

MEMORANDUM FOR THE DIRECTOR

Subject: [Illegible]

[Illegible]

L 04582-67 EWT(1) SCFB DD

ACC NR: AP6033151

SOURCE CODE: UR/0238/66/012/005/0640/0648

AUTHOR: Mishchenko, V. S.

ORG: Laboratory of Developmental Physiology, Institute of Physiology im. O. D. Bohomolets, Academy of Sciences USSR, Laboratoriya vika i fiziologii Instytutu fiziologii Akademiyi nauk UkrSSR

TITLE: Changes in external respiration, ability of blood to transport oxygen, and oxygen parameters in young people training for sports

SOURCE: Fiziologichnyy zhurnal, v. 12, no. 5, 1966, 640-648

TOPIC TAGS: human physiology, blood circulation, respiratory system, pulmonary ventilation, training

ABSTRACT: Changes in external respiration, hemodynamics, and the oxygen capacity, oxygen content, and degree of oxygen saturation of the blood were studied in 60 rowers aged 14-17 yr. Experiments showed that training altered the entire oxygen balance of the organism. Weight and body measurements both increased as a result of training. Oxygen consumption during rest per kg of body weight decreased significantly, and at 14-15 yr had reached the adult level. Basal metabolism in the young athletes studied was near the lower limit of adolescent norms. It was observed that the minute volume of respiration, also calculated in relation to body weight, decreased even more than oxygen consumption. Breathing was less rapid and deeper in the

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young athletes, almost like that of trained adult athletes. In addition, the pulmonary ventilation component in the minute volume of respiration increased. Training affected circulation in the adolescents by producing bradycardia and decreasing the minute volume of blood (with some increase in both systolic and diastolic pressure). Tests showed that the minute volume of blood, whether adjusted for body weight or not, was within norms established for adult athletes trained for endurance. Oxygen capacity of blood was noted to be slightly greater in experimental subjects as compared with their untrained contemporaries. The generally more efficient respiratory and circulatory functions observed in young athletes were characterized by smaller amounts of oxygen entering the lungs and a higher coefficient of utilization of the oxygen in inspired air. In addition, transportation of oxygen by the blood was more efficient and utilization of oxygen from arterial blood was better. It was concluded that athletic training leads to more rapid development of those physiological systems involved in regulating the organism's oxygen regime, to earlier improvement in the efficiency of the oxygen regime, and to more effective utilization of oxygen by the organism. Orig. art. has: 1 figure.

SUB CODE: 06/ SUBM DATE: 03May66/ ORIG REF: 036/ OTH REF: 006/ ATD PRESS: 100

Card 2/2 vmb

S/075/62/017/007/003/215  
B119/B'86

AUTHORS: Mishchenko, V. T., and Poluektov, E. S.

TITLE: Spectrophotometric determination of rare earths in solutions of ethylene diamine tetraacetic complexes

PERIODICAL: Zhurnal analiticheskoy khimii, v. 17, no. 7, 1962, 825 - 830

TEXT: When rare earths are converted to their ethylene diamine tetraacetic complexes other elements present in the analytic solution with a view to spectrophotometric determination have a disturbing effect: the possibility to eliminate this effect was explored. The absorption spectra of Pr, Nd, Sm, Eu, Gd, Dy, Ho, Er, Tm, and Yb complexes in aqueous solution were investigated. As compared with the spectra of non-complex-bound elements, most of these spectra show a 1 - 6 m $\mu$  shift of the absorption maxima toward longer wavelengths. The height of absorption maxima of complexes is 1.1 - 2.6 times that of the maxima of free ions. A complexone III concentration of 0.1 mole/liter, and a pH of 8 - 9, were found to be optimum for investigations with rare earth contents of up to 10 mg/ml (referring to their oxides). A method with a sensitivity of 0.03 mg/ml for Pr<sub>6</sub>O<sub>11</sub>

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Spectrophotometric determination...

S/075/62/017/007/003/006  
B119/B186

and  $\text{Nd}_2\text{O}_3$  and 0.02 mg/ml for  $\text{Sm}_2\text{O}_3$  was developed for determining Pr, Nd, and Sm. Pr is measured at 448 m $\mu$ , Nd at 526.5 or 747.5 m $\mu$ , Sm at 404 and 418 m $\mu$ . The error width is much reduced by the presence of  $\text{NH}_4\text{NO}_3$  when determining Pr, Nd, and Sm, and by ammonium acetate when determining Nd. There are 5 figures and 3 tables. The most important English-language reference is: T. Moeller, J. C. Brantley, *Analyt. Chem.* 22, 455 (1950).

ASSOCIATION: Institut obsnchey i neorganicheskoy khimii AN USSR,  
laboratoriya v Odessa (Institute of General and Inorganic  
Chemistry AS UkrSSR, Laboratories in Odessa)

SUBMITTED: October 13, 1961

Card 2/2

ACCESSION NR: AP4043572

S/0078/64/009/008/1822/1829

AUTHOR: Mishchenko, V. T.; Poluektov, N. S.

TITLE: Polynuclear citric acid complexes of the rare earth elements

SOURCE: Zhurnal neorganicheskoy khimii, v. 9, no. 8, 1964, 1822-1829

TOPIC TAGS: rare earth element complex, citric acid complex, polynuclear rare earth citrate, trinuclear rare earth citrate, absorption spectra, molar ratio method, isomolar series method, aluminum rare earth citrate, thorium rare earth citrate, uranium rare earth citrate

ABSTRACT: The authors continued their work (Izv. Khim. Zhurn. 31, 9 (1964)) on the formation of rare earth element-citric acid complexes to obtain data on the composition and extent of formation of polynuclear compounds by interaction between two rare earth citrates. The interaction of 0.01-0.1M solutions of  $\text{La}^{+3}$  or  $\text{Y}^{+3}$  with 0.01-0.04M solutions of Pr, Nd, Sm and Er citrate, and of Er with Nd and Sm citrate was studied spectrophotometrically at pH 9, using more than

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ACCESSION NR: AP4043572

2:1 of citrate: metal. By the molar ratio and isomolar series methods it was found that trinuclear complexes containing both elements in the inner coordination sphere were formed in which the element with the smaller ionic radius united with the element with the larger ionic radius in a ratio of 1:2, thus:  $Me^I_2Me^{II}Cit_3$  where  $Me^I$  is the rare earth element with the larger, and  $Me^{II}$  the rare earth with the smaller ionic radius, and  $Cit$  is the trinuclear citrate ion. The mixed trinuclear complex was formed only to the extent of 58-88%, this increased upon dilution of the solution. Y and Nd complexed more strongly than La and Nd. Changes in absorption spectra indicate analogous polynuclear citrate complexes are formed between the rare earth elements and  $Al^{+3}$ ,  $Th^{+4}$ , or  $UO_2^{+2}$ . Orig. art. has: 12 figures and 2 tables

ASSOCIATION: Institut obshchey i neorganicheskoy khimii AN UkrSSR Laboratorii v Odesse (Institute of General and Inorganic Chemistry AN UkrSSR)

SUBMITTED: 12Oct63

ENCL: 00

SUB CODE: IC

NO REF SOV: 013

OTHER: 016

? Card 2/2

L 2122-69 EWP(m)/EWP(q)/EWP(b) AEED(a) RSW/JS/PM  
ACCESSION NR: AP4042115 8/0073/64/030/007/0663/0667

AUTHOR: Mishchenko, V. T.; Poluektov, N. S.

13  
12

TITLE: Spectrophotometric investigation of citrate complexes of the rare earth elements in alkali solutions

SOURCE: Ukrainskiy khimicheskij zhurnal, v. 30, no. 7, 1977, 663-667

TOPIC TAGS: magnesium citrate complex, erbium citrate complex, spectrophotometric study, molar ratio method, formation constant, stability constant, complex polymer

ABSTRACT: By spectrophotometric study of solutions of neodymium and erbium citrate complexes with a constant Me: Cit ratio of 1:1, a complex dissociation curve was obtained. It was found the complexes exist in two forms, and at pH = 3-9 the optical density increased with increase in pH. At pH = 0-3 the optical density increased at first and then decreased. The existence of a stable complex at pH below 3, indicated several times in the literature but was not observed. It was established by the methods of molar ratios and isobologram method that at pH = 9 Nd and Er form a complex with a Me: Cit molecular ratio of 1:1. From the

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L 2122-65  
ACCESSION NR: AP4042115

amount of citric acid required to form clear rare earth salts in alkali media it was assumed a 3:2 Me:Cit complex may also be formed. The degree of dissociation and the approximate value of the apparent instability constant of the complexes was calculated. Since the latter is fairly constant at low complex concentrations but increased 2-3 times with increase in concentration (from 0.01 to 0.02M) of the complex, it was suggested that the complex compound polymerized to  $(MeCit)_n$ .  
Orig. art. has: 8 figures and 1 table.

ASSOCIATION: Institut obshchey i neorganicheskoy khimii AN UkrSSR (Institute of General and Inorganic Chemistry AN UkrSSR)

SUBMITTED: 07Jul63

ENCL: 00

SUB CODE: GC

NO REF SOV: 010

OTHER: 009

Cont 2/2

ACCESSION NR: AP4044893

S/0032/64/030/009/1055/1057

AUTHORS: Nikonova, M. P.; Mishchenko, V. T.; Poluektov, N. S.

TITLE: Spectrophotometric determination of praseodymium and neodymium impurities in compounds of the cerium subgroup

SOURCE: Zavodskaya laboratoriya, v. 39, no. 2, 1964, 1055-1057

TOPIC AIDS: spectrophotometry, rare earths, absorption band, praseodymium, neodymium, cerium / SF 10 spectrophotometer

ABSTRACT: The possibility of determining in small quantities of solutions, without lowering the sensitivity, of praseodymium and neodymium impurities in compounds of the cerium subgroup is investigated. A method is described for the spectrophotometric determination of these impurities in solutions of cerium compounds, using the absorption bands of the impurities in the visible region of the spectrum, passing here through a band of the cerium compound. Measurements were made with an SF-10 spectrophotometer. It was determined by an absorption band with maximum at 444 m $\mu$ , led by a band with a maximum at 424 or at 742.5 m $\mu$ . Graphs were plotted to show dependence of optical density (at these maximums) on the concentration of solutions (chlorides of pure rare earths). The

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ACCESSION NR: AP4044893

calibration graphs are rectilinear. The presence of large concentrations of the base element had no substantial effect on the height or position of the absorption in the spectrum. Little difficulty was encountered in determining Pr or Nd in preparations of La and Ce. But some difficulty was encountered with Sm compounds because of the coincidence of the weak absorption band of Sm (443.0 m $\mu$ ) with the Pr band (444 m $\mu$ ). Results were obtained by comparing densities of 443 with 446 in Sm, however. Maximum errors of determination ranged from 5.3 to 10%. The sensitivity in some determinations is greater than with the spectrograph, and the technique is simpler. Orig. art. has: 3 figures and 1 table.

ASSOCIATION: Institut obshchey i neorganicheskoy khimii Akademii nauk UkrSSR  
(Institute of General and Inorganic Chemistry of the Academy of Sciences, UkrSSR)

SUBMITTED: 00

ENCL: 00

SUB CODE: OP

NO REF SOV: 003

OTHER: 002

Card 2/2

I 16746 66 ECT(a)/EWP(j)/T/EWP(t) IJP(a) JD/JG/RM

ACC NR: AP6003636

SOURCE CODE: UR/0078/65/010/010/2275/2281

AUTHOR: Poluektov, N. S.; Mishchenko, V. T.

ORG: none

TITLE: Mixed sulfosalicylate complexes of rare earth elements

SOURCE: Zhurnal neorganicheskoy khimii, v. 10, no. 10, 1965, 2275-2281

TOPIC TAGS: terbium compound, europium compound, lanthanum compound, neodymium compound, erbium compound, yttrium compound, fluorescence spectrum, spectrophotometry

ABSTRACT: The formation of mixed polynuclear complexes (rare earth complexes) with sulfosalicylic acid in neutral and weakly alkaline media was studied by spectrophotometric and fluorometric methods. The absorption spectra of sulfosalicylate solutions of neodymium and erbium change in the presence of such complexes of other rare earths (yttrium and lanthanum were employed). The greatest change is observed in absorption bands having peaks at  $\lambda = 575.5 \text{ nm}$  (Nd) and  $523.0 \text{ nm}$  (Er) in chloride solutions. These bands were used in the study. The data obtained for the properties of complexes studied spectrophotometrically pertain to the pH range of 5.5-9.5. It was found that in a mixed sulfosalicylate

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UDC: 546.65 : 541.49

L 16746-66

ACC NR: AP6003636

complex, the element with the smaller ionic radius (Y, Nd) stands in the ratio of 1:2 to the element with the larger radius (Nd, La), i. e., the mixed complexes formed are trinuclear. A fluorometric study of the formation of mixed complexes by terbium and europium in sulfosalicylic acid solutions showed that the formation is due to a transfer of energy from  $Tb^{3+}$  to  $Eu^{3+}$ , as indicated by the phenomenon of sensitized fluorescence of europium in the presence of terbium. Orig. art. has: 12 figures, 1 table.

SUB CODE: 07/    SUBM DATE: 05Feb65/    ORIG REF: 008/    OTH REF: 002

Card 2/2    ymb

L 14687-66 EWT(m)/EWP(t)/EWP(b) IJP(c) JD/JG  
ACC NRT RP6005880 SOURCE CODE: UR/0075/65/020/010/1073/1081

AUTHOR: Mishchenko, V. T.; Lauer, R. S.; Yefryushina, N. P.; Poluektov, N. S. 50  
B

ORG: Institute of General and Inorganic Chemistry, AN UkrSSR, Odessa Laboratories  
(Institut obshchey i neorganicheskoy khimii AN UkrSSR, Laboratorii v Odesse)

TITLE: Extractive-photometric determination of certain rare earth elements with  
thenoyltrifluoroacetone 2155

SOURCE: Zhurnal analiticheskoy khimii, v. 20, no. 10, 1965, 1073-1081

TOPIC TAGS: rare earth element, photometric analysis, benzene, complex molecule,  
praseodymium, neodymium, samarium, dysprosium, holmium, erbium, thulium, ytterbium,  
absorption spectrum

ABSTRACT: A method of determining rare earth elements from their absorption spec-  
tra in solutions of complex compounds in organic solvents is described. It was  
found that complexes with thenoyltrifluoroacetone were suitable for extractive-photo-  
metric determination of rare earths in benzene solutions. Analysis of the absorp-  
tion spectra of thenoyltrifluoroacetone complexes of praseodymium, neodymium, sama-

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L 14687-66  
ACC NR: AP6005880

rium, dysprosium, holmium, erbium, thulium, and ytterbium in benzene showed that the peak heights of many absorption bands of the rare earths increase by a factor of 1.1-4 as compared to the peak heights of solutions of chlorides. In the case of Ho, Er, and Nd, this factor is 21.1, 9.9, and 8.0 respectively. Optimum conditions for determining Pr, Nd, Sm, Ho, and Er in mixtures of rare earth elements were determined. The calculated sensitivity of the method is (in micrograms per milliliter, based on the oxide) 2.5 for Ho, 3.5 for Nd, 5.5 for Er, 13.0 for Pr, and 90 for Sm. Orig. art. has: 10 figures, 4 tables, 3 formulas.

SUB CODE: 0710

SUBM DATE: 05Aug64/

ORIG REF: 012/

OTH REF: 013

Card 212 *AC*

L 30244-66 EWT(m)/EWP(t)/ETI IJP(c) JD/JG  
ACC NR: AP6013883

SOURCE CODE: UR/0073/65/031/011/1189/1197

AUTHOR: Mishchenko, V. T.; Lauer, R. S.; Yefryushina, N. P.; Poluektov, N. S.

ORG: Odessa Laboratories, Institute of General and Inorganic Chemistry, AN UkrSSR  
(Institut obshchey i neorganicheskoj khimii AN UkrSSR, Laboratorii v Odessa)

TITLE: Absorption-spectrophotometric determination of rare earth elements in tri-  
butyl phosphate extracts 27

SOURCE: Ukrainskiy khimicheskiy zhurnal, v. 31, no. 11, 1965, 1189-1197

TOPIC TAGS: rare earth element, spectrophotometric analysis, phosphate, solvent ex-  
traction, organometallic compound, absorption spectrum

ABSTRACT: The object of the study was to work out a rapid and convenient method of determining rare earth elements directly in tributyl phosphate and its solutions, following the separation of mixtures of rare earth elements by this extracting agent. To this end, the absorption spectra of tributyl phosphate complexes of Pr, Nd, Sm, Eu, Gd, Dy, Ho, Er, and Yb were investigated. It was found that during complexing in tributyl phosphate solutions, most of the absorption band maxima are displaced toward longer wavelengths by 1 to 10 m $\mu$ . A shift of certain absorption peaks toward shorter wavelengths, e. g., that of Eu, is also observed. At the same time, the peak height of many absorption bands frequently increases by a factor of 1.1-3.5 and more. The con-

UDC: 546.65:535.243:541.49

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L 30244-66

ACC NR: AP6013883

ditions for the determination of Pr, Nd, Sm, Ho, and Er in a mixture of rare earth elements of the cerium and yttrium subgroups in tributyl phosphate were established: (a) in concentrated solutions of rare earth elements (up to 130 mg/ml based on the oxide) and (b) when the concentrated solutions were diluted both by tributyl phosphate itself and other solvents. The sensitivity of the method is (in mg/ml based on the oxide): for neodymium, 0.03; holmium and erbium, 0.04; praseodymium, 0.06, and samarium, 0.18 for a cell length of 2 cm. Orig. art. has: 10 figures, 4 tables.

SUB CODE: 07/

SUBM DATE: 11Jun64/

ORIG REF: 006/

OTH REF: 004

Card 2/2

S/137/62/000/001/226/237  
A154/A101

AUTHORS: Poluektov, N. S., Mishchenko, V. T.

TITLE: The present state of the analytical chemistry of lithium, rubidium and cesium

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 1, 1962, 9, abstract 1K59  
(V sb. "Metody opredeleniya i analiza redk. elementov". Moscow, AN SSSR, 1961, 37-56)

TEXT: A review describing qualitative reactions and methods of isolation, separation and determination. There are 269 references.

N. Gertseva

[Abstracter's note: Complete translation]

Card 1/1

S/137/62/000/001/232/237  
A154/A101

AUTHORS: Poluektov, N. S., Mishchenko, V. T.

TITLE: The present state of the analytical chemistry of strontium

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 1, 1962, 11, abstract 1K73  
(V sb. "Metody opredeleniya i analiza redk. elementov". Moscow, AN SSSR, 1961, 108-127)

TEXT: This review contains information on: Qualitative reactions on Sr. Methods of separation and determination. Flame-photometric determination in minerals, ores and rocks. Chemico-spectral determination of admixtures in Sr and Ba. Flame-photometric determination of Ca in salts of Sr. There are 275 references.

B. Melent'yev

[Abstracter's note: Complete translation]

Card 1/1

BRUVER, Ye.A.; MISHCHENKO, V.V.; SMIRNOV, Ya.T.

Efficient groups of boreholes in electric rotary drilling in exploratory workings. Uch. zap. NAIGIMSa no.7:233-239 '62. (MIRA 17:2)

1. Sredneaziatskiy nauchno-issledovatel'skiy institut geologii i mineral'nogo syr'ya, Tashkent.

MISHCHENKO, V.V.

Technical and economical effectiveness of modern means of mechanization  
in sinking exploratory holes in hard rocks. Uch.zap. SAIGIMSa no.10:133-  
137 '63. (MIRA 17:2)

MEDVEDEV, V.V.; MISHCHENKO, V.V.; CHUM, G.V., 1963.

Scraper removal of rocks in sinking horizontal prospecting drilling  
of small sections. "Zh.zap. SAIGIMSa no.10:141-148 '63.(MIRA 17:2)

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KOROVINA, T.V.; MISHCHENKO, V.V.; YAROVLEVA, I.A.

Some clinical and anatomical comparisons in rheumatic fever.  
Zdravookhranenie 3 no. 5:5-9 S-O '60. (MIRA 13:10)

1. Iz kafedr gospital'noy terapii (zav.- prof. M.A. Polyukhov)  
i patologicheskoy anatomii (zav. - dotsent V.Kh. Anestiadi)  
Kishinevskogo meditsinskogo instituta.  
(RHEUMATIC FEVER)



POLYUKHOV, M.A.; MISHCHENKO, V.V.; BALAKHINICHEVA, T., red.; TELPIS, V.,  
tekhn. red.

[Brucellosis in the Moldavian S.S.R.; a short essay on its clinical  
aspects, treatment and prevention] Brutsellez v Moldavskoi SSR;  
kratkii ocherk kliniki, lecheniia i profilaktiki. Kishinev, Kartia  
roldoveniaske, 1961. 86 p. (MIA 1961)  
(MOLDAVIA--BRUCELOSIS)

ALEKSANDROV, N.I.; GEMER, N.Ye.; GAPOCHKO, K.M.; GAZIN, V.S.; S. G. BERT, V.I.  
LAZAREVA, Ye.S.; PISHCHENKO, V.Ye.; S. LEVAKOV, M.N.

Aerosol immunization with dry live vaccines and anatoxins. (Soviet  
No.6: Study of the reactogenic and immunologic effectiveness of  
aerosol immunization with spray vaccines (brucellosis, tularemia,  
anthrax and plague) in man. Zhurnal mikrobiologii i parazitologii  
no.7:56-62 Jan 1961. (Soviet Union) (Soviet Union) (Soviet Union)

(VACCINATION) (AEROSOLS)  
(COMMUNICABLE DISEASES-Prevention)

ALEKSANDROV, N.I.; GEFEN, N.Ye.; GAPOCHKO, K.G.; GARIN, N.S.;  
MASLOV, A.I.; MISHCHENKO, V.V.

Aerosol immunization with dry powder vaccines and anatoxins.  
Report No.10: Clinical study of postvaccinal reactions to  
aerosol immunization with dry brucellosis vaccine. Zhur.  
mikrobiol., epid. i immun. 33 no.11:31-37 N '62.  
(MIRA 17:1)

ALEKSANDROV, N.I.; GEFEN, N.Ye.; GAPOCHKO, K.G.; GARIN, N.S.; MASLOV, A.I.  
MISHCHENKO, V.V.; SMIRNOV, M.S.

Aerosol immunization with dry powder vaccines and anatoxins.  
Report No.9: Further study of the reactivity and immunological  
effectiveness of the method of aerosol immunization with brucel-  
losis powder vaccine. Zhurnal Mikrob. i Immun. 33, no. 12: 96: 1-2, D 1-2.  
(BRUCELLA) (VACCINES) (AEROSOL THERAPY) (MIRA 1:5)

"APPROVED FOR RELEASE: 06/14/2000

CIA-RDP86-00513R001134620011-2

APPROVED FOR RELEASE: 06/14/2000

CIA-RDP86-00513R001134620011-2"

CHUMAKOV, I.D.; MISHCHENKO, V.V.; NAZAROV, L.V.; SMIRNOV, YU.T.

Results of experimental work on the electric rotary drilling of  
solid rocks. Biul.nauch.-tekh.inform VIMS no.1:70-73 '63.

(MIRA 18:20)

1. Sredneaziatskiy nauchno-issledovatel'skiy institut geologii  
i mineral'nogo syr'ya, Tashkent.

KAZITSYNA, L.A.; MINICHENKO, V.V.

Electron absorption spectra of imines of  $\alpha$ -hydroxycarbonyl  
compounds. Zhur. org. khim. 1 no.4:617-624 Ap '65.  
(MIRA 18:11)

ACC NR: AP7004748

SOURCE CODE: UR/0413/67/000/001/0039/0039

INVENTOR: Gvozdev, V. D.; Mishchenko, V. Z.

ORG: none

TITLE: Simulator of aircraft bumping. Class 21, No. 189920

SOURCE: Izobreteniya, promyshlennyye obraztsy, tovarnyye znaki, no. 1, 1967, 39

TOPIC TAGS: aircraft control equipment, automatic control, aircraft automatic pilot, vibration simulation

ABSTRACT: An Author Certificate has been issued for a simulator of aircraft bumping which contains a white noise generator, operational magnetic amplifiers, a step-by-step selector, comparator units, and an automatic pilot. To test the aircraft with the automatic pilot, and to evaluate the performance of the automatic control system directly on board the aircraft, operational magnetic amplifiers are connected in series to the output of the white noise generator. One of these amplifiers is loaded with the ~~step-by-step~~ selector, to the contacts of which a set of resistors is connected, linking the output of the amplifier with the input of the automatic pilot through the comparator units; to these autopilot pickups are also connected. [JP]

SUB CODE: 01/ SUBM DATE: 29Sep65/

Card 1/1

UDC: 621.3.078



ACC NR: AP/005691 (A) SOURCE CODE: UR/0413/67/000/002/0160/0160

INVENTOR: Matveyev, V. N.; Gvozdev, V. D.; Mishchenko, V. Z.

ORG: None

TITLE: A device for simulating "buffeting" on an airplane. Class 62, No. 190801

SOURCE: Izobreteniya, promyshlennyye obraztsy, tovarnyye znaki, no. 2, 1967, 160

TOPIC TAGS: aircraft test, aircraft simulator, automatic control equipment

ABSTRACT: This Author's Certificate introduces a device for simulating "buffeting" on an airplane. The installation includes a unit which simulates variation in the motion parameters of an aircraft without a control system during flights in "rough air". This unit consists of a "white" noise generator, adders and filters. The installation also incorporates a system for automatic control of the aircraft with an autopilot, computer units and pickups. The device is designed for approximately evaluating the operation of a system for automatic control of an aircraft under actual "buffeting" conditions. The filters in the simulation unit are connected through the adders to the input of the autopilot together with the pickups in the system for automatic control of the aircraft.

SUB CODE: 09-01/ SUBM DATE: 11Jan65

UDC: 629.13.01/.06

Card 1/1

L. 63551-65 EWT(I)/EPF(H)-2/ENG(M)/EPA(W)-2/T Pz-6 IJP(c) AT

ACCESSION NR: AP5018838

UR/0368/65/003/001/GJ03/0008  
535.215.4AUTHOR: Kulikov, S. A.; Mishchenko, Ye. D.; Nikitin, V. G.; Startsev, G. P. 29 B

TITLE: Spectral dependence of the quantum yield of metallic and nonmetallic photocathodes in the region of 95—20 mμ

SOURCE: Zhurnal prikladnoy spektroskopii, v. 3, no. 1, 1965, 3-8

TOPIC TAGS: photocathode<sup>2</sup>, quantum yield, photoeffect, photoelectric device, spectral sensitivity

ABSTRACT: The spectral variation of the relative quantum yield of 14 metals and 13 nonmetallic photocathodes was investigated in the extreme ultraviolet spectral region (200—950 Å). The error in the experimentally determined values did not exceed 10%. Table 1 of the Enclosure shows the absolute maximum values of the quantum yields of the materials calculated on the basis of the absolute quantum yield of Pt (G. R. Cook and P. H. Metzger, Journal of chemical physics, v. 41, 1964, p. 321). The wavelengths corresponding to the maxima are approximate. Orig. art. has: 4 figures and 1 table. [CS]

Card 1/3

L 63551-65

ACCESSION NR: AP5018838

ASSOCIATION: none

SUBMITTED: 11Jan65

NO REF SOV: 004

ENCL: 01

OTHER: 013

SUB CODE: EC, GP

ATD PRESS: 4050

Card 2/3

L 63551-65

ACCESSION NR: AP5018838

ENCLOSURE: 01  
0

Table 1. Absolute maximum quantum yields in the region between 200 and 950 Å

Material	Wavelength (mμ)	Q. Yield (electron/photon)	Material	Wavelength (mμ)	Q. Yield (electron/photon)
Cu	73.0	0.17	Pt	48.0	0.15
Au	70.0	0.15	ThO <sub>2</sub>	76.5	0.13
Ag	74.0	0.14	ZrO <sub>2</sub>	32.5	0.24
Al	73.5	0.23	HfO <sub>2</sub>	81.0	0.28
In	80.0	0.07	Al <sub>2</sub> O <sub>3</sub>	70.5	0.20
Zr	79.0	0.28	Sc <sub>2</sub> O <sub>3</sub>	30.0	0.23
Tl	78.0	0.19	Nb <sub>2</sub> O <sub>5</sub>	76.0	0.19
Sn	76.0	0.16	LiF	54.0	0.52
Ta	66.5	0.20	MgF <sub>2</sub>	62.5	0.39
Nb	70.0	0.20	BrF <sub>2</sub>	43.5	0.39
W	60.0	0.16	CsI	63.5	0.63
Mo	63.0	0.18	SbS	80.0	0.20
Ni	51.0	0.15	ZnS	75.5	0.20
Fe	77.5	0.15	BeO	58.0	0.53

Cont 3/3

L 3891-66 EWT(1)

ACCESSION NR: AP5017494

UR/0368/65/002/006/0546/0549  
535.33:535.89

AUTHOR: <sup>44.55</sup> Krasavin, V. V.; <sup>44.55</sup> Kulikov, S. A.; <sup>44.55</sup> Mishchenko, Ye. P.; <sup>46</sup> Startsev, G. P. <sup>B</sup>

TITLE: Measurement of the density of the radiation spectrum of a pulsed source in the far ultraviolet region <sup>44</sup>

SOURCE: Zhurnal prikladnoy spektroskopii, v. 2, no. 6, 1965, 546-549

TOPIC TAGS: UV spectroscopy, emission spectrum, flash lamp

ABSTRACT: This is a continuation of earlier work by the authors (PTE No. 2, 138, 1965) on measurements of the spectrum below 100 nm, where the radiation from a pulsed source with repetition frequency 50 cps and duration 2--3  $\mu$ sec was described. The original apparatus employed an FEU-29 photomultiplier with a luminescent sodium salicylate screen, and the average current was measured with a microammeter (M-59). In the present investigation the apparatus was improved by using a more sensitive photomultiplier (FEU-39) and replacing the microammeter with an automatic recording peak voltmeter. The recording circuit consists of two blocks, a cathode follower with a set of integrating cells, and the peak voltmeter with its independent power supply. The peak voltmeter circuit is briefly described and a sample of the spectrum in the 90--20 nm region is given. The described circuit has high sensitivity

Card 1/2

L 3891-66

ACCESSION NR: AF501749<sup>4</sup>

and a resolution of 0.01 mm over the entire region of the spectrum. Orig. art.  
has: 2 figures and 3 formulas.

ASSOCIATION: none

SUBMITTED: 03Sep64

ENCL: 00

SUB CODE: OP

NR REF SOV: 002

OTHER: 002



Card 2/2

L 26604-66 EWT(1)

ACC NR: AP6010451

SOURCE CODE: UR/0368/66/004/003/0267/0269

AUTHORS: Mishchenko, Ye. D.; Kulikov, S. A.; Startsev, O. P.

ORG: none

TITLE: Cathodoluminescent receiver of the open type for short wave ultraviolet radiation

SOURCE: Zhurnal prikladnoy spektroskopii, v. 4, no. 3, 1966, 267-269

TOPIC TAGS: cathodoluminescence, uv radiation, uv receiver, electron multiplier, secondary electron emission, luminophor, quantum yield

ABSTRACT: The authors describe a radiation receiver which begins to operate stably at pressures  $1 \text{ N/m}^2$  at relatively low supply voltage, of the order of 600 V. At 200 V its sensitivity becomes equivalent to that of a secondary electron multiplier of the open type. The receiver is based on the principle of electronic conversion of light, wherein the ultraviolet radiation incident on the cathode knocks out electrons that are focused by an immersion objective onto a cathode

Card.

1/3

UDC: 621.383.4

51

6

L 26604-66

ACC NR: AP6010451

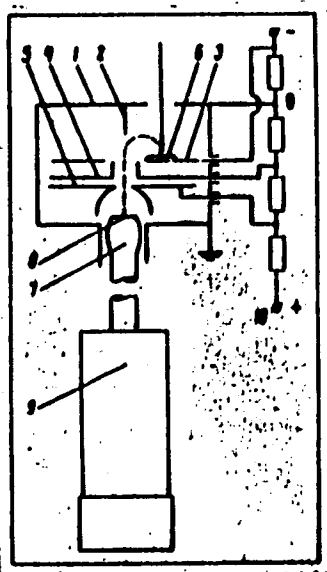


Fig. 1. Diagram of radiation receiver.  
1 -- Brass cylinder, 2 -- focusing rod,  
3 -- control electrode, 4 -- focusing  
diaphragm, 5 -- anode, 6 -- cathode, 7 --  
light pipe, 8 -- cathode luminophor, 9 --  
photomultiplier, 10 -- high voltage  
terminal.



L 26604-66

ACC NR: AP6010451

luminophor. The glow of the luminophor excited by the electrons is recorded with a photomultiplier. The main difference between this receiver and the scintillation receiver is the use of an efficient luminophor and the absence of an aluminum layer on the luminophor. The photocurrent is linearly related to the incident light flux and its sensitivity depends on the voltage applied to the electrodes. The sensitivity depends little on the pressure. By using different luminophors it is possible to modify the properties of the receiver for individual applications (registration of constant and pulsed light flux without afterglow, registration of pulsed light fluxes against the background of strong electric interference, and others). The spectral dependence of the quantum yield can be modified by using different cathodes. Orig. art. has: 3 figures, 1 formula, and 1 table.

SUB CODE: 20/ SUBM DATE: 24Feb65/ OTH REF: 003

MISHCHENKO, Ye. F.

0002

Mishchenko, Ye. F. On the homology theory of non-closed sets. Mat. Sbornik N.S. 29(71), 587-592 (1951).  
(Russian)

For an arbitrary subset  $C$  of the euclidean  $n$ -sphere  $S^n$ ,  $\Delta_p C$  denotes the group of true  $p$ -cycles with compact carriers in  $C$ , modulo those homologous to 0 or compact subsets of  $C$ . Aleksandrov has proved [Mat. Sbornik N.S. 21(63), 161-232 (1947); these Rev. 9, 456] that if  $A$  is the topological image in  $S^n$  of a "stripped" polyhedron and  $B = S^n - A$  then  $\Delta_p A$  and  $\Delta_q B$ ,  $p+q=n-1$ , are dual, where the coefficient group  $\mathfrak{H}$  for  $A$  is discrete and the coefficient group  $\mathfrak{H}$  for  $B$  is compact and  $\mathfrak{H}$  and  $\mathfrak{H}$  are dual. The author proves the same conclusion for  $B$  a curved stripped polyhedron and  $A = S^n - B$ , thus yielding a result symmetric in  $A$  and  $B$ . To prove this, the author shows that if  $B$  is a curved stripped polyhedron, then  $A$  is a homology retract

over any discrete coefficient group. He then applies Aleksandrov's result that if  $A$  is a homology  $p$ -retract over  $\mathfrak{H}$ , then  $\Delta_p A$  and  $\Delta_q B$  are dual. A shorter proof of this result of Aleksandrov is also given, as well as some other contributions to the theory of Aleksandrov.  
E. E. Floyd.

Source: Mathematical Reviews,

Vol 13 No.5

*Source*  
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MISHCHENKO, Ye. F.

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... 1953  
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Mishchenko, E. F. On some questions of the combinatorial topology of nonclosed sets. *Mat. Zametki* 12(74): 219-224 (1953). (Russian)

In the study of duality relations for non-closed subsets of the  $n$ -sphere  $S^n$ , Aleksandrov [*Mat. Sbornik* N.S. 21(63), 161-232 (1947), these Rev. 9, 456] and Kaplan [*Trans. Amer. Math. Soc.* 62, 248-271 (1947), these Rev. 9, 456] have introduced several homology groups for a subset  $E$  of  $S^n$ . In the notation of Aleksandrov, there is the group  $\delta^*E$ , its isomorph  $D^*E$ , as well as the group  $\Delta^*E$  generated by projection cycles with compact carriers. The question has been raised by both Aleksandrov and Kaplan as to whether or not  $D^*E$  and  $\Delta^*E$  are always isomorphic. The author shows that they are not always isomorphic. He exhibits a simple example in  $S^2$  with  $D^*E \neq 0$  and  $\Delta^*E = 0$ . An example is also exhibited of a subset  $A$  of  $S^2$  which again in the notation of Aleksandrov, is a  $(n-1)$ -set but whose complement is not a  $(1)$ -set. F. F. Floyd

MISHCHENKO, Ye. F.

USSR/Mathematics

Card : Pub. 22 - 9/54

Authors : Mishchenko, Ye. F., and Pontryagin, L. S., Member-Correspondent of the Acad. of Sc., USSR

Title : Periodic solutions of systems of differential equations near the points of discontinuity

Periodical : Dok. AN SSSR 102/5, 889-891, June 11, 1955

Abstract : A periodic solution is sought for a system of differential equations of the following type:  $\dot{x} = f(x, y)$ ,  $\dot{y} = g(x, y)$ , where the  $\epsilon$  is a small positive parameter. The solution is found near the points of discontinuity and is given up to  $O(\epsilon)$  precision. A method of determining the period  $T$  is presented. Two USSR references (1947-1951).

Institution : The Acad. of Sc., USSR, V. A. Steklov Institute of Mathematical Scs.

Submitted : April 1, 1955

Call Nr: AF 1108825

Transactions of the Third All-union Mathematical Congress \*(Cont.)  
Jan-Jul 1954, Trudy 1954, V. 1, Ser. Rpt's., Izdatel'stv AN SSSR, Moscow, 1954, 200 p.  
Lyashchenko, N. Ya. (Moscow). Problems Concerning Stability  
of Solutions of the System of Ordinary Differential  
Equations. 223-224

Mitropol'skiy, Yu. A. (Kiyev). Non-stationary Processes  
in Non-linear Oscillating Systems. 224

Mention is made of Krylov and Bogolyubov.

Mishchenko, Ye. F. (Moscow) and Pontyagin, L. S. (Moscow).  
Periodic Solution of the Systems of Differential Equations  
With Small Parameters at the Derivatives. 224

Moseykov, B. I. (Kiyev). Transverse Oscillations of  
Double Rigidity Rods Under Transient Rotation Conditions. 224-225

Mention is made of Krylov, N. M. and Bogolyubov, N. N.

Tolmachev, V. V. (Moscow). Distribution Functions With Time  
Correlation in the Statistical Mechanics of Classic Systems. 225-226  
Card 75/80

PONTRYAGIN, L.S.; MISHCHENKO, Ya. F.

Pavel Sergeevich Aleksandrov; on the occasion of the 60th anniversary of his birth and the 40th anniversary of his scientific activities. Usp.mat.nauk 11 no.4:183-192 J1-Ag '56. (MLRA 9:11)  
(Aleksandrov, Pavel Sergeevich, 1896-)  
(Bibliography--Mathematics)

Mishchenko, Ye. F.

38-5-3/6

AUTHOR: MISHCHENKO, Ye. F.  
TITLE: Asymptotic Calculation of the Periodic Solutions of Systems of Differential Equations with a Small Parameter for the Derivatives (Asimptoticheskoye vychisleniye periodicheskikh resheniy sistem differentsial'nykh uravneniy, soderzhashchikh malyye parametry pri proizvodnykh).

PERIODICAL: Izvestiya Akad.Nauk, Ser.Mat., 1967, Vol.21, Nr 5, pp. 1111-1121 USSR.

ABSTRACT: Let the system  
(1)  $\dot{x} = f(x, y)$   
 $\dot{y} = \epsilon g(x, y)$   
be given, where  $x$  is a  $k$ -dimensional and  $y$  an  $l$ -dimensional vector and  $\epsilon$  denotes a small parameter. The phase space  $R^{k+l}$  of (1) is divided into the direct sum of the  $k$ -dimensional space  $X^k(x^1, \dots, x^k)$  and of the  $l$ -dimensional space  $Y^l(y^1, \dots, y^l)$ . If the image point  $P$  is in a large distance from the surface  $f(x, y) = 0$ , then the vector  $x$  varies quickly and  $y$  slowly. In first approximation,  $y$  can be assumed to be constant:  $y = y_0$  and the quasi-variables of  $x$  can be considered in the space  $X_y^k$  which consists of the

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Asymptotic Calculation of the Periodic Solutions of Systems of Differential Equations With a Small Parameter for the Derivatives

points  $(x, y_0)$  satisfying the equation

(1)  $\epsilon \dot{x} = f(x, y_0)$

If, however, the image point approaches the surface  $f(x, y) = 0$ , then  $x$  and  $y$  vary with velocities of same order, i.e. the position of equilibrium  $y_0$  of the system (2) moves. For a certain  $y_0$  thereby the equilibrium can be lost and a cross variation of the motion can occur, whereby the variables  $x$  change quickly again (up to the approximation of a new position of equilibrium of (2)). To the described fact there corresponds the following pattern of motion in the  $R^{k+1}$ : To a discontinuous solution of the degenerated system

(3)  $f(x, y) = 0$   
 $\dot{y} = g(x, y)$

there corresponds a trajectory consisting of two parts:

- 1) Sections of slow motions which lie on the 1-dimensional surface  $F$  determined by (2) and which are run through by the image point in finite time intervals and 2) sections of quick

Asymptotic Calculation of the Periodic Solutions of Systems of Differential Equations With a Small Parameter for the Derivatives

motions which lie in the k-dimensional subspace of  $R^{n+k}$  determined by  $y=const$  and which are "instantaneously" passed by the image point. The transition from the slow motions into the quick ones takes place in the points of discontinuity. The author postulates that there exists a periodic solution  $Z_0$  of (3) and that it is known and possesses the following properties: 1)  $Z_0$  is stable; 2) the eigenvalues of the matrix

$\left\| \frac{\partial f^\alpha}{\partial x^\beta} \right\|$  have negative real parts on the sections of slow

motion; 3) in the points of discontinuity there exists only one purely imaginary root, while all the other roots have negative real parts. It is proved that then a periodic solution  $Z_\epsilon$  of (1) exists, tending for  $\epsilon \rightarrow 0$  to  $Z_0$ . The solution  $Z_0$  and its period are calculated up to the magnitudes  $\epsilon^{2/3}$  and  $\epsilon \ln \epsilon$ . - The author makes essential use of L.S. Pontryagin's new publication (Izvestia Akad.Nauk S.S.S.R., 1967).

ASSOCIATION: Math. Inst. im. V.A. Steklov, USSR Acad. Sc. (Matematicheskii  
CARD 3/4 institut im. V.A. Steklova, AN SSSR)

Asymptotic Calculation of the Periodic Solutions of Systems of  
Differential Equations With a Small Parameter for the Derivatives

PRESENTED: By P.S. Aleksandrov, Academician

SUBMITTED: May 9, 1957

AVAILABLE: Library of Congress

CARD 4/4

MISHCHENK, /S. F.

"Asymptotic Theory of Relaxation Oscillations."

paper submitted at International Congress Mathematicians, 1958, Moscow, U.S.S.R.

WISHCHENKO, Ye. P., Doc Phys Math Sci -- (diss. "Asymptotic  
methods in the theory of relaxation oscillations."

Mos 1958, [Pub House of Acad Sci USSR] 12 pr (Acad Sci  
USSR. Math Inst im V.A. Steklov) 185 copies. Bibliography  
at the end of text (18 titles) (Kl, 39-57, 106)

AUTHOR:

Mishchenko, Ye. I. Moscow.

TITLE:

ASYMPTOTIC STABILITY OF THE MOTION OF A PARTICLE IN A FIELD OF GRAVITATIONAL RADIATION

SYNOPSIS:

It is shown that the motion of a particle in a field of gravitational radiation is asymptotically stable.

ABSTRACT:

Consider the motion of a particle in a field of gravitational radiation. It is shown that the motion is asymptotically stable.

$$(1) \quad \begin{cases} \dot{x} = -\alpha x \\ \dot{y} = -\alpha y \end{cases}$$

and

$$(2) \quad \begin{cases} \dot{x} = -\alpha x \\ \dot{y} = -\alpha y \end{cases}$$

are the general solution. If  $\alpha > 0$ , the motion is asymptotically stable. If  $\alpha < 0$ , the motion is unstable. If  $\alpha = 0$ , the motion is stable. The stability of the motion is determined by the sign of  $\alpha$ . The general solution of the system (1) and (2) is given by (3) and (4). If  $\alpha > 0$ , the motion is asymptotically stable.



Approximate Theory of the Behavior of Solutions  
Which are Described by Systems of Second Order

which are explicitly given. There are 10 papers, 6  
which are Soviet, 1 French, and 3 English.

ASSOCIATION: Matematicheskii Institut imeni V.A. Steklova Akademiya Nauk  
SSSR (Mathematical Institute imeni V.A. Steklov, Academy of  
Sciences, USSR)

DATE: November 17, 1976

Part 3/3



AUTHOR: Mishchenko, E. P. and Pontryagin, L. S., Corresponding Member of the Academy of Sciences of the USSR, 20.120.5-10/67

TITLE: The Proof of Certain Asymptotic Formulas for the Solutions of Differential Equations With a Small Parameter (Dokazatel'stvo nekotorykh asimptoticheskikh formul dlya resheniy differentsial'nykh uravneniy s malym parametro)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol. 20, Nr 5, pp 967-969 (USSR)

ABSTRACT: In [Ref 2] Pontryagin calculated the formal asymptotic expansions of the solutions of the system

$$\begin{aligned} \dot{x}^i &= f^i(x^1, \dots, x^k, y^1, \dots, y^l) \\ (1) \quad \dot{y}^j &= g^j(x^1, \dots, x^k, y^1, \dots, y^l) \end{aligned}$$

in the neighborhood of a point for which  $\det \left\| \frac{\partial f^i}{\partial x^a} \right\| \neq 0$ . These

expansions were essentially applied in [Ref 1] and in the joining paper of Mishchenko [Ref 2]. In the present paper it is proved that these formal expansions really approximate the solutions of (1) with the given exactness. The proof consists

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The Proof of Certain Asymptotic Formulas for the Solutions of  $20 \times 20$  5-10/67  
Differential Equations With a Small Parameter

In the construction of a "tube" i.e. of a narrow closed neighborhood of the formal approximation. The diameter of the tube tends to zero with  $\epsilon^A$  as  $\epsilon \rightarrow 0$ . It is proved that for initial values inside of the tube the solution also runs inside of the tube.

There are 3 Soviet references.

SUBMITTED: March 6 1958

Card 2/2

16(1)

AUTHORS: Aleksandrov, P.S., Mishchenko, Ye.F. SOV/12-14-3-17/22

TITLE: Lev Semenovich Pontryagin (On the Occasion of his 50-th Birthday)

PERIODICAL: Uspekhi matematicheskikh nauk, 1959, Vol 14, Nr 3,  
pp 195 - 202 (USSR)

ABSTRACT: The authors appreciate the distinguished merits of L.S. Pontryagin and give a short biography of him. Pontryagin was born in 1908, matriculation in 1925 in Moscow; he was a follower of P.S. Aleksandrov. The first paper of Pontryagin was published in 1927. The authors mention A.M. Kolmogorov, G.V. Tolstova, M.F. Bokshteyn, V.G. Boltyanskiy, M.M. Postnikov, A.A. Andronov, R.V. Gamkrelidze, Ye.F. Mishchenko. A list of the publications from 1927 to 1959 with 79 titles and a photograph of Pontryagin are given.

Card 1/1

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~~16(1)~~  
AUTHORS:

Mishchenko, Ye.F., Pontryagin, L.S.

5694

SOV/38-23-5-2/8

TITLE:

The Proof of Some Asymptotic Estimations for the Solutions of  
Differential Equations With Small Parameter in the Derivatives

PERIODICAL:

Izvestiya Akademii nauk SSSR, Seriya matematicheskaya, 1959,  
Vol 23, Nr 5, pp 643 - 660 (USSR)

ABSTRACT:

In [Ref 1] there were obtained formal asymptotic expansions  
for the solutions of

$$(1) \quad \begin{cases} \dot{x}^i = f^i(x^1, \dots, x^k, y^1, \dots, y^l) \\ \dot{y}^j = g^j(x^1, \dots, x^k, y^1, \dots, y^l) \end{cases} \quad (i = 1, \dots, k; j = 1, \dots, l)$$

in the neighborhood of the points in which  $\det \left\| \frac{\partial f^i}{\partial x^k} \right\| = 0$ In the present paper the authors prove that these formally  
calculated expansions really approximate the solutions of (1)  
with given exactness. By linear transformation and choice of  
a new independent variable (1) is brought to the form

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The Proof of Some Asymptotic Estimations for the SOV/38-23-5-2/8  
 Solutions of Differential Equations With Small Parameter in the Deri-  
 vatives

$$(3) \frac{d\xi^1}{d\xi^1} = \frac{\phi^1(\xi, \eta)}{\phi^1(\xi, \eta)}, \frac{d\eta^j}{d\xi^1} = \epsilon \frac{\psi^j(\xi, \eta)}{\phi^1(\xi, \eta)}; \quad i = 2, \dots, k, \quad j = 1, \dots, l$$

By means of a Lyapunov function the authors show that, if the initial point of a solution of (3) lies in a certain small neighborhood U of the formal solution, the solution does not leave this neighborhood, the radius of which tends to zero for  $\epsilon \rightarrow 0$ .

There are 3 Soviet references.

SUBMITTED: March 11, 1959

Card 2/2

56154

20/11/1968 17

1661. 51

Author: Mishchenko, Ye.F., Pontryagin, L.S., Academicians

TITLE: One Statistical Problem on Optimum Control

PERIODICAL: Doklady Akademii nauk SSSR, 1968, Vol. 138, No. 1, pp. 80-82, 1968, 2 p.

ABSTRACT: The point  $z$  is called controlled, if its motion is described

by  
 (1)  $\dot{z}^i = f^i(z^1, \dots, z^n, u), i=1, \dots, n$ , where  $u$  is a con-

trol parameter. The point  $z$  is called random, if the distribution of the probabilities of its possible positions satisfies the first differential equation of A.N.Kolmogorov

[Ref 1/:

$$(2) \quad \frac{\partial P}{\partial t} + a^{ij}(x, \sigma) \cdot \frac{\partial^2 P}{\partial x^i \partial x^j} + b^i(x, \sigma) \frac{\partial P}{\partial x^i} = 0.$$

If the initial positions of  $z$  and  $z_0$  are known, then the probability that  $z$  meets the neighborhood  $\sum_z$  of  $z_0$  within a

certain time interval  $t_0 < t < t_1$  is a functional of the control

$u(t)$ . The control  $u(t)$  is denoted as optimum, if this functional attains an extreme value. The problem of optimum

control can be solved, if the functional is known. In the

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One Statistical Problem on Optimum Control

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present paper the authors show that, if  $\Sigma_z$  is a sphere with the radius  $\epsilon$ , the main term of the functional has the form

$$(4) \quad \epsilon^{n-2} \Psi_u(x, \sigma, \tau),$$

where  $x$  is the position of  $z$  in the moment  $\sigma$ . The authors give the outlines of a scheme for the calculation of the main term without proof.

There are 3 references, 1 of which is Soviet, 1 American, and 1 French.

ASSOCIATION: Matematicheskii institut imeni V.A. Steklova AN S.S.S.R.  
(Mathematical Institute imeni V.A. Steklov AS USSR)

RECEIVED: July 15, 1967

01-24-212

PHASE I BOOK EXPLOITATION

SOV/5883

Pontryagin, Lev Semenovich, Vladimir Grigor'yevich Boltyanskiy, Revaz Valerianovich Gamkrelidze, and Yevgeniy Prolovich Mishchenko

Matematicheskaya teoriya optimal'nykh protsessov (Mathematical Theory of Optimum Processes) Moscow, Fizmatgiz, 1961. 391 p. 10,000 copies printed.

Ed.: N. Kh. Rozov; Tech. Ed.: K. F. Brudno.

PURPOSE: This book is intended for specialists concerned with the mathematical theory of optimum control processes.

COVERAGE: The book contains a systematic presentation of results on the theory of optimum control processes obtained by the authors during the years 1956-1961. Some data obtained from other scientists are also included. The authors' so-called "Principle of Maximum" makes possible the solution of a considerable number of variational problems of nonclassical type associated with the optimization of controlled processes. The principle is presented in detail and is compared with Bellman's principle of dynamic programming. A series of problems on optimum processes is studied on the basis of general methods of the Principle

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Mathematical Theory (Cont.)

SOV, 1988

of Maximum. No personalities are mentioned. There are 28 references: 1 Soviet, 4 English, and 1 German.

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Introduction

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3086  
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D290/D302

16.8000 (1031, 1132, 1329)

AUTHORS: Boltyanskiy, V.G., Gamkrelidze, R.V., mishchenko, Ye. F., and Pontryagin, L.S. (USSR)

TITLE: Principle of maximum in the theory of optimal processes

SOURCE: IFAC, 1st Congress, Moscow 1960. Teoriya diskretnykh, optimal'nykh i samonastroyayushnikhsya sistem. Trudy, v. 2, 1961, 457 - 470

TEXT: The general optimum problem is formulated, as well as the basic results obtained by the authors. The n-dimensional phase-space  $X^n$  is considered, and the controlled object (plant) is described by the vector equation

$$\dot{x} = f(x, u), \quad i = (f^1, \dots, f^n); \quad (2)$$

as the class of allowed controllers is defined as the class of piecewise linear functions  $u(t)$ ,  $t_1 \leq t \leq t_2$ . The optimum problem is formulated as follows: The two points  $\xi_1, \xi_2$  are given in  $X^n$ ; it

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Principle of maximum in the theory ...

is required to choose, among the allowed controllers, a controller  $u(t)$ , so that the corresponding trajectory  $x(t)$  of Eq. (2), defined on the entire interval  $t_1 \leq t \leq t_2$ , connects the points  $\xi_1, \xi_2$ .  $(x(t_1) = \xi_1, x(t_2) = \xi_2)$ , and the integral

$$\int_{t_1}^{t_2} f_0(x(t), u(t)) dt$$

(3)

X

is minimized. Any allowed controller which satisfies the above conditions, is called the optimal controller, and the corresponding trajectory -- optimal trajectory. Depending on the choice of the function  $f_0(x, u)$  integral (3) may represent the time elapsed, the fuel, energy, etc. spent during the process. The necessary conditions which any optimal controller and its corresponding trajectory satisfies, are expressed by the following basic theorem, called the principle of maximum. Preliminarily, the vector  $\bar{x}$  of  $(n + 1)$ -dimensional space  $X^{n+1}$  is introduced, as well as the covariant vector  $\bar{\psi}$  and the scalar function

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3056

S/569/61/002/000/002/008  
D298/D302

Principle of maximum in the theory ...

$$H(\bar{\psi}, x, u) = \sum_{\alpha=0}^n \psi_{\alpha} f^{\alpha}(x, u) .$$

Thereupon the Hamiltonian system of equations

$$\dot{x}^i = \frac{\partial H(\bar{\psi}, x, u)}{\partial \psi_i}, \quad i = 0, \dots, n \quad (6)$$

$$\dot{\psi}_i = - \frac{\partial H(\bar{\psi}, x, u)}{\partial x^i}, \quad i = 0, \dots, n \quad (7)$$

is set up. The notation

$$M(\bar{\psi}, x) = \sup_{u \in U} H(\bar{\psi}, x, u)$$

is used. Theorem 1 (principle of maximum): Let  $u(t)$  be the optimum controller and  $x(t)$  -- the corresponding optimum trajectory of (2). Then the nonzero, covariant, continuous function  $\psi(t)$  can be found

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principle of maximum in the theory ... S/569/61/002/000/002/008  
D298/D302  
 so that the coordinates  $x^1$  and  $x^0$  satisfy on the interval  $t_1$  to  $t_2$  the Hamiltonian system

$$\left. \begin{aligned} \dot{x}_i &= \frac{\partial H(\bar{\psi}, x, u)}{\partial \psi_i} \\ \dot{\psi}_i &= - \frac{\partial H(\bar{\psi}, x, u)}{\partial x^i} \end{aligned} \right| \quad i = 0, 1, \dots, n$$

and the condition of maximum

$$H(\bar{\psi}(t), x(t), u(t)) = M(\bar{\psi}(t), x(t)); \quad (8)$$

thereby  $M, x \equiv 0$ , and  $\psi_0 = \text{const} \leq 0$ . It is noted that the principle of maximum holds also under more general assumptions than above. Under certain conditions, the problem is equivalent to Lagrange's problem of variational calculus, whereby the principle of maximum coincides with Weierstrass's criterion. The basic difference between both formulations consists in the arbitrariness of the set (of the values of  $u$ ) in the case of the principle of maximum. For optimum problem for the case of limited phase coordinates means

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Principle of maximum in the theory ...

that only such allowed controllers can be chosen, for which the corresponding phase trajectory of (2) belongs entirely to a fixed, closed region  $G$  of  $n$ -dimensional phase space  $X^n$ . In this case the functional (3) is minimized. Further, a theorem is formulated for optimal trajectories which lie at the boundaries of the region  $G$ . In order to uniquely determine the optimum trajectory, a further condition has to be satisfied by the trajectory when it passes from the interior of  $G$  to its boundary; this condition is called discontinuity (jump) condition (as the covariant function  $\bar{\psi}$  may undergo a discontinuity). Points of the boundary  $g(x) = 0$ , which satisfy certain conditions, are called point of contiguity (junction). A theorem is formulated which relates the discontinuity conditions to the points of contiguity. Further, a statistical problem is stated. The significance, for optimization theory, of the obtained result, has yet to be ascertained. It is noted, that it led already to the solution of a new problem "small parameter" for parabolic equations. The phase-coordinates are denoted by  $z$ . In addition, the point  $Q$  with probability distribution in the space  $R$ , is considered. It is required to select the controller  $u(t)$  of  $z$  so that the functional

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Principle of maximum in the theory ...

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$$\int_0^{\infty} h(\tau) \frac{d}{d\tau} (\psi_u(x, \sigma, \tau)) d\tau \quad (15)$$

is minimized. The author obtained an effective formula for calculating the probability function  $\psi_u$ . A discussion followed. A.I. Lur'ye (USSR), Sun-Tayan (People's Republic of China) were taking part. There are 10 references: 14 Soviet-bloc and 4 non-Soviet-bloc. The references to the English-language publications read as follows: R.E. Bellman, G.I. Glicksber, O.A. Gross, Some aspects of the mathematical theory of control processes. U.S. Air Force Project RAND, RAND Corporation, California, 1958; J.P. La Salle, Time optimal control systems. Proc. Nat. Ac. Sci., v. 45, no. 4, 1958, p. 53-57. D.W. Bushaw, Experimental towing tank. Stevens Institute of Technology, Report N 469, Hoboken, N.Y., 1955. X

Card 6/6

16.8000 (1132, 1344)

26760  
S/038/61/025/004/001/003  
C111/C444

AUTHORS: Mishchenko, Ye. F., Pontryagin, L. S.  
 TITLE: On a statistical problem of optimal control  
 PERIODICAL: Akademiya nauk SSSR., Izvestiya, Seriya matematicheskaya, v.25, no.4, 1961, 477-498  
 TEXT: The motion of the controlled point  $z$  in the phase space  $R$  of the variables  $z^1, \dots, z^n$ , be represented by

$$\dot{z}^i = f^i(z^1, \dots, z^n, u^1, \dots, u^r), \quad i = 1, \dots, n, \quad (1)$$

where  $u = (u^1, \dots, u^r)$  is the controlling parameter.

The motion of the point  $z \in R$  be a Markov process. The probability density of the fact that the point  $z$ , being in the position  $x$  at the moment  $\sigma$ , takes the position  $y$  at the moment  $\tau$ , be  $p(\sigma, x, \tau, y)$ . As a function of  $\sigma$  and  $x$ ,  $p(\sigma, x, \tau, y)$  forms the fundamental solution of the A. N. Kolmogorov equation

$$\frac{\partial p}{\partial \sigma} + a^{ij}(\sigma, x) \frac{\partial^2 p}{\partial x^i \partial x^j} + b^i(\sigma, x) \frac{\partial p}{\partial x^i} = 0 \quad (2)$$

One supposes that: the right hands of (1) are continuous in all va-

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On a statistical problem...

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C111/C444

riables and continuously differentiable with respect to  $z^1, \dots, z^n$ ; the  $a^{ij}(\sigma, x)$ ,  $b^i(\sigma, x)$ ,  $i, j = 1, \dots, n$  are defined and continuous for  $\sigma > 0$  and arbitrary  $x \in R^n$ ; all eigenvalues of the matrix  $\|a^{ij}(\sigma, x)\|$  have a positive upper and lower bound for these values of the arguments;  $b^i(\sigma, x)$  do not increase with  $|x|$  faster than  $e^{-|x|}$ .

Let a certain small neighborhood  $\Sigma_z$  of  $z$  (e. g. a sphere with radius  $\epsilon_z$ ) move with  $z$ . Let  $h(t)$  be a non-negative function  $h(t) \leq 1$ , defined on the whole  $t$ -axis. Let  $\Psi_u(\sigma, x, \tau)$  be the probability for the fact that the point  $z$ , having been in the position  $x$  at the moment  $\sigma$  meets the neighborhood  $\Sigma_z$  of  $z$  in the time interval  $\sigma \leq t \leq \sigma + \tau$  (an initial position  $z(\sigma)$  be given.)  
Problem Determine  $u(t)$  such that the functional

$$I = \int_0^{\infty} n(s) \frac{\partial}{\partial s} [\Psi_u(\sigma, x, s)] ds \quad (7)$$

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attains a maximum. The control  $u(t)$  thus defined and the corresponding  $z(t)$  are called optimal. Thus the problem leads to the maximum principle which often has been considered by Pontryagin and others if (7) is known as a functional of  $u(t)$  and  $z(t)$ . This last problem is considered in this paper. The following final result is obtained:

Let  $\lambda_1, \dots, \lambda_n$  be the eigenvalues of  $\| a^{1j} \|$ ;  $\| a_{1j} \|$  the inverse matrix to  $\| a^{1j} \|$ ; let  $G(x, \tau, \eta) =$

$$= \frac{1}{[\epsilon(\tau - \sigma)]^n} \exp \left\{ - \frac{a_{1j}(\eta^j - x^j - z^j(\sigma)) (\eta^j - x^j - z^j(\sigma))}{\epsilon(\tau - \sigma)} \right\},$$

Let  $|x - z(\sigma)| > r$ , where  $r$  is an arbitrary positive number independent from  $\epsilon$ ;

Then  $\Psi(\sigma, x, \tau) = \epsilon^{n-2} [\Psi_0(\sigma, x, \tau) + \Psi_1(\sigma, x, \tau) + o(\epsilon^{n-2})]$

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where

$$\psi_0(\sigma, x, \tau) = \frac{\alpha}{\left[ a_{ij}(x^i - z^i(\sigma), x^j - z^j(\sigma)) \right]^{\frac{n-2}{2}}}$$

$$\int G(\sigma, x, \tau, \eta) \propto \frac{\sqrt{\lambda_1 \dots \lambda_n}}{\left[ a_{ij} \eta^i \eta^j \right]^{\frac{n-2}{2}}} d\eta$$

$$\psi_0(\sigma, x, \tau) = \int_{\sigma}^{\tau} ds \int p(\sigma, x, \sigma, y) [b^i - z^i(\sigma, s)] \frac{\partial \psi_0(\sigma, y, \tau)}{\partial y^i} dy$$

and  $\alpha$  being a constant not depending on the equations of motion of  $z$  and  $Q$  and being uniquely defined by the size of the ellipsoid  $\bar{\Sigma}$ :  
 $\lambda_1 \bar{\eta}^2 + \dots + \lambda_n \bar{\eta}^2 = 1$ .

There are 3 Soviet-bloc references and 1 non-Soviet-bloc reference  
 SUBMITTED: October 19 1979

Card 4/4

~~МІСЧЕНКО, Я.~~ [International Congress of Mathematicians held in  
Edinburgh in 1958] ~~Лекції.~~ red

[International Congress of Mathematicians held in  
Edinburgh in 1958] Mezhduimrudnyi matematicheski kon-  
gress v Edinburge, 1958 g., [izdaniye 1-koe]. Moskva  
Fizmatgiz, 1962. 276 p. Translated from the English, French  
and German. (MIRA 16:9)

1. International congress of mathematicians, Edinburgh,  
1958.

(Mathematics-- congresses)

KOLMOGOROV, A.N., akademik; MISHCHENKO, Ye.F.; PONTRYAGIN, L.S., akademik

Probability problem of optimum control. Dokl. AN SSSR 145  
no. 5: 993-995 '62. (MIRA 15:3)

1. Matematicheskiy institut im. V.A. Steklova AN SSSR.  
(Probabilities) (Automatic control)

L 18601-65 EWT(d)/T IJP(c)  
ACCESSION NR: AP4049475

S/0020/64/159/002/0266/0268

AUTHOR: Mishchenko, Ye. F.

TITLE: On the probability<sup>10</sup> of a random point getting into a small <sup>8</sup> neighborhood of a moving manifold

SOURCE: AN SSSR. Doklady\*, v. 159, no. 2, 1964, 266-268

TOPIC TAGS: Kolmogorov equation, moving manifold, Markov type point

ABSTRACT: It is assumed that a k-dimensional, twice-differentiable manifold which changes its form and location according to a certain law  $M_s$  and a random point of Markov type whose probability density  $p(\sigma, x, s, t)$  satisfies the Kolmogorov equation

$$\frac{\partial p}{\partial s} + a^i(\sigma, x) \frac{\partial p}{\partial x^i} + b^i(\sigma, x) \frac{\partial p}{\partial x^2} = 0, \quad (1)$$

where  $x$  is the initial location of the random point at the instant  $s = \sigma$ , moves in n-dimensional Euclidean space. The problem of determining the probability  $\phi(\sigma, x, \tau)$  of the random point getting into the

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L 18601-65

ACCESSION NR: AP4049475

$\epsilon$ -neighborhood  $U(M)$  of the moving manifold  $M$  in the time interval  $\sigma \leq s \leq \tau$  is analyzed. The probability  $\phi(\sigma, x, \tau)$  is sought as a solution of equation (1) with conditions

$$\begin{aligned} \phi(\tau, x, \tau) &= 0, \\ \phi(\sigma, x, \tau) &= 1, \quad x \in V(M_\sigma), \end{aligned} \quad (2)$$

where  $V(M)$  is the boundary of neighborhood  $U(M)$ . The solution of equation (1) with conditions (2) is represented in the form

$$\phi(\sigma, x, \tau) = e^{-\lambda(\tau-\sigma)} \int_{M_\sigma} p(\sigma, x, s, m) \beta(m) dM_s + \omega(\sigma, x, \tau, \epsilon), \quad (3)$$

where  $\omega$  is of the order  $\epsilon^{n-k-1}$  for any point  $x$  whose distance from the manifold  $M_s$  is finite and does not depend on  $\epsilon$ . For the case  $n - k = 2$ , a more simple formula for  $\phi(\sigma, x, \tau)$  is derived. Orig. art. has: 15 formulas.

ASSOCIATION: Matematicheskoy institut im. V. A. Steklova, Akademiya nauk SSSR (Mathematical Institute, Academy of Sciences, SSSR)

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2/3

L. 18601-65  
ACCESSION NR: AP4049475

SUBMITTED: 09May64

NO REF SOV: 003

ENCL: 00

OTHER: 001

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SUB CODE: MA

ATD PRESS: 3154

Card 3/3



L 44169-66 EWT(d) IJP(c)

ACC NR: AP6023964

SOURCE CODE: UR/0376/66/002/004/0439/0452

AUTHOR: Mishchenko, Ye. F.; Nikol'skiy, M. S.ORG: Mathematical Institute im. V. A. Steklov (Matematicheskiy institut)TITLE: A small-parameter problem for parabolic differential equationsSOURCE: Differentsial'nyye uravneniya, v. 2, no. 4, 1966, 439-452TOPIC TAGS: parabolic differential equation, probability, mathematic space, *SMALL PARAMETER, EUCLIDEAN SPACE*

ABSTRACT: The n-dimensional Euclidean space  $R^n$  contains two objects: a k-dimensional twice-continuously differentiable manifold M changing its form and position according to the  $M = M_s$  law, and a Markovian-type random point whose probability density  $p(\sigma, x, \tau, y)$  satisfies the Kolmogorov equation

$$\frac{\partial p}{\partial \sigma} + a^i(\sigma, x) \frac{\partial p}{\partial x^i} + b^i(\sigma, x) \frac{\partial p}{\partial x^i} = 0. \quad (1)$$

It is assumed that the n-dimensional  $\epsilon$ -neighborhood  $U(M)$  of M moves together with M. The author calculates the probability that the random point enters into the neighborhood of  $U(M)$  during the time interval  $\sigma \leq S \leq \tau$ . The paper presents in more detail the results published earlier (F. Mishchenko, DAN SSSR, 159, 2, 266-268, 1964). The main term of the probability discussed is derived. Orig. art. has: 84 formulas.

SUB CODE: 12/ SUBM DATE: 10Jan66/ ORIG REF: 005/ OTH REF: 001

Card 1/1

UDC: 517.946.43

YEGOROV, M.N., prof., MISHCHENKO, Ye.D., SYCHEVA, A.N., KRASNOVA, A.M.

Chemotherapy of diabetes mellitus and problems of dietotherapy.  
Terap. arkh. 30 no.7:18-25 J1'58 (MIRA 11:8)

1. Is kliniki lechebnogo pitaniya (sav. - prof. F.K. Men'shikov)  
Instituta pitaniya AMN SSSR.

(ANTIDIABETICS, therapeutic use,  
(Rus))

(DIETS, in var. dis.  
diabetes mellitus (Rus))

(DIABETES MELLITUS, therapy  
diets (Rus))

MISHCHENKO, Ye.D.

Use of royal jelly preparation in the treatment of some cardiovascular diseases. Inform.biol. i nat.moloch. no.3:71-74 '62.  
(MIRA 16:2)

1. Pervoye terapevticheskoye otdeleniye klinicheskoy bol'nitsy AN SSSR - nauchnyy rukovoditel' prof. M.N. Yegorov.  
(ROYAL JELLY--THERAPEUTIC USE)  
(CARDIOVASCULAR SYSTEM--DISEASES)

SHUBARIN, Yuriy Vasil'yevich; MISHCHENKO, Yu.A., dotsent, retsenzent;  
SHIFRIN, Yu.S., dotsent, retsenzent; TERESHCHENKO, A.I., dotsent,  
otv.red.; BAZILYANSKAYA, I.L., red.; NIKULINA, N.I., tekhred.

[Microwave antennas] Antenny sverkhvysokikh chistot. Khar'kov,  
Izd-vo Khar'kovakogo gos.univ., 1960. 283 p.

(MIRA 14:2)

(Radio, Shortwave--Antennas)

24.7900  
5 1190

1035 1160  
1208 1274 1297

01769  
S/105/11/01/01/01/01/01  
B101/B208

AUTHORS:

Mishchenko, Yu. A., Boretsky, G. K., Kazanskiy, V. B.,  
Pariyskiy, G. B.

TITLE:

Effect of ionizing radiation on the catalytic and magnetic  
properties of titanium dioxide

PERIODICAL:

Kinetika i kataliz, v. 2, no. 2, 1961, 196

TEXT: Several papers published in the course of the last years studied the possibility of changing the catalytic properties of solids under the influence of high-energy radiation. Kohn and Taylor (Refs. 1, 2) observed a considerable effect of gamma and neutron radiations on the catalytic properties of  $Al_2O_3$  and of catalysts on  $SiO_2$  basis (Ref. 3) in the isotopic H - D exchange. It was the purpose of the present study to investigate the effect of gamma radiation on catalytic and magnetic properties of  $TiO_2$ . The catalytic properties were studied by H - D exchange; the magnetic properties by electron paramagnetic resonance. The  $TiO_2$  samples consisted of anatase with specific surface of the order  $130 \text{ m}^2/\text{g}$ .  $TiO_2$  was heated to  $500^\circ\text{C}$  for several

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hours at  $10^{-5}$  mm Hg prior to irradiation. The samples thus treated exhibited no marked catalytic properties at  $0^{\circ}\text{C}$ . They were then irradiated with gamma rays of  $\text{Co}^{60}$  in vacuo at the temperature of liquid nitrogen with  $120 \text{ r/sec}$ . The integral dose was about  $1.7 \cdot 10^7 \text{ r}$ . The irradiated samples showed high catalytic activity at the temperature of liquid nitrogen. The catalytic activity was increased by at least 3-4 orders of magnitude. Heating of the irradiated samples to  $0^{\circ}\text{C}$  considerably decreased the catalytic activity. The constant of the reaction rate at  $0^{\circ}\text{C}$  1 hr after thawing was by about two orders of magnitudes smaller than at the temperature of liquid nitrogen. The  $\text{TiO}_2$  samples heated in vacuo at  $100^{\circ}\text{C}$  showed no signal when the EPR spectrum was taken. At the temperature of liquid nitrogen, the samples irradiated gave a signal with well-resolved hyperfine structure, total width 400 oersteds, g factor approximately 2. The signal does not change if the sample is stored at the temperature of liquid nitrogen. Short heating to room temperature reduced intensity and changed the shape of the signal. When the samples were kept for 1 hr at room temperature the signal became stable. This parallelism in the changes of catalytic activity and EPR signal was also observable in silica gel (Refs. 3, 5) and  $\text{Al}_2\text{O}_3$  (Refs. 3, 6, 7).

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Effect of ...

may be concluded therefrom that irradiation gives rise to the formation of centers (defects, radicals) that cause the increased catalytic activity and the epr signal. The authors are now studying more thoroughly the changes of the epr signal and of the catalytic activity in the annealing of  $TiO_2$  samples and under the action of various gases. References: 1) H. W. Taylor, E. H. Kohn, J. Amer. Chem. Soc., 79, 252, 1957; 2) E. H. Kohn, H. W. Taylor, J. Phys. Chem., 63, 500, 1959; 3) E. H. Kohn, H. W. Taylor, J. Phys. Chem., 63, 966, 1959; 4) E. H. Kohn, private communication on the 2nd International Congress of Catalysis, Paris, July 1960; 5) V. B. Kazanskiy, G. B. Pariyskiy, V. V. Voyevodskiy, Dokl. na II Vsesoyuznom soveshchani... radiatsionnoy khimii (2nd All-Union Conference on Radiation Chemistry), October, 1960; 6) V. B. Kazanskiy, Yu. I. Pecherskaya, Zh. fiz. khim., 34, 477, 1960. [Abstracter's note: Complete translation of the original paper.] There are 6 references: 3 Soviet-bloc and 3 non-Soviet-bloc. The 3 references to English language publications are given in the text of the abstract

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physico-chemical Institute imeni L. Ya. Karpov)

SUBMITTED: February 15, 1960

Card 3/3

MISHCHENKO, Yuriy Andreyevich; VRUBLEVSKIY, A.V., red.; ZUDINA, M.P.,  
tekh. red.

[Detection zones] Zony obnaruzhenia. Moskva, Voenizdat,  
1963. 94 p. (MIRA 16:8)  
(Radar)



L 6716-65 EWT(m)/EPF(c)/EWP(j)/I/EWP(q)/EWP(b) Pc-4/Pr-4 RAEM(1)/SSD/ 7/  
 AS(mp)-2/RAEM(c)/ASD(a)-5/AFWL/ESD(gs)/ESD(t) JD/RM 8/0020/64/157/002/0384/0387  
 ACCESSION NR: AP4042209

AUTHOR: Boreskov, G. K.; Kazanskiy, V. B.; Mishchenko, Yu. A.; Parivakly, G. B.

TITLE: The nature of active centers in hydrogen isotope exchange reaction on irradiated silica gel.

SOURCE: AN SSSR. Doklady\*, v. 157, no. 2, 1964, 384-387

TOPIC TAGS: hydrogen, deuterium, silica gel, electron paramagnetic resonance, spectrophotometry, isotope exchange, irreversible adsorption, gamma irradiation, hydrogen deuterium exchange reaction

ABSTRACT: The purpose of this work was to study the nature of F-centers in irradiated silica gel by optical methods and by radiospectroscopy, and to determine their role in irreversible adsorption of hydrogen and catalytic activity. Prior to irradiation silica gel samples were kept under a vacuum for 24 hours at 400, 500 or 600 C and at residual pressure of  $10^{-5}$  -  $10^{-6}$  mm. After pretreatment samples were irradiated with  $\gamma$ -rays from a  $Co^{60}$  source at liquid nitrogen temperature and at room temperature. The irradiation dose varied from  $2 \times 10^5$  to  $2 \times 10^7$  r. The catalytic activity of silica gel in  $H_2-D_2$  exchange reaction was measured at

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ACCESSION NR: AP4042209

equimolar content of the mixture at 77°K and 0.7 mm pressure. The isotope composition of hydrogen in the course of reaction was measured by means of the electrical conductivity of the mixture. Adsorption measurements were done at room temperature and  $5 \times 10^{-3}$  to 5 mm pressure. The absorption in diffuse scattered light was measured at room temperature with an SF-4 spectrophotometer (see fig. 1 of the enclosure) modified for this purpose according to Ye. I. Kotov (Optika i Spektroskopiya, 3, 92, 1959). EPR spectra were measured with microwave spectrometer EPR-2 at 77°K (see fig. 2 of the enclosure). During irreversible adsorption of hydrogen molecules (above 100°C), they dissociate and electrons are transferred from hydrogen atoms to holes with consequential reduction of acid centers in the nonirradiated silica gel. Since this process required energy of activation it does not proceed at liquid nitrogen temperature. The isotope exchange of hydrogen and deuterium at -196°C occurs on the very same centers, however, adsorption is not accompanied by dissociation but it merely results in weakening of bonds between atoms which constitute these centers. At elevation of temperature the rate of dissociation type of adsorption increases which results in vanishing of active centers. The energy nonuniformity of the radiation produced defects leads to the fact that even at room temperature part of them remains intact, undisrupted by the irreversible adsorption of hydrogen. These defects are catalytically active

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ACCESSION NR: AP4042209

2

centers. Orig. art. has: 2 tables and 3 figures.

ASSOCIATION: Institut khimicheskoy fiziki Akademii nauk SSSR (Institute of Chemical Physics, Academy of Sciences SSSR); Institut kataliza Sibirskogo otdeleniya Akademii nauk SSSR (Institute of Catalysis, Siberian Branch, Academy of Sciences SSSR)

SUBMITTED: 29 Mar 64  
ENCL: 02

SUB CODE: NP, 00  
NO REF SOV: 006  
OTHER: 011

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L 6716-65  
ACCESSION NR: AP4042209

ENCLOSURE: 01

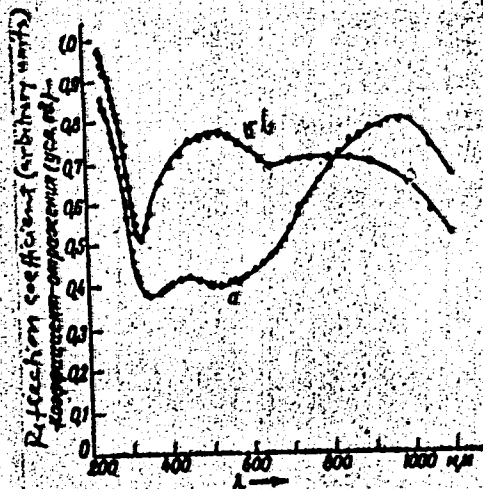


Fig. 1. Optical spectra of silica gel before (a) and after (b) adsorption of hydrogen at room temperature.

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L 6716-65  
ACCESSION NR: AP4042209

ENCLOSURE 02

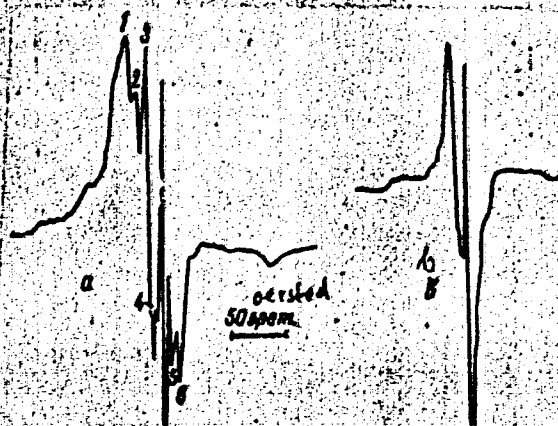


Fig. 2. EPR spectra of irradiated silica gel before (a) and after (b) adsorption of hydrogen.

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[Faint, illegible text visible through the paper]

L 1135-66 EWT(m)/EPF(c)/EPF(n)-2/T GG/RM

ACCESSION NR: AFS020983

UR/0195/65/006/004/0625/0633

541.183:546.11 \* 541.15 45

AUTHOR: Pariyskiy, G. B.; <sup>44.55</sup> Mishchenko, Yu. A.; <sup>44.55</sup> Kazanskiy, V. B. <sup>44.55</sup> 39B

TITLE: Nature of surface radiation defects in irradiated silica gel. I. Mechanism of hydrogen adsorption <sup>44.55</sup> 19.55

SOURCE: Kinetika i kataliz, v. 6, no. 4, 1965, 625-633

TOPIC TAGS: radiation defect, silica gel, aluminum impurity, radiation damage, hydrogen adsorption, color center, acid center

ABSTRACT: The irradiation of silica gel markedly affects its adsorptional and catalytic properties, since, owing to its highly developed surface, the proportion of surface defects in this substance is particularly large. Thus, irradiated silica gel irreversibly adsorbs hydrogen. The adsorption is accompanied by the disappearance of the color centers that had formed as a result of irradiation. Both effects are attributed by Kohn and Taylor (J. Phys. Chem. v. 63, 966, 1959; v. 66, 1017, 1962; J. of Catalysis v. 2, 208, 1963; Nature v. 184, 630, 1959) to the presence of aluminum impurities in the specimens; they have not, however, been successful in establishing the nature of the attendant radiation defects and the mechanism of hydrogen adsorption. Therefore, to elucidate these questions, the present ar-

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ACCESSION NR: , AP5020983

title describes their investigation by adsorptional, optical, and radiospectroscopic methods. Three varieties of silica gel, each obtained by a different method and having a different content of impurities, were investigated. The first, K-5, was obtained by hydrolysis of a  $\text{SiCl}_4$  solution and had a surface area of  $700 \pm 50 \text{ m}^2/\text{g}$ . The two other specimens were obtained by adding  $\text{H}_2\text{SO}_4$  to solutions of sodium silicate; the acid was added until a 1N acid solution was obtained, whereupon the precipitate was carefully washed to remove the sulfate ion and dried for 4 hr at  $500^\circ\text{C}$ . The surface area of both specimens, which were tagged silica gels I and II, was  $300 \pm 50 \text{ m}^2/\text{g}$ . The specimens were irradiated with a  $\text{Co}^{60}$   $\gamma$ -radiation source (doses:  $10^6$  to  $2.5 \times 10^7 \text{ r}$ ). Their absorption spectra in reflected light were then measured with an SF-4 spectrophotometer and their EPR spectra, with an EPR-2 radio-spectrometer. It was found that ionizing radiation leads to the formation of free electrons and vacancies. Part of these electrons may be trapped by the protons of the acid centers that had formed as a result of the presence of aluminum impurity, thus leading to the formation of hydrogen. At room temperature the stabilization of H atoms does not occur, and they may react with hydroxyl groups, causing de-hydration of the surface. Following departure of the H atom, on the Al atom there remains an uncompensated negative charge which may be neutralized when the vacancy on the adjacent O atom gets stabilized. Thus, the color centers forming under the

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L 1435-66

ACCESSION NR: AP5020983

action of irradiation and due to the presence of Al impurity in the specimens re-  
present positively charged vacancies stabilized on the oxygen atoms adjacent to  
the atoms of Al impurity. These defects are centers of irreversible adsorption of  
hydrogen. "The authors wish to express their sincere gratitude to G. K. Borekov  
for his interest in this project and discussion of the findings." Orig. art. has:  
7 figures, 1 table. [16]

ASSOCIATION: Institut khimicheskoy fiziki AN SSSR (Institute of Chemical Physics,  
AN SSSR)

SUBMITTED: 17Feb64

EXCL: 00

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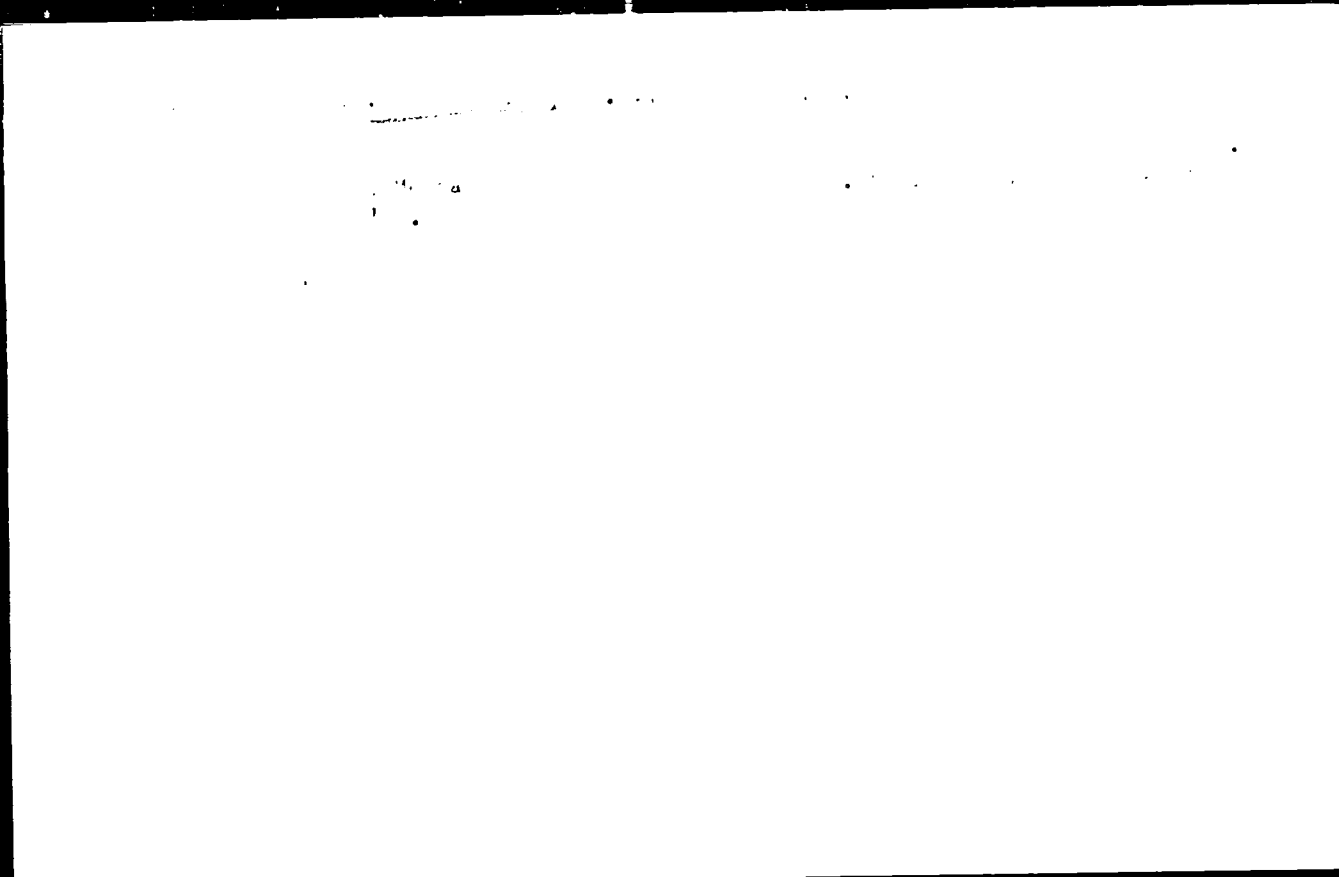
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AUTHOR: Mishchenko, Yu. A.; Boreskov, G. K.

ORG: Physicochemical Institute im. L. Ya. Karpov (Fiziko-khimicheskiy institut)

TITLE: Nature of surface radiation defects <sup>19</sup> in irradiated silica gel. Part 2. Catalytic properties of irradiated silica gel and isotope exchange reactions between hydrogen and deuterium <sub>27</sub>

SOURCE: Kinetika i kataliz, v. 6, no. 5, 1965, 842-848

TOPIC TAGS: silica gel, color center, deuterium, hydrogen, gas adsorption, EPR spectrum, gamma irradiation, irradiation effect

ABSTRACT: An attempt is made to establish the nature of the active centers responsible for the catalytic activity of irradiated silica gel in the reaction of isotope exchange between hydrogen and deuterium under static conditions. Various types of silica gel samples were activated by heating in air at temperatures up to 600C, and then irradiated with Co<sup>60</sup> γ-rays at -196C. The catalytic activity of silica gel is shown to depend strongly on its content of aluminum impurities and on the conditions of activation and irradiation. Symbatic changes  
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in catalytic activity are also observed with changes in hydrogen adsorption capacity, intensity of the sextet signal in ESR spectra, and annealing in vacuum and hydrogen. It is concluded that the color centers observed in optical and ESR spectra and due to the presence of aluminum atoms participate not only in the adsorption of hydrogen, but also in the reaction of catalytic exchange between hydrogen and deuterium. Orig. art. has: 4 figures, 6 tables, and 1 formula. 27. 27 [08]

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