

L 44813-64 EST(1) IIR(c) AT

ACC NR: AP6032020

SOURCE CODE: UR/0386/66/004/006/0213/0216

AUTHOR: Kitayeva, V. F.; Osipov, Yu. I.; Sobolev, N. N.

ORG: Physics Institute im. P. N. Lebedev, Academy of Sciences SSSR (Fizicheskiy Institut Akademii nauk SSSR)

TITLE: Electron temperature in the electric discharge used for the argon ion laser

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu. Prilozheniye, v. 4, no. 6, 1966, 213-216

TOPIC TAGS: gas laser, argon, electron temperature, electron density, electric discharge

ABSTRACT: This is a continuation of an earlier investigation (Dokl. AN SSSR, in press) of the charged-particle concentration and the gas temperature in argon under conditions typical of the operation of a continuously operating ionic argon laser. The results indicated that the decisive influence on the ion motion in the discharge column is exerted by the drift of the ions to the wall and their recombination. The present investigation was devoted to a determination of the electron temperature in a discharge of this type. Measurements were made of the half-width of the Ar II lines radiated transverse to the discharge in a tube of 2.8 mm diameter and ~40 cm length, with a bypass channel. The gas pressure ranged from 0.21 to 0.62 Torr and the current density from 150 to 350 a/cm². The results show that the width of the Ar II line increases with increasing current density. The width Δ_{11} of the line

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radiated transverse to the channel exceeds the width $\Delta x_{||}$ of the line radiated along the discharge by a factor $\sim 1.5-2$. From the values of $\Delta x_{||}$ the authors determined the "effective temperature" of the ions transverse to the discharge and the electron temperature T_e . T_e increases from 5×10^4 to 9×10^4 (for $P_{Ar} = 0.37$ Torr) when the current density rises from 150 to 350 a/cm², and is expected to reach 13×10^4 K at $j = 550$ a/cm². It follows from the results that the increase of the intensity of the spontaneous radiation of the Ar II lines and the increase of the power of the coherent radiation of the laser with increasing current density in the capillary are due primarily to the increase in the electron temperature. The electric-conductivity cross sections (Q_a) calculated from the electron temperature are equal to 8×10^{-16} cm² at 5×10^4 K and 6×10^{-16} cm² at 9×10^4 K. The electron density N_e is also calculated from the temperature and agrees with the values experimentally determined from the half-width of the hydrogen line $H\beta$. It is concluded that the investigations have yielded the basic characteristics of the discharge used for the argon ionic laser, which are of undisputed interest for the explanation of the mechanism that ensures population inversion. Although the increase of T_e with current density is not subject to doubt, the absolute values of the temperature must be verified by other independent methods. The authors thank A. A. Rukhadze for valuable discussions and advice. Orig. art. has: 1 figure, 2 formulas, and 1 table.

SUB CODE: 20/ SUBM DATE: 17 Jun 66/ ORIG REF: 004

Card 2/2

ACC NR: AP7005582

SOURCE CODE: UR/0020/67/172/002/0317/0319

AUTHOR: Kitayeva, V. P.; Osipov, Yu. I.; Sobolev, N. N.

ORG: Physics Institute im. P. N. Lebedev, Academy of Sciences, SSSR
(Fizicheskii institut Adademii nauk SSSR)

TITLE: Spectroscopic investigation of gas discharge for argon ion lasers

SOURCE: AN SSSR. Doklady, v. 172, no. 2, 1967, 317-319

TOPIC TAGS: population inversion, argon ion laser, gas discharge,
DISCHARGE TUBE, GAS DISCHARGE SPECTROSCOPY, ION TEMPERATURE

ABSTRACT: Two types of discharge tubes were used in the investigation: 1) tubes 1-3 mm wide, with capillaries approximately 300 mm long between the bulbs, for use with cw lasers, and 2) tubes 5 mm wide and 95 cm long with hot electrodes, for use with pulsed lasers. For tubes of the first type, the temperatures of the Ar ions and neutral atoms were derived from the measured width of their respective spectral lines; the ion concentrations were derived from the Stark effect exhibited by the H_{α} line of the hydrogen traces. The current densities were about $300 \text{ amp}\cdot\text{cm}^{-2}$; ion concentrations, about $3.5 (10^{13}) \text{ cm}^{-3}$; atom temperatures, about 2500°K (rising with current density); and ion temperatures, about 2.5 times greater than the

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UDC: 535.89

ACC NR: AP7005582

atom temperatures. For tubes of the second type, an He-Ar (10:1) mixture was used. Current was applied in 4- μ sec, 6--10-kv pulses, yielding a density of approximately 500 amp \cdot cm $^{-2}$. The atom temperatures and ion concentrations were obtained by comparing the widths of the H $_{\alpha}$ and H $_{\beta}$ lines and by using an assumed ratio for the contribution of the Stark and Doppler effects. Temperatures from 2000 to 6000 $^{\circ}$ K and concentrations from 0.8 to 20 (10^{13}) cm $^{-3}$ were obtained. Electron temperatures, which are required for population inversion, were extremely difficult to determine in the investigated case. Orig. art. has: 1 figure and 2 tables. [JM]

SUB CODE: 20/ SUBM DATE: 22Mar66/. ORIG REF: 001/ OTH REF: 001/
ATD PRESS: 5116

Card 2/2

CHUPAKHIN, O.N.; PUSHKAREVA, Z.V.; KOKOSHKO, Z. Yu.; KITAYKVA, V.O.

Reaction and derivatives of quinaldine. Part 5: Dehydration
of 2-quinolylpropanediol. Zhur. ob. khim. 34 no.11:3783-3785
N '64 (MIRA 18:1)

1. Ural'skiy politekhnicheskiy institut imeni S.M. Kirova.

ACCESSION NR: AN4023354

8/0299/64/000/004/M017/M018

SOURCE: RZh. Biologiya, Abs. 4M124

AUTHOR: Kitayeva, V. I.

TITLE: Dermatoplasty of ulcers following radiation therapy

CITED SOURCE: Sb. Materialy*obi. nauchno-prakt. konferentsii po onkol. Vy* p 2. Ivanovo, 1963, 133-134

TOPIC TAGS: plastic surgery, ulcer dermatoplasty, radiation therapy, bone ulcer, skin graft acceptance, radiation ulcer, radiation burn

TRANSLATION: The author describes two cases in which skin grafts from the thigh area were used to cover a 3x3 cm ulcer in the sacral region and a 2.5x1.5 cm ulcer in the temporal bone region. After excision of the ulcer in the latter case, the skin flap was removed together with the periosteum. It was established that the use of plastic surgery in treatment of chronic ulcers provides positive results. Periosteal defects do not prevent an acceptance of the skin graft. N.S.

DATE ACQ: 16Mar64

SUB CODE: AM

ENCL: 00

Card 1/1

GORSKAYA, A.I.; BOLOTSKAYA, O.P.; KITAYEVA, V.N.

Characteristics of organic matter from deposits of the ~~ancient~~
Toldian Sea. Trudy VNIIGRI no.174:61-67 '61. (MIRA 18233)
(Odov District--Clay)
(Bitumen)

BOL'SHAKOV, Anatoliy Stepanovich; SARIN, Valeriy Ivanovich;
SHVAYNSHTEYN, Boris Simonovich; PONOMAREV, V.S., inzh.,
retsenzent; ZAZOVSKIY, D.G., inzh., retsenzent; MAKAROV,
M.S., inzh., retsenzent; POPOV, G.V., inzh., retsenzent;
KURBATOV, A.I., retsenzent; KITAYEVA, Z.A., inzh.,
retsenzent; SDOBNIKOV, Ye.F., retsenzent; KOVALEV, A.K.,
inzh., retsenzent; KESAREV, A.P., inzh., retsenzent;
KISELEVA, N.P., inzh., red.; GROMOV, S.A., kand. tekhn.
nauk, red.; SHCHEUBACHEVICH, G.S., inzh., red.; USENKO, L.A.,
tekhn. red.

[Shunting diesel locomotives] Manevrovye teplovozy. Moskva,
1962. 383 p. (MIRA 15:6)

(Diesel locomotives)

KITAYNICH, Boris Yefimovich; TRGUBOVA, T.A., spetsred.; FRIEDMAN, Z.S.,
~~red. red. - O.I., tekhn. red.~~

[Radio traffic] Radiobmen. Leningrad, Isd-vo "Morskoi transport,"
1959. 194 p. (MIRA 12:12)
(Radio in navigation)

SINITSYN, Mikhail Timofeyevich; KITAYEVICH, B.Ye., red.; SEMENOVA, S.A.,
red.isd-va; LAVRENKOVA, M.B., tekhn.red.

[Radio communications at sea] Eksploatatsiia radiosvyazi na
morskoy flote. Izd.2., perer. i dop. Moskva, Izd-vo "Morskoi
transport," 1959. 308 p. (MIRA 12:11)
(Radio--Installation on ships) (Radio in navigation)

KOVAL'CHUK, Viktor Semenovich. Prinimal uchastiye KITAYEVICH, B.Ye.,
prepodavatel'; BORODIN, N.I., kand. tekhn. nauk, dotsent, retsen-
zent; REVUT, D.B., inzh., retsenzent; CHERKANOV, V.V., inzh., re-
tsenzent; TRUBAKOV, A.A., inzh., spets. red.; FRISMAN, Z.S., red.
izd-va; KOTLYAKOVA, O.I., tekhn. red.

[Fundamentals of radio engineering] Osnovy radiotekhniki. Lenin-
grad, Izd-vo "Morskoi transport," 1961. 279 p. (MIRA 14:10)
(Radio) (Radio in navigation)

KITAYEVICH, Boris Yefimovich; FRISMAN, Z.S., red. izd-va; KOTLYAKOVA, O.I., tekhn. red.

[Radio communications] Radiobmen. Izd.2., ispr. 1 dop. Lenin-
trad, izd-vo "Morskoi transport," 1962. 220 p. (MIRA 15:7)
(Radio in navigation)

KITAYEVICH, I.Ye., starshiy prepodavatel'

Relative disposition of two planes. Trudy MIMSKh 4 no.1:123-128 '59.
(MIRA 13:10)

(Geometry, Projective)

KITAYEVICH, Kh.Sh.

New method for cutting fringes. Tekst. prom. 23 no.10:74-75
0 '63. (MIRA 17:1)

1. Pomoshchnik мастера galantereynogo tsekha trikotazhnoy
fabriki "Viliya" Litovskogo soveta narodnogo khozyaystva.

DMITRIYEV, A.I., doktor veterinarnykh nauk; KITAYEVICH, Ye.I., veterinarnyy vrach.

Etiology of bronchial pneumonia in swine after plague inoculation by crystal violet vaccine. Veterinariia 33 no.3:51-52
Mr '56. (MLRA 9:5)

1. Leningradskiy sel'skokhozyaystvennyy institut.
(PNEUMONIA) (HEMORRHAGIC SEPTICEMIA)

81096

S/O58/60/000/006/003/040
A005/A001

26.2340

Translation from: Referativnyy zhurnal, Fizika, 1960, No. 6, p. 29, # 13140

AUTHORS: Sinel'nikov, K.D., Zeydlits, P.M., Orishayev, I.A., Kitayevskiy, L.Kh., Akhiyzer, A.I., Faynberg, Ya.B., Selivanov, N.P., Khizhnyak, N.A.

TITLE: An Electron Accelerator With 3.5 Mev Output Energy

PERIODICAL: Tr. Sessii AN UkrSSR po mirn. ispol'zobaniyu atomn. energii. Kiyev, AN UkrSSR, 1958, pp. 16-23

TEXT: The authors describe a linear electron accelerator with a traveling wave of 3.5 Mev energy. A waveguide loaded with disks is used as accelerating system. The necessary law of wave phase velocity variation is brought about by variation of the diameter of the apertures in the disks. The 280-cm long waveguide is divided into three sections. In the first section, the phase velocity is varied from 0.5 to 0.97 c; in the second and third section it is equal to 0.98 and 0.99 c respectively. The electron equilibrium phase increases during the acceleration process; its initial value is equal to 45° and is chosen according to the optimum capture condition. The computational value of the h.f. power at the

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S/058/60/000/006/003/040
A005/A001

An Electron Accelerator With 3.5 Mev Output Energy

accelerator input is 900 kw; the accelerator field intensity amounts hereat to 16.5 kv/cm. The accelerator output power (about 600 kw) is absorbed in a steel load with water cooling; approximately 300 kw are dissipated in the waveguide walls. An additional axisymmetrical magnetic field with an intensity up to 400 Gs is developed by solenoids for focusing the electrons along the waveguide axis. An electron gun with three electrodes serves as electron source; it operates pulsing synchronously with the magnetron generator and provides for a beam of 5-6 mm diameter at the accelerator input. The output parameters of the accelerator measured are: the current is about 20-30 ma in the pulse of 2 μ sec duration, the average current is about 20-30 μ a; the beam diameter is 3-4 mm with the divergence angle of $7 \cdot 10^{-4}$ - $3 \cdot 10^{-3}$ radian; the energy beam half-width is about 8%.

ASSOCIATION: Fiz.-tekh. in-t AN UkrSSR (Physico-Engineering Institute of the Ukrainian Academy of Sciences)

A.P. Fateyev

Translator's note: This is the full translation of the original Russian abstract.

Card 2/2

24.6730

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S/058/63/000/001/015/120
A062/A101

AUTHORS: Sinel'nikov, K. D., Grishayev, I. A., Grishko, V. M., Pisun, A. N.,
Zykov, A. I., Kitayevskiy, L. Kh.

TITLE: A 30 MeV energy linear travelling-wave electron accelerator

PERIODICAL: Referativnyy zhurnal, Fizika, no. 1, 1963, 3) - 40, abstract 1A374
(In collection: "Elektron. uskoriteli." Tomsk, Tomskiy un-t, 1961,
3 - 9)

TEXT: The authors describe a 30 MeV linear electron accelerator designed
at the Physico-technical Institute of the Academy of Sciences of the Ukrainian
SSSR. The accelerator consists of two sections connected with each other - the
injector section and the main section (with a constant wave phase speed); the
length of the main section is 2.8 m, the value $ka = 2.48$ (k - wave vector, a -
waveguide radius). The two sections are energized by one klystron power ampli-
fier, excited by a magnetron generator. The power dissipated in the main section
and in the output load is ~10 Mw (in the load 3.3 Mw); the field intensity is
then 150 kV/cm. The accelerating system is composed of separate resonators; the

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VERZHIKOVSKIY, Anatoliy Pavlovich; CABIS, Nikolay Vladimirovich;
KITAYEV, Nikolay Mikhaylovich; TINYANKIN, Ivan Ignat'yevich;
KHORBENKO, I.G., kapitan 2 ranga, red.; KUZ'MIN, I.F., tekhn.
red.

[Concise dictionary on radio electronics] Kratkii slovar' po
radioelektronike. Moskva, Voenizdat, 1964. 255 p.
(MIRA 17:2)

KITAYEVICH, A.Ye.; TOLCHENSKIY, V.A.

Case of spinal meningitis of otogenous origin. Zhur. ush., nos.
i gorl. bol. 23 no.5:86-87 S-0'63 (MIRA 17:3)

1. Iz otorinolaringologicheskogo otdeleniya (zav. - Ya.V. Bogatyrev) Dnetskoy tsentral'noy klinicheskoy bol'nitsy.

KITAYEVICH, A.Ye.

Incidence of acute and chronic otitis media among the population
of Makayevka. Zhur.ush., nos. 1 gorl. bol. 24 no.5:14-17 S-O '64.
(MIRA 1813)

1. Iz otorinolaringologicheskogo otdeleniya Gorodskoy bol'nitsy
No.37 Donetsk (glavnyy vrach - Z.O.Moreynis).

KITAYGORA, T. A.

COUNTRY : USSR
 CATEGORY : Plant Physiology. Water Conditions. 1
 RES. JOUR. : SzhBiol., No. 3 1959, No. 10615
 AUTHOR : Dvoretzskaya, Ye. I., Makarcva, N. I., Kitaygora, T. A.
 INST. : Academy of Sciences USSR
 TITLE : On the Characteristics of Water Metabolism and Drought
 Resistance in Some Tree and Shrub Species.
 ORIG. PUB. : V sb.: Fiziol. i bioh. N. A. Makainova., 1959,
 1957, 42-57
 ABSTRACT : In the conditions of a moister climate in the forest
 steppe zone of Ukraine, the intensity of transpiration was
 higher and osmotic pressure lower than in the same woody
 plants in the arid conditions of Stalingrad oblast'.
 Black locust had the greatest heat tolerance; common ash
 and Pennsylvania ash - the lowest. The greatest water
 holding ability was observed in the leaves of Norway
 maple and common ash; the smallest - in the leaves of

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~~KITAYGORODSKAYA, O.D.~~, professor; KUSTAREVA, K.S., nauchnyy sotrudnik;
~~TALANOVA, I.K.~~, nauchnyy sotrudnik

Ultraviolet rays in complex therapy of acute rheumatism in children.
Pediatrics no.5:44-50 8-0 '54. (MIRA 7:12)

1. Iz detakogo otdeleniya (zav. prof. O.D.Kitaygorodskaya) Nauchno-issledovatel'skogo insituta fizioterapii (dir. prof. A.N.Obroscev)
(RHEUMATIC FEVER, in infant and child,
ther., ultraviolet rays)
(ULTRAVIOLET RAYS, therapeutic use,
rheum. fever in child.)

KITAYGRODSKAYA, O.D., professor (Moskva)

Constipation in children. Fel'd. i skush. 21 no.12:8-12 D '56.

(CONSTIPATION)

(MLRA 10:1)

(CHILDREN--CARE AND HYGIENE)

KITAYGORODSKAYA, O.D., professor; RUFER, S.O.; BOSIK, R.N.; GEL'MAN, A.S.;
ROZANOVA, A.M.; KHENDEL', A.S.

Use of diathermia in the compound therapy of pneumonia in children.
Pediatrics 39 no.1:74-75 Jan '56. (MLRA 10:1)

(PNEUMONIA, ther.
diathermy, in child.)
(DIATHERMY, in various dis.
pneumonia in child.)

KITAYGORODSKAYA, O.D., prof. (Moskva)

Role of vitamins in the prevention of diseases in children. Fel'd.
1 skush. 22 no.10:57-59 0 '57. (MIRA 11:1)
(VITAMINS)

KITAYGORODSKAYA, O.D., prof.

It happens in children. Zdorov'e 4 no.1:25-26 Ja '58. (MIRA 11:2)
(DIGESTION) (CHILDREN--NUTRITION)

KITAYGORODSKAYA, O.D., prof.

Attacks of rheumatic fever. Zdorov'e 5 no.3:14-15 Nr '59.

(RHEUMATIC FEVER)

(MIRA 12:3)

KITAYGORODSKAYA, O.D., prof.

Chicken pox. Zdorov'e 5 no.10:18-19 0 '59.
(CHICKEN POX)

(MIRA 13:2)

KITAYGORODSKAYA, O.D., prof. (Moskva)

Diseases of the kidneys and urinary tract in children. Vol'd. 1 akush.
24 no.3:15-20 Mr '59. (MIRA 12:4)

(URINARY ORGANS--DISEASES)
(CHILDREN--DISEASES)

KITAYGORODSKAYA, O.D., prof.

Goat's milk. Zdorov'ie 7 no. 4:31 Ap '61.
(GOAT'S MILK)

(MIRA 14:4)

KITAYGORODSKAYA, O.D., prof. (Moskva)

Pneumonia in children. Fel'd. i akush. 26 no. 12:9-15 D '61.

(MIRA 14:12)

(PNEUMONIA)

KITAYGORODSKAYA, O.D., prof. (Moskva)

Exudative diathesis. Fel'd. 1 akush. 26 no.11:54-56 N '61.

(DIATHESIS)

(MIRA 15:2)

KITAYGORODSKAYA, O.D., prof.

Overheating. Zdorov's 5 no.8:30 Ag '59.
(HEATSTROKE)

(MIRA 13:8)

KITAYGORODSKAYA, O.D., prof.

Rickets. Zdorov's 6 no.12:14-15 D '60.
(RICKETS) 7

(MIRA 13:12)

KITAYGORODSKAYA, O.D., prof. (Moskva)

Epidemic hepatitis (Botkin's disease) in children. Fel'd. i akush.
25 no.4:26-32 Ap '60. (MIRA 14:5)

(HEPATITIS, INFECTIONS)

KITAYGORODSKAYA, O.D., prof. (Moskva)

Conditioning of the child. Fel'd. i akush. 25 no.8:34-39 Ag '60.
(MIRA 13:8)

(CHILDREN—CARE AND HYGIENE)

KITAYGORODSKAYA, O.D., prof.; VAYITSVAYG, G.Ye., red.; LYUDKOVSKAYA,
N.I., tekhn. red.

[Digestive disorders in schoolchildren] Rasstroistva pishche-
varenia u detei shkol'nogo vozrasta. Moskva, Medgiz, 1961. 87 p.
(MIRA 15:2)

(DIGESTIVE ORGANS—DISEASES) (CHILDREN—NUTRITION)

KITAYGORODSKAYA, O.D., prof.

It would seem to be without cause.... Zdorov'e 7 no.11:12-13 N '61.
(FOOD ALLERGY) (CHILDREN-DISEASES) (MIRA 14:11)

KITAYGORODSKAYA, O.D., prof. (Moskva)

Coli-enteritis in children. Fel'd. 1 akush. 27 no.8:8-10 Ag' (2.
(MIRA 16:8)
(ESCHERICHIA COLI) (ALIMENTARY CANAL-DISEASES)

KITAYGORODSKAYA, Ol'ga Davydovna, prof.; MARTYNSON, A.S., red.

[Manual of children's diseases] Uchebnik detskikh bo-
leznei. Moskva, Medgiz, 1963. 430 p. (MIRA 17:6)

LANDAU, L., akademik, laureat Leninskoy premi; KITAICHODSKIY, A., prof.

Motien, what is it? Toki.mcl.30 no.11:3-4 '62. (MIRA 16:9)
(Motien)

~~К И Т А Й Г О Р О Д С К И Й, А. А.~~
KITAYGORODSKIY, A. A.

Institute of Elemento-Organica Compounds, Moscow

"Some Physical Problems of Organic Crystals."

Leningrad

Paper submitted at
Program of the Conference on the Non-Metallic Solids of Mechanical Properties.

May 19 - 26, 1958.

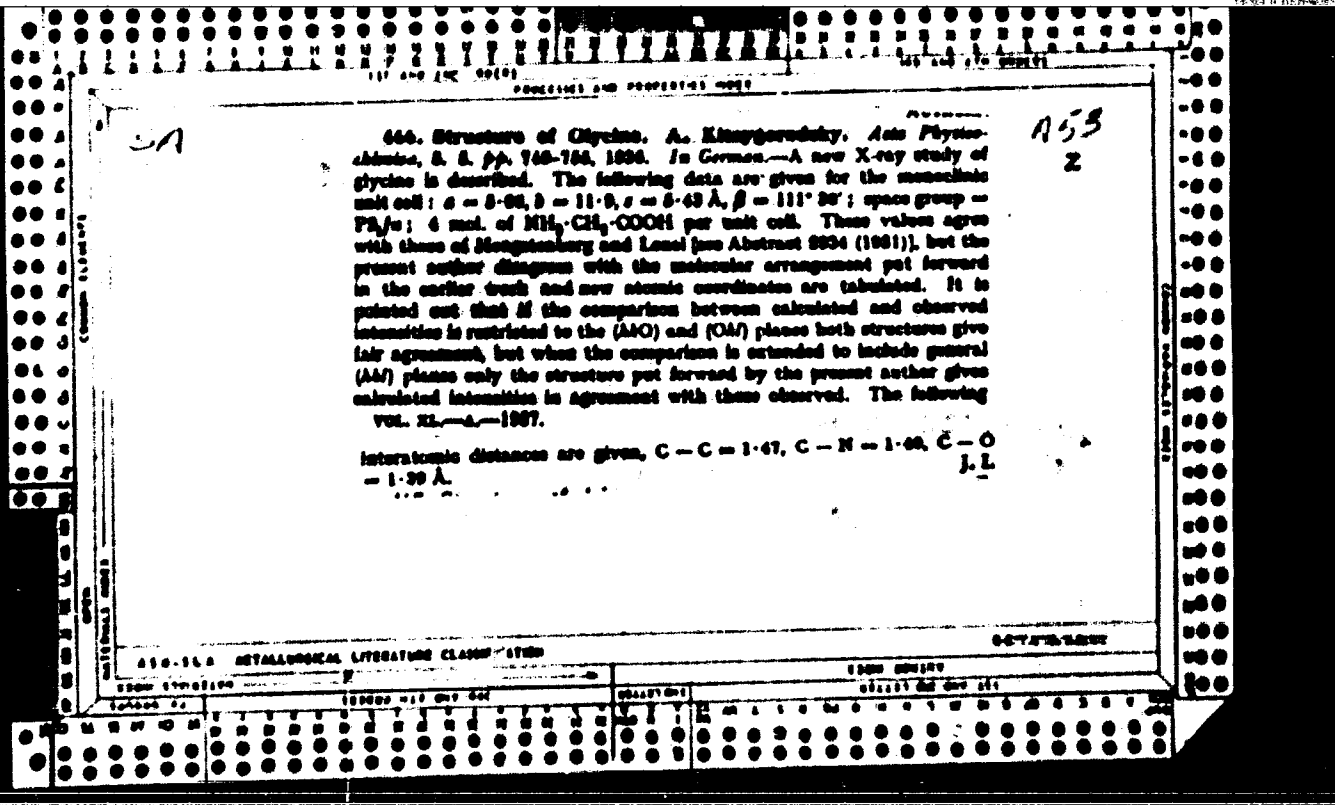
KITAYGORODSKIY, A.B.

Time relay for testing machines. Zav.lab. 23 no.31368 '62.

(MIRA 1514)

1. Institut mekhaniki AN USSR.

(Testing machines)



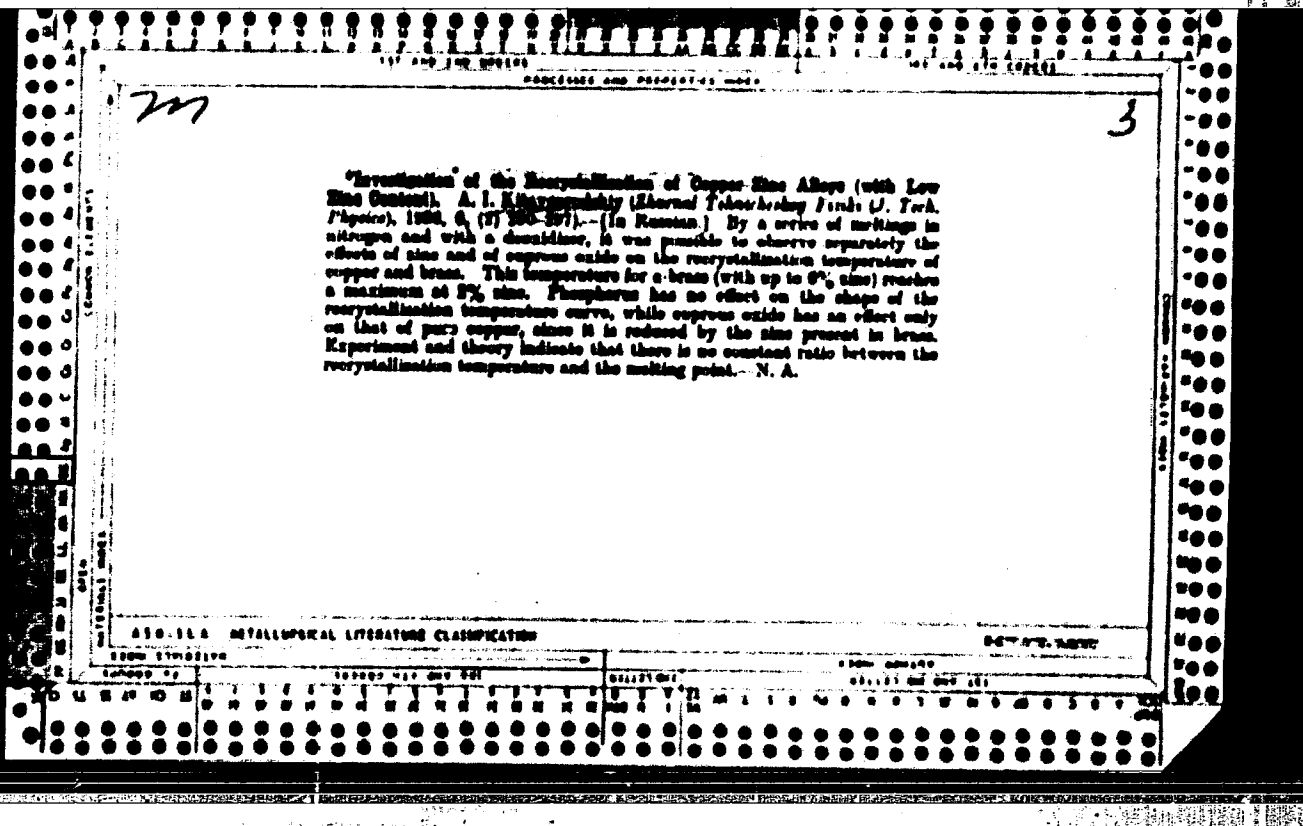
M

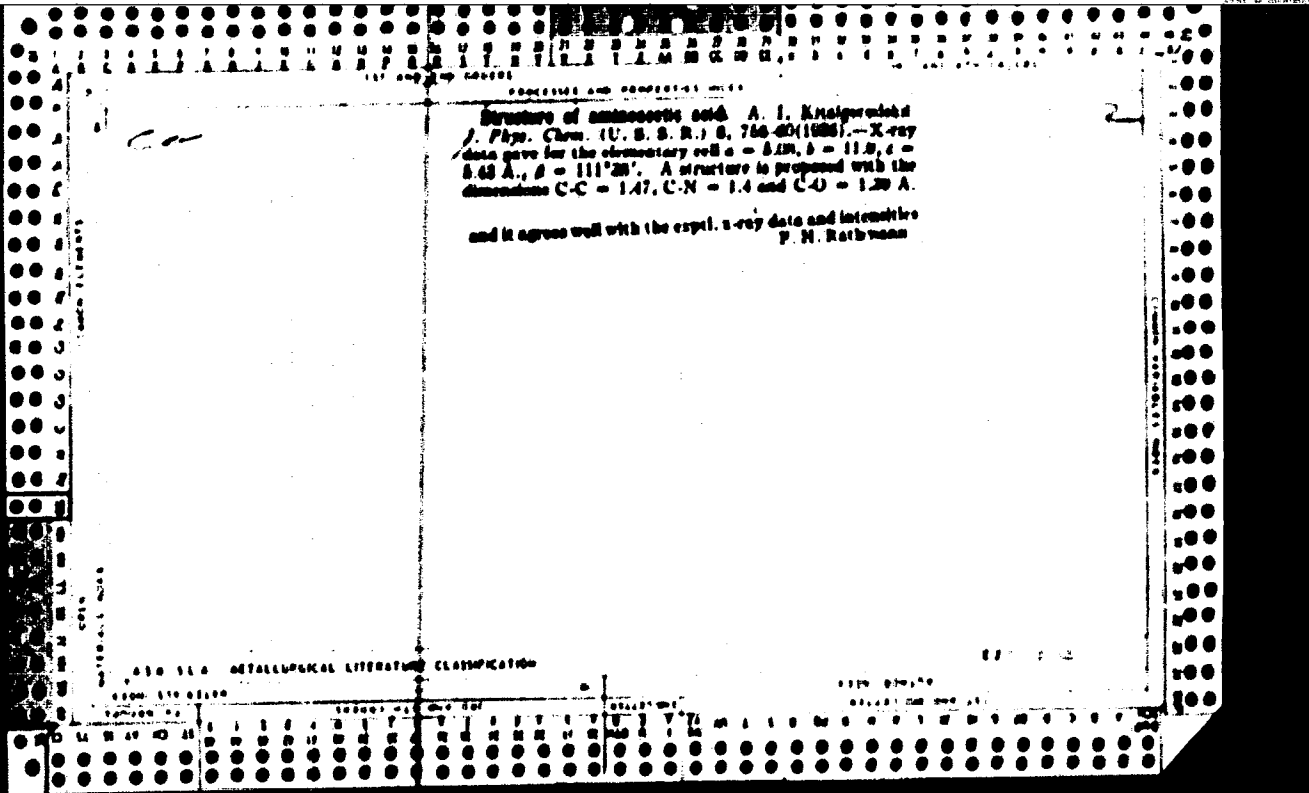
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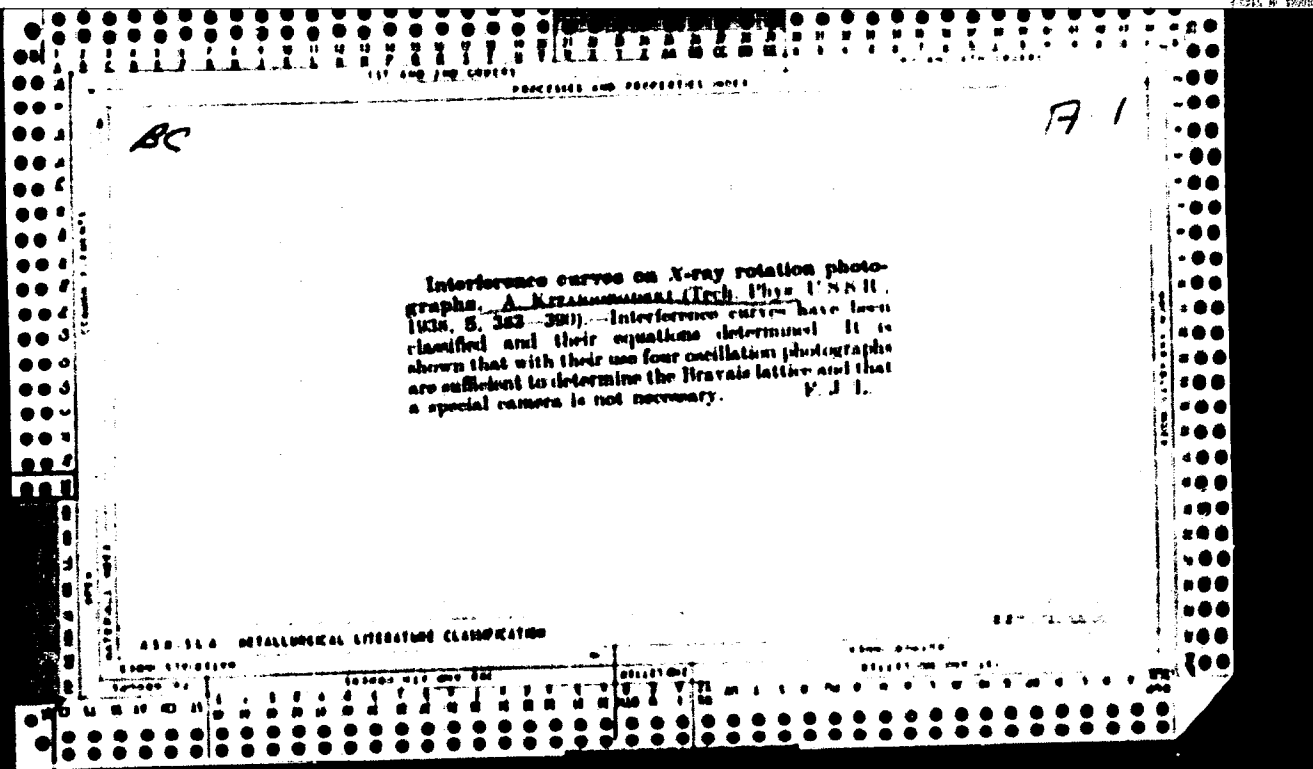
*The Recrystallization of Copper-Zinc Alloys with Zinc Contents up to 7 Per Cent. *Al. Khaganovich, Izv. Akad. Nauk S.S.S.R., 1938, 2, (1), 20-31; *Ac. Sci. Ser. 1938, [A], 28, 579.*— [In German.] Alloys were prepared containing up to 7% zinc by melting copper and zinc together (a) in purified atmosphere, and (b) under charcoal in air, with subsequent desoxidation. Recrystallization was determined on a 97.98% cold worked strip by an X-ray method. At about 2% zinc the rate is a minimum as shown both by time and by temperature curves. The speed is not affected by 0.2-0.4% phosphorus nor by cuprous oxide which markedly inhibits recrystallization in pure copper. The oxide is apparently immediately reduced by zinc. Theoretically, recrystallization depends on the number of nuclei and rate of growth, so that it is unnecessary to assume the formation of a special constituent at 2% zinc. Theoretical investigation of recrystallization is very difficult. The practical rule (recrystallization temperature/melting point) — constant, has no theoretical or experimental basis for the alloys investigated.—R. (1).*

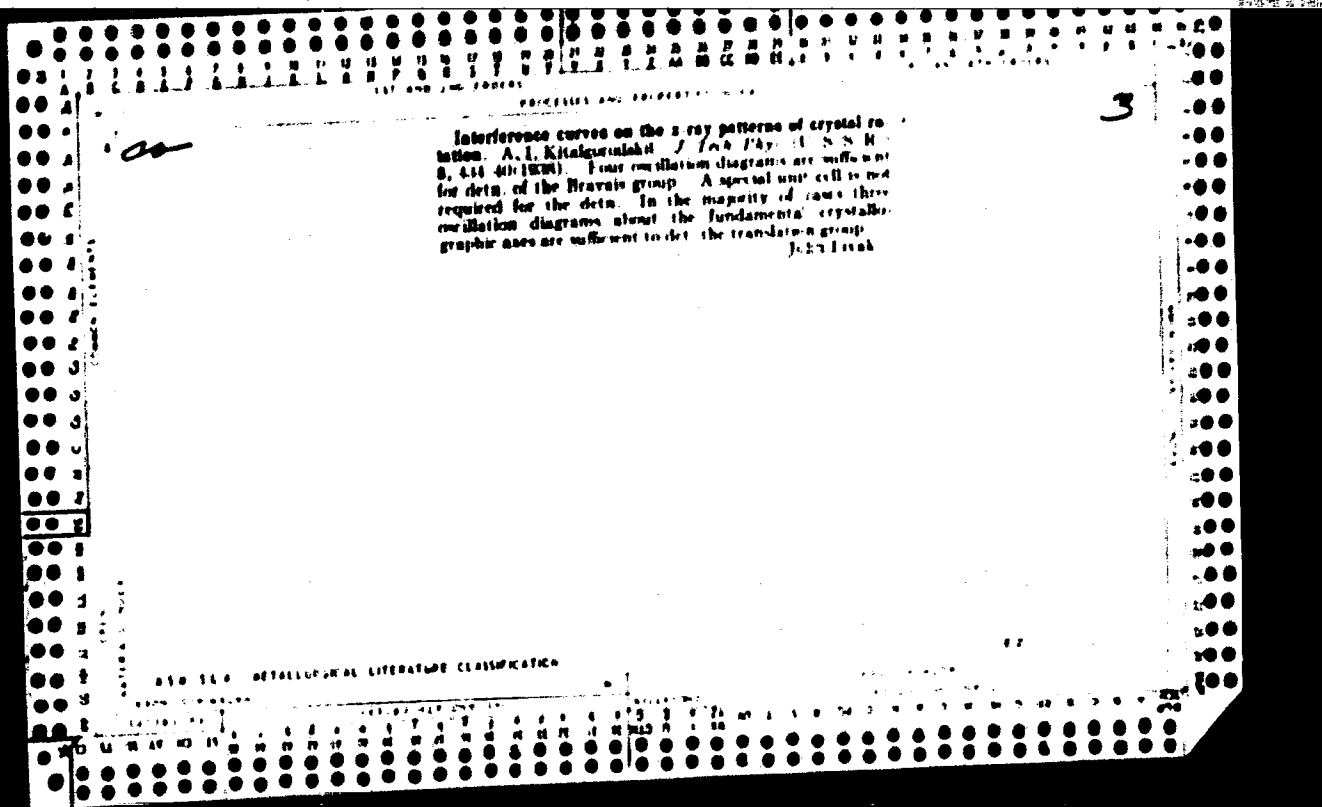
ASB-110 METALLURGICAL LITERATURE CLASSIFICATION

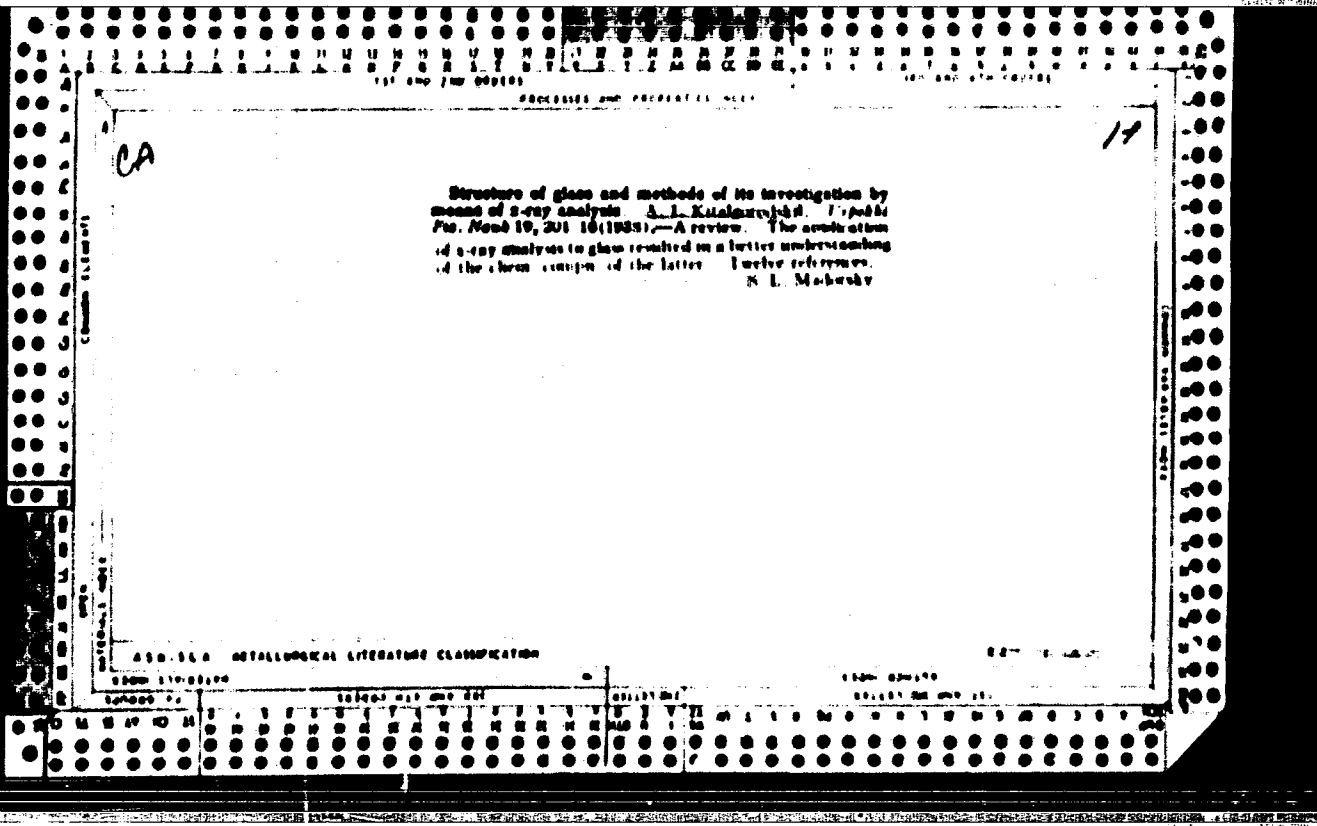
U.S. GPO

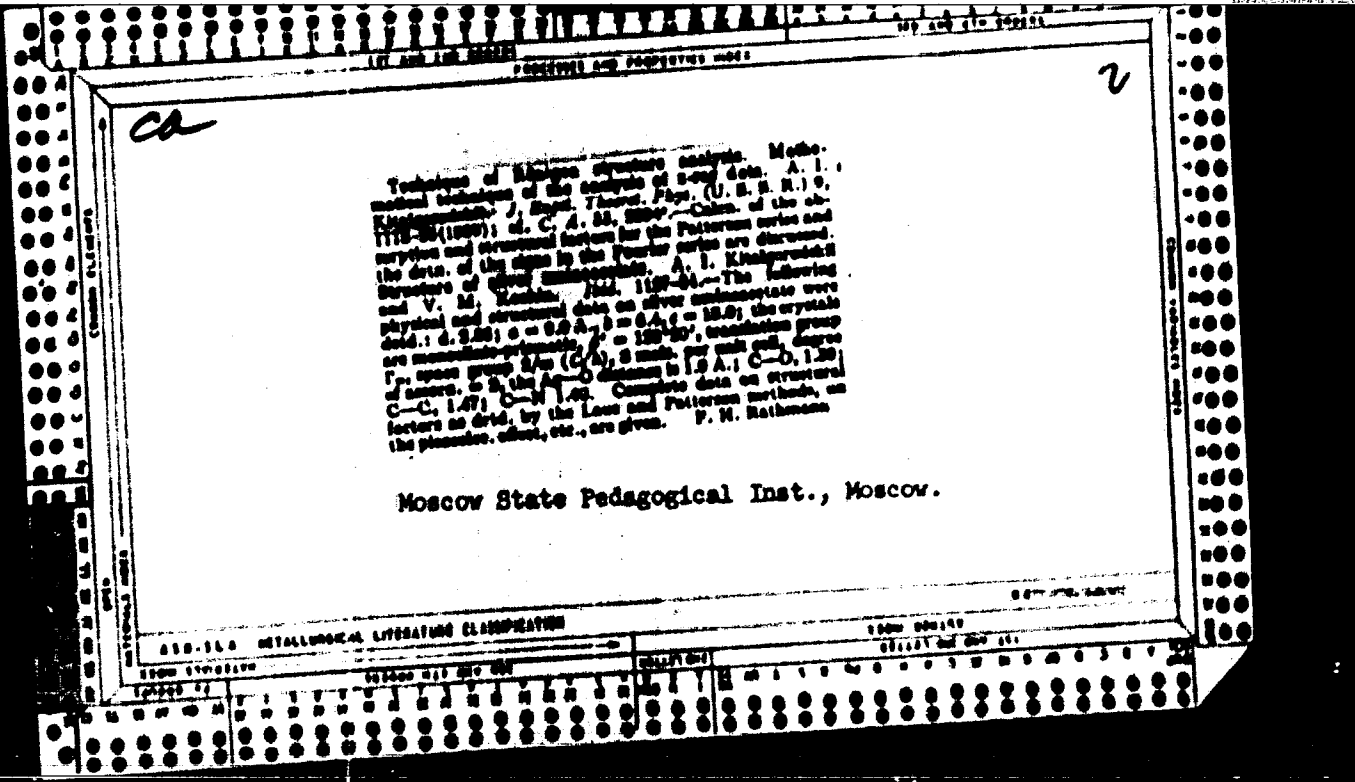












KITAYOVICH, A. I.

"Investigation of the Structure of Amino-acetic Silver," Zhur. Eksper. i Teoret. Fiz., 9, No. 9, 1939.

Dept. of Photobiology, AU Inst. of Experimental Medicine, Moscow.

Книга Ю. П. Давыдов, А. Т., и др.

Reference book on X-ray analysis Moskva, Gos. izd-vo tekhniko-teoret. lit-ry, 1940.
315 p. (54-54080)

QC481.K53

KITAYGORODSKIY, A. I.

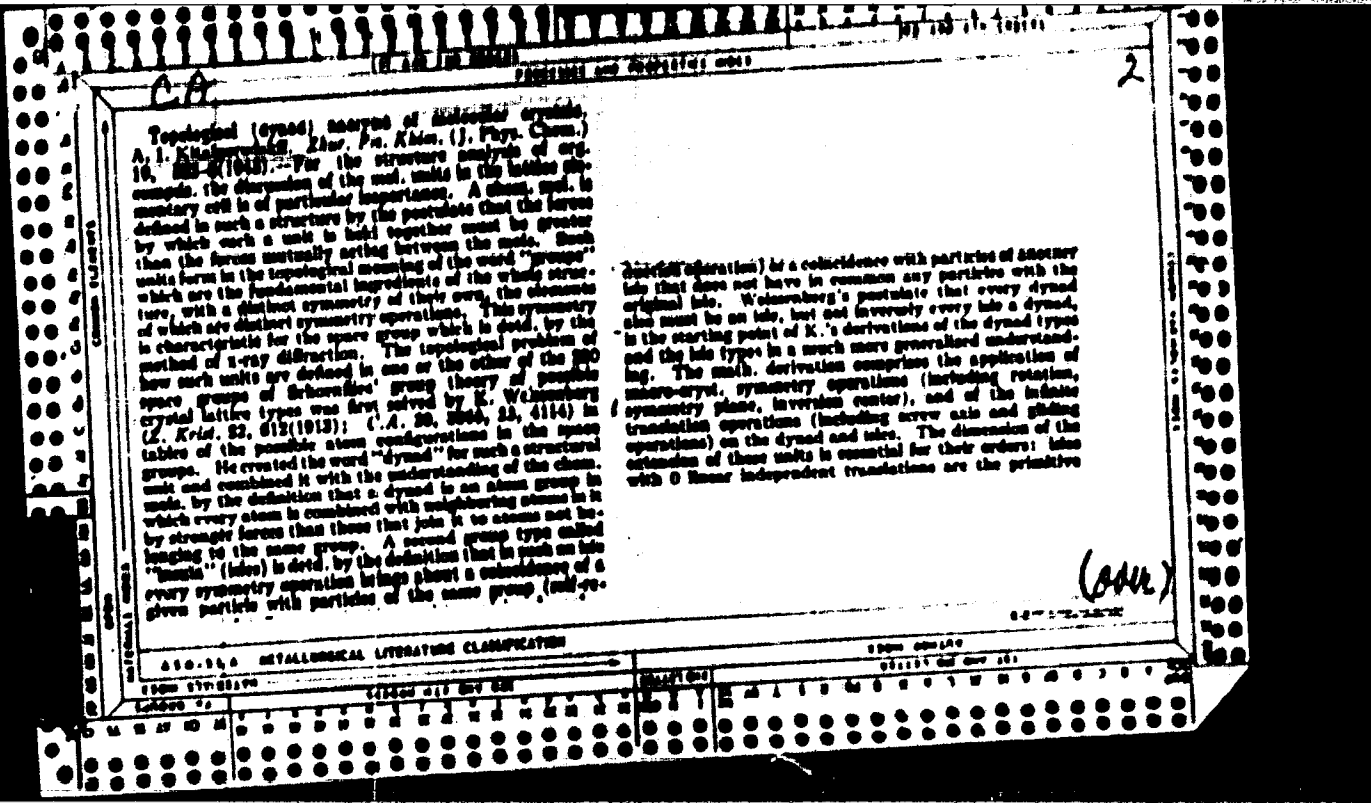
"On Organometallic Compounds of Mercury, 31, X-ray Study of the Structure of $C_2H_2HgCl_2$," Iz. Ak. Nauk SSSR, Otdel. Khim. Nauk, No. 2, 1945.

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Close packing of molecules in crystals of organic compounds. A. Kiselevich. *J. Phys. (USSR)* 9, 211 (1945). Investigations of the structure of naphthalene derivatives, crystals will be published later, lead to the conclusion that the shape of these as well as of all other more simple and many complex rods, of the isomeric and anisotropic rods is similar to the shape of a truncated cylinder. If the central location of the rods is fixed by the requirements of closest packing, an analysis of the elements of symmetry leads to a layer with a coordination number of 6. A coordination no. of 12 is also possible. By using the principle of closest packing and knowing the dimensions of the ellipsoid it is possible to make the dimensions of one of the sections and the orientation of the rods. Thus, the method can be used in structure analysis to rough out the features of the structure being investigated. Frank Grant

U.S. GOVERNMENT PRINTING OFFICE: 1964 O 348-000



space-lattice; in one-dimensional linear translations they form
line-chains; two-dimensional translations, line-networks,
three-dimensional ones, lattice-networks (lattices). Cor-
responding derivations run the dyads of different orders.
By the systematic performance of all possible symmetry
operations of all kinds of such dyads and also a complete
development of the possible space-structures is possible
for which the complete discussion of the space group CM ,
 0 is given: in the crystallographic plane (a) there are 3
different types of network-like dyads, 3 of simple net-
work-like dyads, in (b) are distinguished only 1 kind of network-
like dyad, in (c) 6 different network-like dyads and 1
type of simple network dyad. The symbols used by K.
are of a new, very handy type, indicating the kinds of the
fundamental translations and other operations, the direc-
tions of these operations, and their orders. In the prac-
tical use of group theory systematic symbols of non-equivalency
relations are given for the general classification of the
resulting phenomena of position changes through opera-
tions. The importance of these general principles for org.
concepts, in their crystal structures is evident, and also a
remarkable progress beyond Weissenberg's tables.

W. Dietl

CA

Crystal structure of the naphthylamines. A. I. Kitaigorodskii. *Doklady Akad. Nauk S.S.S.R.* 90, 213-17 (1945).--The 2 diam. assembly structures governed by the tendency to closest packing and by H-bond forces (1) β -Naphthylamine is monoclinic, $a = 8.6$, $b = 8.0$, $c = 16.0$ A., angle 116° , no. of molecules per unit cell = 4. Distortions caused as far as detd. only for low-index reflections. On that basis, the space group C_{2h}^2 is probable. The structure is evidently closely related to that of

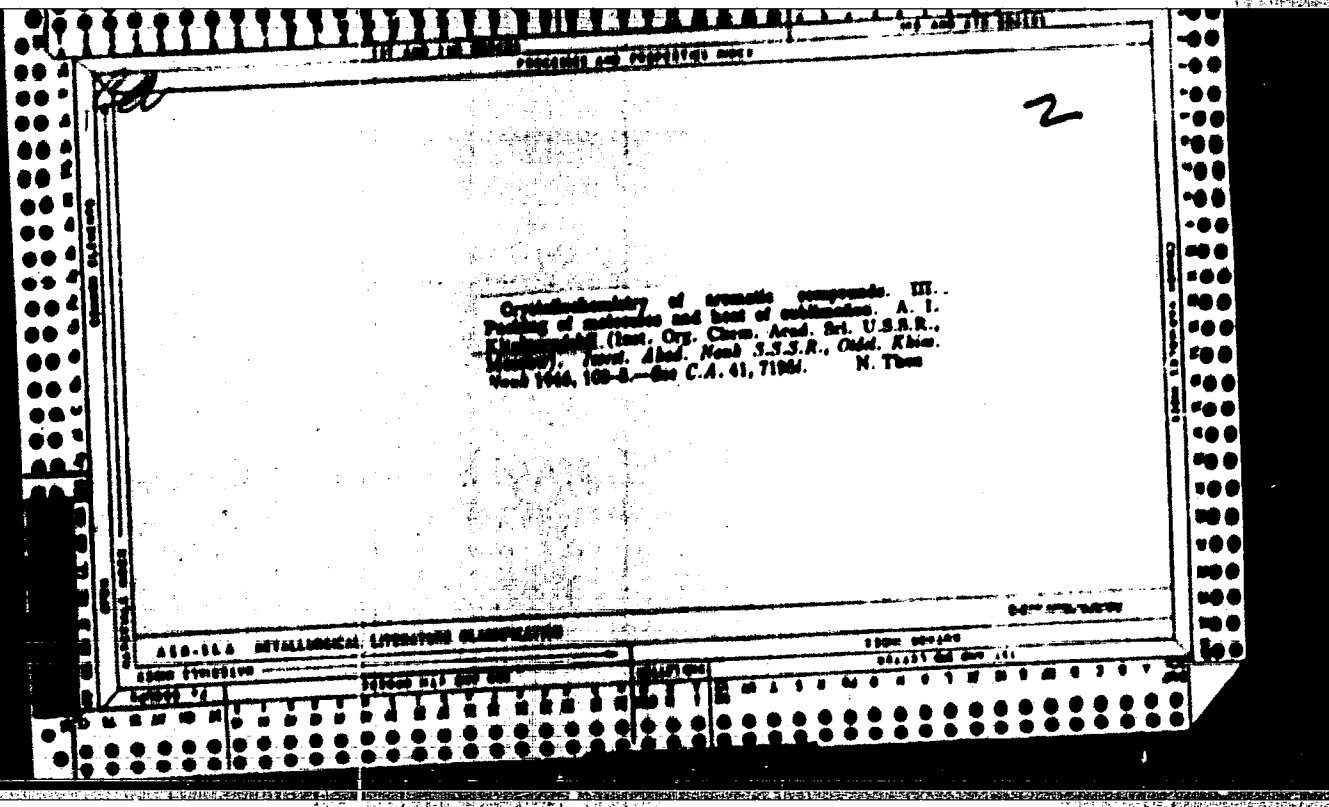
C_{2h}^2 , with z doubled. The positions of the centers of the molecules are the same in both structures; the orientation of the molecules with respect to the axes is somewhat different; specifically, in naphthylamine, the angle of rotation of the short axis of the molecule around the perpendicular to the ab plane, of the long axis around a , and of the long axis around b , are, resp., 23° , -10° , and 34° . (2) α -Naphthylamine crystallizes in the orthorhombic system with $a = 12.0$, $b = 7.65$, and $c = 20.3$ A., thus giving 24 molecules per unit cell. Absence of extinctions of the odd type indicates that the cell is not centered. From rotation patterns around the 2 axes, the only possible space group is $Pna2_1$. The compound forms in the crystal complexes of 2 molecules, and the unit cell consists of 4 "elements" formed by pairs of such complexes, each pair including 6 molecules and possessing a center of symmetry. The peculiar instance of mol. assocn. in the crystal can be linked with the pseudo-hexagonality of the lattice, a pseudohexagonal cell, twice the size of the unit cell, with a tertiary axis parallel to b , being obtained along the axes [011], [211], and [010]. The crystal can be viewed as built up of hexagonal prisms of the length b and radius 6.7 A., each prism containing 6 molecules, i.e. one "element" of the unit cell. Within each element, all 6 molecules are oriented with their long axes parallel; in 3 molecules the NH₂ groups are oriented in one direction, in the 3 others in the opposite direction. There appears to be a tendency for primary amines to occur in groups of 3. N. Then

ASO-558 METALLURGICAL LITERATURE CLASSIFICATION

KITAYGORODSKIY, A. I.

"The Close-Packing of Molecules in Crystals of Organic Compounds," Zhur. Phys.
351, No. 4, Vol 9, 1945.

Inst. of Organic Chemistry of the AS USSR



Crystal structure of 1,3-dimethyl-2,4-dinitrobenzene. A. I. Malozemov (Inst. Org. Chem. Acad. Sci. U.S.S.R., Moscow). *Dokl. Akad. Nauk S.S.S.R.*, Class. Nat. Sci., 1968, 267-270 (in Russian); *J. C.S. Chem. Soc.*, 1968, 1190.

(1) An approx. solution of the orientation of the units in a unit crystal lattice can be gained from geometrical considerations. The unit is represented by an ellipsoid of axes a , b , and c , the half-axes of the cell are A , B , and C . If the a axis forms the smallest angle, α , with the plane xy of the detector layer, the projection of the ellipsoid on that plane is $ab \cos \alpha$; geometrical solution of the system of equations for closest packing of ellipsoids in the xy plane gives $ab = AB/\sqrt{3}$; the angle α can further be called, from C and a . The contact condition $(ab/c)^2 + (\cos^2 \alpha/c^2) = 1/3$ gives the limits of the angle α between the ellipses ab and xy , by $\sin^2 \alpha = (ab/3c)^2 - (a/b)^2 / [(b/a)^2 - (a/b)^2]$ and $(b/a) \cos \alpha < (b/a) < (b/a) \cos \alpha$. The method of trial is illustrated by the following examples. Naphthalene: known cell dimensions $A = 3.145$, $B = 3.308$, $c = 7.30$ A.; taking $a = 1.72$, $b = 3.08$, $c = 6.1$, one has $ab = 6.35$, $ab = 7.17$, $\alpha = 28.8^\circ$ (which checks with C), $\alpha = 28^\circ 40' - 29^\circ 05'$, in fair agreement with Robertson's (*C.A.*, 26, 847) $\alpha = 28.7^\circ$ and $\alpha = 28^\circ$. Similar agreement obtains in the case of anthracene, $a = 1.72$, $b = 3.75$, $c = 8.5$, $\alpha = 28.5^\circ$, $\alpha = 28^\circ 40' - 27^\circ 40'$; dextrin, $a = 2.04$, $b = 2.66$, $c = 3.3 - 4.3$, $\alpha = 7^\circ - 20^\circ$; β -benzocresol, $a = 1.72$, $b = 2.4$, $c = 3.1$, $\alpha = 25^\circ$ (some 5-6° below the exact value), $\alpha = 16 - 16.5^\circ$ (exact, 15°); and β -trinitrobenzene, $a = 1.72$, $b = 2.8$, $c = 3.1$, $\alpha = 28^\circ$ (exact, 33.5°), $\alpha = 63^\circ$ (exact, 67°). Hence the deviations between the calc. and the exact angles do not exceed 5°, the above examples are considered proof of both the correctness of the method and the assumed values of a , b , and c . (2) More precise information on the orientation of the units is gained from unit models (made of cement, of paraffin and resin), using a holder termed "structure holder" in which the model can be rotated by known

with the same lines. With the exact distances between the centers of the molecules possible unit orientations, consistent with the requirement of min. distance between atoms of different molecules, definite intermol. radii of atoms, and with the requirement of closest packing, are tried out. The orientation consistent with the x-ray structure data is selected. (3) By x-ray reduction on a rotating crystal, 1,3-dimethyl-naphthalene has the space group $P6_3c(17^\circ)$, the cell $a = 7.64$, $b = 6.07$, $c = 20.30$ A. Using a model built on the assumption of a distance C(aromatic)-C(aromatic) = 1.408 A., and C(aromatic)-C(aliphatic) = 1.540 A., trial with a set of 8 (so far imperfect) "structure holders," showed one single possible orientation with regard to the cell axes, characterized (roughly) by the angles $\alpha = 8^\circ$, $\alpha = 3^\circ$, $\alpha = 20^\circ$ (within 1-3°). More precise values of the angles are found by geometrical considerations; the 8 equations describing intermol. contacts of atoms, and involving α , β , γ and the intermol. atomic radii $R_H(H-H)$ and $R_C(C-H)$ are shown to be solvable only if the angle α between C(aromatic)-C(aliphatic) and C(aliphatic)-H (angle HCC of the methyl group) is $\alpha = 118^\circ$; the calc. gives $\alpha = -3^\circ 56'$, $\alpha = 4^\circ 19'$, $\alpha = 23^\circ 44'$, $R_H = 1.19$, $R_C = 1.73$ A. The structure factors calculated from these α agree satisfactorily with the measured intensities. The directing angles, calc. from the α , are $\alpha = 0.069$, $\alpha = -0.072$, $\alpha = 0.998$, $\alpha = -0.266$, $\alpha = -0.260$, $\alpha = 0.040$, and the coordinates x , y , z of C atoms, in fractions of the cell axes, 0.069, -0.072, -0.121; 0.064, -0.199, -0.052; 0.030, -0.107, 0.014; 0.082, -0.238, 0.087; 0.014, -0.136, 0.119; 0.042, -0.264, 0.173. The packing coeff. is 0.718. (4) The agreement with x-ray measurements lends considerable wt. to the values of R , in particular to $R_C(C-H) = 1.73$ Å against the commonly accepted 1.56 Å. for the half-thickness of the benzene ring. (5) The distortion of the HCC angle to $\alpha = 118^\circ$ is explained on steric grounds, 118° being the

Also: Iz. Ak. Nauk SSSR, Otdel Khim. Nauk

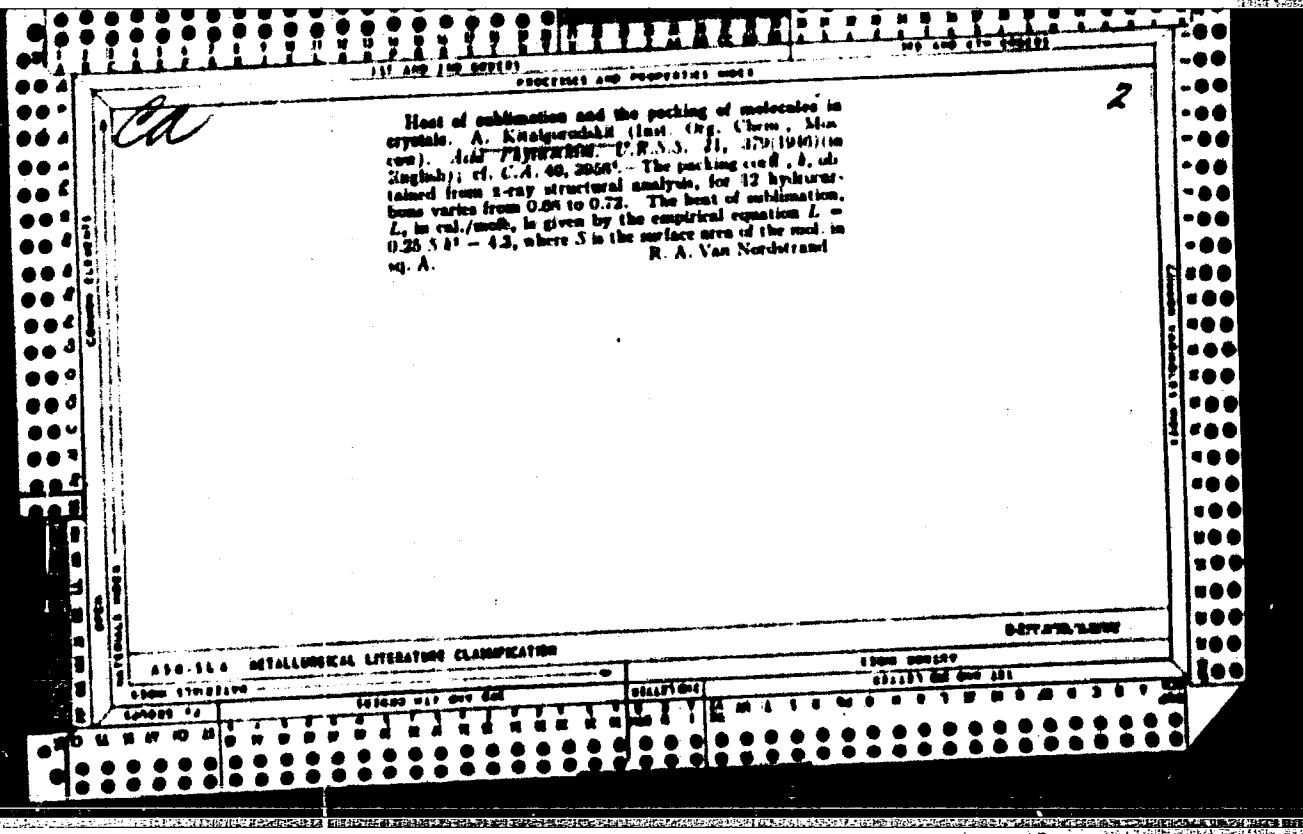
No. 6, 1946

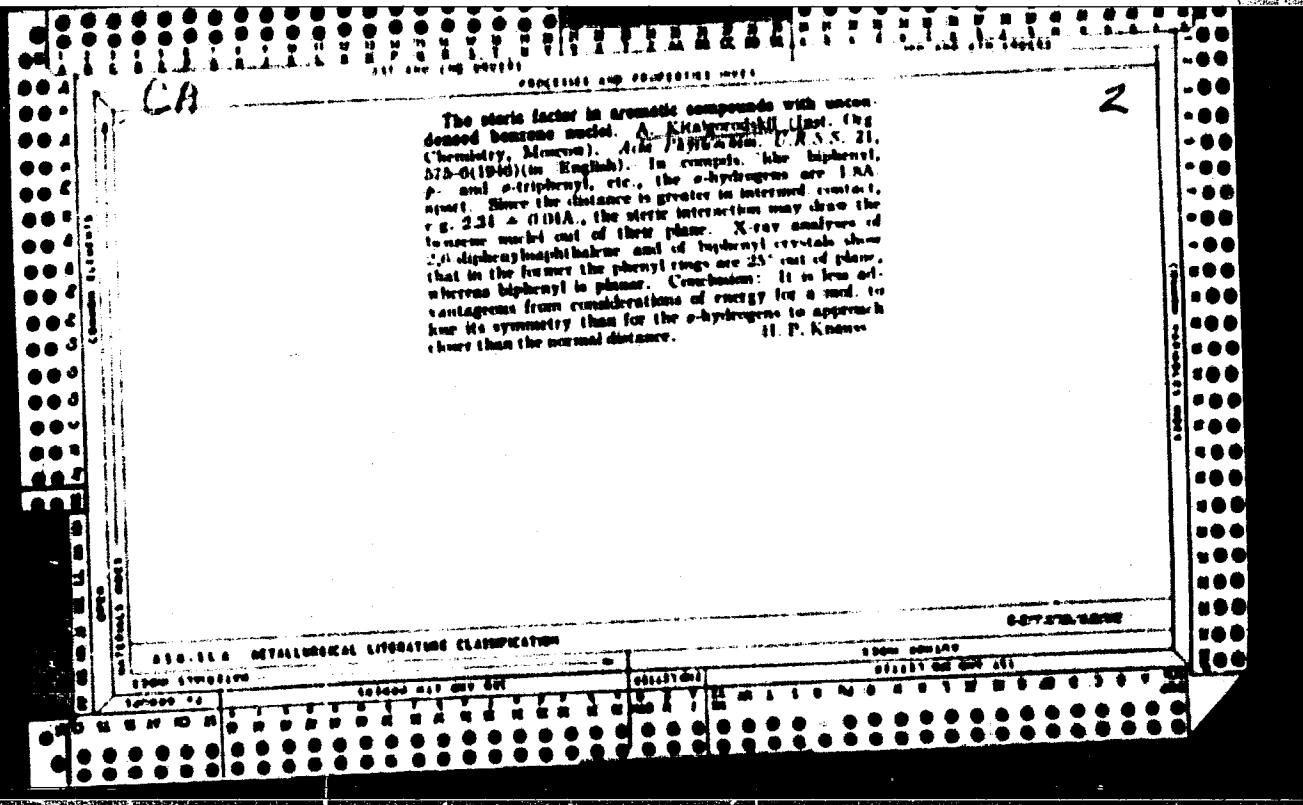
Inst. of Organic Chem., AS USSR

angle at which, with the given radii, overlapping of the H atom of the methyl group and the C atom of the benzene ring occurs, and free rotation of the methyl group becomes possible. However, avoidance of overlapping is by no means a general requirement; thus, in C₆H₆, overlapping of C atoms of 2 neighboring methyl groups occurs if 2 avoided if these groups were disposed alternately on 2 sides of the ring, which they are not. In this case, either free rotation is absent, or else the 12_h groups rotate in such a way that the H atom of the 1st group falls always between 2 H atoms of the 2nd group. Strictly speaking, it would mean absence of a center of symmetry which is consistent with the triclinic crystal form of C₆H₆. V. Crystal structures of 2- and 3,5-derivatives of naphthalene. *Ibid.*, 1947, 261-70 (in Russian). (1) The structure of naphthalene according to Robertson (C.A. 26, 947) does not satisfy the postulates of min. no. of intermolecular contacts between atoms of different molecules, with R₁(C-H) 1.72, R₂(H-H) 1.10, and closest packing of layers; the distance between a C atom in position 4 and a H atom in position 1 of a neighbor mol. by translation along *b*, and between a H atom in position 1 and a C atom in position 9 of a neighbor mol. along the glide-plane *a* should be equal and = 1.90 Å., as in 2,6-dimethylnaphthalene. By the geometrical calcn. outlined above (Part IV), with C-C = 1.41 Å., C-H = 1.08 Å., one finds $\alpha_1 = 27^\circ$, $\alpha_2 = 10^\circ$, $\alpha_3 = 23^\circ 20'$, and for the coordinates *x*, *y*, *z* of the atoms, 0.076, 0.026, 0.326; 0.029, 0.194, 0.526; 0.040, 0.107, 0.031; 0.033, 0.236, -0.026; 0.008, 0.178, -0.264, considerably at variance with R's values. This structure deviates only slightly more from R's measurements than R's own structure and can be held not to conflict with the exp't. (2) X-ray diffraction gave for 2-methylnaphthalene, space group P2₁/a, *a* = 7.75, *b* = 5.94, *c* = 15.4 Å., $\beta = 108^\circ 16'$. By geometrical analysis, 5.94, *c* = 15.4 Å., $\beta = 108^\circ 16'$. By geometrical analysis, contact between mole. occurs between H in position 1 and C in position 9; $\alpha_1 = 6.5^\circ$, $\alpha_2 = 5^\circ$, $\alpha_3 = 24^\circ$. C-H groups of H at C in position 2, the distance between the centers of nearest C-H groups = 2.0 Å., and free rotation is impossible (in contrast to 2,6-dimethylnaphthalene). Layers

are piled up in such a way that the C-H groups of one layer fall in the middle of the interlines between the C-H groups of the next layer, ensuring closest possible packing. The distance between the centers of 2 mole. across the C-H bonds, is 10.10 Å., and across the H bonds, 7.76 Å.; this gives $d_{110} = 17.20$, in exact agreement with the exp't. $17.20 = 0.18$ Å. Amplitudes calc'd from the proposed

structure are in agreement with the measurements. (3) X-ray diffraction on 2-naphthal gave, within ± 0.03 Å., *a* = 8.09, *b* = 8.94, *c* = 17.20, $\beta = 110^\circ 48'$, at variance with the erroneous data listed in Straker's review (vol. 1, p. 731). The complete structure can be obtained from purely geometrical considerations, with $\alpha_1 = 27^\circ$, $\alpha_2 = 10^\circ$, $\alpha_3 = 23^\circ$. The essential conclusions are that the H bond between OH groups does not alter the close packing, and that it appears in the form of a double bridge between 2 OH groups, stable at $\alpha = 60^\circ$ and H-H = 1.50 Å., H O-O = 2.80 Å. The distance C-OH = 1.37 Å. (4) For 2-naphthylamine, no accurate data could be found by x-rays; approx. *a* = 8.5, *b* = 6.9, *c* = 17 Å., $\beta = 116^\circ$, $\alpha_1 = 24^\circ$, $\alpha_2 = -10^\circ$, $\alpha_3 = 22^\circ$, space group P2₁/a. As in the case of 2-naphthal, the H bond does not interfere with close packing. (5) For 2,6-diphenylnaphthalene, x-ray patterns gave space group V_h^h (P₂), *a* = 8.94, *b* = 6.26, *c* = 21.26 Å., 4 mole. in cell. By geometrical analysis, close packing results if the Ph rings are rotated by 23° out of the plane of the naphthalene ring, with the symmetry center of the mol. preserved; the C-C distance linking the naphthalene and the benzene rings is 1.55 Å. The orientation of the naphthalene ring is given by $\alpha_1 = 7^\circ 20'$, $\alpha_2 = 24^\circ 20'$, $\alpha_3 = 27^\circ 20'$. The calc'd structure factors are in agreement with the exp't. intensities. (6) For 2,6-dimethylphenanthrene, x-ray patterns gave space group C₂h (A2a), *a* = 13.2, *b* = 5.65, *c* = 26.5 Å., 4 mole. in cell. The structure found by geometric analysis corresponds to closest possible packing, with the center of symmetry preserved. (7) The common feature of 2- and of 2,6-deriv. of naphthalene are close-packed layers formed by translation along





KITAYGORODSKIY, A.

PA 52708

USSR/Physics
Crystallography
Aromatic Hydrocarbons
Jul/Aug 1946

"The Structure of Dibromanthracene and the C--C Distance in the Aromatic Hydrocarbons," A. Kitaygorodskiy, Inst Org Chem, Acad Sci USSR, Moscow, 2 pp

"Acta Physicochimica URSS" Vol XXI, No 4 - γ . 167-8

Study of the C--C distance in aromatic hydrocarbons by measurements of a dibromanthracene crystal. One of the C--C distances differs essentially from the mean. Doubt expressed regarding validity of the conclusions drawn in a recent study of the structure of coronene by Robertson and White. Received 26 Apr 1946.

52708

also: Dok. AN, 767, No. 4, Vol. 21, 1946, Acad. of Sciences of the USSR, Inst., Organic Chem., Moscow.

KITAYGORODSKIY, A.

USSR/Physics
Crystallography
Aromatic Compounds

Sep/Oct 1946

The Crystal Chemistry of Aromatic Compounds: I, The Packing of Molecules in Crystals of Organic Compounds," A. KITAYGORODSKIY, Inst Org Chem, Acad Sci USSR, Moscow, 22 pp

"Acta Physicochimica URSS" Vol III, No 5 - pp. 811-113

Establishes two types of close packing in a layer, the simple oblique-angled, "centered" rectangular packing. On basis of symmetry of closely packed layers, shows space groups in which they may occur. Formulates two rules of organic crystal chemistry.

SMRPA

USSR/Physics (Cont'd)

Sep/Oct 1946

checking them against all available experimental data. Discussion distributed in a crystal of centrosymmetric molecules. Received, 16 Aug 1945.

Also: Dok. Ak. 899, No. 5, Vol. 21, 1946, AS USSR, Inst. of Organic Chem., Moscow.

54794

KITAYGORODSKIY, A.

PA 24121

Dokl. Akad. Nauk SSSR / Chemistry - Aromatic Compounds Nov/Dec 1945
Chemistry - Crystallography

"The Crystal Chemistry of Aromatic Compounds: II, An Investigation of Two Dicoctyl Naphthalenes of Unknown Structure," A. Kitaygorodskiy, Inst Org Chem, Acad Sci USSR, Moscow, 8 pp

"Acta Physicochimica URSS" Vol XXI, No 6

Using method of X-ray analysis, unit cells of the crystals of 2,6-dicoctyl naphthalene and di-(2,2,4,4) tetramethyl butyl naphthalene were measured, their space groups determined and intensities of reflections estimated. Structure of molecule of former determined and diagram of structure of molecule and crystal drawn to scale in the paper. Received, 18 May 1945.

KITAYGORODSKIY, A. I.

PA 15T19

USSR/Chemistry - Mercury Compounds
Chemistry - Acetylene

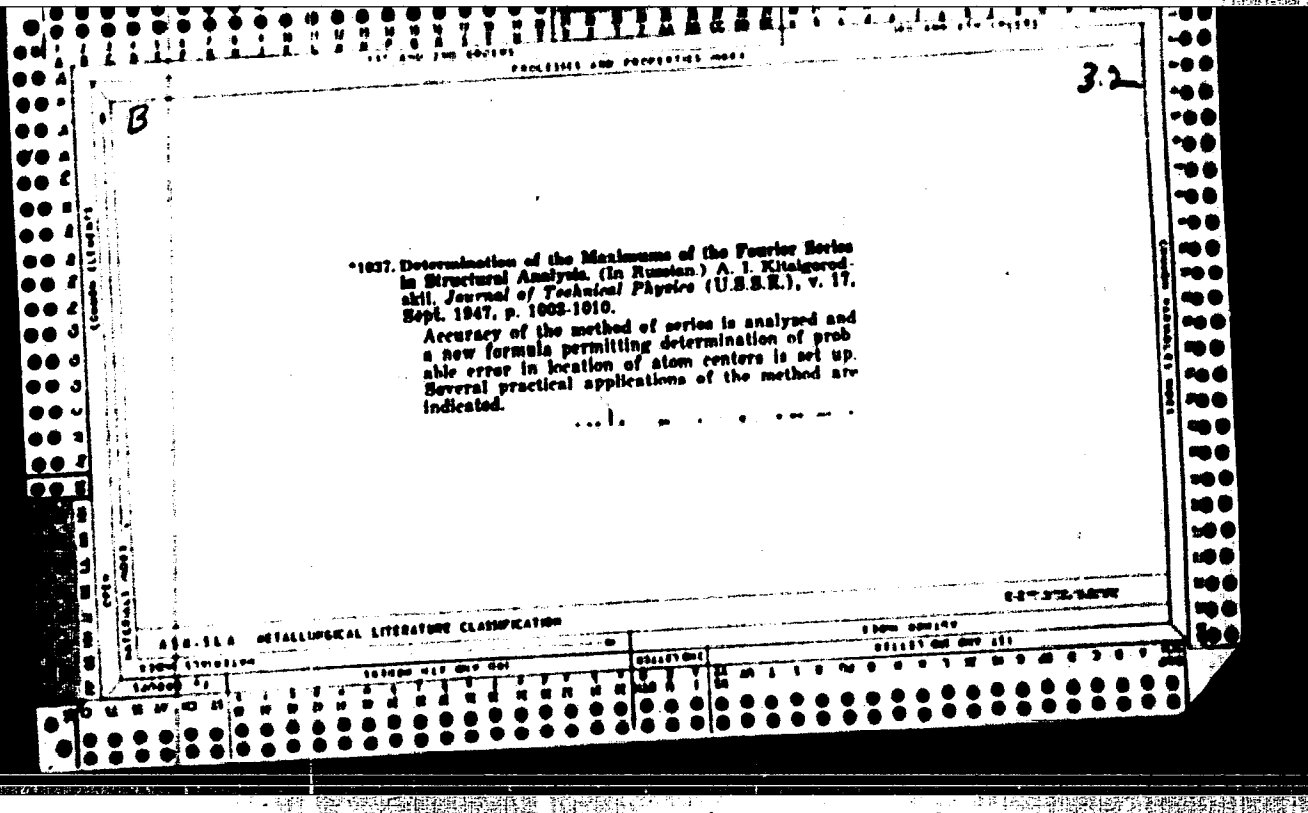
May/June 1947

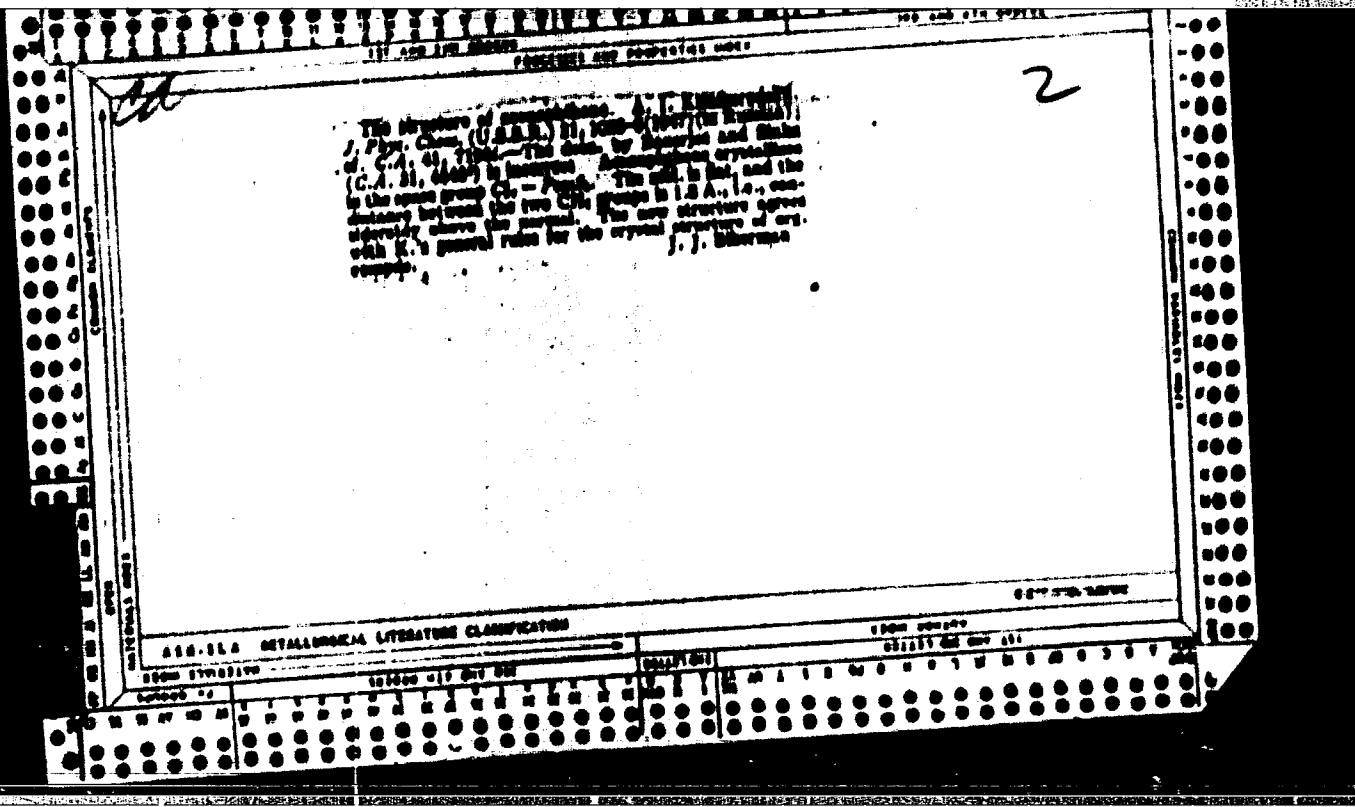
"Organometallic Compounds of Mercury: XXXIV, X-Ray
Structural Investigation of $C_2H_2 \cdot HgClBr$," A. I.
Kitaygorodskiy, 6 pp

"Izv Ak Nauk Otd Khim Nauk" No 3

Measurement of the unit cell, determination of the
space group, determination of the arrangement of
Hg, Cl and Br atoms by the Patterson series, and
consideration of the arrangement of light atoms by
geometrical analysis.

15T19





KITAIGORODSKI, A.

PA 9720

USSR/Crystals - Structure
Crystals, Organic

Feb 1947

"The Crystal Chemistry of Aromatic Compounds: III,
The Packing Coefficient in Organic Crystals," A.
Kitaigorodski, 10 pp

"Acta Physicochimica" Vol XXII, No 2

The author defines the packing coefficient of molecules as $k = \frac{vZ}{V}$ where V is the volume of the unit

cell of the crystal, Z the number of molecules in a unit cell, and v the volume of the molecule, i.e., the volume of the space confined within the spheres of intermolecular radii drawn from the centers of the atoms.

9720

KITAYGORODSKIY, A.I.

PA 50791

USSR/Physics
Crystallography
Twining

Jan 1947

"V. V. Belov's Book: 'Structure of Ionic Crystals and Metallic Phases', A. I. Kitaygorodskiy, 2 pp

"Uspehi Fiz Nauk" Vol XXXIII, No 1

Reviews 236-page book, with 174 illustrations, published by Academy of Sciences, USSR, 1947. Can be considered continuation of work carried out by Federov. Shows possibility of studying all crystals from one viewpoint: 1) symmetry of plane packs; 2) spaces between plane packs; 3) structural motives of Al_1 , Al_2 , etc.; 4) structures with coordination $3C$

USSR/Physics (Contd)

Jan 1947

numbers 8 and 12; 5) pseudosymmetry and twinning; and 6) new structures, based on the principle of plane packs.

12

50791

KITAYGORODSKIY, A.I.

USSR/Physics
Molecular Structures
Academy of Sciences

Feb 1947

"M. V. Vol'kenshteyn's Book, 'Structure of the Molecule'," A. I. Kitaygorodskiy, 1 p

"Uspekhi Fiz Nauk" Vol XXXIII, No 2

Vol'kenshteyn intended to interest student as well as physicist in structure of the molecule. In spite of shortcomings and some rather obvious mistakes pointed out by reviewer, book is noteworthy contribution to Soviet science. Published by Academy of Sciences as "Scientific Research Journal, Monograph Series," 1947, with 270 pages, 193 illustrations, and 49 photographic plates.

10

20193

KITAYGORODSKIY, A. I.

USSR/Chemistry - Organic Compounds
Chemistry - Crystals

Oct 1947

"Principles of Organic Crystallochemistry," A. I.
Kitaygorodskiy, Inst Org Chem, Acad Sci USSR, 2 pp

"Dokl Akad Nauk SSSR" Vol LVIII, No 1

Principle of solid packing limits symmetry of dis-
tribution of molecules in crystal. Formulates law of
crystallochemistry: crystals of organic compounds
can be locked upon as a system with a very solid form
of packed layers. Molecules of the layer have a
coordination number of 6 and are so distributed that
there is no polarity to a perpendicular layer. Submitted
by Academician A. N. Nesmeyanov, 21 Mar 1947.

22711

lines) mol. assoc. in the crystal and supplies information about the symmetry of the layer. (5) The correctness of the foregoing conclusions is illustrated by a survey of available data, with the admittedly possible exception of heavy compounds with org. radicals and of salts of org. bases. Beyond that, 11 literature instances of structure data of org. compounds which appeared to conflict with the principles stated under (1) are shown to be erroneous, and are replaced by new expl. structure data of the author, with the result that the conflict is resolved. The following list gives the complete, the reference of the structure data, considered to be erroneous, and the newly determined structure data. *2,4,6-Trinitrochlorobenzene* (Hertz and Bamber, C.A. 27, 2222) monoclinic; taking the width of the plate as the direction of the *c* axis, the cell is *a* = 11.59 = 0.04, *b* = 6.82 = 0.02, *c* = 14.82 = 0.02 Å, β =

124° 10', $\alpha = \lambda$, space group $C_2 = P2_1$, no systematic extinctions of the *hkl* type; N.'s measurements appear to be correct, his interpretations erroneous. *p-Nitrophenol* (Frand and Merchant, C.A. 22, 4827), *a* = 6.86 = 0.02, *b* = 14.20 = 0.04, *c* = 18.71 = 0.04 Å, space group $P2_1 = P_{212}$. *p-Phenylenediamine* (Casper, C.A. 22, 219), monoclinic, *a* = 8.46, *b* = 6.00, *c* = 22.2 Å, $\beta = 92^\circ$, space group $C_2 = P2_1/c$ and not $C_2 = P_{212}$. *Acetophenone* (Strukturbericht, 1), *a* = 7.24 = 0.02, *b* = 7.28 = 0.04, *c* = 18.7 = 0.1 Å, group $P2_1 = P_{212}$. *Acetylsalicylic acid* (Frand and Kapadia, C.A. 29, 4227), *a* = 9.4, *b* = 10.2, *c* = 12.2 (all = 0.05 Å), group $C_2 = P_{212}$. *Catechol* (Casper, C.A. 26, 2101) *a* = 11.04, *b* = 8.46, *c* = 10.15, $\beta = 115^\circ$, $\alpha = \lambda$, group $C_2 = P2_1/c$. *o-Nitrophenol* (Hermann and Durak, C.A. 22, 2982) paracrubic monoclinic, *a* = 8 Å, *b* = 10.0, *c* = 20 Å, $\beta = 90^\circ$, base centered, probable space group $C_2 = P2_1/c$. *Dinitrobenzene* (Hendricks and Ilshert, C.A. 26, 702); the data are correct with respect to the extinctions, but analysis of the intensities leads to the space group $C_2 = P_{212}$, not P_{212} . *Acetophenone* (Ohta, C.A. 22, 4872) monoclinic, *a* = 12.22, *b* = 3.92, *c* = 7.82 Å, $\beta = 102^\circ 43'$, $\alpha = \lambda$ (in agreement with Ito, C.A. 24, 2717), group $P2_1/c$. *Acetophenone* (Banerjee and Dey, C.A. 21, 4547), space group C_2 , not $P2_1$. *o-Phenylenediamine* (Casper, C.A. 22, 219) monoclinic, *a* = 8.25, *b* = 12.22, *c* = 22.2 Å, $\beta = 90^\circ$, space group $P2_1/c$. N. Then

CA 2

Crystal structure of diphenylmercury. A. J. Kital,
Sverdlovsk and D. R. Ordanich. *Dokl. akad. nauk. U.S.S.R.*
Chem. ser. chem. 1948, 202 (in Russian).—X-ray exam.
of Ph_2Hg crystals gives $a = 10.75 \text{ \AA}$, $b = 8.20 \text{ \AA}$, $c =$
 8.20 \AA , with vol. of elementary cell 690 \AA^3 , 2 mole. per
cell. Space group is C_{2h} with the Hg atom at the center
of symmetry in the crystal. The C-Hg-C angle appears
to be 180° with Ph rings in the same plane. O. M. K.

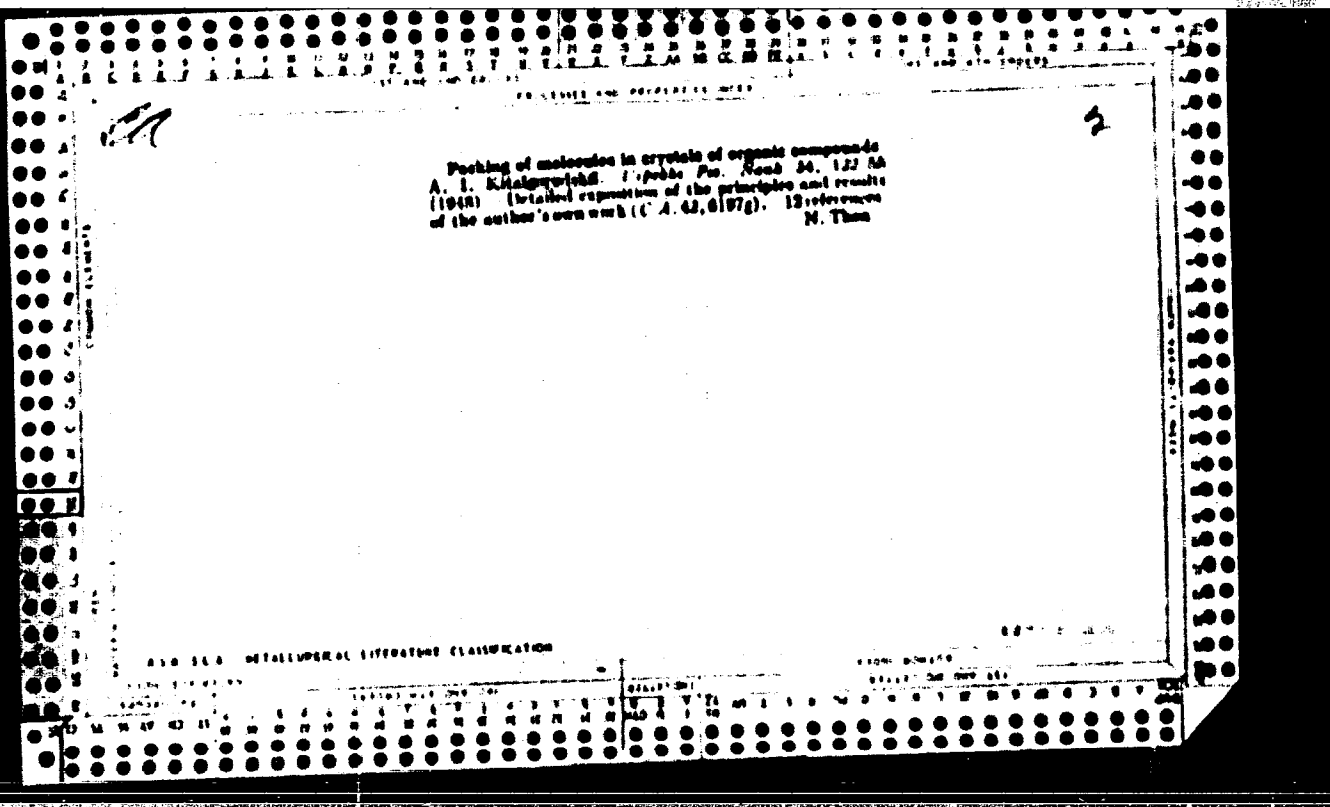
Also: Iz. Ak. Nauk SSSR, Otdel. Khim. Nauk No. 2, 1948

Inst. Organic Chem AS USSR

ALU-113 METALLURGICAL LITERATURE CLASSIFICATION

A

X-ray structure analysis of organic compounds. A. I. Kuznetsov. *Izvestiya Akad. Nauk SSSR Ser. Khim.* 1978, No. 11, 2118. (U.S.S.R. Chem. Abstr. 1979, 10:100000h) This review, largely a summary of the author's own work, discusses the

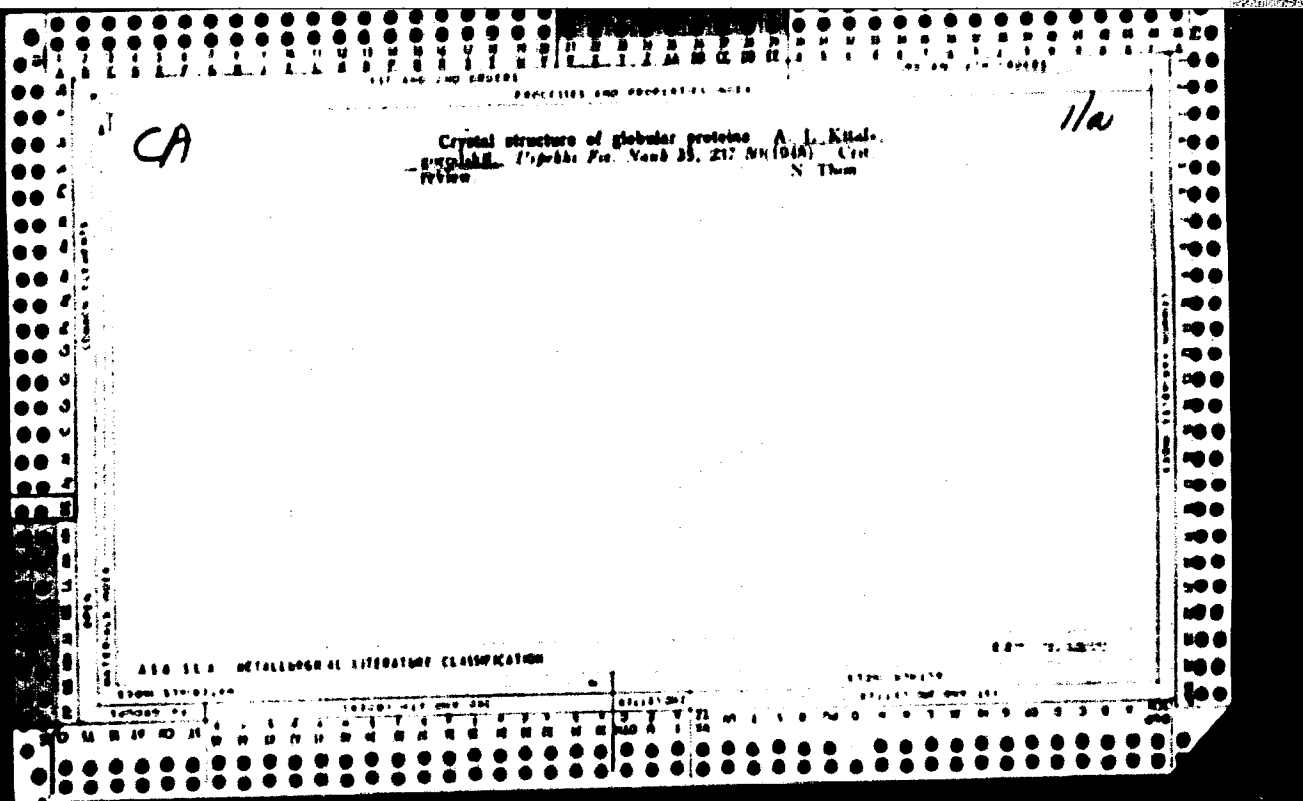


KITAYGORODSKIY, A. I.

"Review of W. T. Sproull's Book 'X-rays in Practice'." Uspekhi Fiz. Nauk 35,
No. 1, 1948.

KITAYGORODSKIY, A. I.

"Review of N. D. Papaleksi's Book 'Course in Physics, Vol 2,' Uspekhi Fiz. Nauk
35, No. 2, 1948.



KITAYGORODSKIY, A. I.

"Measurement of Roentgen Dispersion Caused by a Monocrystal with the Aid of a Geiger Counter," (British). Uspekhi Fiz. Nauk 36, No. 4, 1948.

KITAYGORODSKIY, A. I.

"The Structure of Matter," Nauka I Zhizn' No. 4, USSR, 1949.

LA

2

Crystallography of organic compounds VII
 Pseudosymmetry of the internal structure of crystals and its application in the structure analysis in the molecules of some organic compounds (acetophenone, p-nitrotol, γ -hydroquinone). A. I. Khalimovskii (Inst. Org. Chem., Acad. Sci. U.S.S.R., Moscow). (Sov. Acad. Sci. News S.S.S.R., *Chem. Abstr.* 1960, 548-51; *J. C.A.* 49, 548a). Although the symmetry of a crystal does not universally the x-ray extinctions, inferences as to symmetry based on the observation of extinctions involve, along with a probable symmetry, also further possible symmetries. Reflections $(h) \pm k \pm l$ in a monoclinic crystal of the class C_2 indicate a probable $2mm$ axis, with a point $s, \frac{1}{2} + y, z$ corresponding to each point xyz , but the possibility is left open for a group wherein a point $s + a, \frac{1}{2} + y, z + b$ corresponds to a point xyz . This latter relation is termed a "pseudotwin." In an analogous way, a pseudo- abp plane, perpendicular to the b axis, is defined by the correspondence $\frac{1}{2} + s, y + a, \frac{1}{2} + z$ to xyz , where, again, a can have any value; even though this relation does not correspond to a true symmetry, it will give rise to extinctions hkl at $h + l \neq 2n$ typical for the abp plane. A pseudo-center of symmetry can be defined if the points of a cell are divided into 2 groups, each of which forms a centered lattice of its own, e.g. with the correspondence $xyz \rightarrow s + \frac{1}{2}, y + \frac{1}{2}, z$ and $xyz \rightarrow s + \frac{1}{2}, y, z + \frac{1}{2}$; $h + l \neq 2n$ results in extinctions hkl on condition that both $h + k \neq 2n$ and $h + l \neq 2n$. The application of the concept of pseudosymmetry is illustrated by the following 2 examples: (1) Acenaphthene, ortho rhombic, $a = 8.3, b = 14.1, c = 7.3$ A., 4 mols. in the cell, extinctions $0kl$ at $l \neq 2n$ and $h0l$ at $h \neq 2n$. The probable symmetry

is C_2 but if one assumes a probable axis A , further possible symmetry groups are $C_2 = P_2mm, C_2 = P_2m, C_2 = P_2m$, and $C_2 = P_2m$. By the principle of close packing, and by considerations of geometry and dimensions, the first and second possibilities appear excluded. A symmetry P_2 with a simple symmetry axis along c and a pseudo- abp plane perpendicular to c is permissible on consideration of geometry but is invalidated by the analysis of intensities, the Patterson series on the ab plane having but one marked spot at $2x = 0.66$, not at 0.33 and 0.33. This leaves only the possibility C_2 with each occupying 2 mirror planes not related by symmetry, which gives rise to a pseudo-axis in 2 layers. (2) α -Naphthalene, monoclinic, $a = 13.0, b = 4.20, c = 13.4$ A., $\beta = 117^\circ 40'$, 4 mols. in the cell, extinctions hkl at $h \neq 2n, 0kl$ at $l \neq 2n$, and $h0l$ at $h \neq 2n$. The latter indicate a pseudo-symmetry plane, perpendicular to c with abp along c , and a true space group $P2_1/c$. The pseudo-symmetry is possible only if the center of the naphthalene ring lies at $x = 0.33, y = 0$, the origin being the inversion center of the crystal. The O atom must lie on the same line as the center of the ring. The structure is completely characterized by the coordinates of the mol. center $0.342, 0.0$, and the bond angles $\phi_1 = 34^\circ, \phi_2 = 63^\circ, \phi_3 = 74.5^\circ$. (3) γ -Hydroquinone, monoclinic variety (obtained by sublimation of the rhombohedral form through filter paper) $a = 13.2, b = 6.15, c = 8.05$ A., $\beta = 107^\circ$, extinctions (at variance with Caspar, *C.A.* 31, 3800) $h0l$, $0kl$, and $0kl$ at h, l , and $h \neq 2n, k \neq 2n$ at $h \neq 2n, 0kl$ at $l \neq 2n$; hkl at both $h + k \neq 2n$ and $h + l \neq 2n$. The 4 mols. of the cell must be so distributed that in the projection perpendicular to b repetition error

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every $a/2$, in the projection perpendicular to a c axis. Z , and there is a pseudo-center with part of the atoms centering at the other part of a ; by the dimensions of the cell, the $O-O$ pairs should be close to the a axis of the cell. These requirements are met by a structure with the centers of the hydrogen rings lying at $000, \frac{1}{2}, \frac{1}{2}, 0, \frac{1}{2}, 0, \frac{1}{2}, 0, \frac{1}{2}, \frac{1}{2}$, i.e. these centers form a centered cell. The division into 2 groups called for by the pseudo-center can be performed only in one way, namely 1 group involving the ring, the other the OH groups. If the latter were to lie on the line passing through the diam. of the ring, it would mean a true symmetry center, in conflict with observations. The only possible disposition is with the OH groups centering at the ring, etc. The $O-O$ line does not pass through the diam. of the ring. The extinctions $h0l$ at $h \neq 2n$ and $0k0$ at $k \neq 2n$ correspond to true symmetry elements, and the true space group is $P2_1/a$ with 4 mol. occupying in pairs unassociated pairs of inversion centers in the plane $z = 0$ and $z = \frac{1}{2}$. The O atoms must deviate from the diam. of the ring by at least 0.3 \AA , i.e. the angle of the C-O bond is not less than $11-12^\circ$; some decrease of that inclination may however be due, by a shift of the center of the electron cloud relative to the nucleus of the O atom, but that shift cannot amount to 0.3 \AA . N. Tern

ХИТАЙГОРОДСКИЙ
1959

**The Structure of Acenaphthene, and Certain Problems in Re-
gard to the Method of X-Ray Analysis (original text in Russian),
A. Y. Kovalovskii, J. Phys. Chem. (USSR) Sep '59 (23-9
ISSN); by 1959-1959; V. 11, No. 11 B.**

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Acenaphthene crystallizes in a spatial group of $C_{2v}^h \cdot P_{21}^2$, with four molecules in the nucleus whose dimensions are $a = 8.3$; $b = 13.66$; $c = 7.3$ A. The structure of acenaphthene is composed of two layers of molecules not interconnected with symmetrical operation. The symmetrical line of molecules lies on the surface of the crystal symmetry. The molecule of acenaphthene is flat, the distance between the groups of CH_2 equals 1.84 ± 0.4 A, and the width of benzoid nucleus equals 2.35 ± 0.1 A. The increase in comparison with the normal single C-C compound should be explained by the considerable tension present in the molecule. The reduction in width of the benzoid nucleus down to 6.66 A apparently is also connected with these tensions. An assumption should be made that the

organic molecule of the system is more flexible than required. The normal intervals for single and double-bonded compounds are accomplished only in simple structures and under tension. According to this it should be mentioned that the structure of naphthalene determined in relation to interatomic spaces is very inaccurate. It is also known that in naphthalene itself the benzoid-nuclei can be investigated only in first approximation as normal hexagons with a surface of 1.4 A.

ASB 518 METALLOGICAL LITERATURE CLASSIFICATION

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Crystalline structure of mercury alkyl halides. I. H. (Inden) and A. J. Khatyrovskii. *Zhur. Fiz. Khim.* 23, 1161-71 (1949); *U.S.S.R. 1970a*. Several x-ray methods applied to 0.010-cm thick plates of compds. prepd. according to Shiba and Joraki (*C.A.* 25, 1870) gave for tetragonal BiHgCl , BiHgBr , and PvHgCl (all belonging to space group $D_{2d} - P_{42m}$) a and c 4.88 and 9.26, 4.85 and 10.22, 4.90 and 10.22, and 4.70 and 13.09 Å, resp., and for rhombic BiHgCl ($C_{2v} - P_{mm}$) a 4.10, b 4.54, and c 18.16 Å. In the tetragonal crystals, Hg, halogens and the center of the alkyl radical are situated on the quaternary axis. The distances of Hg are 1.27, 1.31, 1.26, 1.22, and 1.26 Å, resp. The Hg-Cl, Hg-Br, and Hg-C distances are 2.68, 2.61, and 2.69 Å, all \pm 0.02 Å. The Bi, Bi, and Pv radicals seem to rotate about the c axis, but the rotation must be synchronized to avoid collisions. I. I. Shierman

KITAYGORODSKIY, A. I.

"Review of Ch. S. Barrett's 'Structure of Metals (Crystallographic Methods, Principles and Data)'." Uspekhi Fiz. Nauk 37, No 2, 1949.

KITAYGORODSKIY, A. I.

"Review of V. P. Tarasova and M. P. Shaskol'skaya's Translation of M. Burger's Book, 'Roentgen Crystallography'." Uspekhi Fiz. Nauk 37, No. 3, 1949.

KITAYGORODSKIY, A. I.

"The Fundamentals of Organic Crystallochemistry," received a D.I. Mendeleev Prize for 1948 and 1949.

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KITAYGORODSKIY, A. I.

IA 170T99

USSR/Physics - X-rays
Book Report

Mar 50

"M. Burger's Book, 'X-ray Crystallography,'"
A. I. Kitaygorodskiy

"Uspekhi Fiz Nauk" Vol XXXVII, No 3, pp 401-4

Book report of the Russian translation, by V. P. Taranova and M. P. Shaskol'skaya under editor-ship of M. M. Umanskiy, from subject English-language book. Printed at Moscow 1948 by State Publishers of Foreign Lit; 484 pp, 252 fig.

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KITAYGORODSKIY, A.

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USSR/Physics - Molecules
Mechanics

Aug 50

"Review of V. I. Pavlov's Book, 'Physics Course,'
Volume I," A. Kitaygorodskiy

"Uspekhi Fiz Nauk" Vol XLI, No 4, pp 565-569

Subject volume (published 1959, Gostekhizdat, 447 pp,
160 figures) is devoted to mechanics and molecular
physics. Part I is a chapter on hydrodynamics and
aerodynamics; Part II consists of 9 chapters, mainly
on molecular kinetic theory of structure of matter.

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New facts on interatomic distances in aromatic compounds. A. I. Khatayevich and S. S. Katskhisa (Inst. of Chem., Acad. Sci. U.S.S.R.). *Doklady Akad. Nauk S.S.R.* 71, 800-803 (1981). — The accepted tenet that, in aromatic compounds, all C—C distances are equal (1.37–1.38 Å), is refuted by new data on the structures of 1,5-dichloronaphthalene (I) and 1,5-dichloronaphthalene (II). In I, triclinic, space group C_2^2 , A_2 , $a = 15.10$, $b = 4.10$, $c = 14.2$ Å, $\beta = 92^\circ 56'$, no. of molecules in the cell 4, orientation of the mol. relative to the axes of the cell $\varphi_1 = -24^\circ 40'$, $\varphi_2 = 23^\circ 5'$, $\varphi_3 = 75^\circ 5'$, the C—C distances are C₁—C₂ = 1.32, C₂—C₃ = 1.16, C₃—C₄ = 1.32 and C₅—C₆ = 1.34 Å. In II, monoclinic, C_2^2 , A_2 , cell constants $a = 19.0$, $b = 4.06$, $c = 14.4$ Å, $\beta = 93^\circ 10'$, no. of molecules 4, orientation $\varphi_1 = -20^\circ 20'$, $\varphi_2 = -21^\circ$, $\varphi_3 = 75^\circ$, C₁—C₂ = 1.40, C₂—C₃ = 1.37, C₃—C₄ = 1.44, C₅—C₆ = 1.32, C₇—C₈ = 1.30, C₉—C₁₀ = 1.32, C₁₁—C₁₂ = 1.42. Evidently, the double bonds, characterized by the distances 1.32–1.34 Å, are to a large extent localized, and the single-bond distance is shortened. There is no over-all averaging of the bond distances as predicted by quantum-mechanics.

UMANSKIY, Ya. G., TRAPEENIKOV, A. I. and KITAYGORODSKIY, A. I.

Rentgenografiia (X-Rays Applied to the Industry), 310 p., Moscow, 1951.

PA 18/187

KITAYGORODSKIY, A. I.

USSR/Physics - Crystallography Mar/Apr 51

"Analyzing the Results From the Structural Investigation of Crystals," A. I. Kitaygorodskiy, Inst of Org Chem, Acad Sci USSR

"Is Ak Nauk SSSR, Ser Fiz" Vol XV, No 2, pp 157-163

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Dr

Results of structural investigations clarify the position of atoms in the elementary structural unit. The accuracy with which the coordinates of the "centers" of atoms are determined recently became the object of detailed investigations and discussions. Intra-atomic distances

LC 187/87

USSR/Physics - Crystallography (Contd) Mar/Apr 51

of complex structures have been determined with accuracy up to 0.01 Å in the best cases and 0.05 Å in others, by the complete use of all possible intensities of the reflected rays. Author discusses steric interaction (hindrance), flexibility of the valence angle, and analysis of the forces. Kitaygorodskiy's lecture was discussed by the following persons: V. I. Kasatochkin, Moscow, G. S. Zhdanov, Moscow, and M. V. Belov, Moscow; the latter: 2, in opposition to the 1st, agrees that Kitaygorodskiy has proposed a new method for the analysis of structure. Submitted at 3d All-Union Conference on Use of X-rays in Study of Materials held 19-24 Jun 50 in Leningrad. LC 187/87

PA 187T90

USSR/Physics - X-ray Analysis, Mar/Apr 51
Crystallographic

"Determination of Chemical Formulas by the Method of Roentgeno-Structural Analysis," A. I. Kitaygorodskiy, Yu. T. Sturchkov, Inst of Org Chem, Acad Sci USSR

"Tr Ak Nauk SSSR, Ser Fiz" Vol IV, No 2, pp 176-178

Authors have X-rayed hundreds of chem compds during the 38 years of the existence of roentgeno-structural analysis. Their main efforts have been directed toward detg the distances between atoms in molecules and crystals. In most cases the chem formula

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USSR/Physics - X-ray Analysis, Mar/Apr 51
Crystallographic (Contd)

can be detd by subject method if some orienting data is 1st known, as in the case of penicillin. Published at 3d All-Union Conference on Use of X-rays in Study of Materials held 19 - 24 Jun 50 in Leningrad

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