ACCESSION NR: AT4007051 S/2598/63/000/010/0278/0283

AUTHOR: Shorshorov, M. Kh.; Nazarov, G. V.

TITLE: Phase transformations in the weld-adjacent zone of alpha and alpha plus beta titanium alloys and criteria for selecting welding conditions

SOURCE: AN SSSR. Institut metallurgii. Titan i yego splavy*, no. 10, 1963. Issledovaniya titanovy*kh splavov, 278-283

ABSTRACT: In continuation of earlier work on other Ti alloys ("Titan i yego splavy*", vy*p. VII, Izd-vo AN SSSR, 1962, p. 226), the authors studied the kinetics of the phase transformations in the weld-adjacent zone of Ti alloys VT-5-1, VT-14, VT-14-1 and 48-0T3 by a dilatometric method. Analysis of the anisothermic transformations during continuous cooling under the conditions of the welding cycle showed that the temperature of onset of the $\beta \rightarrow \alpha'$ transformation decreases along an S-shaped curve with increasing cooling rate (4.5-260 degrees/sec.), and that the transformation is practically complete in a relatively narrow interval (50-100C below the temperature of onset for alloys VT-5-1 and 48-0T3, and 30-80C below for VT-14-1). The temperature of onset of this phase transformation also decreased with an increase in the content of nitrogen and oxygen in the alloy. In alloy VT-5-1, the temperature of onset of the hydride transformation (which did not appear in alloy VT-14-1) passed through a maximum with increasing cooling rate.

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ACCESSION NR: AT4007051

The effect of alloy composition (presence of Mo, V, etc.) and the parameters of the welding cycle on the structure and mechanical properties of the weld-adjacent zone were also investigated; an example of these results is shown in Fig. 1 of the Enclosure. On the basis of these results, the authors conclude that the α-alloys and α + β alloys of the martensitic class with a low content of alloying elements show high plasticity in the weld-adjacent zone over a wide range of optimal cooling rates (10-150 degrees/sec.) and duration of temperatures above the transformation point (8-40 seconds). As the content of gases and β-stabilizing elements in these alloys increases, the optimal range of the parameters contracts and the plasticity in the weld-adjacent zone decreases markedly both at high cooling rates (due to hardening) and at low cooling rates (due to superheating and sensitivity to grain growth). Thus, in alloy VT-14, the plasticity of the weld-adjacent zone increases with decreasing cooling rate, but always remains below that of the original metal, while in VT-14-1 (7.5% Mo) the plasticity is higher than that of the original metal at an optimal cooling rate. In the aging α + β alloys with an intermediate content of alloying elements, maximal plasticity is obtained at various cooling rates, depending on the type and content of β-stabilizing elements. Orig. art. has: 5 figures.

ASSOCIATION: Institut metallurgii AN SSSR (Metallurgical Institute, AN SSSR)

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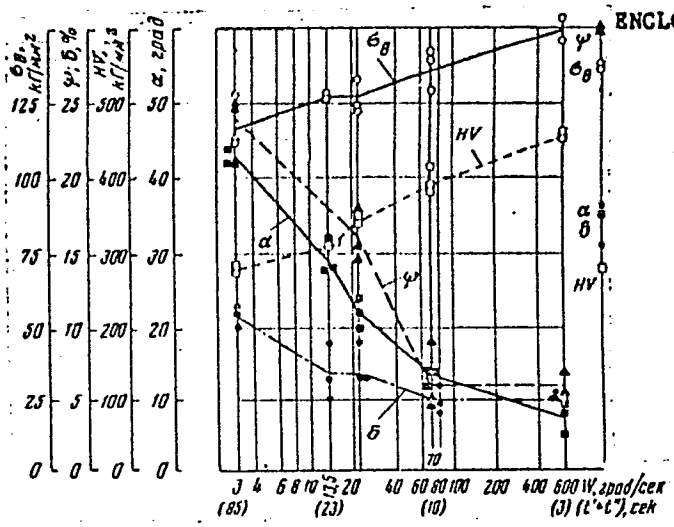
ACCESSION NR: AT4007051

ENCLOSURE: 01



Effect of cooling rate (W) at the onset of the $\beta \rightarrow \alpha'$ transformation and of duration of temperatures above this point ($t' - t''$) on the mechanical properties of the weld-adjacent zone in alloy VT-14 with 3.6% Mo and V. Units of the ordinates are: kg/mm^2, % elongation, kg/mm^2 and degrees, respectively; right-hand ordinate = original state; abscissa = W in degrees/sec. and $t' - t''$ in seconds.

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L 15321-65 EWT(m)/EWP(w)/EWA(d)/EWP(t)/EWP(b) ASD(m)-3/AFETR/AFTC(p) MJW/JD

ACCESSION NR: AP4047012 S/0135/64/000/010/0010/0013

AUTHOR: Russiyan, A. V., (Candidate of technical sciences); Matsnev, E. P. (Engineer); Shorshorov, M. Kh. (Doctor of technical sciences)

TITLE: On the susceptibility of KhN35VTYu and KhN60MVTYu alloys to hot crack formation in the weld adjacent zone during arc welding

SOURCE: Svarochnoye proizvodstvo, no. 10, 1964, 10-13

TOPIC TAGS: nickel alloy, heat resistant alloy, welding, weldability, KhN35VTYu alloy, KhN60MVTYu alloy, weldability test

ABSTRACT: An extensive series of experiments was conducted in an attempt to determine the effect of individual alloying elements, melting conditions, and the arc heat input on the weldability of KhN35VTYu or EI787 and KhN60MVTYu or EP202 with emphasis on their susceptibility to hot crack formation in the weld adjacent zone during arc welding. The EP202 alloy was found to have the better weldability. Under conditions of low heat input and a boron content not exceeding 0.001%, no hot cracks were formed in the weld adjacent zone. Although EI787 alloy has the same range of hot brittleness as EP202, it, nevertheless, is

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L 15321-65
ACCESSION NR: AP4047012

1 14

much more susceptible to hot cracking. Electroslag or vacuum melting considerably reduces this susceptibility but does not eliminate it completely, especially in welding rigid articles and with boron content of about 0.009%. Orig. art. has: 8 figures and 2 tables.

ASSOCIATION: none

SUBMITTED: 00 ENCL: 00 SUB CODE: MM, IE

NO REF SOV: 004 OTHER: 000 ATD PRESS: 3138

Card 2/2

L 56461-65 EWT(d)/EPA(s)-2/EWT(m)/EWP(w)/EWA(d)/EWP(v)/T/EWP(t)/EWP(k)/EWP(h)/EWP(z)/EWP(b)/EWP(l)/EWA(c) Pf-4 MJW/JD/HM/HW/EM

ACCESSION NR: AP5018627 UR/0135/64/000/012/0001/0004

AUTHOR: Shorshorov, M. Kh. (Doctor of technical sciences); Belov, V. V. (Engineer)

TITLE: Effect of technological factors on failure of the heat-affected zone in hardened steels

SOURCE: Svarochnoye proizvodstvo, no. 12, 1964, 1-4

TOPIC TAGS: metal fatigue strength, metal test, metal deformation, steel, metallurgic testing machine

Abstract: The IMET-4 machine was developed in 1959-1960 at the Institute of Metallurgy imeni A. A. Baykov for the comparative quantitative fatigue strength testing of metals. The machine permits the investigation of specimens in the post-treated state according to various temperature cycles with consideration of the effect of deformation, for example, after quenching, thermal cycle of welding (for the heat-affected zone), thermomechanical treatment, etc. Each of these methods of treatment is simulated in the machine on flat notched specimens by electric heating and stressing them at the required temperature in the cooling process with subsequent holding at a constant tensile stress until failure. By changing the load from specimen to specimen a strength-time relationship curve can be constructed

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in semi-logarhythmic coordinates and on it the minimum failure stress and time to failure at this stress can be determined.

In the tests under study the thermal cycles of the specimens differed from actual thermal cycles of welding steel by lower rates of heating and longer durations of the metal above the Ac_3 temperature which ensured, during a relatively low T_{max}, the size of austenite grains approximately the same size as grains in the heat-affected zone close to the line of fusion.

The effect of the degree of deformation of austenite on the fatigue strength was investigated in steels EI962A (15Kh12NMVFA) and 42Kh2GSNM. In the cooling process the specimens were stressed in the austenitic state in the 550-400°C range to 0, 15, 30, and 50 kg/mm^2; later, in the process of martensitic transformation in the 270-140 or 220-110°C ranges, as well as at 20°C, up to the full assigned stress. The cooling rate of the specimens was greater than the critical rate of quenching. Tests at high degrees of deformation practically coincided with the conditions of ausforming of hardened steels, but at low degrees -- to conditions of welding and ordinary quenching.

Measurement of the deformation kinetics of specimens in the process of stressing and testing indicated that in the first stressing period the deformation amounts to 70-90% of the total deformation. After complete cooling there is no noticeable macroscopic deformation in the under-load holding

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ACCESSION NR: AP5018627

process at room temperature. Most of the specimens failed during testing in the course of 10-12 hours after stressing; several specimens failed within 1-2 days. The fracture surface of the specimens has a grainy crystal structure, typical for brittle fracture.

Steel 42Kh2GSNM has the lowest resistance to delayed fracture at the deformation degree of austenite ε_ψ = 12-14%, ε_δ = 5-10%: $\sigma_{\rho\,min}$ = 49-50 kg/mm^2, t_ρ = 2 hours. From the lowest degree of deformation (ε_ψ = 2-8% and σ_δ = 2%) resistance to delayed fracture is increased insignificantly, $\sigma_{\rho min}$ is increased to ~57 kg/mm^2. This value is close to conditions at which austenite is deformed in the heat-affected zone during welding. With an increase in the degree of deformation (ε_ψ = 50% and ε_δ = 28%) the fatigue strength is sharply increased, the value of $\sigma_{\rho\,min}$ is increased to 107 kg/mm^2, and t_ρ becomes more than 24 hours. Consequently, even at this degree of deformation, ausforming increases the fatigue strength of steel by a factor of 2.

In steel 15Kh12NMVFA the relationship of $\sigma_{\rho\,min}$ to degree of austenite deformation has the same character. The lowest fatigue strength

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ACCESSION NR: AP5018627

7

($\sigma_{P\,min}$ = 90 kg/mm^2) appears at ε_φ = 9-14% and ε_δ = 4-7%. With an increase or decrease in the degree of deformation from these values, the resistance to delayed fracture is increased: at ε_φ = 5% and ε_δ = 2%, $\sigma_{P\,min}$ is increased up to 105 kg/mm^2 but at ε_φ = 25-30% and ε_δ = 12-14% -- up to 180-200 kg/mm^2, which is close to the tensile strength of steel in static fracture. This indicates that steel 15Kh12NMVFA, because of the lower content of carbon, does not become susceptible to delayed fracture at lesser degrees of austenite deformation than steel 42Kh2GSNM.

The effect of the structure state and parameters of the thermal welding cycle on fatigue strength was investigated on steels of the pearlite (35KhGSA, 40KhGSA, 45KhNMTA, 43Kh3SNMFA) and martensite (15Kh12NMVFA) classes. Specimens were subjected to the action of three thermal cycles which corresponded to the conditions of single-pass welding of sheets of small, medium, and large thickness.

The method and IMET-4 machine for fatigue testing made it possible to obtain comparative quantitative characteristics of resistance of hardened steels, to the formation of cold cracks in the heat-affected zone in related to the parameters of the welding conditions, and heat and thermomechanical treatment of weld joints.

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L 56461-65
ACCESSION NR: AP5018627

In steels with the high austenite stability and 0.3-0.5% carbon content, practically at any conditions of single-pass arc welding and surfacing, cracks can be prevented only by the self-tempering of the martensite during the welding process by means of slowing cooling rate or corresponding preheating rate.

In steels with the same carbon content, but with average or low austenite stability, during the welding of which the structural condition of the heat-affected zone is easily controlled, the absence of cracks for a decrease in the cooling rate is explained by the appearance of bainite and pearlite structures. When carbon content is low, cracks can be prevented in marsensitic steels not only by welding under variable, but also quite rigid conditions.

Delayed fracture and the formation of cold cracks occur most intensively at temperatures somewhat below room temperature.

With an increase of the acting stresses, but below the minimum fracture stress, the rate of development and completeness of recovery of the hardened metal in the heat-effected zone increases due to acceleration of the recovery process of microstresses and ordering of the grain boundary structure.

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L 56461-65

ACCESSION NR: AP5018627

Thermomechanical treatment is one of the new and effective ways to increase the resistance of weld joints of hardened steels to the formation of cold cracks. Orig. art. has 2 figures, 7 graphs, and 1 table.

ASSOCIATION: Institut metallurgii im. A. A. Baykova(Institute of Metallurgy)

SUBMITTED: 00 ENCL: 00 SUB CODE: MM

NO REF SOV: 006 OTHER: 000 JPRS

Card 6/6

SHONGHOROV, M. Ph.

Methods of quantitative evaluation of the resistance of metal joints and the weld-affected zone toward the formation of hot cracks. Avtom. svar. 17 no.12:8-16 D '64.
(MIRA 18:3)

1. Institut metallurgii im. A.A. Baykova.

L 38556-66 EWT(m)/T/EWP(w)/EWP(t)/ETI IJP(c) GD/JD

ACC NR: AT6012403 SOURCE CODE: UR/0000/65/000/000/0278/0288

44
43
B+1

AUTHORS: Shorshorov, M. Kh.; Meshcheryakov, V. N.

ORG: none

TITLE: Delayed failure of titanium alloys

SOURCE: Soveshchaniye po metallokhimii, metallovedeniyu i primeneniyu titana i yego splavov, 6th. Novyye issledovaniya titanovykh splavov (New research on titanium alloys); trudy soveshchaniya. Moscow, Izd-vo Nauka, 1965, 278-288

TOPIC TAGS: metal stress, elongation, material failure, titanium alloy, metal property, zirconium containing alloy, test method, aluminum containing alloy / IMYeT-4 test method, VT6S titanium alloy, OT4-1 titanium alloy, VT6 titanium alloy, VT14M titanium alloy

ABSTRACT: To clarify the mechanism of delayed failure of titanium alloys, previous work by M. Kh. Shorshorov and V. V. Belov (Vliyaniye tekhnologicheskikh faktorov na soprotivlyayemost' okoloshovnoy zony zakalivayushchikhsya staley zaderzhannomy razrusheniyu (metodika IMYeT-4). Svarochnoye proizvodstvo, 1964, No. 11) was continued by experimenting on 2-3 mm thick specimens using the IMYeT-4 method. Specimens of VT6S, Ti-Al-Zr, OT4-1, VT6, and VT14M titanium alloys containing different amounts of gases (O,N,H) were subjected to constant loads, and the time histories of stress and elongation were measured. Curves of ψ and σ_p as a function of time are presented for the different alloys containing 0.1--0.45% O, 0.03--0.1% N, and 0.002--0.05% H,

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L 38556-66

ACC NR: AT6012403

and the results are summarized in a comprehensive table. Sample photographs of microcracks which lead to eventual failure are shown, and the mechanism of delayed failure in the different alloys is discussed in detail. It was found that (based on the IMYeT-4 experiments) the titanium alloys can be placed in the following order with respect to delayed failure resistance: VT6S, alloys of the Ti-A-Zr system, VT6, and VT14M. Orig. art. has: 2 tables and 6 figures.

SUB CODE: 13/ SUBM DATE: 02Dec65/ ORIG REF: 011/ OTH REF: 004

Card 2/2

L 38555-66
ACC NR: AT6012402

by several diagrams for anisotropic phase transformations. The shapes of the phase diagrams (of four general types) are discussed in detail. The effects of titanium alloy composition and welding parameters on the structure and properties of welded seams are also discussed. Curves of the mechanical properties of the base metal as a function of time spent above the $\alpha \rightarrow \beta$ transformation temperature and as a function of the subsequent cooling rate are presented and discussed in terms of choosing effective welding parameters. Orig. art. has: 5 figures and 1 table.

SUB CODE: 13/ SUBM DATE: 02Dec65/ ORIG REF: 006

Card 2/2

ACC NR: AT6012404 SOURCE CODE: UR/0000/65/000/000/0289/0294

AUTHORS: Shorshorov, M. Kh.; Kainova, G. Ye.; Smirnov, B. A.; Meshcheryakov, V. N.

ORG: none

TITLE: Rational regimes of mechanical-thermal treatment of titanium alloy VT15 and its welded joints

SOURCE: Soveshchaniye po metallokhimii, metallovedeniyu i primeneniyu titana i yego splavov, 6th. Novyye issledovaniya titanovykh splavov (New research on titanium alloys); trudy soveshchaniya. Moscow, Izd-vo Nauka, 1965, 289-294

TOPIC TAGS: titanium alloy, metal property, metal welding, weld heat treatment/ VT15 titanium alloy

ABSTRACT: The effects of quenching temperature and subsequent mechanical-thermal treatment regimes on the structure and mechanical properties of titanium alloy VT15 and its welded joints were experimentally investigated on 2-mm thick specimens at the Metallurgy Institute im. A. A. Baykov (Institut metallurgii). After argon-arc welding (single pass), the specimens were quenched from 800, 1000, and 1200C in water, followed by aging (480C for 18 hrs, 560C for 15 min). Dilatometric and microstructural observations of the kinetics of phase transitions were made, and some results are presented and discussed. Based on these observations, several rational methods for increasing the strength and plastic properties of welded seams were attempted with the following

L 38557-66

ACC NR: AT6012404

results: 1) to obtain the highest mechanical properties (σ_b = 175--179 kg/mm^2, ψ = 6--10%), plastic deformation of the β-phase must be performed at 400--450C; 2) if the β-phase is deformed at room temperature, satisfactory properties (162--172, 10--20%) can be obtained by subsequent heating to 600--650C (for a short time); 3) increasing the quenching temperature from 800 to 1100--1200C decreases chemical nonuniformities and results in more uniform mechanical properties after mechanical-thermal treatment. Orig. art. has: 7 figures.

SUB CODE: 11, 13/ SUBM DATE: 02Dec65/ ORIG REF: 002

Card 2/2

SHORSHOROV, Mikhail Khrisanfovich. RYKALIN, N.N., red.; TRIFONOVSKIY, A.A., red.

[Metallography of welded steel and titanium alloys] Metallovedenie svarki stali i splavov titana. Moskva, Nauka, 1965. 335 p. (MIRA 18:8)

1. Chlen-korrespondent AN SSSR (for Rykalin).

L 34068-65 EPF(c)/EPF(n)-2/EPR/EPA(s)-2/EPA(w)-2/EWP(k)/EWA(c)/EWT(m)/EPA(bb)-2/EWP(b)/T/EWP(e)/EWP(v)/EWP(t) Pf-4/Pq-4/Pr-4/Ps-4/Pt-10/Pu-4/Pab-10
WH/WW/JD/HM/JG

ACCESSION NR: AP5007604 S/0363/65/001/001/0029/0036

AUTHOR: Rykalin, N. N.; Shorshorov, M. Kh.; Krasulin, Yu. L.

TITLE: Physical and chemical problems of joining different materials

SOURCE: AN SSSR. Izvestiya. Neorganicheskiye materialy, v. 1, no. 1, 1965, 29-36

TOPIC TAGS: welding, welding energy, welding theory, ceramic welding, glass welding, radiation welding

ABSTRACT: In a general review of the literature, the authors examine the theoretical aspects of controlling the joining of different solids by welding through a proper selection of temperature, time of phase contact, value of local plastic-elastic deformation, and the time of radiation. The process of joining two different materials is divided into 2 principal stages. In case of joining different materials, one of which is in the molten state, the relaxation period of the interphase energy, during which the diffusion is retarded, must be considered. Particular attention is paid to the welding of metals with glass or ceramics (e.g., Al with silica) and the welding of solid Ti with liquid Al. The authors conclude that these processes require a regulatable energy source to control the type of bond

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L 34068-65

ACCESSION NR: AP5007604

produced, but that more research is needed on the nature of the energy characteristics of the joining process and the development of processes using thermal, mechanical and radiation activation. Orig. art. has: 3 figures and 2 formulas.

ASSOCIATION: Institut metallurgii im. A.A. Baykova (Metallurgical institute)

SUBMITTED: 16Sep64 ENCL: 00 SUB CODE: IE, MM

NO REF SOV: 010 OTHER: 003

Card 2/2

L 26614-65 EWT(m)/EWP(w)/EWA(d)/EWP(v)/T/EWP(t)/EWP(k)/EWP(b) Pf-4 JXT(c,g)
ACCESSION NR: AP5005066 MJW/JD/HM S/0135/65/000/002/0007/0010

AUTHOR: Belov, V. V. (Engineer); Shorshorov, M. Kh. (Doctor of technical sciences)

TITLE: Evaluation of susceptibility of steel welds to cold crack formation by the methods of rigid specimens and IMET-4

SOURCE: Svarochnoye proizvodstvo, no. 2, 1965, 7-10

TOPIC TAGS: heat resistant steel, steel welding, steel weld, weld cracking steel, complex alloyed steel, super strength steel, weld crack resistance, weld cracking susceptibility

ABSTRACT: A study has been made of the susceptibility of steel welds to cold cracking. Several steels, including complex alloyed super-strength steels, 40KhGSNMTA and 30Kh2GSNVM, and heat-resistant steels 25Kh11M3F(ET801)* and 13Kh12N2MF, were tested (see Fig. 1 of the Enclosure). The CTS and "cross" tests and the IMET-4 test were used. It was concluded that the critical cooling rate can be used as criterion for evaluation of susceptibility to cold cracking but only in welding with a continucus cooling to room temperature. In welding

Card 1/4 *[Original paper gives ET801 instead of ET801]

with preheating or refrigerati..., the temperature of preheating and holding time and the temperature of refrigeration are the criteria. At identical conditions of preheating and refrigeration, even in welding under different conditions, the cooling rate of the heat-affected zone can be used as a criterion. In rigid tests, cold cracks appear at cooling rates corresponding to the formation of the structures with a comparatively high content of martensite. The cross test is much more rigid than CTS test; the cold cracks in the former test do not form only when cooling rates are 2—3 times lower and the martensite content is two times lower than in a CTS test. For steels with a high hardenability, the preheating temperature should be about 50C lower than the M_s temperature to ensure an adequate self-tempering of martensite and relaxation processes in welding with continuous cooling. Steels with a higher M_s temperature are generally less susceptible to cold cracking. The results of the IMET-4 test are in satisfactory agreement with those of the other tests used. Orig. art. has: 3 figures and 3 tables. [MS]

ASSOCIATION: Institut metallurgii im. A. A. Baykova (Institute of Metallurgy)

L 02[illegible] EWT(m)/EWP(w)/T/EWP(t)/ETI/EWP(k) IJP(c) JD/HW

ACC NR: AP6032455 SOURCE CODE: UR/0129/66/000/009/0030/0033

60
59
B

AUTHOR: Shorshorov, M. Kh.; Antipov, V. I.; Senin, A. M.; Belov, V. V.

ORG: Institute of Metallurgy, AN SSSR (Institut metallurgii AN SSSR)

TITLE: Polygonization of austenite subjected to low temperature thermomechanical treatment

SOURCE: Metallovedeniye i termicheskaya obrabotka metallov, no. 9, 1966, 30-33 and appropriate insert facing p. 49

TOPIC TAGS: polygonization, ~~mechanical treatment~~, high strength steel/15Kh11MF steel, 15Kh12NMVFA steel, 25Kh2GSNVM steel, 28Kh3SNMVFA steel

ABSTRACT: The effect of polygonization annealing on the properties of superstrength steels subjected to low temperature thermomechanical treatment (LTMT) has been investigated. The schematic layout of the continuous process combining LTMT and polygonization annealing (Author Certificate 155161) is shown in Fig. 1. Specimens of 15Kh11MF, 15Kh12NMVFA, 25Kh2GSNVM, and 28Kh3SNMVFA steels were heated to 1050, 1100 and 1200C and cooled in an air jet to 550C, at which temperature they were stretched by 30—37%, immediately rapidly reheated to 550—700C, kept at that temperature from 0 to 5000 sec (polygonization annealing), and then cooled in an air jet. It was found that polygonization annealing improved the strength only very

Card 1/2 UDC: 621.789.669.14.018.85

L 02980-67

ACC NR: AP6032455

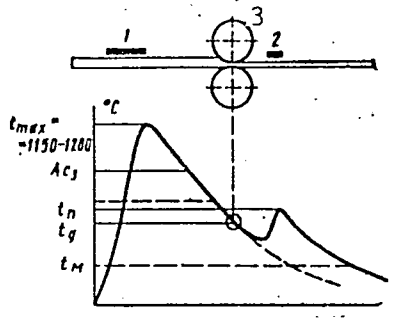

Fig. 1. Layout of continuous LTMT with polygonization annealing

1 - Inductor for recrystallization annealing; 2 - inductor for polygonization annealing; 3 - rolls.

slightly, but greatly increased the ductility. For instance, conventionally heat treated 25Kh2GSVM and 28Kh3SNMVFA steels had a tensile strength of 190 kg/mm^2 and 198 kg/mm^2 , and a reduction of area of 20% and 17%, respectively. The same steels, after LTMT but without polygonization, had a strength of 212 kg/mm^2 and 223 kg/mm^2, and a reduction of area of 26.8% and 26%, respectively. After polygonization annealing at 600C for 20—100 sec (optimal conditions), the strength was 217—218 kg/mm^2 and 225 kg/mm^2, and the reduction of area 36.6—38% and 34%, respectively. Orig. art. has: 4 figures and 1 table.

SUB CODE: 11/ SUBM DATE: none/ ORIG REF: 003/ ATD PRESS: 5099

Card 2/2

L 44307-66 EWT(m)/EWP(w)/T/EWP(t)/ETI IJP(c) JD

ACC NR: AP6019839 (N) SOURCE CODE: UR/0370/66/000/001/0165/0171

AUTHOR: Shorshorov, M. Kh. (Moscow); Belov, V. V. (Moscow)

ORG: none

TITLE: Energy characteristics of the delayed fracture of hardened steel

SOURCE: AN SSSR. Izvestiya. Metally, no. 1, 1966, 165-171

TOPIC TAGS: chromium steel, material fracture, atomic theory, crystal theory, metal stress / 40Kh chromium steel

ABSTRACT: The nature of cold cracks during the heat treatment and welding of hardening steels is now normally interpreted from the standpoint of the modern theory of delayed fracture. Further developing this theory, one of the authors (Shorshorov, M. Kh. Izv. AN SSSR, OTN, Metallurgiya i toplivo, 1962, no. 4) had offered the hypothesis that vacancies play a major role in the mechanism of the formation of microcrack nuclei along the grain boundaries, on showing that the considerable excess concentrations of vacancies in hardened steel stem from quenching from high temperatures and plastic deformation during martensitic transformation. Natural or applied stresses induce viscoelastic flow (shear formation) along the bound-

UDC: 669.156

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aries of grains oriented in the direction of action of these stresses, and they also induce the accumulation of triaxial normal tensile microstresses at transverse boundaries. The interaction between applied stresses and the field of these microstresses results in an energy gradient which causes the excess vacancies to migrate toward the transverse boundaries, so that the effectiveness of these boundaries as vacancy concentrators sharply increases. In this connection, the authors describe a series of experiments undertaken to analyze the activation energy of the process of delayed fracture of hardened steel. Flat specimens of 40Kh chromium steel were electrically heated to 1573-1603°K for 30-40 sec at the rate of 40-60 deg/sec, and then cooled in calm air at the rate of 35-45 deg/sec to the test temperature (373, 348, 323, 293, 273 and 77°K). During cooling the specimens were subjected to loads of 300 kg/mm^3 and higher. After such treatment all the specimens had the structure of martensite with residual austenite. Subsequent mechanical tests of the specimens showed that they are prone to delayed fracture only at near-room temperatures (273-348°K). The activation energy u_σ of the process of delayed fracture was estimated with the aid of an Arrhenius-Zhurkov equation, and analysis of the test findings showed that u_σ decreases from 0.77 to 0.63-0.59 and 0.39-0.34 ev when the applied stress σ increases from 0 to the minimum breaking stress σ_r^{min} = 300-400 kg/mm^2 and to σ = 900-1000 kg/mm^2, respectively. Approximate calculations of the activation energy of the movement of vacancies for 40Kh steel show that the activation energy for monovacancies is ~1.15 ev and for bivacancies, ~0.65 ev. Hence, as σ increases,

ACC NR: AP6035500 (N) SOURCE CODE: UR/0135/66/000/011/0011/0012

AUTHOR: Meshcheryakov, V. N. (Engineer); Shorshorov, M. Kh. (Doctor of technical sciences); Florinskiy, Yu. B. (Engineer)

ORG: Institute of Metallurgy im. A. A. Baykov (Institut metallurgii)

TITLE: Effect of the gas content on the susceptibility of Ti-Al-Zr welds to delayed failure and cold cracking

SOURCE: Svarochnoye proizvodstvo, no. 11, 1966, 11-12

TOPIC TAGS: titanium alloy, aluminum containing alloy, zirconium containing alloy, alloy welding, weld delayed failure, weld cold cracking, alloy weld

ABSTRACT: The susceptibility to delayed cold cracking in the heat-affected zone of the welds in alpha-titanium alloys of the Ti-Al-Zr system containing from 0.13—14 to 0.45% O_2 and from 0.002 to 0.15% H_2 has been investigated. Notched specimens with a TIG spot weld on each side of the notch were subjected to a prolonged tensile test under a constant stress and the plastic deformation was measured during the test as well as after rupture. The test results showed that increasing the oxygen content from 0.14 to 0.45% in a Ti-Al-Zr alloy at a low hydrogen content of 0.002% increased the rupture strength of both the base and the heat-affected zone metal from 68—69 to 80—84 kg/mm^2, and the time-to-rupture from 0.25—5 to 4—7 days (see Fig. 1). The reduction of area at rupture decreased only from 15—20% to 9—8%

UDC: 621.791.052.019:669.295.5

Card 1/3

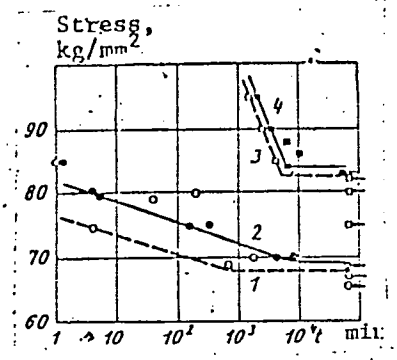

Fig. 1. Stress versus time-to-failure in Ti-Al-Zr alloy base metal (1, 3) and the heat-affected zone (2, 4) containing 0.13—0.14% (1, 2) or 0.45% (3, 4) oxygen.

which indicated that both the base and the heat-affected zone metals remain capable of plastic deformation and, consequently, stress relaxation. The insignificant increase in sensitivity to delayed cold cracking with increasing oxygen content is ascribed to a favorable effect of zirconium which forms a compound with oxygen, or reduces the effectiveness of dislocation pinning by oxygen atoms. Increasing the hydrogen content of alloys from 0.002 to 0.015% decreased the rupture strength of the base metal containing 0.1% and 0.29% O_2 by only 2—2.5 and 3.5—4 kg/mm², respectively. The metal in the heat-affected zone had a somewhat higher resistance to delayed cold cracking than the base metal, probably because of partial desorption

ACC NR: AM5027203 Monograph UR

Shorshorov, Minas Khachaturovich

Metallography in the welding of steel and alloys of titanium (Metallovedeniye svarki stali i splavov titana) Moscow, Izd-vo "Nauka", 1965. 335 p. illus., biblio. Errata slip inserted. 3000 copies printed.

TOPIC TAGS: titanium, titanium steel, titanium alloy, titanium welding, alloy welding, steel welding, phase transition, metal property, welding technology, welding inspection, weldability

PURPOSE AND COVERAGE: The book is intended for engineers, scientists and also for workers employed at machine, shipbuilding, defense and aviation industries and concerned with problems of welding of titanium steel and alloys. The book reviews the problems of phase transformations in titanium steels and alloys in nonequilibrium condition specific for welding technics, analyzes the methods of thermomechanical treatment applicable for welds and presents the new suggestions for preventing of cracks. Besides the book summarizes the results of the author's work at the Institute of Metallurgy imeni A. A. Baykov during 1952-1963.

Editor's Note: -4 5

Card 1/4 UDC: 669-15:621.791:669.14.018+669.295

SHORSHOROVA, E.D., inzh.; KLEPIKOV, V.I., inzh.

Electrodes for the hard facing of cutting tools. Svar. proizv. no.3:37-38 Mr '63. (MIRA 16:3)

1. Rostovskiy zavod sel'skokhozyaystvennogo mashinostroyeniya. (Hard facing) (Electrodes)

SHORTANBAYEV, A.D.

Potentialities for the increase of labor productivity in connection with mechanization of stoping operations. Ugol' 35 no.7:13-15 Jl '60. (MIRA 13:7)

1. Glavnyy inzhener kombinata Karagandaugol'.
(Karaganda Basin--Coal mines and mining--Labor productivity)
(Stoping (Mining)--Equipment and supplies)

SHORTANBAYEV, A.D.

Karaganda Basin miners are striving for an increase in labor productivity. Ugol' 36 no.9:4-6 S '61. (MIRA 14:9)

1. Glavnyy inzhener kombinata Karagandaugol'.
(Karaganda Basin--Coal mines and mining--Labor productivity)

SHORTANBAYEV, A.D.

Field and within-the- seam systems of seam development. Nauch. trudy KNIUI no.14:9-15 '64. (MIRA 18:4)

SHORYANTS, Nikolay Georgiyevich; BONAREV, N., red.; KUZNETSOVA, A., tekhn. red.

[Let's change our way of life and the methods of work] Rabotat' i zhit' po-novomu. Moskva, Mosk. rabochii, 1961. 46 p. (MIRA 14:9)

1. Sekretar' partkoma kolkhoza im. I.V.Stalina Lukhovitskogo rayona Moskovskoy oblasti (for Shoryants).
(Collective farms) (Lukhovitsy District--Rural conditions)

SHORYGIN, A.A. [deceased]

Biocoenosis. Biul.MOIP.Otd.biol. 60 no.6:87-98 N-D '55.(MLRA 9:3)
(ZOOLOGY--ECOLOGY) (MARINE BIOLOGY)

SHORYGIN, A. P.

LC

40T87

USSR/Physics Sep/Oct 1947
Electromagnets
Currents, Electric - Alternating

PA40T87

"Determination of the Parameter of Closed-circuit Windings in Alternating Current Electromagnets," A. P. Shorygin, 13 pp

"Avtomatika i Telemekhanika" Vol VIII, No 5

Magnitude of minimum momentary forces of attraction in alternating current electromagnets which are supplied by closed-circuit windings on terminals depends upon the relationship between reactive and inductive reactance of the closed-circuit winding, on relative magnitude of the area of the terminal which is pro-

LC

USSR/Physics (Contd) Sep/Oct 1947

40T87

tected and unprotected by the winding, and upon relative magnitude of the clearance opposite the area. In the article the indicated dependence is studied and the optimum value of parameters for three of the most interesting and frequent cases are found. The constancy of the main current of an electromagnet, the constancy of the magnetomotive force, and the constancy of necessary power. Simple formulas are deduced which combine the indicated parameters, the basic dimensions of the electromagnet and the closed-circuit winding.

40T87

ACC NR: AP6029552 SOURCE CODE: UR/0103/66/000/008/0152/0166

AUTHOR: Shorygin, A. P. (Moscow)

ORG: none

TITLE: Electrochemical elements

SOURCE: Avtomatika i telemekhanika, no. 8, 1966, 152-166

TOPIC TAGS: automatic control technology, electrochemistry, electronic component

ABSTRACT: Developments of the past 10--15 years in the application of electrochemical phenomena to the design of automatic control, measuring, and computing devices are reviewed. A variety of electrochemical components designed for reception of external effects, for data processing and storage, for generation, modulation, and detection of low- and infralow frequency processes, and some others are discussed. Due to their simplicity, low power consumption, flexibility of use, suitability for microminiaturization and for construction of matrix systems, these components are of great value in automatic devices. General characteristics of the electrochemical components are given, and the basic types of systems, the operational principles, areas of application, and existing limitations are pointed out. The most industrially promising components are described, as are the areas requiring further investigations. Orig. art. has: 6 figures, 1 table, and 9 equations.

SUB CODE: 09/ SUBM DATE: 13Apr66/ ORIG REF: 032/ OTH REF: 015

Card 1/1 UDC: 621.38:541.13

L 25645-66 EWT(d)/EWP(l)/IJP(c) BB/GG

ACC NR: AM6008325 Monograph UR/ 46 B+1

Shorygin, Andrey Pavlovich

Magnetic elements of computers (Magnitnyye elementy vychislitel'nykh mashin) Moscow, Izd-vo "Vysshaya shkola", 1965. 335 p. illus., biblio. 10,000 copies printed.

TOPIC TAGS: magnetic element, magnetic circuit, computer component, magnetic switch, shift register, ferrite transistor, computer circuit, magnetic storage, permanent storage, working storage

PURPOSE AND COVERAGE: This textbook has been approved by the Ministry of Higher and Special Secondary Education of the RSFSR for schools of higher engineering and especially for students in correspondence courses specializing in digital computers, automation, and telemechanics, and students taking refresher courses for graduate engineers. The book deals with theory and design methods for magnetic switching, magnetic shift registers, logical elements, and storage units using magnetic elements in which the principle of construction and operation is based on magnetic tape, disk, and drum recording. A. A. Papernov, V. A. Zhozhikashvili, P. A. Ionkin, M. V. Nemtsov, and Yu. M. Shamayev provided comments and advice; B. S. Sotskov showed constant interest in the work and offered valuable recommen-

Card 1/6

dations. References are listed by chapter in the bibliography.

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ACC NR: AM6008325

1. Magnetic-tape storage unit -- 280
2. Preparation of magnetic tape for recording -- 281
3. The magnetic recording process -- 283
4. The reproduction for magnetic recording and its characteristic features -- 289
5. Interference in magnetic-tape recording and methods of suppressing it -- 297
6. Properties of magnetic tape -- 300
7. Magnetic heads -- 302
8. Methods for recording information using a magnetic carrier -- 311
9. Recording and reproduction devices. Tape winders -- 315
10. Magnetic drums -- 318
11. Magnetic disks -- 325

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SUB CODE: 09/ SUBM DATE: 12Jul65/ ORIG REF: 095/ OTH REF: 082

Card 6/6 FV

SHORYGIN, Andrey Pavlovich; KRAKAU, T.K., dots., retsenzent; GOMOYUNOV, K.K., retsenzent; DANILOVA. V.V., red.

[Magnetic elements of computers] Magnitnye elementy vychislitel'nykh mashin. Moskva, Vysshaia shkola, 1965. 335 p. (MIRA 18:11)

1. Leningradskiy politekhnicheskiy institut im. M.I.Kalinina (for Krakau). 2. Kafedra inzhenernoy elektrofiziki Moskovskogo energeticheskogo instituta im. Molotova (for Gomoyunov).

TOPCHIYEV, A.V.,akademik, glavnyy redaktor; SOTSKOV, B.S.,doktor tekhnicheskikh nauk, otvetstvennyy redaktor; AGEYKIN, D.I.,redaktor; SUBBOTINA, G.V.,redaktor; SHORYGIN, A.P.,redaktor; YARMOL'CHUK, G.G., redaktor; KISELEVA, A.A.,tekhnicheskiy redaktor

[A session of the Academy of Sciences of the U.S.S.R. on scientific problems in automatization of production, October 15-20, 1956; scientific principles for setting up technical means of automatization] Sessiia Akademii nauk SSSR po nauchnym problemam avtomatizatsii proizvodstva, 15-20 oktiabria 1956 g.; nauchnye osnovy postroeniia tekhnicheskikh sredstv avtomatiki. Moskva, 1957. 186 p.
(MLRA 10:5)

(Automatic control)

SHORYGIN, A. S.

28123. SHORYGIN, A. S.-- novyye knigi po fizike i astronomii. (sistemat. i annotir. spisok). fizika v shokole. 1949, N. 4 S. 84-36.

SO: Letopis' Zhurnal'nykh Statey. Vol. 37, 1949.

LUKASHEVSKIY, V.A.; SHORYGIN, O.P.

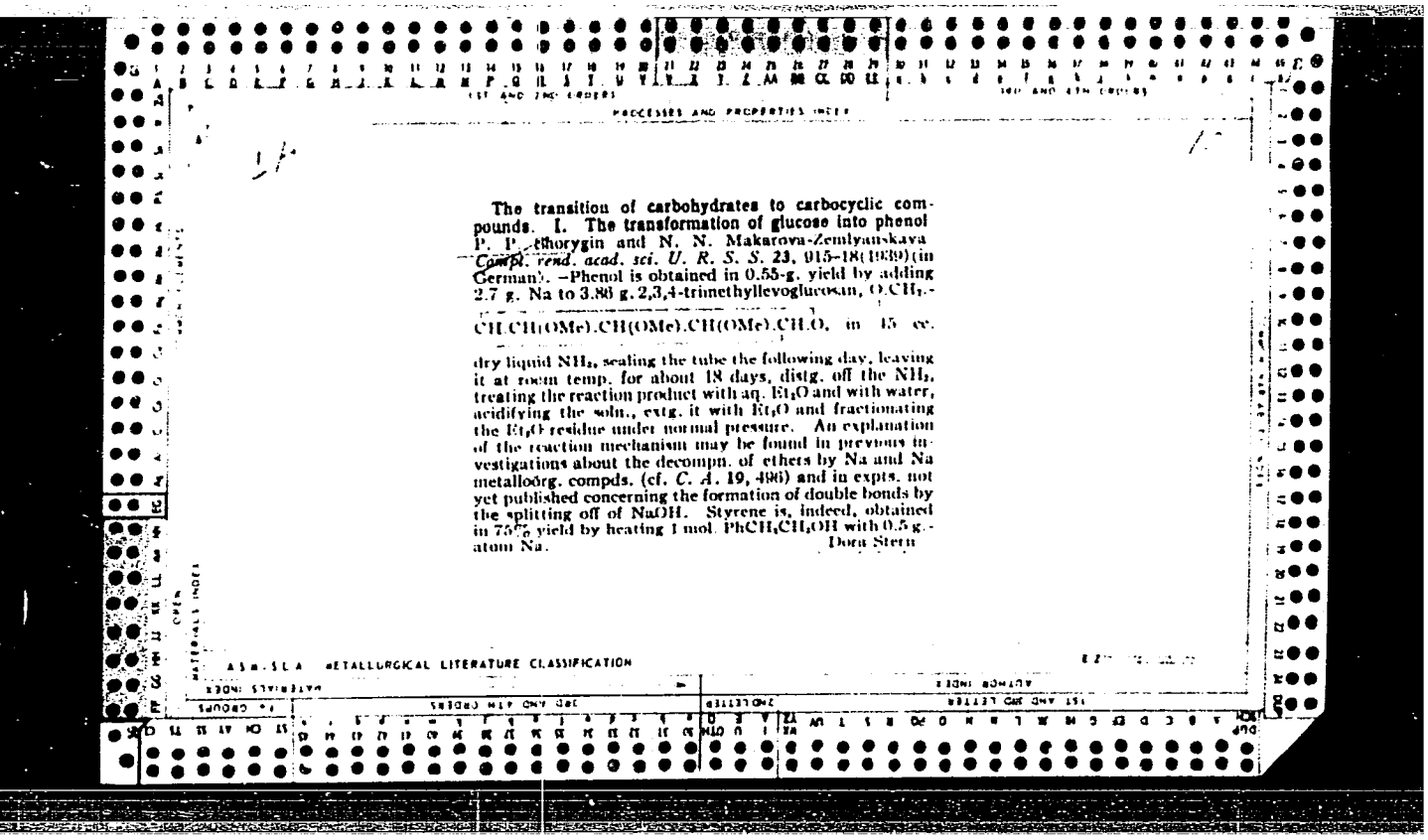
Investigating the statistical characteristics of irregular wind waves in a limited body of water. Trudy Okean kom. 9:69-83 '60. (MIRA 14:1)

(Waves)

IZUMRUDOVA, T.V.; DEREVENCHUK, L.N.; ARKHIPOVA, F.I.; SHORYGINA, N.N.

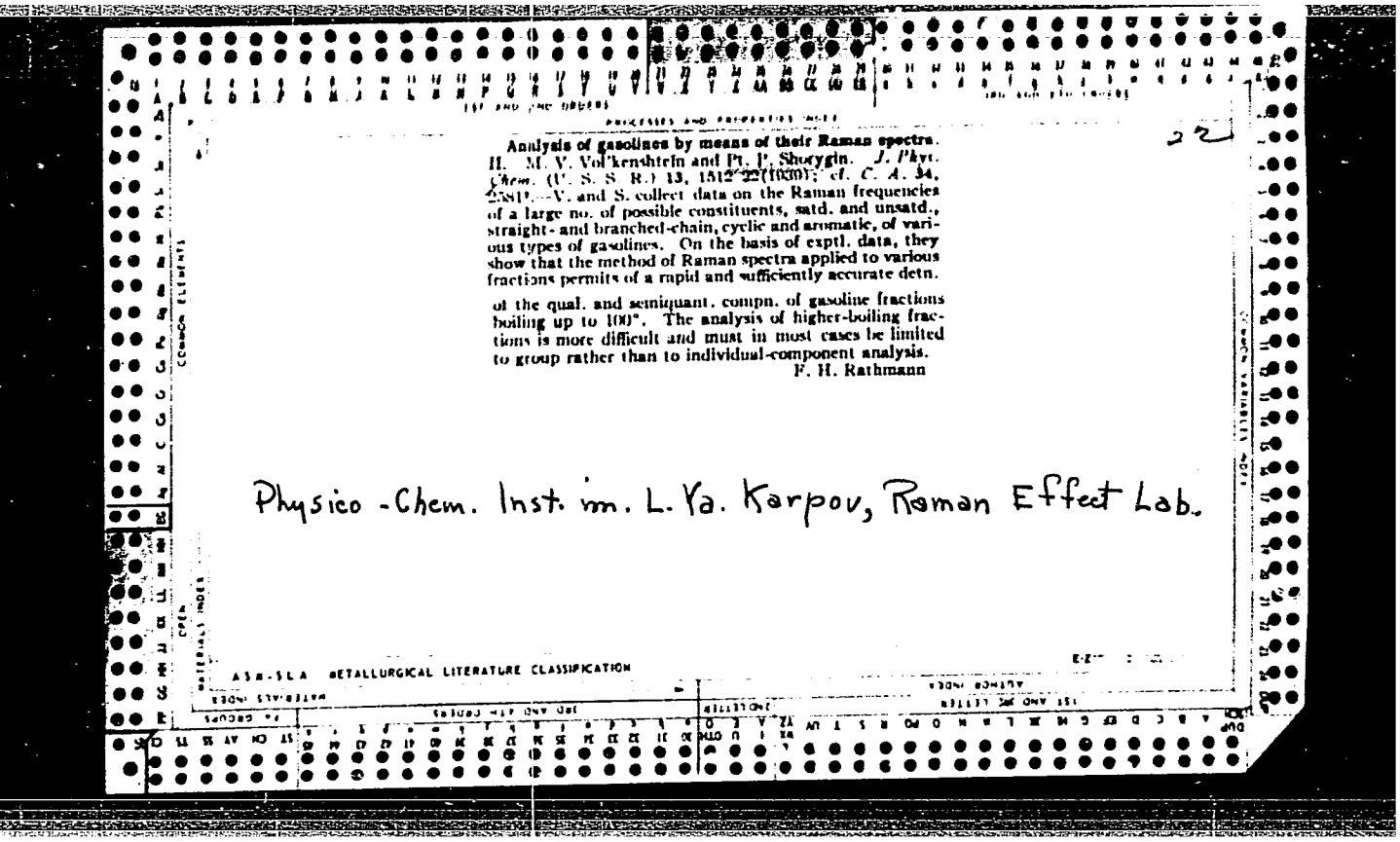
Modification of lignin for the purpose of obtaining a water-soluble derivative. Zhur.prikl.khim. 38 no.11:2614-2616 N '65. (MIRA 18:12)

1. Submitted March 12, 1965.



The transition of carbohydrates to carbocyclic compounds. I. The transformation of glucose into phenol P. P. Shorygin and N. N. Makarova-Zemlyanskaya *Compt. rend. acad. sci. U. R. S. S.* 23, 915–18(1939)(in German). —Phenol is obtained in 0.55-g. yield by adding 2.7 g. Na to 3.86 g. 2,3,4-trimethyllevoglucosan, $O.CH_2.CH(CH(OMe).CH(OMe).CH(OMe).CH.O$, in 15 cc. dry liquid NH_3, sealing the tube the following day, leaving it at room temp. for about 18 days, distg. off the NH_3, treating the reaction product with aq. Et_2O and with water, acidifying the soln., extg. it with Et_2O and fractionating the Et_2O residue under normal pressure. An explanation of the reaction mechanism may be found in previous investigations about the decompn. of ethers by Na and Na metalloörg. compds. (cf. *C. A.* 19, 496) and in expts. not yet published concerning the formation of double bonds by the splitting off of NaOH. Styrene is, indeed, obtained in 75% yield by heating 1 mol. $PhCH_2CH_2OH$ with 0.5 g.-atom Na.

Dora Stern



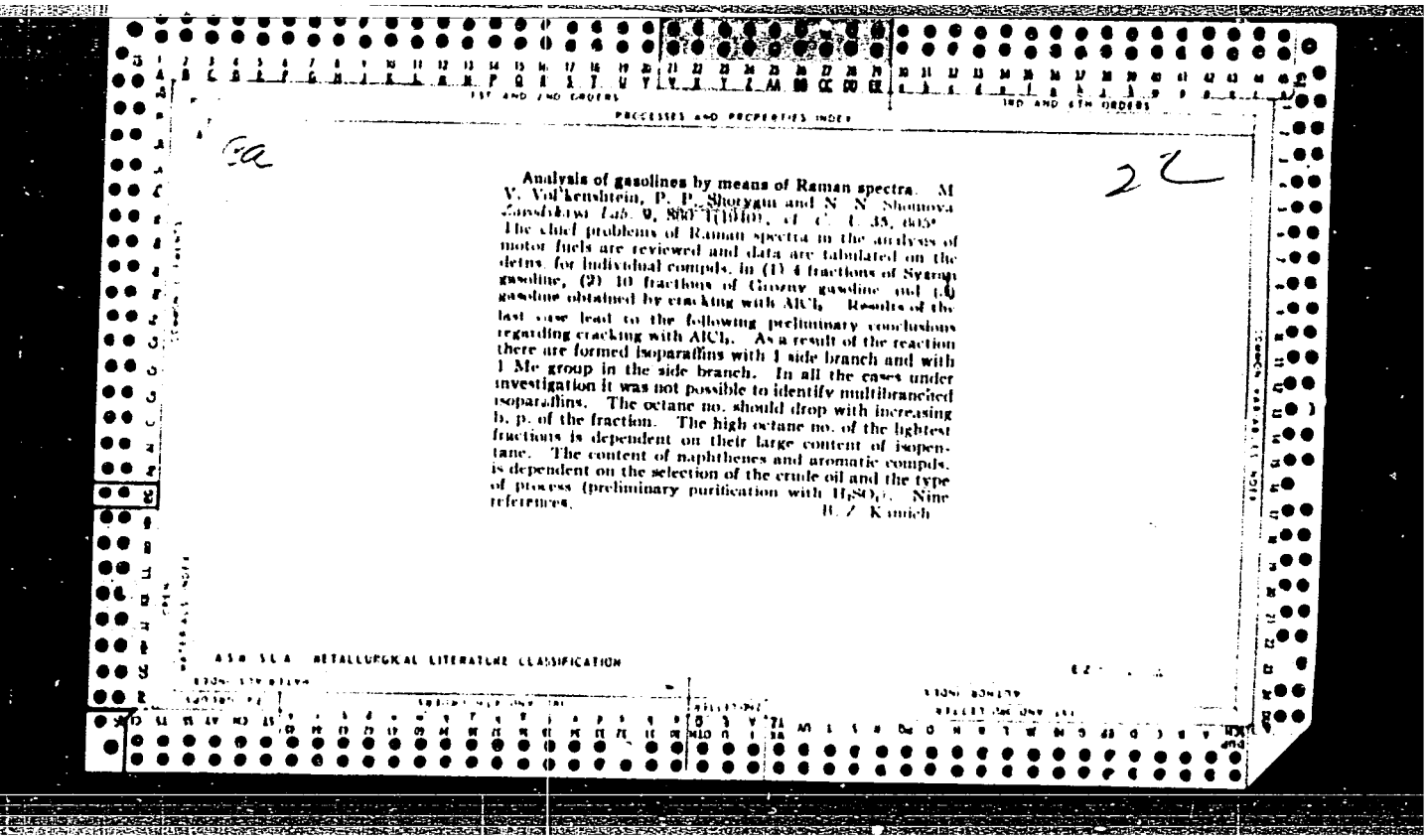
Analysis of gasolines by means of their Raman spectra. II. M. V. Vol'kenshtein and Pt. P. Shorygin. *J. Phys. Chem.* (U. S. S. R.) 13, 1512-22(1939); *cf. C. A.* 34, 2381⁹.—V. and S. collect data on the Raman frequencies of a large no. of possible constituents, satd. and unsatd., straight- and branched-chain, cyclic and aromatic, of various types of gasolines. On the basis of exptl. data, they show that the method of Raman spectra applied to various fractions permits of a rapid and sufficiently accurate detn. of the qual. and semiquant. compn. of gasoline fractions boiling up to 100°. The analysis of higher-boiling fractions is more difficult and must in most cases be limited to group rather than to individual-component analysis.

F. H. Rathmann

22

Physico-Chem. Inst. im. L. Ya. Karpov, Raman Effect Lab.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION



PROCESSES AND PROPERTIES INDEX

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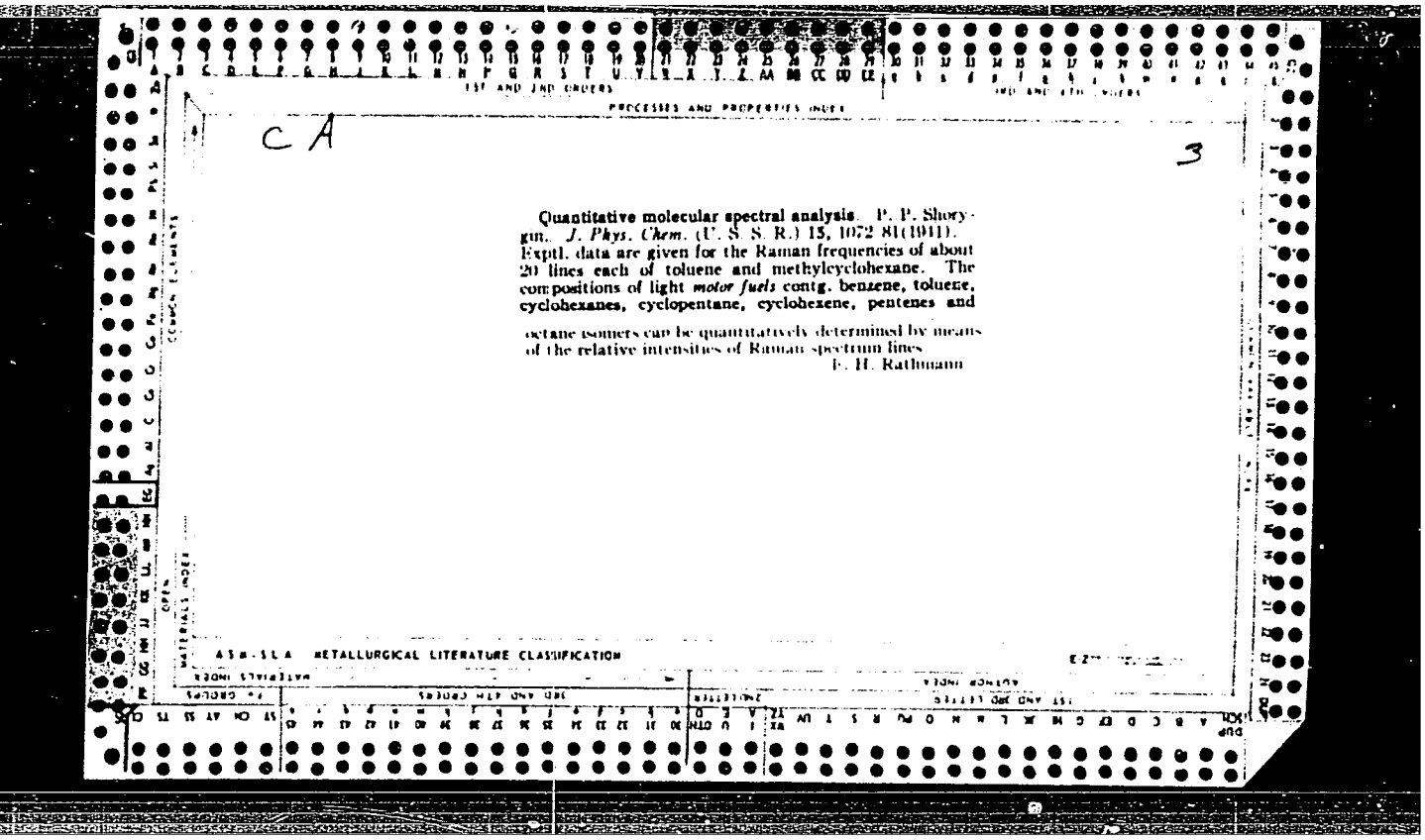
2L

Analysis of gasolines by means of Raman spectra. M V. Vol'kenshtein, P. P. Shorygin and N. N. Shumova. *Zavodskaya Lab.* 9, 865-71(1940). cf. C. A. 35, 605⁹. The chief problems of Raman spectra in the analysis of motor fuels are reviewed and data are tabulated on the detns. for individual compds. in (1) 4 fractions of Syzran gasoline, (2) 10 fractions of Grozny gasoline and (3) gasoline obtained by cracking with $AlCl_3$. Results of the last case lead to the following preliminary conclusions regarding cracking with $AlCl_3$. As a result of the reaction there are formed isoparaffins with 1 side branch and with 1 Me group in the side branch. In all the cases under investigation it was not possible to identify multibranched isoparaffins. The octane no. should drop with increasing b. p. of the fraction. The high octane no. of the lightest fractions is dependent on their large content of isopentane. The content of naphthenes and aromatic compds. is dependent on the selection of the crude oil and the type of process (preliminary purification with H_2SO_4). Nine references.

B. Z. Kanich

ASM SLA METALLURGICAL LITERATURE CLASSIFICATION



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3

Quantitative molecular spectral analysis. P. P. Shorygin. *J. Phys. Chem.* (U. S. S. R.) 15, 1072-81(1941). Exptl. data are given for the Raman frequencies of about 20 lines each of toluene and methylcyclohexane. The compositions of light *motor fuels* contg. benzene, toluene, cyclohexanes, cyclopentane, cyclohexene, pentenes and octane isomers can be quantitatively determined by means of the relative intensities of Raman spectrum lines.

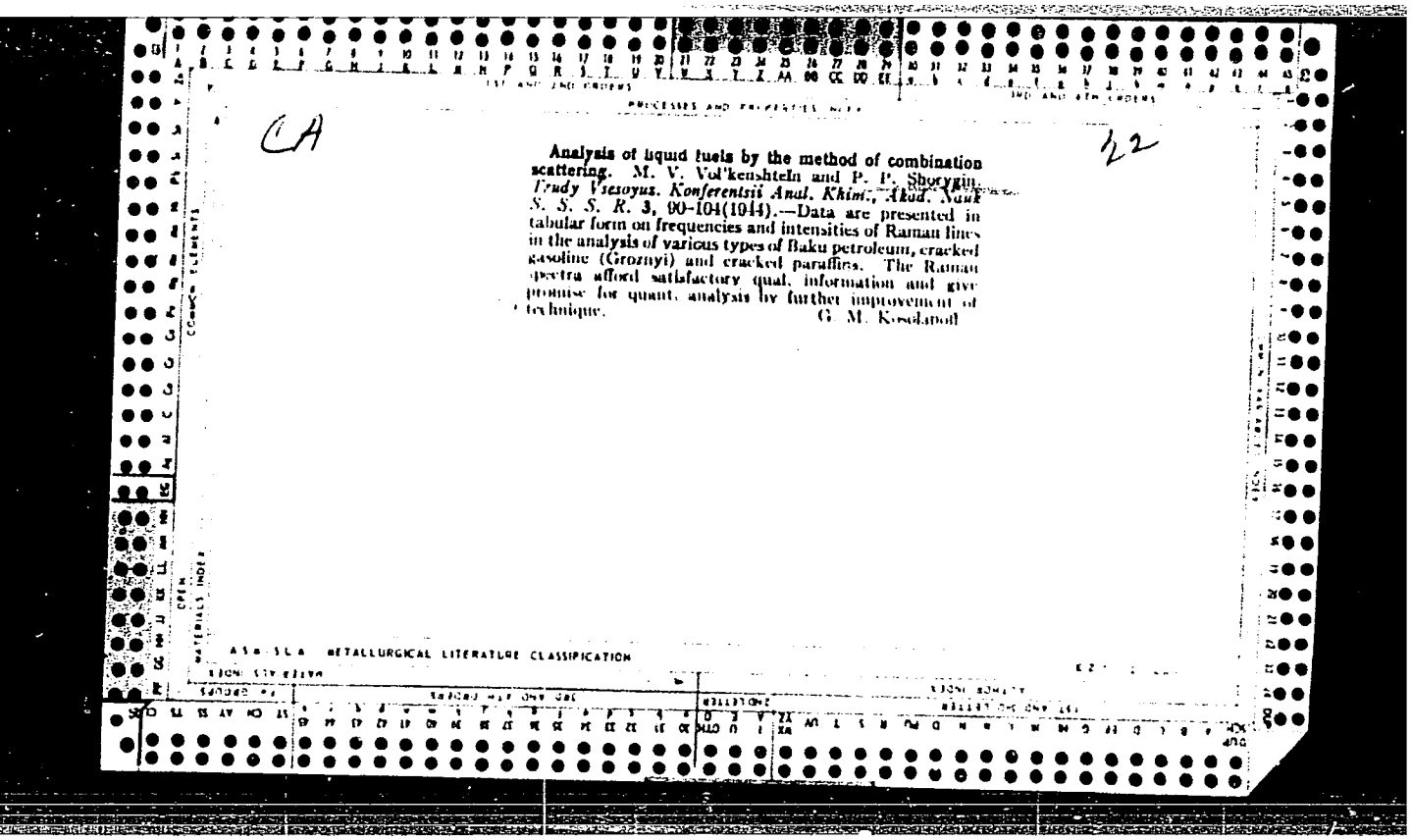
F. H. Rathmann

[redacted]

SHCRYGIN, F. F.

SHCRYGIN, F. F. CA: 37-1650/T
(Karpov Inst. Physical Chem., Moscow)
Acta Physicochim. URSS 16, 12-25 (1942) - in English
Quantitative molecular spectral analysis.

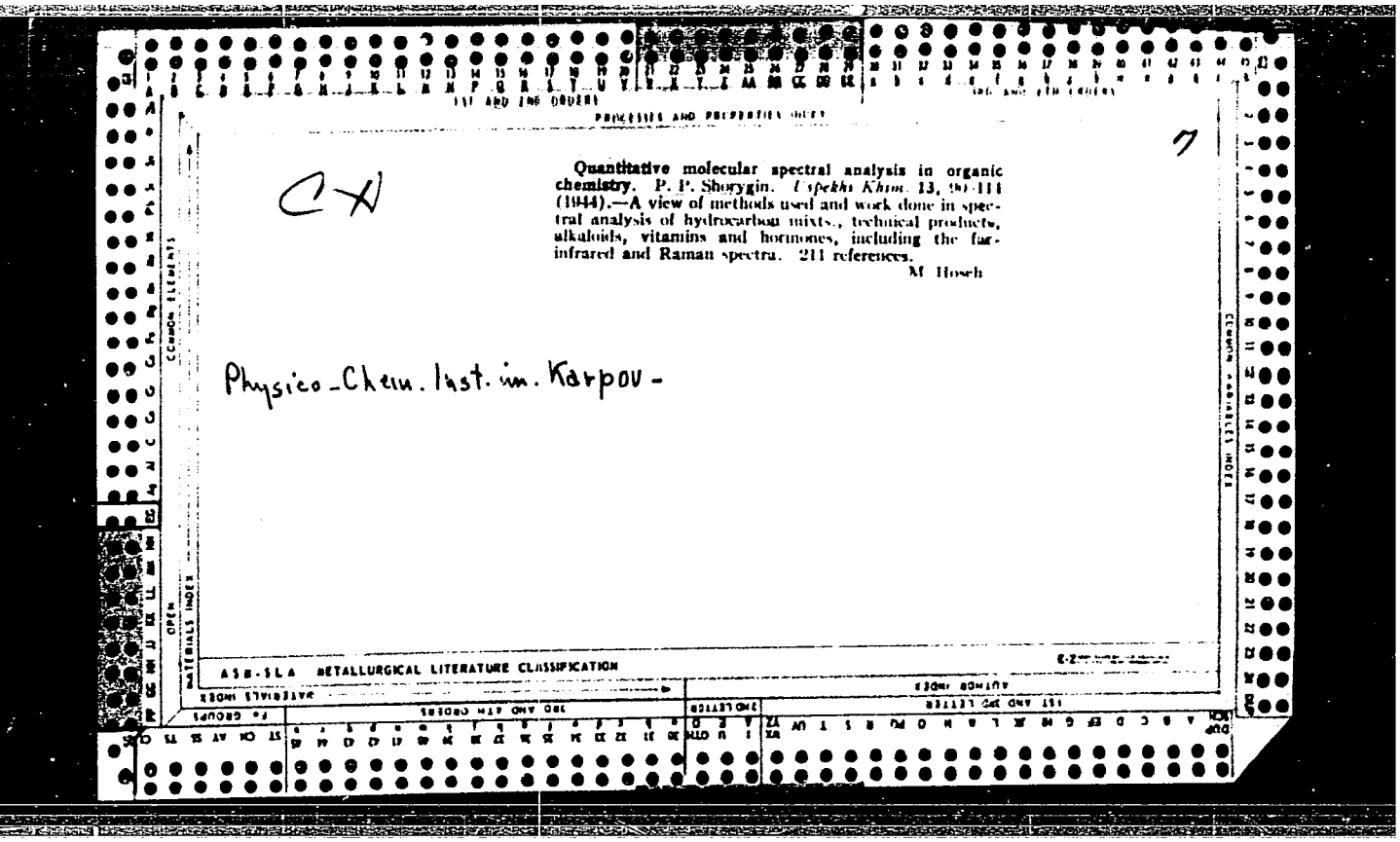
[redacted]



CA

22

Analysis of liquid fuels by the method of combination scattering. M. V. Vol'kenshtein and P. P. Shorygin. *Trudy Vsesoyuz. Konferentsii Anal. Khim., Akad. Nauk S. S. S. R.* 3, 90-104(1944).—Data are presented in tabular form on frequencies and intensities of Raman lines in the analysis of various types of Baku petroleum, cracked gasoline (Groznyi) and cracked paraffins. The Raman spectra afford satisfactory qual. information and give promise for quant. analysis by further improvement of technique.
G. M. Kosolapoff



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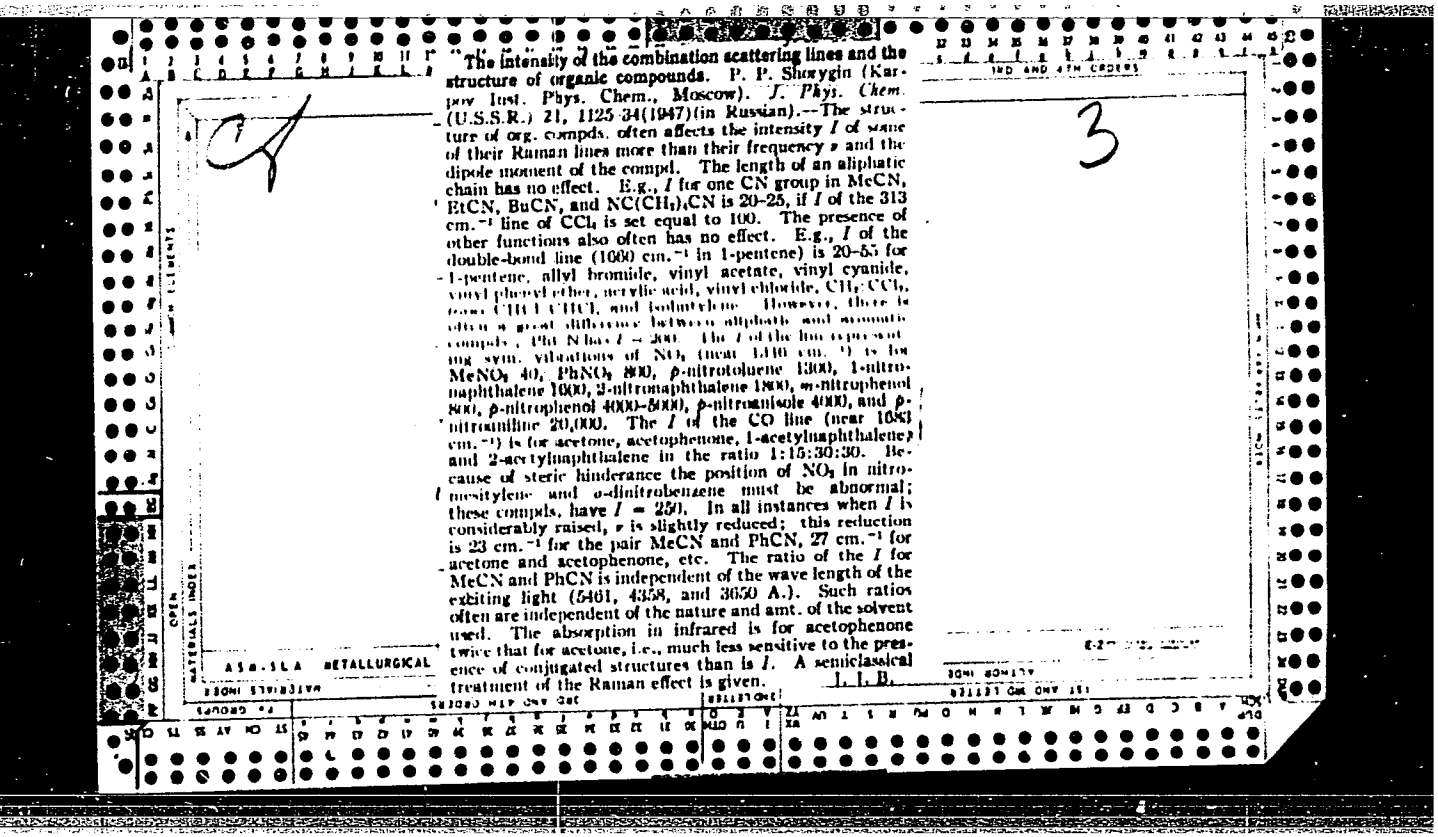
7

Quantitative molecular spectral analysis in organic chemistry. P. P. Shorygin. *Uspekhi Khim.* 13, 90-111 (1944).—A view of methods used and work done in spectral analysis of hydrocarbon mixts., technical products, alkaloids, vitamins and hormones, including the far-infrared and Raman spectra. 211 references.

M. Hosch

Physico-Chem. Inst. im. Karpov -

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION



"The intensity of the combination scattering lines and the structure of organic compounds. P. P. Shorygin (Karpov Inst. Phys. Chem., Moscow). *J. Phys. Chem.* (U.S.S.R.) 21, 1125-34(1947)(in Russian).--The structure of org. compds. often affects the intensity I of some of their Raman lines more than their frequency ν and the dipole moment of the compd. The length of an aliphatic chain has no effect. E.g., I for one CN group in MeCN, EtCN, BuCN, and $NC(CH_2)_4CN$ is 20–25, if I of the 313 cm.$^{-1}$ line of CCl_4 is set equal to 100. The presence of other functions also often has no effect. E.g., I of the double-bond line (1660 cm.$^{-1}$ in 1-pentene) is 20–55 for 1-pentene, allyl bromide, vinyl acetate, vinyl cyanide, vinyl phenyl ether, acrylic acid, vinyl chloride, $CH_2:CCl_2$, trans $ClHC:CHCl$, and isobutylene. However, there is often a great difference between aliphatic and aromatic compds., PhCN has I = 200. The I of the line representing sym. vibrations of NO_2 (near 1410 cm.$^{-1}$) is for $MeNO_2$ 40, $PhNO_2$ 800, p-nitrotoluene 1300, 1-nitronaphthalene 1000, 2-nitronaphthalene 1800, m-nitrophenol 800, p-nitrophenol 4000–5000, p-nitroanisole 4000, and p-nitroaniline 20,000. The I of the CO line (near 1683 cm.$^{-1}$) is for acetone, acetophenone, 1-acetylnaphthalene, and 2-acetylnaphthalene in the ratio 1:15:30:30. Because of steric hinderance the position of NO_2 in nitromesitylene and o-dinitrobenzene must be abnormal; these compds. have I = 250. In all instances when I is considerably raised, ν is slightly reduced; this reduction is 23 cm.$^{-1}$ for the pair MeCN and PhCN, 27 cm.$^{-1}$ for acetone and acetophenone, etc. The ratio of the I for MeCN and PhCN is independent of the wave length of the exciting light (5461, 4358, and 3650 A.). Such ratios often are independent of the nature and amt. of the solvent used. The absorption in infrared is for acetophenone twice that for acetone, i.e., much less sensitive to the presence of conjugated structures than is I. A semiclassical treatment of the Raman effect is given.

L. I. B.

SHCRYGIN, P. T.

SHCRYGIN, P. P. CA: 44-4333/c
Izvest. Akad. Nauk SSSR, Phys. Ser. 12, 576-81 (1948)
Study of the energy distribution in Raman spectra scattering.

SHORYGIN, P. P.

PA 55/49T89

USSR/Physics Aug 48
Dispersion Spectrum

"Research on the Combination Dispersion Spectra of Naphthalene Derivatives," P. P. Shorygin, Physicochem Inst imeni L. Ya. Karpov, Moscow, 8 3/4 pp

"Zhur Fiz Khim" Vol XXII, No 8, pp 917-925

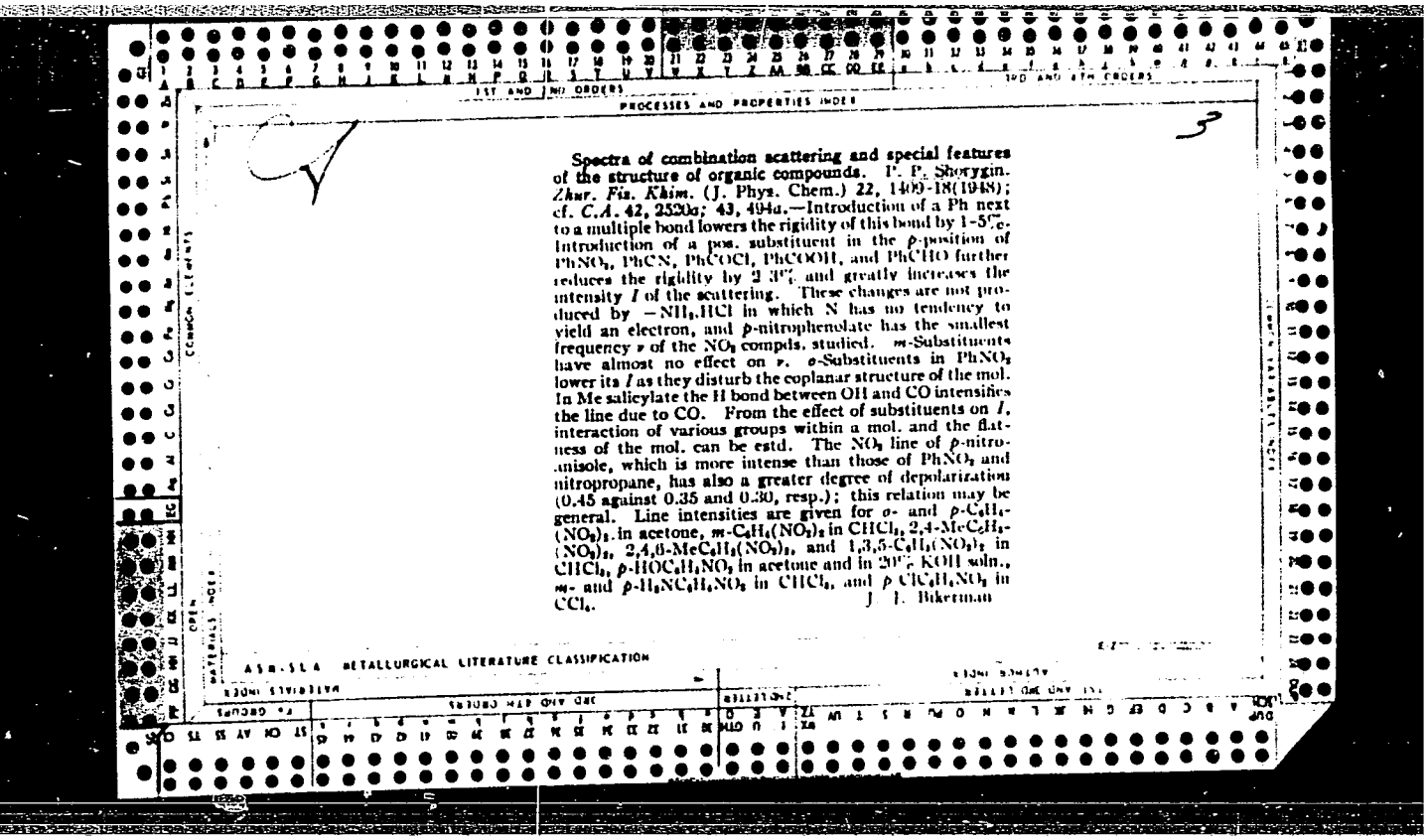
Spectral analysis reveals no great difference in the structure of carbonyl and nitro groups of naphthalene and benzene derivatives. Author takes exception to Manzoni's conclusions on the intramolecular hydrogen bond in naphthyl ketones. Studies spectra of two nitrotetralenes. New

55/49T89

USSR/Physics (Contd) Aug 48

Methods used to study spectra are based on line intensity determination, effect of intramolecular interaction on frequencies, accurate frequency measurement, and comparison of spectra. Submitted 9 Dec 47.

55/49T89



PROCESSES AND PROPERTIES INDEX

Spectra of combination scattering and special features of the structure of organic compounds. P. P. Shorygin. *Zhur. Fiz. Khim.* (J. Phys. Chem.) 22, 1409-18(1948); cf. *C.A.* 42, 2520a; 43, 494d.—Introduction of a Ph next to a multiple bond lowers the rigidity of this bond by 1-5%. Introduction of a pos. substituent in the *p*-position of $PhNO_2$, PhCN, PhCOCl, PhCOOH, and PhCHO further reduces the rigidity by 2-3% and greatly increases the intensity *I* of the scattering. These changes are not produced by $-NH_3.HCl$ in which N has no tendency to yield an electron, and *p*-nitrophenolate has the smallest frequency ν of the NO_2 compds. studied. *m*-Substituents have almost no effect on ν. *o*-Substituents in $PhNO_2$ lower its *I* as they disturb the coplanar structure of the mol. In Me salicylate the H bond between OH and CO intensifies the line due to CO. From the effect of substituents on *I*, interaction of various groups within a mol. and the flatness of the mol. can be estd. The NO_2 line of *p*-nitroanisole, which is more intense than those of $PhNO_2$ and nitropropane, has also a greater degree of depolarization (0.45 against 0.35 and 0.30, resp.); this relation may be general. Line intensities are given for *o*- and *p*-$C_6H_4(NO_2)_2$ in acetone, *m*-$C_6H_4(NO_2)_2$ in $CHCl_3$, 2,4-$MeC_6H_3(NO_2)_2$, 2,4,6-$MeC_6H_2(NO_2)_3$, and 1,3,5-$C_6H_3(NO_2)_3$ in $CHCl_3$, *p*-$HOC_6H_4NO_2$ in acetone and in 20% KOH soln., *m*- and *p*-$H_2NC_6H_4NO_2$ in $CHCl_3$, and *p*-$ClC_6H_4NO_2$ in CCl_4.

J. J. Bikerman

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

CA

Effect of molecular interaction on the spectra of combination scattering of light. P. P. Shorygin. *Zhur. Fiz. Khim.* 23, 873-84(1949). cf. *C.A.* 43, 2959d. To determine the effect of solvents on the frequency ν of Raman spectra these were measured within ±0.5 cm.$^{-1}$; the exciting line was Hg 4358.3 A. The ν of weakly polar substances is little affected by soln.; e.g., the C:C line of styrene is 1630.7 1631.1 in melt, $PhNO_2$, $COMe_2$, and CCl_4. In strongly polar substances the lines not related to the polar groups have ν which are independent of the solvent while the lines belonging to the polar groups are greatly affected. Thus, the 1001.0 and 1599.3 lines due to the C_6H_5 ring) of PhCOMe are almost unaltered in 5% solns in cyclohexane (I), CCl_4, $COMe_2$, and MeOH, while the 1683.2 line of C:O is 1695 in hexane and I, 1681 in $CHCl_3$, about 1690 in $CHCl_2CO_2H$ (II) (20% soln.), etc., it is split in two in MeOH and AcOH. These data contradict those of Kohlrausch, *C.A.* 35, 6187.) $COMe_2$ behaves similarly to PhCOMe. The shift of ν by solvents is almost identical for PhCN and MeCN (lines 2228.8 and 2252.0, resp.) but the order of solvents is for nitriles different from that for ketones. The ν of C:O taking part in a H bond also is shifted; thus the line 1677.5 of Me solvolate becomes 1681, 1680.5, and 1677 in hexane, MeCN and II, resp.; the small effect of II shows that the H bond is not broken by acids. The ν 507.6, 590.3, 593.3, 622.0 and 795.3 of MeBr, EtBr, PrBr, iso C_4H_9Br, and 1-bromononane resp., are increased by dissolving in 9 parts hexane by 6.5, 7, 4, 2, and 4; the effect is smaller the smaller the vol. concn. of C-Br in the liquid. The line 847.0 of *trans* CHCl:CHCl is shifted to 849 by hexane and 845 by $COMe_2$ although the dipole moment of the mol. is independent of the normal coordinate. On the contrary the line 656.2 of CS_2 is not affected by C_6H_{14}, hexane, and $COMe_2$. The solvent effect cannot be attributed to the dielec. const. of the solvent; all the previous theories of the effect are refuted by expt. Orientation of dipoles, their deformation in the field of other dipoles, and mutual effect of vibrations of identical dipoles must be considered. The shift of ν is approx. proportional to the concn. of the solvent (expts. on $PhNO_2$ in MeOH and on PhCOMe in hexane). The rise of temp. to 170° has almost no effect on ν of PhCOMe and $PhNO_2$.

I. J. Bikerman

CA

3

Line intensity in Raman spectra and structural analysis. P. P. Shorygin. *Izvest. Akad. Nauk S.S.S.R., Ser. Fiz.* 14, 383–4(1950).—Examples of investigations of line intensities which shed light on the structure of org. mols. are: the absence of salt formation in weak org. acids and bases; the valence state of the N atom joined to a benzene ring; problems of coplanarity; differences in character between nitro groups in *o*- and *p*-nitrotoluene and in picric acid; presence of conjugated bonds. S. Pakswer

CA

Spectroscopic investigation of isomers of pentachlorophenolchlor (pentachlorophenyl hypochlorite). P. P. Shorygin and M. I. Gostev (Karpov Phys.-Chem. Inst., Moscow). *Zhur. Fiz. Khim.* 24, 938–42(1959).—The combination scattering spectra of Cl_5C_6OH and 2 isomers of Cl_5C_6OCl (I) were detd. The data confirmed the phenolic structure of I m. 51° and the cyclohexadienone structure of the isomer m. 106°. Paul W. Howerton

C.A.

Spectroscopic investigation of the anions of benzoic acids. A. I. Finkel'shtein and P. P. Shorygin (L. Ya. Karpov Physico-Chem. Inst., Moscow). *Doklady Akad. Nauk S.S.S.R.* **73**, 759-62(1950).—The following Raman spectra have been detd. for the Na salts in aq. soln. BzO⁻ (I), 406(2), 463(?), 497(1), 619(3), 633(?), 833(4), 901(1), 942(1), 1004(8), 1025(1), 1142(2), 1160(0), 1216(1), 1323(0), 1396(10), 1491(1), 1545(1), 1600(8), 2875(1), 3076(1); p-$NO_2C_6H_4CO_2^-$ (II), 705(1), 862(2), 1106(4), 1276(1), 1345(10), 1382(2), 1599(7), 2868(2), 3084(1); p-$NH_2C_6H_4CO_2^-$ (III), 422(0), 507(1), 602(1), 707(1), 850(4), 938(0), 1036(2), 1107(0), 1145(3), 1183(2), 1285(2), 1349(2), 1386(10), 1521(3), 1559(0), 1610(10), 2879(5), 3079(1); p-$C_6H_4(CO_2^-)_2$ (IV), 322(1), 388(1), 488(1), 594(0), 634(3), 709(1), 807(1), 856(4), 1023(1), 1104(2), 1127(5), 1399(8), 1443(0), 1511(1), 1550(2), 1608(10), 2870(3), 3080(1). The 1396 cm.⁻¹ frequency of I and its intensity (about twice that of the 313 line of CCl_4) correspond to the group CO_2^- conjugated with the ring, and must therefore be assigned to the sym. valence vibration of the CO_2^- group. Hence, in the case of AcOH, it is the 1413 cm.⁻¹ line of AcOH, and not 1347, which corresponds to the sym. valence vibration, in contradiction with the assignment of Hibben, and in agreement with Kohlrausch. In contrast to the CO_2H group, the CO_2^- group on a benzene ring is electropos. This follows from the lowering of the frequency of the NO_2 group in II as compared with that same frequency in $PhNO_2$, and more conclusively from the more than 3-fold increase of the intensity of the 1345 cm.⁻¹ band from $PhNO_2$ to II. Hence, CO_2^- should be, in contrast to CO_2H, an ortho-para directing substituent; an indication to that effect is the chlorination of BzOH in dil. aq. soln. in an alk. medium (Saint-Evre, *Ann. chim. phys.*, Sér. 3, 25, 485(1808); Lasser, *Chem. Zentr.* 1903, II, 1224), yielding mainly ortho-para products. Comparison of the frequencies of the sym. valence vibration of the CO_2^- group in AcO^-, I, II, III, and IV, i.e. 1413, 1396, 1382, 1386, and 1399, with the dissocn. consts. of the acids, leads to the conclusion that the increased acidity of I and II as compared with AcOH must be a shift of an electron to the ring in the anions. The lowering of the frequency in III may be due either to strong intermol. interaction or to a decreased C—O bond strength. N. Thon

3

SHORYGIN, P.P.

185T11

USSR/Chemistry - Analytical Mar 51

"Importance of Vibrating Sublevels of Effective Electron Levels to the Line Intensity of Spectra of Combination Scattering of Light," P. P. Shorygin, Physicochem Inst imeni L. Ya. Karpov, Moscow

"Zhur Fiz Khim" Vol XXV, No 3, pp 341-344

Examn of quantum treatment of combination scattering of light and role of vibrating sublevels of effective levels of electron excitement established agreement with conclusions of semi-classical treatment. Group of upper vibrating

185T11

USSR/Chemistry - Analytical (Contd) Mar 51

sublevels has components opposite in sign and almost compensatory to components of group of lower sublevels. Compensation decreases as exciting frequency is increased. Combination scattering of light is possible because of greater proximity of vibrating sublevels in levels of electron excitement and because of dependence of electronic natural functions of these levels on vibrating state of sublevel.

185T11

SHORYGIN, P. P.

PA 197T28

USSR/Chemistry - Molecular Compounds Dec 51

"Employment of Investigation of the Intensity of Lines of Combination Scattering of Light for the Study of Molecular Compounds," P. P. Shorygin, A. Kh. Khalilov, Phys Chem Inst imeni L. Ya. Karpov, Moscow

"Zhur Fiz Khim" Vol XXV, No 12, pp 1475-1478

Investigation of Raman spectra, with special emphasis on line intensity, revealed that in solns of aniline in HCOOH and AcOH and solns of p-nitroanaline in AcOH, mol compds, not real salts, are formed. Data on intensity of 1,600 cm-1 band of

LC 197T28

USSR/Chemistry - Molecular Compounds Dec 51
(Contd)

benzene ring can be used to solve problem of valency state of N atom added to ring. Data on intensity of nitro-group band can be used to ascertain character of substituents in p-position.

LC 197T28

SHORYGIN, P. P.

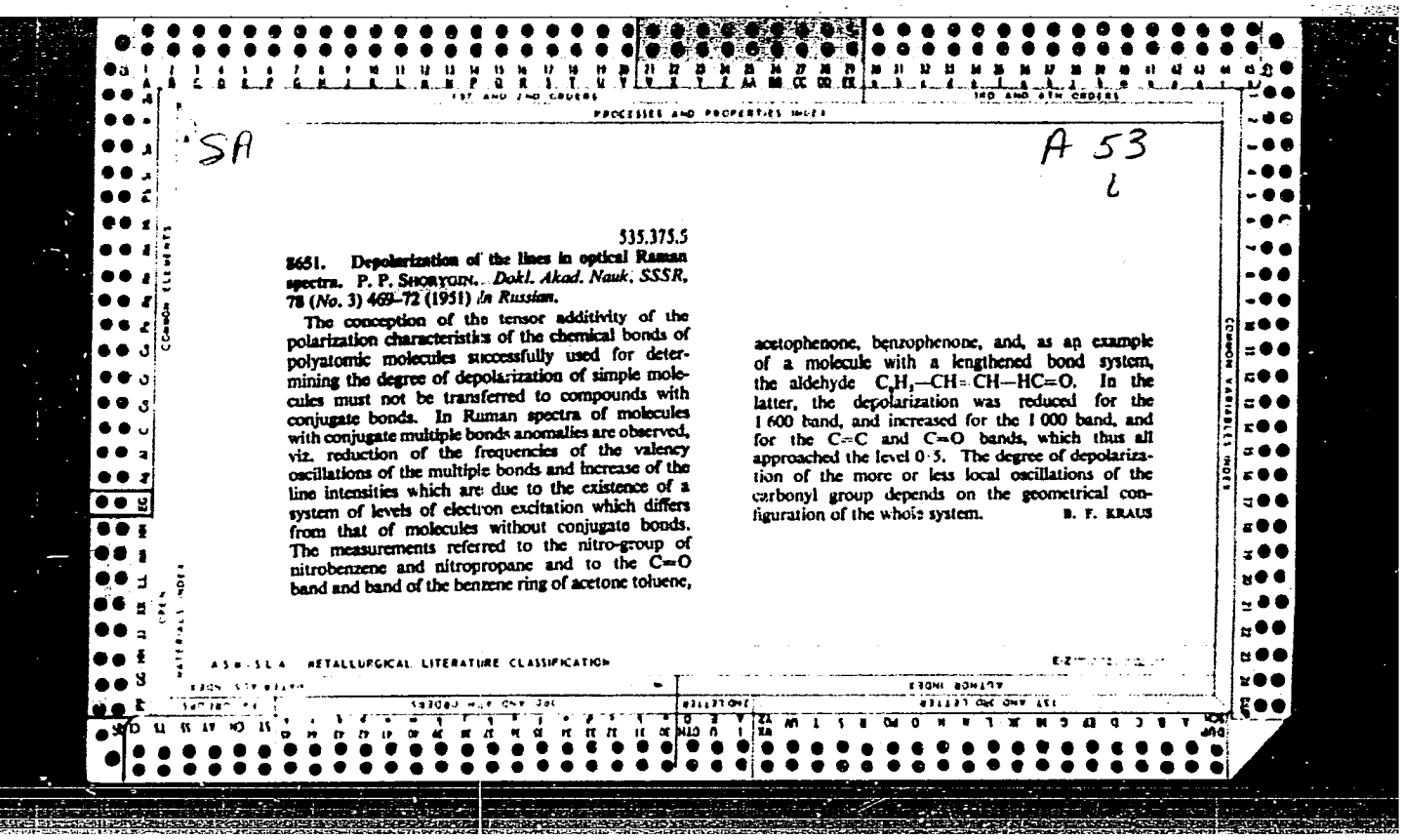
USSR/Chemistry - Aromatic Hydrocarbons 1 May 51

"The Relationship Between the Line Intensity of Raman Spectra of Benzene Derivatives and Their Structural Characteristics," A. Kh. Khalilov, P. P. Shorygin

"Dok Ak Nauk SSSR" Vol LXXVIII, No 1, pp 87-90

Measures the coeffs of intensity of the Raman Lines for benzene derivs bearing substituents which have both single and multiple bonds. Electropos substituents in the para position of nitro derivs of benzene bring about a sharp increase in the intensity of the line corresponding to the NO_2 group but electroneg substituents have little effect.

217T5



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535.375.5

8651. Depolarization of the lines in optical Raman spectra. P. P. Shorygin. *Dokl. Akad. Nauk. SSSR*, 78 (*No.* 3) 469–72 (1951) *In Russian.*

The conception of the tensor additivity of the polarization characteristics of the chemical bonds of polyatomic molecules successfully used for determining the degree of depolarization of simple molecules must not be transferred to compounds with conjugate bonds. In Raman spectra of molecules with conjugate multiple bonds anomalies are observed, viz. reduction of the frequencies of the valency oscillations of the multiple bonds and increase of the line intensities which are due to the existence of a system of levels of electron excitation which differs from that of molecules without conjugate bonds. The measurements referred to the nitro-group of nitrobenzene and nitropropane and to the C=O band and band of the benzene ring of acetone toluene, acetophenone, benzophenone, and, as an example of a molecule with a lengthened bond system, the aldehyde C_6H_5—CH=CH—HC=O. In the latter, the depolarization was reduced for the 1 600 band, and increased for the 1 000 band, and for the C=C and C=O bands, which thus all approached the level 0·5. The degree of depolarization of the more or less local oscillations of the carbonyl group depends on the geometrical configuration of the whole system. B. F. KRAUS

USSR/Chemistry - Double Bonds 21 Jun 51

"Investigation by the Combination Light Dispersion Method of the Mutual Interaction of Nonconjugated Double Bonds," A. Kh. Khalilov, P. P. Shorygin, Sci. Res. Phys. Chem. Inst. im~~eni~~ L. Ya. Karpov. (-c1957-)

"Dok Ak Nauk SSSR" Vol LXXVIII, No 6, pp 1177-1180 Vol. AN, 78 (6). 1951

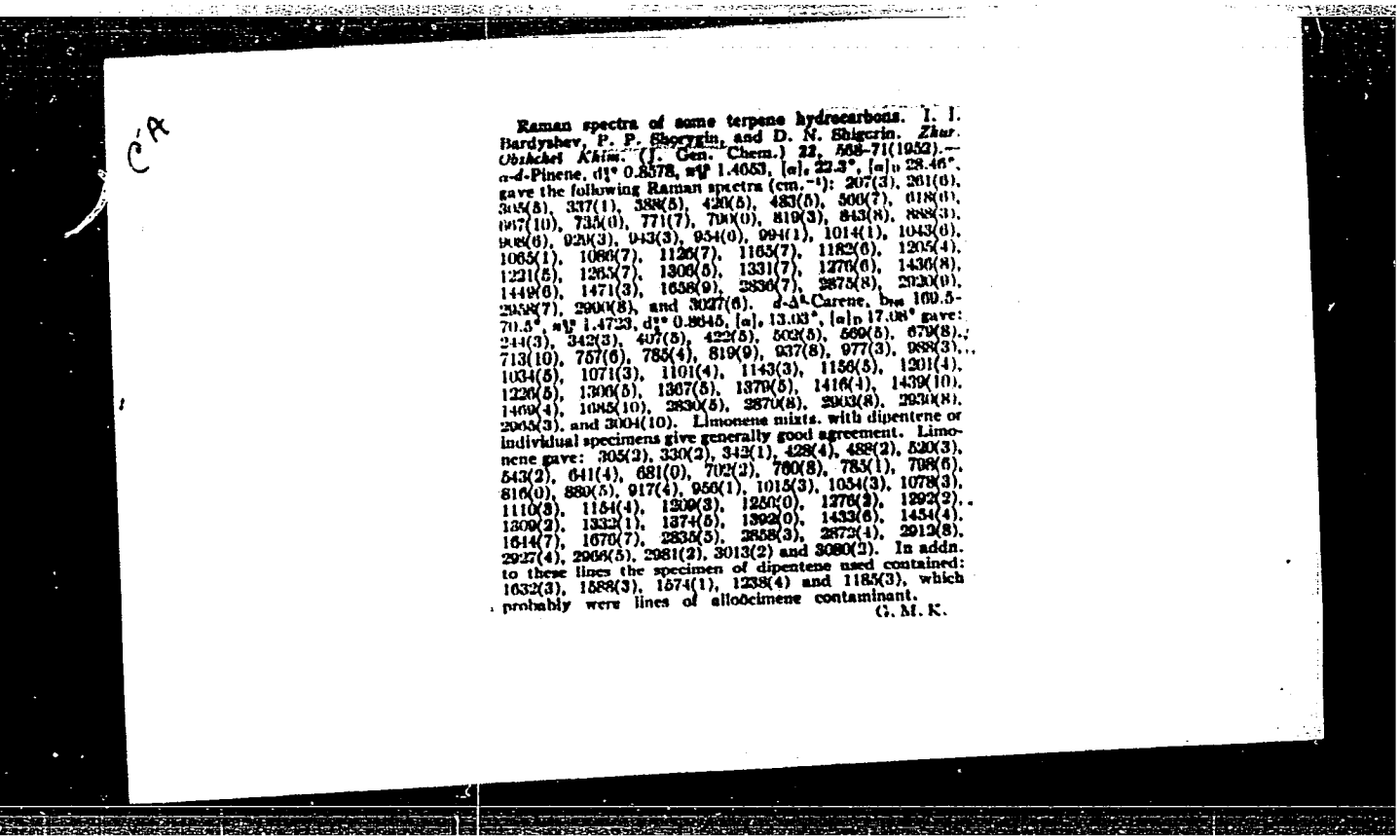
When 2 double bonds are sepd by CH_2 group, line of benzene ring and lines of double bonds are strengthened. When they are sepd by oxygen bridge, these lines are weakened or unchanged. This indicates that interaction between double bonds cannot be regarded as weakened conjugation effect.

PA 184T19

C.A

3

Variation of the intensity of Raman lines with the frequency of the exciting light. A. Kh. Khaldov and P. P. Shorygin. *Doklady Akad. Nauk S.S.S.R.* 81, 1051-3 (1951).—Placzek's formula for the intensity I = const. $(\nu_0 - \nu)^4$, where ν = frequency of the Raman line, ν_0 = frequency of the exciting line, cannot be expected to be valid for mols. with conjugated double bonds where the closeness of the energy levels for valence electrons does not warrant application of the polarizability theory, as the scattering tensor must be strongly dependent on ν_0; the total contribution of the electronic levels to the Raman line intensity cannot be identified with the arithmetic sum of the individual contributions of each level. Measurements were made in excitation with ν_0 = 5461, 4358, 4047, and 3655 A. For cyclohexane, the ratio of the line intensities 1442 and 450 cm.$^{-1}$ is practically independent of ν_0 (1.04, 1.20, 1.07, -); consequently, since it is known that the 450 line obeys Placzek's formula (*Relevskoe rasseyanue u Raman-effekt*, 1936), the same holds for the line 1442 cm.$^{-1}$ of cyclohexane. The following data give the intensity of the stated Raman frequencies (cm.$^{-1}$) relative to the intensity of the cyclohexane 1442 line, for the above 4 values of ν_0: ethyl cinnamate (1595 cm.$^{-1}$) —, 1.17, 1.42, 2.46; (1631) —, 2.22, 3.7, —; styrene (1600) 0.59, 0.72, 0.93, 1.31; (1630) 0.75, 1.02, 1.42, —; benzonitrile (1597) 0.64, 0.77, 0.93, 1.29; (2224) 1.38, 1.81, 2.23, 2.58; nitrobenzene (1348) 0.95, 1.71, —, —; crotonaldehyde (1640) 0.43, 0.97, 1.78, —; (1690) 1.45, 1.87, —, —. In all these compds., the intensities of all multiple-bond bands increase with ν_0 much faster than according to Placzek's $(\nu_0 - \nu)^4$ law. N. T.



C'A

Raman spectra of some terpene hydrocarbons. I. I. Bardyshev, P. P. Shorygin, and D. N. Shigorin. *Zhur. Obshchei Khim.* (J. Gen. Chem.) **22**, 568–71(1952).—α-d-Pinene, d_4^{20} 0.8578, n_D^{20} 1.4653, [α]$_D$ 22.3°, [α]$_D$ 28.46°, gave the following Raman spectra (cm.$^{-1}$): 207(3), 261(6), 305(5), 337(1), 388(5), 420(5), 453(5), 500(7), 618(0), 667(10), 735(0), 771(7), 799(0), 819(3), 843(8), 888(3), 908(6), 920(3), 943(3), 954(0), 994(1), 1014(1), 1043(6), 1065(1), 1080(7), 1126(7), 1165(7), 1182(6), 1205(4), 1221(5), 1265(7), 1306(5), 1331(7), 1376(6), 1436(8), 1449(6), 1471(3), 1658(9), 2836(7), 2875(8), 2920(9), 2938(7), 2960(8), and 3027(6). δ-Δ^3-Carene, b$_{16}$ 169.5–70.5°, n_D^{20} 1.4723, d_4^{20} 0.8845, [α]$_D$ 13.03°, [α]$_D$ 17.08° gave: 244(3), 342(3), 407(5), 422(5), 502(5), 569(5), 679(8), 713(10), 757(6), 785(4), 819(9), 937(8), 977(3), 988(3), 1034(5), 1071(3), 1101(4), 1143(3), 1156(5), 1201(4), 1226(5), 1300(5), 1307(5), 1379(5), 1416(4), 1439(10), 1469(4), 1085(10), 2830(5), 2870(8), 2903(8), 2930(8), 2953(3), and 3004(10). Limonene mixts. with dipentene or individual specimens give generally good agreement. Limonene gave: 305(2), 330(2), 342(1), 428(4), 488(2), 520(3), 543(2), 641(4), 681(0), 702(2), 760(8), 785(1), 798(6), 816(0), 880(5), 917(4), 956(1), 1015(3), 1054(3), 1078(3), 1110(3), 1154(4), 1209(3), 1250(0), 1278(2), 1292(2), 1309(2), 1332(1), 1374(5), 1392(0), 1433(6), 1454(4), 1644(7), 1670(7), 2835(5), 2858(3), 2872(4), 2912(8), 2927(4), 2966(5), 2981(2), 3013(2) and 3080(2). In addn. to these lines the specimen of dipentene used contained: 1632(3), 1588(3), 1574(1), 1238(4) and 1185(3), which probably were lines of alloöcimene contaminant.

G. M. K.

SHORYGIN, P. P. PA 245T100

USSR/Physics - Raman Effect 11 Nov 52

"Resonance Combination Scattering of Light," P. P. Shorygin

"Dok Ak Nauk SSSR" Vol 87, No 2, pp 201-204

Presents results of measuring the oscillatory frequencies w an coefficients of integral intensity I possessed by the line of valence symmetrical oscillation of the nitro group NO_2 in the Raman spectra of a number of para-derivatives of nitrobenzol. Submitted by Acad G. S. Landsberg 7 Oct 52.

245T100

SHORYGIN, P. P.

USSR/Physics - Raman Spectra Sep/Oct 53

"Resonance Combination Scattering of Light," P. P. Shorygin, Phys Chem Inst im Karpov

Iz Ak Nauk, Ser Fiz, Vol 17, No 5, pp 581-585

Describes phenomena of resonant combination scattering. Tabulates results of measurements of aromatic nitro derivs as compared to data on nitropropane.

274T88

SHORYGIN, P. P.

Chemical Abst.
Vol. 48 No. 6
Mar. 25, 1954
Electronic Phenomena and Spectra

The Raman spectra of some terpene hydrocarbons. I. T. Hardyshev, P. P. Shorygin, and D. V. Shizorin. *J. Gen. Chem. U.S.S.R.* 22, 631-3(1953)(Engl. translation).—See *C.A.* 46, 7433f. H. L. H.

SHORYGIN, P. P.

USSR/ Physics - Spectral analysis

Card 1/1 Pub. 43 - 21/62

Authors : Shorygin, P. P., and Osityanskaya, L. Z.

Title : Combined light diffusion and its dependence upon frequency

Periodical : Izv. AN SSSR. Ser. fiz. 18/6, 681-682, Nov-Dec 1954

Abstract : The relation between combined light diffusion and its frequency was investigated on a series of compounds with conjugated and non-conjugated multiple C = C, C = O, C = N, NO_2 bonds. It was found that an increase in the frequency of electron conversion is followed by an increase in the intensity of the combined light diffusion line. The line intensity of conjugated multiple bonds was increasing much faster than that of lines of non-conjugated bonds.

Institution : The L. Ya. Karpov Phys-Chem Inst

Submitted : .....

SHORYGIN, P. P.
USSR/Chemistry

Card 1/1

Authors : Shorygin, P. P., and Gostev, M. P.

Title : Letters to the Editorial Office. Spectroscopic Analysis of Products, Obtained from Chlorination of Pentachlorphenol.

Periodical : Zhur. Fiz. Khim. Vol. 28, Ed. 4, 762-764, Apr 1954

Abstract : Brief comments on letters submitted to the editorial office, concerning the spectroscopic analysis of products derived from the chlorination of pentachlorophenol. Three references; graphs.

Institution : L. Ya. Karpov' Physico-Chemical Institute, Moscow.

Submitted : January 9, 1954

SHORYGYN, P.P.

USSR/ Physics - Physical chemistry

Card 1/1 : Pub. 22 - 13/44

Authors : Shorygin, P. P., and Osityanskaya, L. Z.

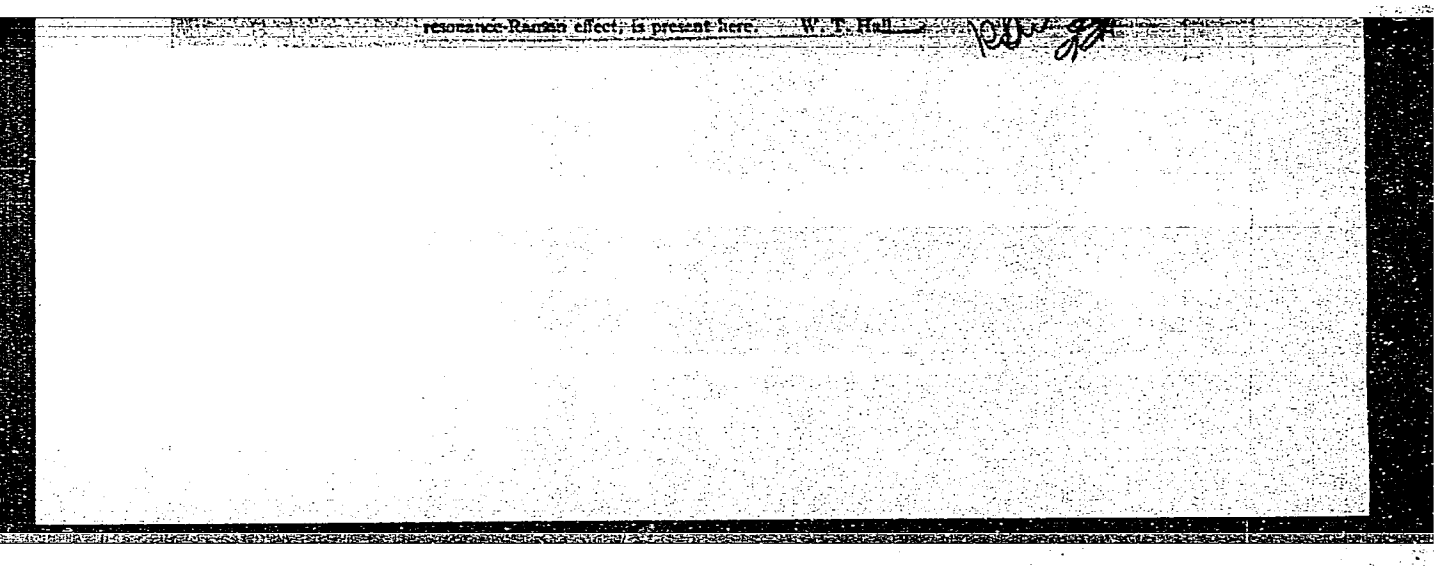
Title : Combined light-dispersion and its dependence on frequencies

Periodical : Dok. AN SSSR 98/1, 51-54, Sep 1, 1954

Abstract : Some results of theoretical and experimental studies of the dependence of spectral-line intensities of combined light-dispersion on the frequencies are described and shown in a table. Three references (1935-1950).

Institution : Scientific Research Physico-Chemical Institute im. L. Ya. Karpov

Presented by : Academician G. S. Lindberg, April 22, 1954



SHORYGIN, P. P. (Prof.)

"The Interaction of the Substituents in Molecules of Organic Compounds."

report presented at Scientific Conference at the Inst. for Physical Chemistry imeni L. Ya. Karpov, Acad. Sci. USSR, Nov 1957.

PRIKHOT'KO, A.F.

24(7) P 3 PHASE I BOOK EXPLOITATION SOV/1365

L'vov. Universytet

Materialy X Vsesoyuznogo soveshchaniya po spektroskopii. t. 1: Molekulyarnaya spektroskopiya (Papers of the 10th All-Union Conference on Spectroscopy. Vol. 1: Molecular Spectroscopy) [L'vov] Izd-vo L'vovskogo univ-ta, 1957. 499 p. 4,000 copies printed. (Series: Its: Pizychnyy zbirnyk, vyp. 3/8/)

Additional Sponsoring Agency: Akademiya nauk SSSR. Komissiya po spektroskopii. Ed.: Gazer, S.L.; Tech. Ed.: Saranyuk, T.V.; Editorial Board: Lavisberg, G.S., Academician (Resp. Ed., Deceased), Naporent, B.S., Doctor of Physical and Mathematical Sciences, Fabelinskiy, I.L., Doctor of Physical and Mathematical Sciences, Fabrikant, V.A., Doctor of Physical and Mathematical Sciences, Kornitskiy, V.G., Candidate of Technical Sciences, Rayskiy, S.M., Candidate of Physical and Mathematical Sciences, Klimovskiy, L.K., Candidate of Physical and Mathematical Sciences, Miliyanchuk, V.S., Candidate of Physical and Mathematical Sciences, and Glauberman, A. Ye., Candidate of Physical and Mathematical Sciences.

Card 1/30

Card 15/30

AUTHORS: Shorygin, P. P., and Yegorova, Z. S. 20-117-5-36/54

TITLE: The Influence of Substituents on the Properties of the Molecules of Benzene Monoderivatives (Vliyaniye zamestiteley na svoystva molekul monoproizvodnykh benzola).

PERIODICAL: Doklady AN SSSR, 1957, Vol. 117, Nr 5, pp. 856-859 (USSR).

ABSTRACT: The present paper investigates various monoderivates of benzene PhX, which contain as substituents X alkyle groups, halogenatoms and other groups of different types. The authors were interested in the problem, wether a common basis exists for the different manifestations of the influence of the substituents on the benzene ring. One of these manifestations consists in an increase of the intensity of the characteristic lines of the benzene ring in the spectra of the combination dispersion. The intensity of these lines is shortly reported on. The first table contains the following: 1) The results of the measurements of the coefficients of the integral intensity of the line of the benzene ring $\sim 1600^{-1}$ in the spectra of the combination dispersion. 2) The values of excitation of the molecular refraction at λ = 5893 Å and at λ = 4361 Å. 3) The position of the intensive absorption bands. 4) The anomalies of the dipole moments. 5) The Khammet- constants, which determine the influence of the substituents on the

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The Influence of Substituents on the Properties of the Molecules of Benzene Monoderivatives

the various optical properties of PhX.
There are 2 tables, and 4 references, 2 of which are Slavic.

ASSOCIATION: Physico-Chemical Scientific Research Institute imeni L. Ya. Karpov (Nauchno-issledovatel'skiy fiziko-khimicheskiy institut imeni L. Ya. Karpova).

PRESENTED: July 6, 1957, by V. N. Kondrat'yev, Academician.

SUBMITTED: February 1, 1957.

Card 3/3

SHORYGIN, P.P.

Mutual effect of atomic groups in the molecules of aromatic compounds. Probl.fiz.khim. no.1:164-172 '58. (MIRA 15:11)

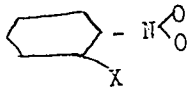
1. Laboratoriya stroyeniya molekul Nauchno-issledovatel'skogo fiziko-khimicheskogo instituta im. Karpova.
(Aromatic compounds) (Substitution (Chemistry))

AUTHORS: Shorygin, P. P., Il'icheva, Z. F. SOV/48-22-9-12/40

TITLE: On the Dependence of the Spectra of Aromatic Nitro Compounds on the Rotation Angle of the Nitro Group About the Bond C-N (O zavisimosti spektrov aromaticheskikh nitrosoyedineniy ot ugla povorota nitrogruppy vokrug svyazi C-N)

PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, 1958, Vol 22, Nr 9, pp 1058 - 1062 (USSR)

ABSTRACT: Quantitative relations between the distinctive features of conjugation and the angle Θ are only little investigated. In spite of this a knowledge of these relations is very important for the investigation of the nature of the interaction of the atoms in complicated molecules. Different interactions must depend on the angle Θ to a different degree. The authors investigated the ultraviolet absorption spectra, the spectra of combination dispersion, and the dipole moments of the ortho-derivatives of nitro benzene including such of the type



with various substituents X. In the

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case of a fairly exact estimation of the correction factors, by which various factors influencing θ are taken account of, the data listed in the table must be regarded to be very approximative. If the NH_2-group (or a similar one) is introduced into the para-position of the nitro benzene molecule the difficulties met in the interpretation of the absorption spectra are reduced. These difficulties partly depend on the immediate action of the ortho-substituents X upon the benzene ring and upon the absorption spectrum. If the dependence of λ and of the energy of the molecule on the angle θ is known for the normal state it is possible to estimate the θ -dependence of the energy of an excited molecule. As λ depends on this angle to quite a low extent the double bond C-N in the excited molecule hardly seems to be strong. The interpretation of the dipole moments is rendered even more difficult by the absence of exact data on the angles C-C-Hal and on other angles. With increasing volume of the substituent X the line intensity of the nitro group in the spectrum of combination dispersion

decreases rapidly and finally approaches those values which are characteristic for the molecules without conjunction. The investigated parameters can be applied only with certain restrictions. Nevertheless it can be found that the introduction of two Cl-atoms into ortho positions (at an angle θ of about 60-70°) almost completely removes the observed conjunction characteristics. The information gained shows that the effect of induction has no essential influence on the properties of the nitro compounds. As the nitro group belongs to the most polar ones an even less importance of this effect may be expected in other types of compounds. There are 3 figures, 1 table, and 3 references, 3 of which are Soviet.

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

AUTHORS: Shorygin, P. P., Yegorova, Z. S. 76-32-4-30/43

TITLE: The Effect of Substituents on the Molecular Properties of Aromatic Compounds of the C_6H_5X Type (Vliyaniye zamestiteley na svoystva molekul aromaticheskikh soyedineniy tipa C_6H_5X)

PERIODICAL: Zhurnal Fizicheskoy Khimii, 1958, Vol. 32, Nr 4, pp. 915 - 921 (USSR)

ABSTRACT: Investigations of various monosubstituents of benzene containing alkyl groups, halogen atoms or other groups as substituents were carried out. As one of the most characteristic properties the increase of the intensity of benzene-ring bands in the Raman spectrum is regarded, where the band $\sim$1600 cm $^{-1}$ not very intensive in benzene and alkyl benzenes shows an essential intensification in the substitution products, which can serve as an orientation of the polarization determinations dependent on the nuclear coordinates of the benzene ring. The band in the section 1000 cm $^{-1}$ is less sensitive in this respect, however, it is also intensified in most cases when the 1600^{-1} line is intensified. The results of the measurements of the Raman spectra I_{1600} and I_{1000} as well as other measuring values

Card 1/3

The Effect of Substituents on the Molecular Properties of Aromatic Compounds of the C_6H_5X Type

of the different substitution compounds are mentioned on a table. The majority of measurements of the 1600 cm^{-1} band were verified on a photoelectric spectrophotometer according to V. P. Bazov, the data for phenylbutadiene by V. M. Medvedeva, for aniline by Z. Alaune and for ethylacetanilide by T. N. Shkurina having been determined. For the oscillations of the benzene ring in the monodeuterium benzene a representation according to M. A. Kovner is mentioned. From the table can, among other, be seen that the alkyl groups exercise little influence on the chemical, electrical and optical properties of the PhX molecules, while substituents with C=C bindings and a benzene ring have a great effect on the optical properties and a small effect on the chemical properties as well as on the dipole; strongly electronegative or electropositive substituents show noticeable effect on all these properties. Based on the results obtained the authors state that no general parallelism can be observed in the various phenomena of the interaction of the atom groups in the molecules PhX and that thus the con-

The Effect of Substituents on the Molecular Properties of Aromatic Compounds of the C_6H_5X Type

ception "stronger or weaker interaction" of the atom groups can be used only in certain conditions (a series of similar compounds etc.). Even in simple models the influence of the electric field of the substituents on the benzene ring can, for instance, be characterized by any parameter, except when the model was roughly simplified and only a dipole difference in length and power of the charges was assumed. A difference according to the "Electro-Negativity" of the substituent is also limited, as, for instance, the dipole moment of HJ is smaller than of MeJ and on the other hand that HF is greater than that of MeF. There are 3 figures, 2 tables and 4 references, 2 of which are Soviet.

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova,Moskva (Moscow Physicochemical Institute imeni L. Ya. Karpov)

SUBMITTED: July 6, 1957
AVAILABLE: Library of Congress
Card 3/3 1. Cyclic compounds--Molecular structure 2. Spectrophotometers --Applications 3. Raman spectroscopy--Applications

AUTHORS: Shorygin, P. P., Yegorova, Z. S. 20-118-4-38/61

TITLE: The Influence of Substituents on the Properties of the Molecules of Para-Derivatives of Benzene (Vliyaniye zamestiteley na svoystva molekul para-diproizvodnykh benzola)

PERIODICAL: Doklady Akademii Nauk SSSR, 1958, Vol. 118, Nr 4, pp. 763-766 (USSR)

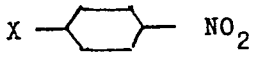
ABSTRACT: This work investigates the spectra and the dipole moments of the para-derivatives of nitrobenzene

with various substituents X. The nitro group belongs to the most electronegative groups; the characteristic marks of the influence of the electropositive substituents are in case of the derivatives of nitrobenzene expressed especially clearly. In a table the following quantities are given:

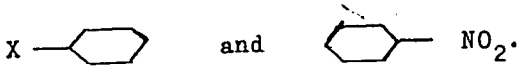
Card 1/4

The Influence of Substituents on the Properties of the Molecules of Para-Derivatives of Benzene 20-118-4-38/61

1) The values of the shifts ($\Delta\omega$) of the symmetrical valence oscillations of the nitrogroup, according to the measurements of the spectra of the combination scattering (Raman spectra) in the benzene solutions. The shifts $\Delta\omega$ are caused by the introduction of the substituent X.
2) The coefficients of the integral intensity of this line in the spectra of the combination scattering.
3) The characteristic of the intensive absorption bands in the ultraviolet range.
4) The difference $\Delta\mu$ between the observed amount of the dipolmoment of



and the vectorial sum of the moments of



5) The constants by Khammet σ_{pair}, which predominantly were

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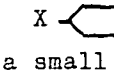
ascertained from the dissociation constants of



$X-C_6H_4-COOH$. The substituents C_6H_5. and $CH_2:CH$ have only a small influence on the dipole moments and the chemical properties, but they influence the optical properties to a considerable extent. The alkyl groups X influence the dipole moments of the nitro compounds. The differences in the found values of the constants σ are quite important, but these quantities have only a very approximate character. Altogether the transition from $-CH_3$ to $-CMe_3$ is connected with a very insignificant change of the characteristic marks of the mutual influence of the groups. The series of the electropositive substituents, which were composed according to the degree of their influence on the dipole moments, the frequency, and the intensity of the line of the nitrogroup resemble each other very closely. Probable reasons for the even so observed differences are given. A more complete agreement is observed for the characteristic marks of the influence of the substituents on the different optical

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properties of the molecules X-C6H4-NO2. In case of the monoderivatives of benzene, however, considerable differences are observed. A here given formula describes more or less satisfyingly the dependence of the intensity of the symmetrical valence oscillations of the nitro group on the frequency of the incident light.
There are 2 figures, 1 table, and 1 Soviet reference.

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PRESENTED: September 11, 1957, by B. A. Kazanskiy, Member of the Academy

SUBMITTED: June 27, 1957

AVAILABLE: Library of Congress

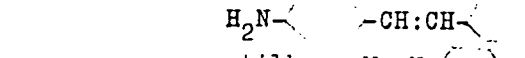
Card 4/4

AUTHORS: Shorygin, P. P., Ivanova, T. M. SOV/2o-121-1-18/55

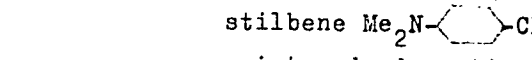
TITLE: On the Simultaneous Observation of Combination Scattering of Light and of Fluorescence (Ob odnovremennom nablyudenii kombinatsionnogo rasseyaniya sveta i fluorestsentsii)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol. 121, Nr 1, pp. 70 - 73 (USSR)

ABSTRACT: The investigation of many compounds with various types of electron excitation levels is important for a further study of the relations between the scattering of light and fluorescence. The present paper examines the spectra of 4-nitro-4'-amino stilbene



and of 4-nitro-4'-dimethylamino stilbene



According to melting point and adsorption spectra both substances showed the trans-form. Nitro-amino stilbene has a very intensive absorption band in the range from 4000 to 4500 Å and gives a strong fluorescence when irradiated by such wave lengths. Nitro-dimethylamino stilbene exhibits similar spectra. Two

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tables contain data on the position of the maximum of the absorption band, the position of the maximum of the fluorescence band, the quantum yield of the fluorescence, the mean life of the excited state, the molecular absorption coefficient at 4358 Å, and the frequency of the symmetrical oscillation of the nitro-group in the spectrum of the combination scattering of the two substances mentioned above. The simultaneous observation of combination scattering and of fluorescence is the most important result. The determination of the quantum yield of fluorescence which is excited by various frequencies shows that the observed edge of the absorption band corresponds with the transition which is responsible for the fluorescence. The same electron transition seems to be responsible for the lines of the combination scattering as well. A phenomenon of fluorescence which proceeds relatively slow (including afterglow) and independently of this a quick process of scattering seem to be connected with the long-life electron level. The frequency of the nitro-group is, in the derivatives of nitro stilbene investigated in this paper, lower by 3 - 5 cm^{-1} than in the case of non-

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substituted nitro stilbene. The authors express their gratitude to I.V.Obreimov for valuable suggestions. There are 2 figures, 2 tables, and 3 references,

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PRESENTED: March 14, 1958, by V.N.Kondrat'yev, Member, Academy of Sciences, USSR

SUBMITTED: March 5, 1958

1. Light--Scattering 2. Stilbenes--Fluorescence 3. Stilbenes--Spectra

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AUTHORS: Shorygin, P. P., [illegible] SOV/20-121-5-39/50

TITLE: On the Dependence of the Conjugation Characteristics of the Rotation Angle of the Methoxy- and Dimethyl-Amino Groups With Respect to the Plane of the Benzene Ring (O zavisimosti priznakov sopryazheniya ot ugla povorota metoksil'noy i dimetilaminogrupp otnositel'no ploskosti benzol'nogo kol'tsa)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol. 121, Nr 5, pp. 869-872 (USSR)

ABSTRACT: Whenever steric hindrances are lacking, the characteristic features of the mutual influence of the group $-N(CH_3)_2$, and $-OCH_3$, respectively, and of the benzene ring can be easily observed. As is known, the deviations of the molecular energy of anisole and dimethyl aniline calculated according to the additive scheme from those determined from the heats of combustion, attain from 8 to 10 kcal/mol; the anomalies of the dipole moments of these molecules are also considerable. The introduction of —OR- and NR_2-groups into the benzene-ring leads to a considerable approximation of the bands of

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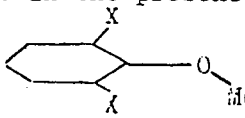
absorption and to a sharp increase of the polarizability of the molecules and to a change of other optical properties. According to radiographic data the methoxy group is situated in the plane of the benzene ring, whenever ortho-substituents are lacking. In the presence of substituents (X) in molecules

of the type  the placing of the OMe group in the

plane of the benzene ring becomes impossible; the C — O-plane

must obviously form an angle θ with the plane of the benzene ring which is the greater, the greater are the dimensions of the X-group. The difficulties of interpreting the spectra connected with the immediate influence of the X-substituent, become more insignificant by passing over to compounds of the type

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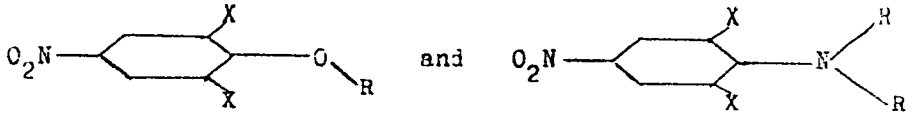

The characteristics of the influence of NR_2 and OR on the system of conjugated bonds "nitro-group - benzene-ring - amino group" are more distinctly marked than the characteristics of their influence on the benzene ring in the molecules $PhNR_2$ and PhOR. The existence of a nitro-group also permits the establishment of additional criteria, in order to judge on the influence of NR_2 and OR at different rotation angles (θ) on the system of conjugated bonds. The intensity of the lines of the nitro-group is particularly sensitive in comparison with the influence of such substituents which are in a para-position, i.e. of the NR_2- or OR-groups. Table 1 shows different respective parameters for 12 compounds. It follows

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from table 1 that the OH-, OR-, NH_2-, and NR_2-groups in the molecules of p-nitrophenol, p-nitro-anisole, p-nitro-aniline and p-nitro-dimethyl aniline reduce the frequency of the nitro-group. The intensity of the Raman-line of the nitro-group, on the other hand is increased. Finally they influence the spectrum of absorption in the sense of an increase and an approximation of the spectrum of absorption. The anomalies of the dipole moment are especially great with the nitro-amines. Concluding, influences exercized by individual groups in the afore-mentioned compounds are discussed and compared with each other.
There are 2 figures, 1 table, and 2 references, which are Soviet.

ASSOCIATION: Nauchno-issledovatel'skiy fiziko-khimicheskiy institut im. L.Ya. Karpova (Scientific Physicochemical Research Institute imeni L.Ya. Karpov)

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