
of 2,2-dimethyl butane. Alkylation at this stage, however, proceeds via
the primary carbon atom at the unbranched end of the carbon chain. This
fact confirms the stepwise character of the alkylation process established
previously (Ref. 8). It was found that in the presence of aluminum oxide
an olefin (ethylene, propylene) is added to the tertiary carbon atom of
isobutane less easily than to the secondary carbon atom of n-butane.
Yu. P. Yegorov and K. G. Gayvoronskaya analyzed the fractions by means of
their Raman spectra. There are 1 figure, 2 tables, and 11 references,
6 of which are Soviet.

ASSOCIATION: Institut organicheskoy khimii im. N. D. Zelinskogo Akademii
              nauk SSSR (Institute of Organic Chemistry imeni N. D.
              Zelinskiy of the Academy of Sciences, USSR)

SUBMITTED: July 16, 1958

Card 2/2

5.3000

78099
SOV/62-60-1-5/37

AUTHORS: Stegner, G., Balandin, A. A., Rudenko, A. P.

TITLE: Influence of Different Stages of Polycondensation of the Products of Catalytic Decomposition of Ethyl Alcohol on the Rate of Carbonization

PERIODICAL: Izvestiya Akademii nauk SSSR. Otdeleniye khimicheskikh nauk, 1960, Nr 1, pp 24-30 (USSR)

ABSTRACT: This is a continuation of the author's previous work (Izv. AN SSSR, Chem. Ed., 1959, 1896) on the mechanism of carbonization in the decomposition of ethyl alcohol over copper-silica. Experimental data presented in this paper confirm previous conclusions (see above reference) concerning the mechanism of carbonization which accompanies catalytic decomposition of ethyl alcohol. Carbonization is considered to be a multi-stage polycondensation of ethyl alcohol and the products of its catalytic decomposition. The so-called low temperature carbonization (below 600°) proceeds

Card 1/2

Influence of Different Stages of
Polycondensation of the Products of
Catalytic Decomposition of Ethyl
Alcohol on the Rate of Carbonization

78059
SOV/62-60-1-5/37

through dehydrogenation of ethyl alcohol. Accele-
ration or slowing down of ethyl alcohol decomposition
(dehydrogenation and dehydration) causes a change in
the rate of carbonization. There are 4 figures; and
11 references, 1 German, 10 Soviet.

ASSOCIATION: M. V. Lomonosov Moscow State University (Moskovskiy
                gosudarstvennyy universitet imeni M. V. Lomonosova)

SUBMITTED: May 4, 1958

Card 2/2

5.1190

78058
SOV/62-60-1-4/37

AUTHORS: Freydlin, L. Kh., Balandin, A. A., Borunova, N. V., Agronomov, A. Ye.

TITLE: Concerning Connections Between the Microstructure of Aluminum Oxide and Activity of Nickel-Alumina Catalysts of Various Nickel Content

PERIODICAL: Izvestiya Akademii nauk SSSR. Otdeleniye khimicheskikh nauk, 1960, Nr 1, pp 21-23 (USSR)

ABSTRACT: This paper presents the results of investigations of the connection between the microstructure of aluminum oxide and activity of nickel-alumina catalysts of various Ni content. The catalysts were prepared by impregnation of alumina with $Ni(NO_3)_2$ and reduction with H_2 at 350°. The alumina for the catalysts 1 and 2 (see Table) was prepared by ignition of commercial aluminum oxide at 500°. Alumina for catalyst 3 was prepared by treatment of $Al(NO_3)_3$ with ammonia.

Card 1/4   Activity of the catalysts was determined by the degree

Concerning Connections Between the
Microstructure of Aluminum Oxide and
Activity of Nickel-Alumina Catalysts
of Various Nickel Content

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of cyclohexane dehydrogenation. The results are
shown in Table 1. The following conclusions were
made: Properties of nickel-alumina catalysts of
various Ni content depend on the character of
microstructure of alumina. Catalysts prepared with
large-pore alumina, containing 5-10% Ni, are of high
and practically the same activity. Activity of the
catalyst. containing 50% Ni, is considerably lower.
Catalysts prepared with fine-pore alumina and containing
5, 10, and 30% Ni are of a low activity and unstable.
There are 1 table; and 9 references, 1 U.S., and 8 Soviet.
The U.S. reference is: S. Brunauer, P. Emmet, A.
Teller, J. Am. Chem. Soc., 62, 1723 (1940).

ASSOCIATION: N. D. Zelinskiy Institute of Organic Chemistry Academy
of Sciences USSR and M. V. Lomonosov Moscow State University
(Institut organicheskoy khimii imeni N. D. Zelinskogo
Akademii nauk SSSR, Moskovskiy gosudarstvennyy universitet
imeni M. V. Lomonosova)

SUBMITTED: May 5, 1958

Card 2/4

Concerning Connections Between the
Microstructure of Aluminum Oxide and
Activity of Nickel-Alumina Catalysts
of Various Nickel Content

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SOV/62-60-1-4/37

Table 1

o								
b	c	d	e	f	g	h	i	j
—	1	-..	—	190	20—100	65	-5.1	59.4
1	..	10	25	175	20—100	56	4.6	89.0
2		10	25	175	20—100	52	4.3	—
3	2	2	25	240	25—110	45	4.8	44.0
3		5	25	—	—	—	--	80.0
4		10	10	—	—	—	—	89.2
5		30	10	150	25—100	45	3.3	87.2
6		30	15	150	25—100	45	2.9	62.4
7	3	..	—	370	15—40	28	4.7	—
8		2	20	385	14—40	22	4.0	3.4
9		5	20	370	14—40	22	3.7	48.4
10		10	20	350	11—35	20	3.2	52.4
11		30	20	270	10—27	18	2.4	—

(Key to Table on Card 4/4)

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Concerning Connections Between the
Microstructure of Aluminum Oxide and
Activity of Nickel-Alumina Catalysts
of Various Nickel Content

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SOV/62-60-1-4/37

Key to Table 1: (a) number; (b) experiment; (c) sample
of aluminum oxide; (d) Ni content in % by weight; (e)
duration of reduction with H_2 in hr; (f) specific
surface in m^2/g; (g) range of pore size in A; (h)
maximum distribution of volumes of pores along the
radius in A; (i) total amount of benzene absorbed on
saturation, in millimoles/g; (j) degree of cyclohexane
dehydrogenation in % of theoretical.

Card 4/4

5.3200

78097
SOV/62-60-1-5/51

AUTHORS: Balandin, A. A., Brusov, I. I., Polkovnikov, B. D.

TITLE: Kinetics of 2-Vinylpyridine Hydrogenation Over Raney's Catalyst

PERIODICAL: Izvestiya Akademii nauk SSSR. Otdeleniye khimicheskikh nauk, 1960, Nr 1, pp 15-20 (USSR)

ABSTRACT: This paper presents experimental data on kinetics of 2-vinylpyridine hydrogenation over Raney nickel in 96% ethyl alcohol at temperatures from 5 to 40°, under atmospheric pressure. The results obtained are shown in the figures, where $\dfrac{\Delta V_0}{\Delta t}$ (a) is the total volume of hydrogen absorbed and $\dfrac{\sum \Delta V_0 t}{2}$ (b) the volume of H_2 absorbed, and reduced to standard conditions. Effect of styrene concentration on the rate of its hydrogenation was also studied; the results are shown in Fig. 6.

Card 1/7

Kinetics of 2-Vinylpyridine Hydrogenation
Over Raney's Catalyst

78057
SOV/62-60-1-3/57
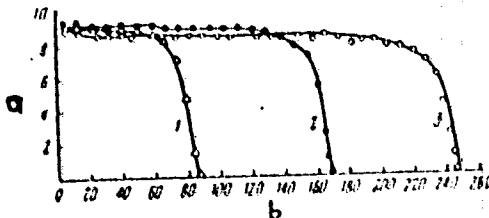
Fig. 1. Effect of 2-vinylpyridine concentration on the
rate of hydrogenation:(1) 0.3987 g; (2) 0.7976 g;
(3) 1.1949 g (a and b given in text).

Fig. 2. Effect of the
products of reaction on the
rate of 2-vinylpyridine
hydrogenation. (1) without
addition of the products;
(2) on repeated hydrogenation;
(3) with addition of 2 ml
of 2-ethylpyridine (a and b
are explained in text).
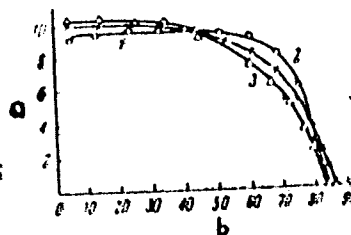
Card 2/7

Kinetics of 2-Vinylpyridine Hydrogenation   78057
Over Raney's Catalyst   SOV/62-60-1-3/37

Fig. 3. Effect of solvent
on hydrogenation of
2-vinylpyridine: (1) in
96% C_2H_5OH; (2) in C_6H_6;
(a and b given in text).
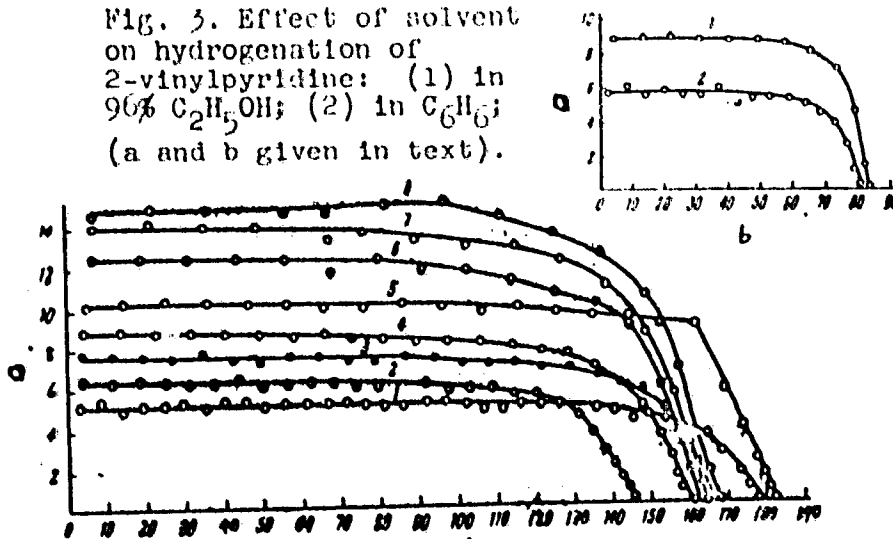
Fig. 4
(Caption for Fig. 4 on Card 4/7)

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Kinetics of 2-Vinylpyridine Hydrogenation   78057
Over Raney's Catalyst   SOV/62-60-1-3/37

Fig. 4. Kinetics curves of 2-vinylpyridine hydro-
genation at various temperatures: (1) 5.4°; (2) 10°;
(3) 15°; (4) 20°; (5) 25°; (6) 30°; (7) 35°; (8) 40°
(a and b.given in text).

Fig. 5. Dependence of
the log of rate constant
on temperature.
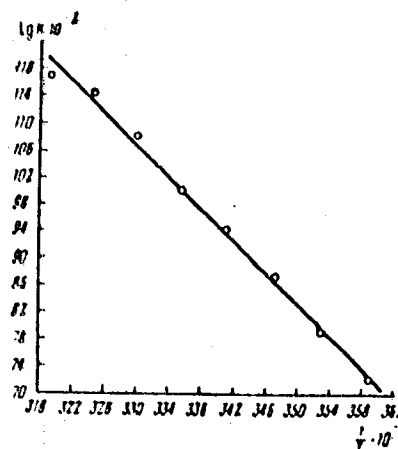
Card 4/7

Kinetics of 2-Vinylpyridine Hydrogenation   78067
Over Raney's Catalyst   SOV/62-60-1-3/37

Fig. 6. Hydrogenation of styrene. (1) 0.3875 g;
(2) 0.3875 g; (3) 0.7750 g; (4) 0.4135 g; (5) 0.4135 g;
(6) 0.4135 (in this case another catalyst was used)
(a and b given in text).

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Kinetics of 2-Vinylpyridine Hydrogenation   78057
Over Raney's Catalyst   SOV/62-60-1-3/37

The following conclusions were made: Hydrogenation of
2-vinylpyridine proceeds rapidly in 96% ethyl alcohol;
in benzene the reaction is about 1.6 times slower.
The rate of reaction increases about 3 times with in-
creasing temperature from 5 to 40°. At these tempera-
tures the reaction follows first order kinetics. The
true energy of activation is equal to 5.6 kcal/mole.
Hydrogenation of styrene under similar conditions is
also a first order reaction. Substitution of one
hydrogen atom in ethylene by an α-pyridyl radical
has the same effect on the rate of hydrogenation over
Raney nickel as substitution by a phenyl radical.
There are 5 tables; 6 figures; and 7 references, 1
U.S., 1 Polish, 5 Soviet. The U.S. reference is: E. C.
Gregg, D. Craig, J. Am. Chem. Soc., 70, 3138 (1948).

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Kinetics of 2-Vinylpyridine Hydrogenation   78057
Over Raney's Catalyst   SOV/62-60-1-3/37

ASSOCIATION: N. D. Zelinskiy Institute of Organic Chemistry Academy
              of Sciences USSR (Institut organicheskoy khimii imeni
              N. D. Zelinskogo Akademii nauk SSSR)

SUBMITTED: April 25, 1958

Card 7/7

S/595/60/000/0CC/010/014
E075/E435

AUTHORS: Bogdanova, O.K., Balandin, A.A., Paryshnikova, I.P.

TITLE: Dehydrogenation kinetics of ethyl benzene to styrene
              and isopropyl benzene to a-methylstyrene

SOURCE: Vsesoyuznoye soveshchaniye po khimicheskoy
              pererabotke neftyanykh uglevodorodov v poluprodukty
              dlya sinteza volokon i plasticheskikh mass. Baku, 1957.
              Baku, Izd-vo AN Azerb. SSR, 1960, 241-247

TEXT: The object of the work is a study of the kinetics of
dehydrogenation of ethyl and isopropyl benzene; it is a
continuation of the authors' investigations on the effect of
molecular structure on dehydrogenation kinetics.   The
experimental work was carried out by passage through an
electrically heated glass tube containing an oxide catalyst on a
screen, at atmospheric pressure.   Dilution ratios of 1:3 to 5
and 1:2 were used for ethyl and propyl benzene respectively;
the steam was superheated to 300°C.   Liquid and gaseous product
fractions were analysed and good agreement between hydrogen and
unsaturated hydrocarbons was found.   The kinetics of isopropyl
benzene dehydrogenation were studied at three feed rates in the
Card 1/4

Dehydrogenation kinetics'...

S/595/60/000/000/010/014
E075/E435

temperature range of 500 to 550°C, rate being measured by the
hydrogen produced.   A table of reaction product analysis is
given.   Under identical conditions the dehydrogenation rate of
binary mixtures of isopropyl benzene and its reaction product,
α-methylstyrene, were studied to obtain adsorption coefficients on
the catalyst from

$$z = \frac{m_0/m - 1}{\frac{100}{p} - 1} \qquad (1)$$

where m_0 = number of moles reaction product for feed of pure
starting material; m = number of moles reaction product for feed
of mixture; p = % of starting material in mixture.
The relative adsorption coefficient of hydrogen was found to be
0.7 and was independent of temperature.   The relative adsorption
coefficient of α-methylstyrene falls with temperature, a table and
graph are given.   Plotting the log of the adsorption coefficient
against the reciprocal of the absolute temperature gives a straight
line.   The reaction rate was calculated by using the general
equation for catalytic reactions derived by A.A.Balandin (Ref.2:
Card 2/4

Dehydrogenation kinetics ...   S/595/60/000/000/010/014
                                E075/E435

ZhOKh, 1942, 12, 156)

$$[2.303\,(z_i + z_3)A_i]\lg \frac{A_i}{A_i - m} - m(r_2 \cdot z_3 - 1) - K \qquad (2)$$

The calculated reaction rate has been plotted against the
reciprocal of the absolute temperature and the points lie on a
straight line.   The activation energy has been calculated as
30.3 Kcals/mol.   A series of experiments with catalyst particles
varying in size from 1.5 to 5 mm was carried out;   particle size
had no effect on reaction rate.   The dehydrogenation of ethyl
benzene was studied in the range of 520 to 560°C.   The results
were similar to those obtained with isopropyl benzene but the
adsorption coefficients and reaction rates were considerably lower.
Figures for product analysis, adsorption coefficients and reaction
rates are given.   The higher rates for isopropyl benzene are
considered to be due to the introduction of a methyl group into
the alpha position.   At higher temperatures there is a
considerable increase in conversion;   in the 580 to 600°C range
at rates of 800 to 1000 ml/litre catalyst/hour, yield of styrene
Card 3/4

Dehydrogenation kinetics ...

S/595/60/000/000/010/014
E075/E435

and methylstyrene reached 70 to 83%, which is near to
equilibrium.   This is of considerable practical interest.
Increase of feed rate towards 1400 to 2000 ml/litre catalyst/hour
led to a slow decrease in yield.   At these higher temperatures the
reaction rate plot changes but the plot of Log K against the
reciprocal of the absolute temperature still falls on a straight
line of a different slope.   The activation energies become 18.8
and 19.5 Kcals for isopropyl and ethyl benzene respectively.
[Abstractor's note: Steam adsorption was neglected in all
reaction rate calculations.]   The dehydrogenation of ethyl
cyclohexane was investigated.   The low rate of reaction shows
that in the absence of conjugation, the dehydrogenation of the
side chain is slowed down.   There are 5 figures, 4 tables and
5 references: 2 Soviet-bloc and 3 non-Soviet-bloc.   The
reference to an English language publication reads as follows:
Ref.4: Gilliland E.K.   Chem. Eng. News. 23, 129 (1945).

Card 4/4

S/595/60/000/000/009/014
E134/E485

AUTHORS: Balandin, A.A., Bogdanova, O.K., Shcheglova, A.P.

TITLE: Catalytic dehydrogenation of isopentenes to isoprene

SOURCE: Vsesoyuznoye soveshchaniye po khimicheskoy
           pererabotke neftyanykh uglevodorodov v poluprodukty
           dlya sinteza volokon i plasticheskikh mass. Baku, 1957.
           Baku, Izd-vo AN Azerb. SSR, 1960. 233-239

TEXT: The paper is concerned with the catalytic dehydrogenation
of isopentenes and the conversion of isopentane-isopentenes
mixtures to isoprene as part of the general problem of
manufacture of isoprene rubber from the isopentane fraction in
petroleum.   The authors studied dehydrogenation of isopentene and
isopentane-isopentenes mixtures in the presence of steam at
atmospheric pressure.   Artificial mixtures as well as mixtures
obtained by dehydrogenation of isopentane on an Al-Cr catalyst
were used.   The experiments were carried out by continuous flow
over a mixed oxide catalyst.   Work on isopentene was concerned
with the effect of temperature, flow rate and steam dilution ratio
on isoprene yield.   Yield based on isopentene feed increased from
14.5 to 36% as temperature rose from 540 to 620°C but dropped from

Card 1/4

Catalytic dehydrogenation ...   S/595/60/000/000/009/014
                                                 E134/E485

92 to 85% of the reacted isopentene.   Curves showing the effect of
temperature and flow rate on isoprene yield are given (Fig. 1 and 2).
Best dilution ratios are 1:2 or 1:3 by weight.   A complete mass
balance for operation with a 1:3 ratio at 600°C at a rate of
4500 g/litre catalyst/hour is given.   Under these circumstances,
yield is 28 to 30% on feed and 88 to 92% on reacted isopentene.
The removal of carbon from the catalyst in the form of carbon
dioxide makes prolonged reaction without regeneration possible.
The results show that the catalyst acts selectively.
Investigations of mixtures 55% isopentane-45% isopentene were
carried out under identical conditions to study the effect of flow
rate and temperature.   Conversion of mixture and yield of isoprene
increased with rising temperature but yield of isoprene based on
reacted isopentene dropped from 94 to 86.5%.   A full analysis is
given.   At 600°C, a flow rate of 4400 g/litre catalyst/hour and
1:3 dilution ratio yield of isoprene on isopentene present was
38 to 40% and was more than 90% of the reacted isopentene.   Under
identical conditions dehydrogenation of isopentane to isopentene
only took place to the extent of 4 to 6% and there is no direct
Card 2/4

Catalytic dehydrogenation ...

S/595/60/000/000/009/014
E134/E485

conversion to isoprene.   Results with mixtures obtained by
dehydrogenation of isopentane over an Al-Cr catalyst were similar
to those with synthetic mixtures.   Full analysis showing effect
of flow rate and temperature is given.   The degree of conversion
decreases with increasing flow rate.   The kinetics of the
reaction were investigated in the 530 to 580°C range with a
steam dilution ratio of 1:2 and hourly flow rates of 5200 to
7000 g/litre catalyst/hour.   Reaction rate is given by equation of
the following type

$$\frac{dx}{dx} \quad K \quad \frac{|A_1|}{[A_1| + z_2 |A_2| + z_3 |A_3|}$$ (1)

The adsorption coefficients z were determined experimentally by
measuring the rate of dehydrogenation of binary mixtures of the
starting material and the reaction products and were calculated
from

$$z_1 = \frac{m_0 - 1}{\frac{m}{100} - 1}$$ (2)
$$\rho$$

Card 3/8 4

Catalytic dehydrogenation ...

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E134/E435

where m_0 - number of mols of reaction product for feed of pure
starting material; m - number of mols of reaction product for
feed of mixture; p - percent of reacting material in initial
mixture.   The hydrogen adsorption coefficients remained constant
at 0.83.   The isoprene adsorption coefficients dropped from 5.7 to
2.8 (z_2) between 530 and 580°C.   The reaction rates were
calculated using the adsorption coefficients and the plot of log K
against the reciprocal of the absolute temperature gave a straight
line.   The activation energy was calculated as 23300 calorics/
molecule.   The mixtures used in the tests were produced in the
laboratory of Academician B.A.Kazanskiy and Corresponding Member
N.I.Shuykin.   There are 3 figures, 4 tables and 6 references:
2 Soviet-bloc and 4 non-Soviet-bloc.   The four references to
English language publications read as follows: Ref.3: US Patent
2440471, 1948; C.A.42, 54 4, 1948; Ref.4: US Patent 2442319, 1948;
C.A.42, 6106, 1948; Ref.5: Grosse A., Morell J.C., Mavity J.M.
Industr. Engng. Chem. 32, 309, 1940; Ref.6: Mavity J.M.
Zetterholm E.E. Trans. Am. Inst. Chem. Engn., 40, 1944, 473.

Card 4/0 4

BALANDIN, A. A.

"Some Problems of Use of Catalysis in Chemical Technology"

report presented at the General Conference of the Division of Chemical
Sciences of the Academy of Sciences, USSR, 27-28 October 1960

SA: Izvestiya Akademii nauk SSSR, otdeleniye khimicheskikh nauk,No. 2,
1961, Moscow, pages 378-380

BALAMBIN, H.A.

S/062/61/000/001/004/016
B101/B220

AUTHORS: Tolstopyatova, A. A., Konenko, I. R., and Balandin, A. A.

TITLE: Kinetics of dehydrogenation and dehydration of isopropyl alcohol on titanium dioxide (anatase)

PERIODICAL: Izvestiya Akademii nauk SSSR. Otdeleniye khimicheskikh nauk, no. 1, 1961, 38-44

TEXT: By way of introduction the authors offer a survey of reports dealing with the catalytic efficacy of TiO_2, and then report on the dehydrogenation and dehydration of isopropyl alcohol on anatase. Regarding the production of the catalyst they refer to another report published by them. For the verification of the kinetics of monomolecular heterogeneous-catalytic reactions they proceed from the equation $k = A_1(Z_2-Z_3)\ln A_1/(A_1-m)-(Z_2+Z_3-1)m$ (1). A_1 is the volume of alcohol converted per minute, which is introduced at the rate v; m is the volume of propylene (or hydrogen) formed per minute; Z_2, Z_3 are the relative adsorption coefficients of the reaction products (hydrogen and acetone

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Kinetics of dehydrogenation and dehydration...   S/062/61/000/001/004/016
B101/B220

in the case of dehydrogenation; propylene and water in the case of dehydration); Z_2 and Z_3 were calculated from $Z = (m_0/m-1)/(100/p-1)$ (2), where m_0, m are the amounts of the reaction products resulting on the passage of pure alcohol (m_0) and on the passage of a p molar mixture with the reaction product. Since Z is the equilibrium constant of the displacement of the isopropyl alcohol from the catalytic centers by the reaction products, it was possible to calculate also ΔF of the free energy, ΔS of entropy, and ΔH of the heat content. The adsorption coefficient Z_{ac} of acetone was found to be highly dependent on temperature and much less so on the degree to which the catalyst was covered with carbon. The following is indicated for not carbonized TiO_2; $Z_{ac} = 2.4$ at $282^{\circ}C$; 1.7 at $294^{\circ}C$; 1.2 at $310^{\circ}C$. For carbonized TiO_2 these values amounted to 2.7, 1.8 and 0.9. The adsorption coefficient Z_{H_2} of the hydrogen remains constantly 0.9 in the range of $276-306^{\circ}C$. Moreover, it was found that $Z_{H_2O} = 1.9$ at $282^{\circ}C$, 1.4 at $294^{\circ}C$, and 0.9 at $310^{\circ}C$, whereas $Z_{propylene}$ remains a constant 0.2 in the temperature range of $300-330^{\circ}C$. A. M. Rubinshteyn and S. G. Kulikov are mentioned.

Card 2/3

Kinetics of dehydrogenation and dehydration...   S/062/61/000/001/004/016
B101/B220

There are 1 figure, 8 tables, and 24 references: 8 Soviet-bloc and 13 non-Soviet-bloc.

ASSOCIATION: Institut organicheskoy khimii im. N. D. Zelinskogo Akademii nauk SSSR (Institute of Organic Chemistry imeni N. D. Zelinskiy, Academy of Sciences USSR)

SUBMITTED: June 29, 1959

Card 3/3

S/062/61/000/001/005/016
B101/B220

AUTHORS: Balandin, A. A., Konenko, I. R., and Tolstopyatova, A. A.

TITLE: Effect of the method of production on the catalytic proper-
             ties of titanium dioxide in the reaction with ethyl alcohol,
             isopropyl alcohol, and cyclohexane

PERIODICAL: Izvestiya Akademii nauk SSSR. Otdeleniye khimicheskikh nauk,
             no. 1, 1961, 45-50

TEXT: The authors were concerned with the investigation of the catalytic
properties of titanium dioxide. Here, they studied the dependence of
those properties on the method of TiO_2 synthesis. Four specimens were used.
Catalyst 1 (anatase), whose production is described in Ref. 1, a previous
report of the authors; catalyst 2, obtained by hydrolysis of $TiCl_4$ by means
of ammonia solution in a weakly acid medium at room temperature; catalyst
3, obtained by precipitation of $Ti(OH)_3$ from $TiCl_3$ by means of ammonia
at room temperature and conversion to $Ti(OH)_4$ which occurred automatically

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Effect of the method of production....   S/062/61/000/001/005/016
                                                B101/B220

while washing the precipitate; catalyst 4, obtained by hydrolysis of ethyl ortho-
titanate by means of distilled water at room temperature. The further
treatment of the hydroxides for the purpose of obtaining TiO_2 was per-

formed according to Ref. 1. Ethanol reacted with these catalysts accord-
ing to three reactions: a) dehydrogenation, b) dehydration,   c) hydrogena-
tion of the resulting ethylene. Moreover, up to 2% ethyl acetate was
formed on all four catalysts. The reaction of isopropanol corresponded
to data mentioned in Ref. 1. Due to the growing accumulation of carbon
on the catalyst, the rate of dehydration increases, whereas that of de-
hydrogenation deoreases. Cyclohexane is dehydrogenated on all four
catalysts. The differences between the catalysts regarding the activation
energy ε and the factor k_o of the Arrhenius equation are listed in Table 8.

The linear function $\log k_o = a\varepsilon + b$ (a, b – constants) is conserved for

all reactions. A. M. Rubinshteyn and S. G. Kulikov are mentioned. There
are 2 figures, 8 tables, and 6 references: 4 Soviet-bloc and 2 non-Soviet-
bloc.

Card 2/5

Effect of the method of production...   S/062/61/000/001/005/016
                                               B101/B220

ASSOCIATION: Institut organicheskoy khimii im. N. D. Zelinskogo Akademii
              nauk SSSR (Institute of Organic Chemistry imeni N. D.
              Zelinskiy, Academy of Sciences USSR)

SUBMITTED: July 9, 1959

Card 3/5

Effect of the method of production...

Влияние способа приготовления катализатора TiO₂ на величины энергий активации

A Состояние поверхности катализатора	E_i Реакции	E, ккал/M J катализатор				k_0 J катализатор			
		1	2	3	4	1	2	3	4
ч. о.	Дегидрогенизация этилового спирта	22,8	20,4	0,4	12,4	$1,0 \cdot 10^6$	$1,9 \cdot 10^7$	$1,4 \cdot 10^3$	$1,2 \cdot 10^4$
ч. о.	Дегидратация этилового спирта	25,0	25,4	0,0	12,5	$1,5 \cdot 10^8$	$5,6 \cdot 10^6$	$3,7 \cdot 10^8$	$4,4 \cdot 10^3$
п. о.	Дегидратация изопропилового спирта	22,9	9,1	26,2	17,2	$3,7 \cdot 10^6$	$9,1 \cdot 10^6$	$1,0 \cdot 10^{10}$	$2,8 \cdot 10^7$
ч. о.	Гидрогенизация этилена	21,2	24,2	13,0	10,8	$1,8 \cdot 10^7$	$1,0 \cdot 10^3$	$1,3 \cdot 10^4$	$2,7 \cdot 10^4$
ч. о.	Дегидрогенизация циклогексана	19,0	14,7	21,0	15,0	$8,7 \cdot 10^6$	$5,1 \cdot 10^4$	$1,3 \cdot 10^6$	$3,5 \cdot 10^4$
ч. о.	Дегидратация изопропилового спирта	9,1	10,4	—	—	$1,0 \cdot 10^4$	$2,2 \cdot 10^4$	—	—
н. о.	Дегидрогенизация изопропилового спирта	24,4	15,3	—	—	$4,5 \cdot 10^6$	$6,9 \cdot 10^3$	—	—
п. о.	Дегидрогенизация циклогексана	11,9	—	—	—	$1,9 \cdot 10^5$	—	—	—
ч. о.	Дегидрогенизация пропилового спирта	25,2 19,4	—	—	—	$4,9 \cdot 10^7$ $2,3 \cdot 10^6$	—	—	—
ч. о.	Дегидратация н.пропилового спирта	12,1	—	—	—	$4,5 \cdot 10^6$	—	—	—

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Effect of the method of

S/062/61/000/001/005/016
B101/B220

	1	2	3	4
	2,84	2,81	3,01	3,03
	2,73	2,99	2,70	2,70
	2,39	2,28	2,54	2,31
	2,91	3,01	3,01	3,10
	3,20	3,12	3,53	3,30
	2,24	2,40	—	—
	2,53	2,62	—	—
	2,25			
	3,27	—	—	—
	2,71	—	—	—
	3,05	2,73	2,96	2,80
	2,60			

Legend to Table 8: Effect of the method of preparing the TiO_2 catalyst on the amounts of activation energies. 1) Condition of catalyst surface; 2) reaction; 3) catalyst; 4) partially carbonized; 5) completely carbonized; 6) not carbonized; 7) dehydrogenation of ethanol; 8) dehydration of ethanol; 9) dehydration of isopropanol; 10) hydrogenation of ethylene; 11) dehydrogenation of cyclohexane; 12) dehydrogenation of isopropanol; 13) dehydrogenation of propanol; 14) dehydration of n-propanol.

Card 5/5

RUDENKO, A.P.; BALANDIN, A.A.; CHUYEVA, G.Yu.

Factors causing a change in the mechanisms of carbon formation during the decomposition of hydrocarbons. Izv. AN SSSR. Otd. khim. nauk no. 1:164-166 Ja '61.   (MIRA 14:2)

1. Moskovskiy gosudarstvennyy universitet im. M.V. Lomonosova.
              (Hydrocarbons)   (Carbon)

5.1190 1273

33120
S/638/61/001/000/050/056
B125/B104

AUTHORS: Balandin, A. A., Spitsyn, V. I., Duzhenkov, V. I.,
               Barsova, L. I.

TITLE: Radiochemical method of preparing metallic catalysts

SOURCE: Tashkentskaya konferentsiya po mirnomy ispol'zovaniyu
               atomnoy energii. Tashkent, 1959. Trudy. v. 1. Tashkent,
               1961, 289-295

TEXT: Platinum and palladium catalysts are reduced by radiochemical reac-
tions from aqueous solutions of suitable compounds. Cyclohexene is hydro-
genated for a catalytic check reaction. Chloroplatinic acid samples in
Pyrex glass cells, kept by a thermostat at a constant temperature, were
irradiated by means of a lineac (maximum dose rate $3 \cdot 10^{18}$ ev/cm^3·sec) and
a Co^{60} source of 400 g-equ. Ra. At integral doses of $2 \cdot 10$ ev/cm^3, solid
$H_2PtCl_6 \cdot 6H_2O$ and its aqueous solution (0.1-1.0 M) are not reduced to
metal owing to the stability of the $PtCl_6^{--}$ ion. In saturated solutions of
$Na_2\left[Pt(OH)_xCl_{6-x}\right]$ and $K_2\left[Pt(OH)_xCl_{6-x}\right]$, which were examined because of the

Card 1/3,

Radiochemical method of ...

33120
S/638/61/001/000/050/056
B125/B104

lower stability of the hydrocomplexes, irradiation acted indirectly upon the addends in the inner sphere. The least radiation-resistant $Na_2[Pt(OH)_5Cl]$ decomposes completely at $4 \cdot 10^{21}$ ev/cm^3 to form metallic platinum. The third group of compounds presented in the figure exhibits the least radiochemical resistance which drops in the sequence $Cl-Pt-Cl > OH-Pt-OH > OH-Pt-Cl$. The resulting palladium sharply retards the decomposition of the compounds produced. The optical density of a K_2PdCl_4 solution also

depends largely on the dose rate. Zelinskiy's method was used to compare the catalytic activities of the metal samples, measured in low-temperature hydrogenation of cyclohexene in 96% ethanol and in an ethanol solution in 0.1 N H_2SO_4, with the activity of metals obtained by reducing the

corresponding salts with formaldehyde. The platinum catalyst produced by radiolysis is 4-5 times more active than platinum black produced by Zelinskiy's method (Table 2). In the radiolysis of aqueous $PdCl_2$ and K_2PdCl_4 solution, Pd^{2+} is completely reduced to metal, the reduction

process being noticeably retarded by metallic palladium. The apparent activation energies of a platinum catalyst and platinum black, calculated

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Radiochemical method of ...

33120
S/638/61/001/000/050/056
B125/B104

from the rate constants, of zeroth order, amount to 4.0 and 8.8 kcal/mole, respectively, and their surfaces, determined from cyclohexane adsorption, amount to 23 and 18 m^2/g at $0^\circ C$. The catalysts produced by the radiation method are less active than the platinum black obtained by Zelinskiy's method. The catalytic action of radiolytic precipitates of $PdCl_2$ solution of different concentrations differs in intensity. The activation energy of the catalysts in question satisfies the Arrhenius equation $K=K_0 e^{-E/RT}$. The activity of the resulting metal was reduced by adding HCl to the irradiated $PdCl_2$ solution. Both irradiated and nonirradiated palladium black samples produced by reduction according to Zelinskiy's method exhibited the same activity. Previous studies did not reveal the causes underlying the change of catalytic activity in radio- lytically prepared metal blacks. It is, however, hoped that very active catalysts can be produced radiolytically. There are 4 figures, 2 tables, and 12 references: 7 Soviet and 5 non-Soviet. The four most recent refer- ences to English-language publications read as follows: Taylor E. H., Wethington J. A. J. Am. Chem. Soc., 76, 971, 1954; Gibson E. J., Clarke R. W., Dorling T. A., Pope D. II Intern. Conf. Peaceful Uses of atomic Energy, alconf), 15 p/63, 1958; Taylor E. H. J. Chem. Education, 36, 396,

Card 3/4

33120
S/638/61/001/000/050/056
B125/B104

Radiochemical method of ...

1959; Haldar, B. C., J. Am. Chem. Soc., 4229, 1954.

ASSOCIATION: Institut fizicheskoy khimii AN SSSR (Institute of Physical
Chemistry AS USSR), Moskovskiy gosuniversitet im. M. V.
Lomonosova (Moscow State University imeni M. V. Lomonosov)

Table 2. Comparison between activities of Pt black and Pd black,
prepared by chemical reduction using Zelinskiy's method, and by radiolysis
of salts.
Legend: (1) production process; (2) test temperature, °C; (3) weighed
portion of catalyst; (4) rate constant; (5) specific activity of catalyst;
(6) ratio of specific activities; (7) platinum; (8) palladium; (9) chemically
prepared; (10) radiolytically prepared;

Fig. Structural formulas of the compounds investigated.

Card 4/5/

TOLSTOPYATOVA, A.A.; BALANDIN, A.A.; KONENKO, I.R.

Energies of the bonds between reacting organic compounds and the catalytic active centers of titanium dioxide. Izv. AN SSSR. Otd. khim. nauk no.2:214-217 F '61.   (MIRA 14:2)

1. Institut organicheskoy khimii im.N.D.Zelinskogo AN SSSR.
         (Titanium oxide)   (Chemical bonds)

20937

5·11 80   1209   S/062/61/000/003/003/013
B117/B208

AUTHORS: Balandin, A. A., Sokolova, N. P., and Simanov, Yu. P.

TITLE: Niobium and tantalum pentoxides as dehydration catalysts

PERIODICAL: Izvestiya Akademii nauk SSSR. Otdeleniye khimicheskikh
             nauk, no. 3, 1961, 415-424

TEXT: The authors studied the dehydration kinetics of isopropyl alcohol
on niobium and tantalum pentoxides. The experiments with Nb_2O_5 samples
were carried out in a catalytic continuous-flow device (Ref. 3:
A. A. Balandin and A. A. Tolstopyatova, Zh. fiz. khimii 30, 1367, 1956)
in a temperature range of $360°-400°C$ and at a flow rate of the alcohol
of 0.15 ml/min. The volume of the catalyst was 2 ml, and the volume rate
of the alcohol 4.5 hr^{-1}. The activity of Nb_2O_5 was found to depend on
temperature and calcination time of the oxide during its formation from
metal. Experiments disclosed that the most active Nb_2O_5 samples are
obtained by calcination of metallic niobium at $530°$ within 1-2 hr.
Although the formation rate of the oxide depends on the form (powder,

Card 1/4

20937

Niobium and tantalum pentoxides...

S/062/61/000/003/003/013
B117/B208

filings, larger parts) of the metal used, and the individual experiments with Nb_2O_5 provide no comparable results, the catalyst is active in any case. Activity is maintained for some time, e.g., for ten hours without regeneration. X-ray phase analyses carried out with a "ФэНИКС" (Feniks) tube of the БСВ (BSV) type with an iron anode at a voltage of 25 kv and a charge of 8 ma disclosed that the catalytically most active form of Nb_2O_5 is a low-temperature γ-modification. The high-temperature modification of Nb_2O_5 is less active. The Nb_2O_5 modification remains unchanged during catalytic dehydration of alcohol. To study the dehydration kinetics of isopropyl alcohol on Ta_2O_5, the same continuous-flow system was used. The experiments were conducted in the temperature range of 336°-$382^\circ C$ at a flow rate of the alcohol of 0.2 ml/min. The volume of the catalyst was 2 ml, and the volume rate of the alcohol 6.0 hr^{-1}. A comparison of the catalytic activity of Nb_2O_5 and Ta_2O_5, prepared at equal temperatures, suggests that Ta_2O_5 is more active than Nb_2O_5 under otherwise equal experimental conditions, particularly in the same temperature range. A lower activation energy corresponds to the higher activity of Ta_2O_5, as

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Niobium and tantalum pentoxides...

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compared with Nb_2O_5. Nb_2O_5, on the other hand, remains active for a longer time and is better regenerable. The catalysts obtained from pure Nb_2O_5 and Ta_2O_2 may be regenerated by air. The conditions of such a regeneration were studied. At present, the investigations of the effects of temperature and calcination time of Ta_2O_5 on its catalytic activity, and of the effect of these factors on the activity of Nb_2O_5 and Ta_2O_5 with respect to other reactions, especially condensation, are continued.
A. Ye. Agronomov is thanked for determining the catalyst surface by the BET method, and V. M. Akimov for X-ray analysis of Ta_2O_5. The laboratory assistant Z. M. Skul'skaya took part in the experimental work.
R. A. Zvinchuk and A. V. Topchiyev are mentioned. There are 3 figures, 9 tables, and 10 references: 8 Soviet-bloc and 2 non-Soviet-bloc.

ASSOCIATION: Institut organicheskoy khimii im. N. D. Zelinskogo Akademii nauk SSSR (Institute of Organic Chemistry imeni N. D. Zelinskiy, Academy of Sciences USSR). Moskovskiy gosudarstvennyy universitet im. M. V. Lomonosova (Moscow State University imeni M. V. Lomonosov)

Card 3/4

BOGDANOVA, O.K.; BALANDIN, A.A.; SHCHEGLOVA, A.P.

Regularities in the catalytic dehydrogenation of primary and
secondary alcohols. Izv.AN SSSR Otd.khim.nauk no.3:425-429 Mr
'61.
(MIRA 14:4)

1. Institut organicheskoy khimii imeni N.D.Zelinskogo AN SSSR.
(Dehydrogenation) (Alcohols)

22514

S 1190   2209, 1274, 1297

S/062/61/000/004/003/008
B118/B208

AUTHORS: Balandin, A. A., Spitsyn, Vikt. I., Dobrosel'skaya, N. P.,
Mikhaylenko, I. Ye., Vereshchinskiy, I. V., and
Glazunov, P. Ya.

TITLE: Effect of radioactive radiation of a solid body on its
catalytic properties

PERIODICAL: Izvestiya Akademii nauk SSSR. Otdeleniye khimicheskikh nauk,
no. 4, 1961, 565-571

TEXT: There are no data available on the effect of the proper radio-
active radiation of solids on their catalytic properties. The authors of
the present paper investigated the change of catalytic activity as a
result of decay of the radioactive isotope, furthermore whether also the
β-radiation of a foreign element affects the reaction to be studied, and
the effect of irradiating the catalyst by a fast electron beam. The effect
of the radioactive catalysts $CaCl_2$, $MgSO_4$, and Na_2SO_4, containing the
β-emitters S^{35} and Ca^{45}, on the dehydration of cyclohexanol was studied.
The increased catalytic activity of radioactive catalysts, contrary to
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S/062/61/000/004/003/008
B118/B208

Effect of radioactive...

non-labeled catalysts, which had been previously observed by the authors, was confirmed in many cases. The catalytic activity decreases with decreasing radioactivity of the catalyst owing to decay of the isotopes S^{35} and Ca^{45}. Bombardment of the surface of the non-labeled catalyst with 800-kev electrons has no pronounced effect, contrary to the effect of β-particles of labeled S^{35} and Ca^{45} which are constituents of the catalyst. Thus not only the labeled S^{35}, but also the labeled Ca^{45} increases the catalytic activity of magnesium sulfate in the dehydration of cyclohexanol. The radioactive isotope need not be a component of the acting catalyst. It must be concluded that the increased activity of the radioactive catalysts studied is due to a continuous bombardment of the active centers of the catalyst with β-particles. The latter transfer their energy to the adsorbed cyclohexanol molecules and reduce the activation energy of the chemical reaction. It may be concluded from the decrease of the catalytic activity due to the decay of the isotope in the catalyst that the new elements resulting in the radioactive conversion do not increase the activity. Apparently, the activation of the catalyst surface takes place

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22514

Effect of radioactive...

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B118/B208

at the expense of the proper radioactive radiation. There are 8 figures,
2 tables, and 4 Soviet-bloc references.

ASSOCIATION: Institut fizicheskoy khimii Akademii nauk SSSR (Institute of
Physical Chemistry of the Academy of Sciences USSR).
Moskovskiy gosudarstvennyy universitet im. M. V. Lomonosova
(Moscow State University imeni M. V. Lomonosov)

SUBMITTED: January 16, 1960

Card 3/3

BOGDANOVA, O.K.; SHCHEGLOVA, A.P.; BALANDIN, A.A.; VOZNESENSKAYA, I.I.

Catalytic dehydrogenation of n-pentenes. Izv.AN SSSR Otd.khim.
nauk no.4:578-582 Ap '61.   (MIRA 14:4)

1. Institut organicheskoy khimii im. N.D.Zelinskogo AN SSSR.
            (Pentene)   (Dehydrogenation)

TOLSTOPYATOVA, A.A.; BALANDIN, A.A.; MATYUSHENKO, V.Kh.; PETROV, Yu.I.

Kinetics of the dehydrogenation and dehydration of alcohols, and of the dehydrogenation of hydrocarbons over WS_2 and MoS_2 catalysts. Izv. AN SSSR Otd.khim.nauk no.4:583-590 Ap '61.   (MIRA 14:4)

1. Institut organicheskoy khimii im. N.D.Zelinskcgo AN SSSR.
   (Dehydrogenation)   (Dehydration (Chemistry))
                (Molybdenum sulfide)   (Tungsten sulfide)

BALANDIN, A.A.; RUDENKO, A.P.; STEGNER, G.

Formation of coal dendrites in the course of decomposition of alcohols on nickel. Izv.AN SSSR.Otd.khim.nauk no.5:762-770 My '61. (MIRA 14:5)

1. Moskovskiy gosudarstvennyy universitet im. M.V.Lomonosova.
(Alcohols)   (Coal)

RUDENKO, A.P.; BALANDIN, A.A.; ZABOLOTNAYA, M.M.

Mechanism of coal formation during the decomposition of methane, ethane, ethylene, and acetylene on silica gel. Izv.AN SSSR.Otd.khim. nauk no.6:989-995 Je '61. (MIRA 14:6)

1. Moskovskiy gosudarstvennyy universitet im. M.V.Lomonosova.
(Hydrocarbons)   (Coal)

BALANDIN, A.A.; SOKOLOVA, N.P.

Catalytic properties of niobium pentoxide in the vapor phase amination of ethyl alcohol with aniline. Izv. AN SSSR. Otd.khim.nauk no.9:1543-1548 S '61. (MIRA 14:9)

1. Institut organicheskoy khimii im. N.D.Zelinskogo AN SSSR.
(Niobium oxide) (Ethyl alcohol) (Aniline)

BALANDIN, A.A.; ISAGULYANTS, O.V.; SOKOLOVA, N.P.; ZAKHARYCHEVA, I.I.

Mechanism of propane formation in the decomposition of isopropyl
alcohol on vanadium trioxide. Izv. AN SSSR. Otd.khim.nauk
no.9:1549-1551 S '61.   (MIRA 14:9)

1. Institut organicheskoy khimii im. N.D.Zelinskogo AN SSSR.
                    (Isopropyl alcohol) (Propane)

BALANDIN, A.A.; KLABUNOVSKIY, Ye.I.; LITVIN, Ye.F.

Composition of butenes formed in the catalytic dehydration of
2-butanol. Izv.AN SSSR.Otd.khim.nauk no.10:1863-1870 O '61.
(MIRA 14:10)

1. Institut organicheskoy khimii im. N.D.Zelinskogo AN SSSR.
           (Butene)   (Butanol)

BALANDIN, A.A.; ROZHDESTVENSKAYA, I.D.

Mechanism of cyclohexane dehydrogenation on a crystalline chromium
α-oxide. Izv.AN SSSR.Otd.khim.nauk no.11:1955-1961 N '61.
(MIRA 14:11)

1. Institut organicheskoy khimii im. N.D.Zelinskogo AN SSSR.
(Cyclohexane) (Dehydrogenation)

BALANDIN, A.A.; KLABUNOVSKIY, Ye.I.; ANTIK, L.V.

Synthesis and transformations of dihydroxyanthrylene-naphthohy-
droquinone (stereochemistry of catalysis). Izv. AN SSSR Otd.-
khim.nauk no.12:2189-2192 D '61.   (MIRA 14:11)

1. Institut organicheskoy khimii im. N.D.Zelinskogo AN SSSR.
              (Anthracene) (Naphthoquinone)

KIABUNOVSKIY, Ye.I.; BALANDIN, A.A.; GODUNOVA, L.F.

Chromatographic separation of menthol. Izv. AN SSSR Otd.khim.nauk
no.12:2243-2244 D '61.   (MIRA 14:11)

1. Institut organicheskoy khimii im. N.D.Zelinskogo AN SSSR.
(Menthol)

BOGDANOVA, O.K.; SHCHEGLOVA, A.P.; BALANDIN, A.A.; BELOMESTNYKH, I.P.

Catalytic dehydrogenation of ethyl benzene into styrene.
Neftekhimiia 1 no.2:195-200 Mr-Ap '61.   (MIRA 15:2)

1. Institut organicheskoy khimii AN SSSR im. N.D. Zelinskogo.
            (Benzene)   (Styrene)
                    (Dehydrogenation)

S/195/61/002/001/001/006
B101/B216

AUTHORS: Balandin, A. A., Klabunovskiy, Ye. I.

TITLE: Steric position of atoms, and catalysis (on the occasion
                 of the 100th birthday of N. D. Zelinskiy)

PERIODICAL: Kinetika i kataliz, v. 2, no. 1, 1961, 3-8

TEXT: On the occasion of the 100th anniversary of N. D. Zelinskiy's
birthday, the authors give a survey of problems of catalysis and
stereochemistry, which had been studied by Zelinskiy and further
investigated by his successors. Zelinskiy made detailed investigations
of the stereoisomerism of derivatives of di- and tribasic organic acids,
and studied the optical activation of crystallization of dimethyl
dihydroxy glutaric acid. Basing on stereochemical considerations,
Zelinskiy arrived at the following concept of heterogeneous ca'·iysis:
"The deformation of molecules occurs under the influence of th·· orce
field present on the active surface of the catalyst, this force 'ield
influencing the configuration of particles and rendering them rea'j to
interact ...". From this concept, A. A. Balandin developed his multiplet

Card 1/3

Sterio position of atoms, and ...

S/195/61/002/001/001/006
B101/B216

theory of catalysis (Ref. 5: Khim. nauka i promyshlennost', 4, 655, 1959), which assumes the highest possible agreement between the structure of the reacting molecules and the surface structure of the catalyst. A multiplet complex is formed between the reacting atom group and the catalyst without deformation of valency angles. It is mentioned that N. D. Zelinskiy discovered the metallic dehydrogenation catalysts with face-centered crystal lattices in 1911. The principles of stereochemical influencing of catalytic processes are illustrated, using the hydrogenation of cis- and trans-olefins and the conversion of maleic acid to fumaric acid on palladium as examples. The multiplet theory enables classification of all known catalytic reactions. About 2000 types of catalytic reactions were laid down, many of which have not been realized so far. The equations of the multiplet theory permitted advance calculation as to which out of the 15 possible modes of decomposition of cyclohexanol would be most likely on activated carbon, the prediction being confirmed experimentally (Ref. 15: A. A. Balandin et al. Izv. AN SSSR, Otd. khim. nauk., 1960, 614). The steric specificity of enzyme catalysis is also explained by the multiplet theory. It is mentioned that Zelinskiy verified the organic origin of petroleum postulated by reason of the optically active

Card 2/3

Sterio position of atoms, and ...

S/195/61/002/001/001/006
B101/B216

substances contained in it, by experimentally preparing similar products by dry distillation of organic substances of vegetable and animal origin. The authors stress the versatility of Zelinskiy's scientific activity, the results of which may be utilized for further development up to the present day. There are 1 figure and 18 references: 17 Soviet-bloc and 1 non-Soviet-bloc. The reference to the English-language publication reads as follows: R. L. Burwell, jr., Chem. Rev. 57, 895, 1957.

SUBMITTED: December 8, 1960

Card 3/3

VASSERBERG, V.E.; BALANDIN, A.A.; LEVI, O.I.

Radiochemical study of the mechanism of dehydration catalysis. Part 1:
Reactions of C^{14} -dimethyl ether with hydrocarbons. Kin. i kat. 2
no.1:61-65 Ja-F '61.   (MIRA 14:3)

1. Institut organicheskoy khimii imeni N.D. Zelinskogo AN SSSR.
            (Ether) (Hydrocarbons) (Dehydration(Chemistry))

TOLSTOPYATOVA, A.A.; KONEKO, I.R.; BALANDIN, A.A.

Catalytic properties of yttrium oxide. Conversions of alcohols and
hydrocarbons. Kin. i kat. 2 no.1:135-143 Ja-F '61.   (MIRA 14:3)

1. Institut organicheskoy khimii imeni N.D. Zelinskogo AN SSSR.
                    (Yttrium oxide)
                        (Alcohols)
                    (Hydrocarbons)

BALANDIN, A.A.; TOLSTOPYATOVA, A.A.; DUDZIK, Z.

Catalytic properties of thorium dioxide in the dehydrogenation
and dehydration of alcohols, and in the dehydrogenation of cyclic
hydrocarbons. Kin.i kat. 2 no.2:273-284 Mr-Ap '61.

(MIRA 14:6)

1. Moskovskiy gosudarstvennyy universitet, kafedra organicheskogo
kataliza.

(Thorium oxide)
(Dehydrogenation)
(Dehydration (Chemistry)

RUDENKO, A.P.; BALANDIN, A.A.

Dehydrocondensation of methane with the formation of a coal-
yielding substance.   Kin.i kat.   2   no.4:529-533   Jl-Ag '61.
(MIRA 14:10)

1. Moskovskiy gosudarstvennyy universitet imeni M.V.Lomonosova.
        (Methane)   (Condensation products (Chemistry))

BALANDIN, A.A.; SPITSYN, V.I.; RUDENKO, A.P.; DOBROSEL'SKAYA, N.P.;
MIKHAYLENKO, I.Ye.; PIROGOVA, G.I.; GLAZUNOV, P.Ya.

Apparatus for studying heterogeneous catalysis at high temperature
using radioactive catalysts and ionizing radiations. Kin.i kat.
2 no.4:626-632 Jl-Ag '61.   (MIRA 14:10)

1. Institut fizicheskoy khimii AN SSSR i Moskovskiy gosudarstvennyy
universitet imeni M.V.Lomonosova.
                        (Catalysis)

33491
S/195/61/002/005/016/027
E030/E185

$S.1190$

AUTHORS: Isagulyants, G.V., and Balandin, A.A.

TITLE: The use of radiocarbon (C^{14}) in studying the mechanism
              of parallel-consecutive catalytic processes

PERIODICAL: Kinetika i kataliz, v.2, no.5, 1961, 737-740

TEXT: The use of radiocarbon is proposed to determine the
stages and process of forming products in parallel-consecutive
reactions, the general scheme of which is represented by:

$$A \underset{W_1'}{\overset{W_1}{\rightleftarrows}} B$$

$$W_2 \searrow \quad W_1' \quad \swarrow W_3$$
$$C$$
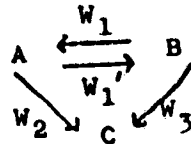
(II) $\checkmark$

where   A is the initial product,   B and C the products formed
during the process.   Three typical cases arise: for a reaction
rate $W_2 \simeq 0$,   C is formed consecutively from A with B as inter-
mediate;   for $W_3 \simeq 0$, B and C are formed from A in parallel but

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independent of each other; and when all the rates are commensurable, C is a product of a consecutive-parallel reaction. The formulae for the rates W_i are:

$$W_1 = \frac{d\beta}{d\tau} \cdot \frac{C_2}{(\alpha - \beta)} \; ; \quad W_1' = \frac{d\alpha}{d\tau} \cdot \frac{C_1}{(\alpha - \beta)} \; ;$$

$$W_3 = \frac{C_3(d\gamma/d\tau) + (\gamma - \alpha)(dC_3/d\tau)}{\beta - \alpha} \; ; \quad W_2 = \frac{dC_3}{d\tau} - W_3 ; \tag{1}$$

where α, β, γ are the specific activities and C_1, C_2, C_3 the concentrations of A, B, C, respectively; τ is the contact time. The authors were able to observe the above discussed cases in many processes by adding to the initial product A a small quantity of B or C marked with C^{14} and determining the changes in concentration and specific radioactivity in relation to contact time. One of these processes was that of the decompo- sition of ethyl alcohol investigated by the authors together with Ye.I. Popov and Yu.I. Derbentsev (Ref.3; Izv. AN SSSR, Otd.khim. n., 1958, 233). The decomposition was carried out in the

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temperature range 275 - 400 °C with aluminium oxide as catalyst.
It occurs in two directions: into ethylene and into ethyl ether.
At the lower temperatures, decomposition into ethylene was much
slower than the dehydration reaction (reversible) into ethyl
ether. As the temperature rose, the decomposition rate of ethyl
alcohol into ethylene rose until at 400 °C it became comparable
with that of the ether reaction. Thus, the concentrations of
both alcohol and ether show maxima. As the temperature rises the
ether maximum is produced not only by the direct alcohol-ethylene
reaction, but also by decomposition of the ether to ethylene.
At 400 °C where there is 100% conversion to ethylene, 80% of the
ethylene is produced from the alcohol and 20% from the ether.
The dehydrogenation of cyclohexane to cyclohexene and to benzene
is another similar process (Ref.5: Yu.I. Derbentsev,
A.A. Balandin, G.V. Isagulyants, Kinetika i kataliz, v.2, 741,
1961). A pure consecutive process occurs in the dehydrogenation
of butane-butene mixtures on chromium catalysts. Both the butane
and butenes are converted directly to butadiene, the conversion
rate from butane being about 3 times faster than from butene.
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