TSVETKOV, V.L.

Eyeless (atraumatic) needle for repeated use (modification II). (MIRA 14:10)
Oft. zhur. 16 no.5:311-312 '61.

1. Iz glaznogo otdeleniya Orlovskoy oblastnoy bol'nitsy.
(EYE, INSTRUMENTS AND APPARATUS FOR)

TSVETKOV, V.L.

Method of an accurate localization of foreign bodies in the eye. Vest. rent. i rad. 40 no.2:71-72 Mr-Ap '65. (MIRA 18:6)

1. Orlovskaya oblastnaya bol'nitsa.

TSVETKOV, V.L. (Orel)

Prevention of and first aid in eye injuries at a feldsher-midwife center. Fel'd. i akush. 26 no.5:15-18 My '61. (MIRA 14:5)
(EYE--WOUNDS AND INJURIES)

TSVETKOV, V.L., ordinator

Sharppointed pincers for the removal of foreign bodies from the cornea and conjunctiva. Vest.oft. 69 no.2:39 Mr-Ap '56. (MLRA 9:7)

1. Iz glaznoy kliniki (direktor professor A.G.Krol') Kurskgog meditsinskogo instituta.
(SURGICAL INSTRUMEN TS AND APPARATUS)
(EYE--FOREIGN BODIES)

TSVETKOV, V.M. [deceased]; PROKOF'YEV, A.P., redaktor; NEMANOVA, G.F., redaktor izdatel'stva; GORDIYENKO, Ye.B., tekhnicheskiy redaktor

[Instructions for using the classification of reserves for tin ore deposits] Instruktsiia po primeneniiu klassifikatsii zapasov k mestoroshdeniiam oloviannykh rud. Moskva, Gos.nauchno-tekhn.izd-vo lit-ry po geol.i okhrane nedr, 1955. 41 p. (MLRA 10:9)

1. Russia (1923- U.S.S.R.) Gosudarstvennaya komissiya po zapasam poleznykh iskopayemykh. (Tin ores)

TSVETKOV, V.M. (Moskva)

Explosions in sandy grounds. PMTF no.5:150-153 S-O '62.
(MIRA 16:1)

(Explosions) (Sandy soils)

TSVETKOV, V. N.

The organization and work in a footwear testing shop.

Moskva, Gos. izd-vo legkoi promyshl., 1939-48.

2 v. (52-39652)

APPROVED FOR RELEASE: 04/03/2001 CIA-RDP86-00513R001757220009-8"

TSVETKOV, V. N.

36250. TSVETKOV, V. N. -- Klassifikatsiya i kharakteristika zagotovochnykh shvov obuvi legkaya prom-st', 1949, No. 10, 29-31

so: Letopis' Zhurnal'nykh Statey, No. 49, 1949

TSVETKOV, V.N., kandidat tekhnicheskikh nauk.

Classification and specification of shoe bottom design. Leg. prom. 17 no.1:16-19 Ja '57. (MLRA 10:2)

(Shoe industry)

TSVETKOV, V.N.; DUBROVSKIY, A.S.

Qualitative tip bending of footwear tacks. Leg.prom. 17 no.8:18-21 Ag '57. (MIRA 10:10)

(Shoe industry)

TSVETKOV, Vladimir Nikolayevich, kand.tekhn.nauk; KOVNER, S.S., prof., retsenzent; MURVANIDZE, D.S., retsenzent; PLEMYANNIKOV, M.N., red.; MEDVEDEV, L.Ya., tekhn.red.

[Elements in the theory of the mechanical strengthening of bottoms] Elementy teorii mekhanicheskikh kreplenii niza obuvi. Moskva, Gos. nauchno-tekhn.izd-vo lit-ry po legkoi promyshl., 1958. 336 p. (MIRA 11:12)

(Shoe manufacture)

TSVETKOV, V.N.; DUBROVSKIY, A.S.

New design of sole nails. Leg. prom. 18 no.4:38-39 Ap '58. (MIRA 11:4)
(Shoe manufacture)

TSVETKOV, V.N.; DUBROVSKIY, A.S.

Nail fastening of porous rubber soles. Leg.prom. 18 no.12:18-19 D '58. (MIRA 11:12)

(Shoe manufacture)

TSVETKOV, V. N.: Doc Tech Sci (diss) -- "Elements of the theory and construction of mechanical reinforcement for shoe bottoms". Moscow, 1959. 51 pp (Min Trade RSFSR, Moscow Order of Labor Red Banner Inst of National Economy im G. V. Plekhanov), 100 copies (KL, No 8, 1959, 136)

TSVETKOV, V.N.

Training of engineering personnel for light industry must be raised to the level of the new tasks. Kozh.-obuv.prom. no.1: 19-21 Ja '59. (MIRA 12:6)

1. Direktor Moskovskogo tekhnologicheskogo instituta legkoy promyshlennosti.
(Russia--Manufactures)
(Industrial arts--Study and teaching)

TSVETKOV, V.N., dotsent, kand.tekhn.nauk; BYKHOVSKIY, Y.B., inzh.

Flexibility of glued soles. Izv.vys.ucheb.zav.; tekh.leg. prom. no.6:83-95 '59. (MIRA 13:5)

1. Moskovskiy tekhnologicheskiy institut legkoy promyshlennosti. Rekomendovana kafedroy tekhnologii obuvi.
(Shoe manufacture)

TSVETKOV, V.N.; BYCHKOVA, V.Ye.; SAVVON, S.M.; NEKRASOV, I.K.

Intramolecular interaction and segment anisotropy of chain molecules in solution. Vysokom. soed. 1 no.9:1407-1415 S '59.
(MIRA 13:3)

1. Institut vysokomolekulyarnykh soyedineniy AN SSSR i Leningradskiy gosudarstvennyy universitet im. A.A. Zhdanova.
(Macromolecular compounds) (Propene) (Styrene)

TSVETKOV, V.N., kand.tekhn.nauk dots.; ANDREYEV, F.S., inzh.

Construction parameters for fastening porous rubber soles with nylon threads. Izv.vys.ucheb.zav.; tekh.leg.prom. no.5:85-94 '59. (MIRA 13:4)

1. Moskovskiy tekhnologicheskiy institut legkoy promyshlennosti. Rekomendovana kafedroy tekhnologii obuvnogo proizvodstva. (Boots and shoes, Rubber) (Nylon)

TSVETKOV, V.N., kand. tekhn. nauk, dotsent

Determining the coefficient of the sole of the hind part of the foot. Nauch. trudy MTILP no.24:96-100 '62. (MIRA 16:7)

(Shoe manufacture) (Foot)

TSVETKOV, V.N., kand. tekhn. nauk, dotsent; SHATOKHIN, N.K., inzh.; DUBROVSKIY, A.S., inzh.

Quality of needle wire. Nauch. trudy MTILP no.24:146-149 '62.
(MIRA 16:7)

(Wire--Testing)

TSVETKOV, V.N., kand. tekhn. nauk, dotsent

Effect of the rate of loading on the mechanical properties of stiff leather. Nauch. trudy MTILP no.24:75-89 '62. (MIRA 16:7)

(Leather—Testing)
(Strength of materials)

PURVANIDZE, E.M., prepodavatel'; TSVETKOV, V.N., kand. tekhn. nauk, dotsent

New developments in shoe design and construction. Nauch. trudy MTILP no.24:100-112 '62. (MIRA 16:7)

(Shoe manufacture)

TSVETKOV, V.N., kand. tekhn. nauk, dotsent; KOROTKAYA, L.I., inzh.

Determining the constant of the relaxation time of straing in chrome shoe upper leather. Nauch. trudy MTILP 25:61-72 '62. (MIRA 16:8)

1. Kafedra tekhnologii izdeliy iz kozhi Moskovskogo tekhnologicheskogo instituta legkoy promyshlennosti.

TSVETKOV, V.N., kand. tekhn. nauk, dotsent; ARKHIPOV, N.N., dotsent; SKALON, I.P., starshiy prepodavatel'

Machine for coating sole edges with glue. Nauch. trudy MTIIP no.28:230-231 '63.

Machine for cement lasting of shoe uppers. Ibid.:232-234
(MIRA 17:11)

[illegible], V.[illegible], [illegible]
[illegible]

[illegible]chine for [illegible] and application [illegible]
[illegible] no.28:36-38 '63. [illegible]

TSVETKOV, V.N., Cand Chem Sci--(diss) "Certain problems of non-electrolytic coagulation of polystyrene latex." Mos, 1958. 12 pp (Min of Higher Education USSR. Mos Order of Lenin Chemico-Technological Inst im D.I.Mendeleyev), 150 copies (KL,45-58, 143)

TSVETKOV, V.N., kand.tekhn.nauk, dotsent; ANDREYEV, F.S., inzh.

Efficient parameters for the fastening of porous rubber soles with nylon threads. Report No.2. Izv.vys.ucheb.zav.; tekh.leg.prom. no.1:85-96 '60. (MIRA 14:5)

1. Moskovskiy tekhnologicheskiy institut legkoy promyshlennosti. Rekomendovana kafedroy tekhnologii obuvnogo proizvodstva.
(Boots and shoes, Rubber)

TSVETKOV, V.N., kand.tekhn.nauk, dotsent

Use of the power function for rating leather shrinkage. Izv. vys. ucheb. zav.; tekh. leg. prom. no. 1:107-115 '60. (MIRA 14:5)

1. Moskovskiy tekhnologicheskiy institut legkoy promyshlennosti. (Leather—Testing)

TSVETKOV, V.N., kand.tekhn.nauk, dotsent; RYBCHINSKIY, V.D., inzh.

Effect of the moisture of sole parts leather on the contact stress in the mechanical joints of shoe soles. Nauch.trudy MTILP no.18: 76-90 '60. (MIRA 15:2)

1. Kafedra tekhnologii izdeliy iz kozhi Moskovskogo tekhnologicheskogo instituta legkoy promyshlennosti.
(Leather) (Strains and stresses)

TSVETKOV, V.N., kand.tekhn.nauk, dotsent

Practical footwear of a lighter weight. Izv.vys.ucheb.zav.; tekh. leg.prom. no.2:44-49 '61. (MIRA 14:5)

1. Moskovskiy tekhnologicheskiy institut legkoy promyshlennosti. Rekomendovana kafedroy tekhnologii obuvnogo proizvodstva Kiyevskogo tekhnologicheskogo instituta legkoy promyshlennosti. (Boots and shoes)

TSVETKOV, V.N., kand. tekhn.nauk, dotsent; LOSHCHAKOVA, L.A., inzh.

Modulus of elasticity of stiff leather. Izv.vys.ucheb.zav.; tekh.leg. prom. no.3:81-89 '61. (MIRA 14:7)

1. Moskovskiy tekhnologicheskiy institut legkoy promyshlennosti.
(Leather)

TSVETKOV, V. N., kand.tekhn.nauk, dotsent; KLOCHKOVA, N. S., inzh.

New shoe construction method without lasting. Izv.vys.ucheb. zav.; tekh.leg.prom. no.4:67-85 '61. (MIRA 14:10)

1. Moskovskiy tekhnologicheskiy institut legkoy promyshlennosti.
(Shoe manufacture)

TSVETKOV, V.M., kand.tekhn.nauk, dotsent; RYBCHENSKIY, V.D., inzh.

Characteristics of the effect of moisture on leather shrinkage. Izv.vys.ucheb.zav.;tekh.leg.prom. no.4:96-106 '61. (MIRA 14:10)

1. Moskovskiy tekhnologicheskiy institut legkoy promyshlennosti.
(Leather--Testing)

TSVETKOV, V.N., kand.tekhn.nauk, dotsent

Resistance to cracking in bending of sole and insole leather.
Nauch.trudy MTILP no.23:82-100 '61. (MIRA 15:9)

1. Kafedra tekhnologii izdeliy iz kozhi Moskovskogo tekhnologicheskogo instituta legkoy promyshlennosti.
(Leather--Testing)

TSVETKOV, V.N., kand.tekhn.nauk, dotsent

Power of chrome-vegetable tanned leather to hold a metal tack. Nauch.trudy MTILP no.23:101-111 '61. (MIRA 15:9)

1. Kafedra tekhnologii izdeliy iz kozhi Moskovskogo tekhnologicheskogo instituta legkoy promyshlennosti.
(Leather—Testing)

TSVETKOV, V.N., kand.tekhn.nauk, dotsent; SYCHENKOVA, O.P., inzh.

Bending strength of the sole construction fastened with the thread-cement system. Nauch.trudy MTILP no.23:112-149 '61. (MIRA 15:9)

1. Kafedra tekhnologii izdeliy iz kozhi Moskovskogo tekhnologicheskogo instituta legkoy promyshlennosti.
(Shoe manufacture)

TSVETKOV, V.N., kand.tekhn.nauk, dotsent

Strength of the joint between sole leather and fasteners. Izv.vys.ucheb.zav.;tekh.leg.prom. no.2:84-89 '62. (MIRA 15:5)

1. Moskovskiy tekhnologicheskiy institut legkoy promyshlennosti. (Shoe manufacture) (Leather--Testing)

TSVETKOV, V.N., kand.tekhn.nauk, dotsent; KOVALEV, A.A., inzh.

Effect of the physicomechanical actions on the modification of stiffness caused by the bending of shoe soles manufactured with the hot vulcanization method. Izv.vys.ucheb.zav.; tekh. leg.prom. 3:74-82 '62. (MIRA 15:6)

1. Moskovskiy tekhnologicheskiy institut legkoy promyshlennosti. Rekomendovana kafedroy tekhnologii izdeliy iz kozhi.
(Boots and shoes, Rubber--Testing)

TSVETKOV, V. N., kand. tekhn. nauk, dotsent

Stiffness of leather sole parts in bending. Izv. vys. ucheb. zav.; tekh. leg. prom. no.4:76-86 '62. (MIRA 15:10)

1. Moskovskiy tekhnologicheskiy institut legkoy promyshlennosti.

(Leather—Testing)

TSVETKOV, V.N., kand. tekhn. nauk, dotsent; KOROTKAYA, L.I., inzh.

Determining the constant of the relaxation time of strains in chrome shoe upper leather. Nauch. trudy MTILP 25:61-72 '62. (MIRA 16:8)

1. Kafedra tekhnologii izdeliy iz kozhi Moskovskogo tekhnologicheskogo instituta legkoy promyshlennosti.

TSVETKOV, V.N., kand. tekhn. nauk, dotsent; FEDULOVA, L.L., inzh.

Determining the constant of the relaxation time of strains in chrome shoe-upper leather. Nauch. trudy MTILP 25:73-81 '62.
(MIRA 16:8)

1. Kafedra tekhnologii izdeliy iz kozhi Moskovskogo tekhnologicheskogo instituta legkoy promyshlennosti.

TSVETKOV, V.N., kand. tekhn. nauk, dotsent; RAKITYANSKIY, V.F., inzh.

Effect of the tanning method on the thickness of sole leather in case of its wet processing. Nauch. trudy MTILP 25: 82-91 '62. (MIRA 16:8)

TSVETKOV, V.N., kand. tekhn. nauk, dotsent; GLUKHOV, V.N., inzh.

Force of resistance of the contact friction in the fastening of leather shoe elements. Nauch. trudy MTILP 25:92-105 '62. (MIRA 16:8)

1. Kafedra tekhnologii izdeliy iz kozhi Moskovskogo tekhnologicheskogo instituta legkoy promyshlennosti.

TSVETKOV, V.N., kand. tekhn. nauk, dotsent

Determining the constant of the relaxation time in the deformation of sole leather. Report No.3. Nauch. --- MTILP no.26:118-133 '62.

Bases of the calculation of the flexural rigidity of footwear; report given at the 2d International Congress of the Representatives of the Leather and Shoe Industry in Budapest. Ibid.:146-157

Calculation of thread seams for the leather parts of shoe uppers. Ibid.:170-175

(MIRA 17:5)

1. Kafedra tekhnologii izdeliy iz kozhi Moskovskogo tekhnologicheskogo instituta legkoy promyshlennosti.

TSVETKOV, V.N., kand. tekhn. nauk, dotsent; ALIFANOVA, L.N., inzh.

Determining the constant of the relaxation time in the deformation of sole leather. Report No.4. Nauch. trudy MTILP no.26:134-145 '62. (MIRA 17:5)

1. Kafedra tekhnologii izdeliy iz kozhi Moskovskogo tekhnologicheskogo instituta legkoy promyshlennosti.

TSVETKOV, V.N., kand.tekhn.nauk, dotsent; SYCHENKOVA, O.P., inzh.

Stiffness in bending of the footwear manufactured by the inseam method. Izv.vys.ucheb.zav.; tekh.leg.prom. no.1:115-125 '63. (MIRA 16:3)

1. Moskovskiy tekhnologicheskiy institut legkoy promyshlennosti.
(Shoe manufacture)

TSVETKOV, V.N., kand. tekhn. nauk, dotsent

Strength characteristics of a single-row thread seam in shoe upper parts made from chrome tanned calf leather. Nauch. trudy MTILP no. 28:143-148 '63.

Strength characteristics of a single-row thread seam of shoe-upper parts made from chrome tanned kip. Ibid.:149-154

Strength [illegible] of a single-row thread seam of shoe-upper parts made from kid. Ibid.:155-[illegible]

Strength characteristics of a single-row thread seam in shoe-upper parts made from cabretta leather. Ibid.:[illegible]-166

Strength characteristics of a single-row thread seam in shoe-upper parts made from pigskin. Ibid.:16[illegible]-172

Strength correlation of thread stitches in the fastening of leather shoe-upper parts.

(MIRA 17:11)

TSVETKOV, V.N., kand. tekhn. nauk, dotsent

Analysis of thread joints for the leather elements of shoe uppers.
Kozh. obuv. prom. 5 no.7:18-20 Jl '63. (MIRA 16:8)
(Shoe manufacture)

CVETKOV, Nikolajevic, Vladimir [TSvetkov, Vladimir Nikolayevich], kandidat technickych ved; BENES, Antonin [translator]

Determining the time constant of the deformation relaxation in the chrome upper-leather. Pt.2. Kozarstvi 13 no.2:37-38 F '63.

1. Rektor Vysoke skoly technicke lehkeho prumyslu, Moskva (for Cvetkov). 2. Vyzkumny ustav kozedelny, Gottwaldov (for Benes).

TSVETKOV, V.N., kand. tekhn. nauk, dotsent; GLUKHOV. V.N., inzh.

Resistive force of the contact friction of chrome-vegetable and vegetable tanned leather for soles. Izv. vys. ucheb. zav.; tekh. leg. prom. no.2:60-66 '63. (MIRA 16:10)

1. Moskovskiy tekhnologicheskiy institut legkoy promyshlennosti. Rekomendovana kafedroy tekhnologii izdeliy iz kozhi.

TSVETKOV, V.N., kand. tekhn. nauk, dotsent [deceased]

Effect of the number of stitch rows and the distance between them on the strength of the fastening of the leather parts of shoe uppers. Nauch. trudy MTILP no.29:136-149 '64.

Substituting a feed plate for a feed awl in the sewing machine for sole attachment. Ibid.:152-154 (MIRA 18:4)

L 10433-66 EWA(j)/EWT(m)/EWP(j)/EWA(b)-2/T WW/RM

ACC NR: AM5011706 BOOK EXPLOITATION UR

TSvetkov, V.N.; Eskin, V.Ye.; Frankel', S.Ya.

Structure of macromolecules in solutions (Struktura makromolekul v rastvorakh), Moscow, Izd-vo "Nauka," 1964, 719 p. illus., tables, diagm., biblio., index. 3,800 copies printed.

TOPIC TAGS: macromolecular synthetic polymer, macromolecular structure, macromolecular dynamic and optic, structure in solution, physical properties

PURPOSE AND COVERAGE: This monograph is devoted to the hydrodynamic and optical properties of macromolecules. To the latter belong: viscosity, light scattering, sedimentation, and dynamic double refraction. This book discusses the application of the indicated investigation methods to a series of concrete and important problems: molecular weight determination, molecular weight distribution, macromolecule sizes, their configurations, structures, branching, deformability, internal mobility, stereoregularity and the analysis of the copolymer composition, heterogeneity. The authors acknowledge the contributions of Baranov, V.G.; Korotkina, O.Z.; Shtennikova, I.N.; and other co-workers of the Institute of Macromolecular Compounds of the Academy of Sciences of the USSR (IVS AN SSSR Institut Vysokomolekulyarnykh Soyedineniy Akademii Nauk SSSR). This book is designed for a wide circle of scientific workers and engineers working in the field of physics, chemistry, biology, physical chemistry, and technology of synthetic and biologic polymers, as well as for the teaching staff

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and advanced students at higher educational institutions specializing in the indicated sciences.

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Card 4/4

L 39635-66 EWT(l) IJP(c) CD-2

ACC NR: AP6002884 SOURCE CODE: UR/0286/65/000/024/0041/0041

AUTHOR: Kunstman, V. G.; Tsvetkov, V. N.

ORG: none

TITLE: Device for measuring the strength of magnetic fields. Class 21, no. 176977

SOURCE: Byulleten' izobreteniy i tovarnykh znakov, no. 24, 1965, 41

TOPIC TAGS: magnetic field, magnetic field intensity, nonhomogeneous magnetic field, magnetic field measurement, measurement, measuring apparatus, nuclear magnetic resonance

ABSTRACT: The device for measuring the strength of magnetic fields, based on the utilization of the nuclear magnetic resonance phenomenon, consisting of a transmitter with a high-frequency coil, an ampoule with working substance and modulator coil located in the measured magnetic field, a generator, a wide-band amplifier, a detector, a low-frequency amplifier, and an oscillograph, is characterized by the fact that resonance amplifiers connected in parallel and tuned to the first, second and third harmonic of the nuclear magnetic resonance signal are included between the low-frequency amplifier and the oscillograph. These features are incorporated in the design in order to facilitate the search for the nuclear magnetic resonance signal in fields of relatively high nonhomogeneity and to increase the signal to noise ratio.

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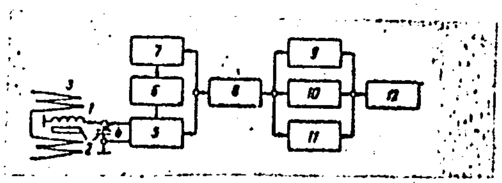
ACC NR: AP6002884



1. high-frequency transmitter coil, 2. ampoule with working substance, 3. modulator coil, 4. capacitor, 5. generator, 6. wide-band amplifier, 7. detector, 8. reference frequency amplifier, 9 - 11. resonance amplifiers, 12. oscillograph

SUB CODE: 14,20/ SUBM DATE: 25Jun64/

Card 2/2 MLP

L 04978-67

ACC NR: AP6030151 SOURCE CODE: UR/0120/66/000/004/0166/0168

AUTHOR: Kunstman, V. G.; Tsvetkov, V. N.

ORG: none

30
B

TITLE: Magnetic field intensity meter with automatic self-adjustment to the measured field

SOURCE: Pribory i tekhnika eksperimenta, no. 4, 1966, 166-168

TOPIC TAGS: magnetic field intensity, magnetic field measurement, weak magnetic field, magnetic field measuring device, electronic test equipment

ABSTRACT: A magnetic field intensity meter which uses the phenomenon of proton resonance in automatically adjusting to and following the field being measured has been developed. The device consists of two units: a high frequency unit with sensors and an autodyne circuit, and a control unit with low frequency circuit components. The device is designed for the 1—16 Koe (4—70 Mc) range. By using the automatically adjusting frequency autodyne, the frequency deviation from the resonance value of the field due to various destabilizing factors is reduced by a factor of 30. With an inhomogeneity of the measured magnetic field 10^{-3} cm^{-1}, the deviation of the frequency resonance value does not exceed 10^{-5} Orig. art. has: 1 figure. [KM]

SUB CODE: 09/ SUBM DATE: 11Aug65/ ORIG REF: 002/ OTH REF: 001/

Card 1/1 UDC: 621.317.44

M TSVETKOV, V.N.

21

Iron Wire (Bronze-Plated), Its Applications and Technical Requirements. V. N. Zvetkov and I. Dembo (*Orladenie Tekhnikoi: Kozhoburnoe Proizvodstvo*, 1933, (2), 41-43; *C. Abs.*, 1933, 27, 5702).—[In Russian.] Various tests are described.—S. G.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

3499. Orientation of Molecules in Thin Films of Anisotropic Liquids. V. Fréedericksz and V. Zvetkov. *Comptes Rendus de l'Acad. des Sciences, U.R.S.S.* 2, pp. 548-553, June 21, 1934. German Summary.—A thin anisotropic liquid film between object and cover glass may have a homogeneous or inhomogeneous structure. A film which in the absence of an external field is homogeneous may become inhomogeneous in an external magnetic or electric field and vice-versa. The experiments are made with p-azoxyanisol because of its large double refraction, and the orientation of the molecules within certain limits can be determined by observation of the limit of total reflection for the extraordinary ray, if the ordinary and extraordinary refractive indices are known. The paper describes experiments made and a method of calculating the elastic constants. The theroetical and experimental values of the maximum angle of rotation of a particle in the middle of a thin film agree to within about 4 %. R. L.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

1ST AND 2ND ORDERS

PROCESSES AND PROPERTIES INDEX

2

Molecular orientation in thin layers of anisotropic liquids and the measurement of some constants characterizing their elastic properties. V. Fréderiks and V. Zvetkov. *Physik. Z. Sowjetunion* 6, 490-504(1934); cf. C. A. 28, 6040[1].—Expts. with the liquid-cryst. phase of p-azoxyanisole are given. Values of consts. characterizing the elasticity of its torsion and of its bending are given as a function of temp. C. DeL. West

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

1ST AND 2ND ORDERS

PROCESSES AND PROPERTIES INDEX

BC

a-1

Action of the electric field on anisotropic liquids. I. Motion of the liquid in the electric field. II. Orientation of the liquid in the electric field. V. FREDERIKSZ and V. ZVETKOV (Acta Physicochim. U.R.S.S., 1935, 3, 879—894, 895—912; cf. A., 1935, 1305).—I. The electric field induces an intensive motion in the liquid, which increases with the field strength. Experiments with films of varying thickness show that for a given field strength E the effect appears only when the thickness is > a certain val. z_0 and z_0E is a const. which increases with time. A magnetic field H parallel to the surface of the liquid and perpendicular to the electric field increases z_0 but when parallel to the electric field and perpendicular to the surface, z_0 is diminished.

II. The orienting action of the electric field has been determined by investigating the simultaneous action of electric and magnetic fields on a liquid layer of thickness $< z_0$. Azoxyanisole (I) and p-acetoxybenzylideneazine are oriented perpendicular to the electric field according to Zocher's rule, whilst dibenzylideneazine and anisylidenebenzidine take up positions with the mol. axis parallel to the lines of force. The orienting effect depends on the dielectric anisotropy of the liquid, and the theoretical relation $\alpha H^2 + \beta E^2 = 1/z_0^2$ is in good agreement with the experiments. The effect of a magnetic field H_s can be counteracted by an electric field E_s, the ratio H_s/E_s decreasing with temp. The diamagnetic anisotropy and the elasticity const. A of (I) have been calc. R. S.

3RD AND 4TH ORDERS

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Ca 2

The effect of the magnetic and the electric field on anisotropic fluid mixtures. V. Tsvetkov. *Acta Physicochim. U. R. S. S.* 6, 865-84(1937)(in German).—Thin layers of liquid mixts. of complex org. compds. were confined between a plane glass and a convex glass surface, and the patterns, similar to Newton's rings, were studied by polarized light when a magnetic field perpendicular or parallel to the plane surface, or an elec. field perpendicular to the surface was applied. A large no. of photographs of the patterns are reproduced. Anisotropic mixts. of *p*-azoxyanisole and methoxycinnamic acid, as well as some other isomorphous liquid-crystal mixts., give a layer well oriented perpendicular to the surface although the pure components form layers oriented parallel to the glass. From the effect of the magnetic field it was shown that in these mixts. the elastic properties decrease more rapidly with increasing temp. than does the magnetic anisotropy. The const. that characterizes the elastic properties is detd. by the transformation temp. of the mixt. rather than by its percentage compn. The values of this const. for 3 types of deformation of the anisotropic fluid are calcd. The effect of the elec. field on the mixt. shows that the dielec. anisotropy reverses sign at a definite temp. detd. by the concn. of the components. W. W. Stiller

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Cu

The question of the cause of the motion of the anisotropic fluids in the electric field. V. Tsvetkov. *Acta Physicochim. U. R. S. S.* 6, 885-92(1937)(in German). From a crit. review of the results described in the preceding paper on the effect of magnetic and elec. fields on anisotropic fluid mixts., it is shown that the chief cause of the motion is the dielec. anisotropy of the prepns. W. W. Stifler

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

CA

13

Preparation of adhesives from raw materials obtained in U. S. S. R. V. S. Tsvetkov. *Legkaya Prom.* 1938, No. 5, 99-100; *Khim. Referat. Zhur.* 2, No. 1, [illegible]. --A no. of formulas for new adhesives and for their utilization are given. Addn. to synthetic rubber of 25-200% (of the dry residue) of rosin gives best results. Gas black and MgO give best results as active fillers. Benzene was used as solvent for adhesives from synthetic rubber. Formulas for adhesives prepd. from gutta-percha with rosin are given. Butyl and ethyl acetates were used as solvents instead of the toxic benzene and dichloroethane.

W. R. Henn

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

BC

a-1

Effect of a magnetic field on the viscosity of the anisotropic liquid p-azoxyanisole. V. N. Zvetkov and G. M. Michailov (Acta Physicochim. U.R.S.S., 1938, 8, 77—94).—The viscosity was investigated under conditions for which Poiseuille's law held. With a magnetic field (up to 10^4 gauss) normal to the direction of flow an increase of viscosity as much as 100% was obtained. The increase was greater for small rates of flow and disappeared with $v > 7 \cdot 4$ cm. per sec. This explains discrepancies of previous workers. The effect decreased with temp., becoming zero at 135° (transition temp., anisotropic → isotropic liquid). A parallel magnetic field caused a decrease of viscosity but of smaller magnitude than with the normal field. J. A. K.

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CA

Dispersion of light in anisotropic liquids. V. N. Tsvetkov. *J. Exptl. Theoret. Phys.* (U. S. S. R.) 8, 855-60(1938).—The transparency of *p*-azoxyanisole or acetoxybenzalazine placed in either a transverse or a longitudinal magnetic field attains a max. at 2000 oersteds and then does not increase up to 22,000 oersteds. The depolarization of light transmitted along the surface layer is complete in either a transverse or a longitudinal field of 3000 oersteds. Residual "turbidity" is due to thermal oscillations of mol. groups too large to be oriented by a magnetic field of 22,000 oersteds. F. H. Rathmann

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

BC

A-1

Light scattering in anisotropic liquids. I. Investigations in transmitted light. II. Depolarisation of scattered light. V. Zvetkov (Acta Physicochim. U.R.S.S., 1938, 9, 111—120, 130—140).—Transmission measurements on liquid p-azoxyanisole (I) in magnetic fields up to 22,000 gauss have been made with particular reference to the influence of surface layers on the results. Both in longitudinal and in transverse fields max. transmissivity is attained at 2000 gauss and remains unaltered at higher field strengths. The effect of field strength on the degree of depolarisation has also been considered.

II. The state of polarisation of light scattered at 90° to the incident light by (I) and by acetoxybenzylideneazine and the influence of magnetic fields up to 20,000 gauss on the degree of polarisation have been studied. The scattering of light in strong magnetic fields cannot be interpreted by the theory of Ornstein and de Braaf. W. R. A.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

A 53
d

SA

4490. Influence of Electric Fields on Flow of p-Azoxyanisole in Capillary Tubes. G. Mikhailov and V. Zvetkov. *J. of Exp. and Theor. Phys. U.S.S.R.* 9. 2. pp. 208-214, 1939. *In Russian.*—Using the capillary method it was found that a longitudinal electric field reduces and a transverse field increases the time of flow of p-azoxyanisole. The effects disappear in the isotropic phase. The transverse increase occurs only if the speed of flow is not high enough to have a large orienting effect, and disappears also with increase of frequency. The authors interpret the results as being due not to a direct orienting effect of the field, but to a flow in the anisotropic liquid caused by the field. [See Abstract 1660 (1938).] D. S.

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5A

78. Action of magnetic and electric fields on flow of p-azoxy-anisole. G. MIKHAILOV AND V. ZVETKOV. *J. of Exp. and Theor. Phys. U.S.S.R.*, 9, 5, pp. 597-601, 1939. *In Russian.*—The paper continues previous work on the action of magnetic and electric fields on viscosity in the nematic phase [see Abstract 4490 (1939)]. It is shown that the effect of a magnetic field normal to the flow direction reaches saturation for a field depending on the velocity. The viscosity of p-azoxyanisole when its molecules are oriented parallel to the flow but normal to the velocity gradient is found to be about 4 times the viscosity when molecules are normal to the flow but parallel to the velocity gradient. From the simultaneous action of magnetic and electric fields it is confirmed that the effect of an electric field is due to the orienting effect of the flow set up by the electric field. D. S.

ASB-SLA METALLURGICAL LITERATURE CLASSIFICATION

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A 53 d

74. **Flow of anisotropic liquids in rotating magnetic fields.** V. ZVETKOV. *J. of Exp. and Theor. Phys. U.S.S.R.*, **9**, 5, pp. 602–615, 1939. *In Russian.*—It is found that anisotropic liquid azoxyanisole is set into rotation by a rotating magnetic field (of several thousand gauss) and hence produces a couple on its containing vessel. This couple depends on the field strength, the speed of rotation and the temperature. This effect is interpreted as due to the small rotational mobility of the structural units of the liquid crystal, and the size of these units is estimated from the experimental data as $\sim 10^{-8}$ to 10^{-8} cm. D. S.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

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Effect of the electric field on the streaming velocity in a capillary tube of the anisotropic liquid *p*-azoxyanisole. G. M. Mikhailov and V. N. Tsvetkov. *Acta Physicochim. U. R. S. S.* 10, 415-32(1939)(in German).—In a longitudinal elec. field the rate of flow of anisotropic *p*-azoxyanisole ($t = 120°$) is greater, in a transverse elec. field of low frequency less, than in a field-free capillary. For the isotropic liquid (> 140°) these effects are not observed. Nor in the case of a transverse field were effects observed except at low streaming velocities. With increasing frequency, the effects decrease and high frequencies, $\nu = 34 \times 10^{4} - 6 \times 10^{6}$, had no effect on the streaming velocity. The inertial effects observed indicate that the change in viscosity in an elec. field is not due to purely orienting effects of the field but to the elec. current induced between the electrodes through the anisotropic liquid.

F. H. Rathmann

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

BC

A-1.

Movement of anisotropic liquids in a rotating magnetic field. V. Zvetkov (Acta Physicochim. U.R.S.S., 1939, 10, 555—578).—In a rotating magnetic field *p*-azoxyanisole is set in rotatory motion, and the torsional moments thereby communicated to the walls of the vessel have been measured. With increasing speed of rotation of the field the moment increases linearly to a max., and then decreases. The max. moment, and the frequency at which it occurs, $\propto H^2$. With rising temp. the max. becomes lower and shifts towards higher frequencies. The theory of the effect is worked out and the diamagnetic anisotropy is calc. in agreement with vals. obtained by other methods.

F. J. G.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

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Effect of magnetic and electric fields on the streaming velocity of anisotropic liquid p-azoxyanisole in a capillary tube. (I. M. MICHAILOV and V. N. ZVETKOV (Acta Physicochim. U.R.S.S., 1939, 10, 775—788).—The effect of a transverse magnetic field on the streaming velocity of *p*-azoxyanisole (I) reaches a saturation val. for sufficiently strong fields. The coeff. of internal viscosity of (I) when the axes of the mol. are perpendicular to the stream and parallel to the velocity gradient is about four times the coeff. when the mols. are arranged parallel to the stream and perpendicular to the velocity gradient. The simultaneous action of a magnetic and an electric field has been investigated. The change in the streaming time from that in the magnetic field alone is due to the orientation of mols. by the electric field. A. J. M.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

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Size and shape of molecular swarms in anisotropic liquids. V. N. Tsvetkov. *Acta Physicochim. U. R. S. S.* 11, 97-106(1939)(in German).—From the values of the viscosity coeffs. of *p*-azoxyanisole in rotating magnetic fields up to 2000 oersteds at 112.5°, it is concluded that the particles are not single mols. but polymol. groups with diams. of the order of 7 × 10^{-3} cm. The effects are due to chaotic, non-periodic rotations around the equil. position with an av. angular deviation of 1°. Cf. *C. A.* 33, 6072[a].
F. H. Rathmann

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CA

The optical properties of anisotropic liquid layers in a
rotating magnetic field. V. N. Tsvetkov. *Acta Physico-*
chim. U. R. S. S. 11, 637-48(in German); *J. Exptl.*
Theoret. Phys. (U. S. S. R.) 9, 947-61(1939).—When the
axis of rotation is directed so that the mutual forces of
interaction of the particles do not hinder their rotation in
the field, the phase displacement between the field H and
the polarization vector of the substance can be measured.
The results obtained on azoxyanisole and acetoxybenzal-
azine layers agree with those previously found for azoxy-
anisole (cf. *C. A.* 33, 3645[9], 6672[9]). The equation $6\eta\omega B$ =
$^1/_2 H^2 \Delta x \sin 2\alpha$ (where α = phase displacement, B = form
factor = $^2/_3$, ω = rotational velocity) gives values of η
agreeing well with those obtained by other methods.
When the axis of rotation is parallel to the layer surface,
the substance behaves as a continuum in which the mutual
interaction forces are the main factor. The app. is illus-
trated and exptl. data are given. F. H. Rathmann

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Dielectric constant of a moving anisotropic liquid. V. Marinin and V. Tsvetkov. *Acta Physicochim. U. R. S. S.* 11, 837–48(1939)(in German); *J. Exptl. Theoret. Phys.* (U. S. S. R.) 9, 1388–92(in Russian).—By means of a suspension method, the dielec. properties of p-azoxyanisole in motion through a capillary are found to vary with the velocity of flow, the strength of the magnetic field and the temp. At 119° and v = 0.1 cm./sec. the orienting effect is 20% in a field of 3000 gausses, 59% for 1000 gausses; for 2.12 cm./sec. the effects are 87 and 93%. The orienting effect falls linearly with temp. from 90 to 120°, then rapidly to zero at 134°; it increases rapidly with H up to 800 gausses, and only slowly above 1000 gausses, the bend point being almost independent of the temp.

F. H. Rathmann

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2

Orientation of minlocules of anisotropic liquids in a
stream. V. N. Tavatkov and V. Marinin. Acta Physi-
cochim. U. R. S. S. 13, 219-40 (in German); J. Exptl.
Theoret. Phys. (U. S. S. R.) 10, 929-41 (1940).—Theoreti-
cal-math. On the basis of the change of the dielec. prop-
erties of anisotropic liquids in a magnetic field, and the
effect thereon of the rate of motion, it is shown that the
experimentally observed effects (cf. C. A. 34, 4025[1])
cannot be explained by assuming mol. swarms moving
independently, whereas the assumption that each long
ellipsoidal swarm with a/b more than 2 is hindered in its
free rotation by the orienting field of the swarm complex
and that Brownian motion can be neglected explains
these effects. F. H. Rathmann

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

2

Effect of the magnetic and electric fields on the viscosity and molecular orientation of anisotropic liquids. V. N. Tsvetkov (Phys. Inst., Leningrad Univ.). *Akad. Nauk S.S.S.R., Otdel. Tekh. Nauk, Inst. Mashinovedeniya, Soveshchanie Vyazkosti Zhidkostei i Kolloid. Rastvorov* (*Conf. on Viscosity of Liquids and Colloidal Solns.*) **1**, 47-57(1941)(in Russian); cf. C.A. **33**, 3045[9]. In the magnetic field, at const. rate of flow (expressed by the pressure difference P in g./sq. cm.), the viscosity of *p*-azoxyanisole (expressed by the time of flow through the capillary, τ) at 120°, rises with the field intensity H up to about 10,000 oersteds and remains const. from there on. Plots of the relative change $\Delta\tau/\tau$ due to the magnetic field, against the pressure difference P, show the effect to decrease systematically with increasing P, at 3 different fields, H = 7150, 8800, and 9700 oersteds; at high rates of flow, the effect of the magnetic field becomes unnoticeable, thus at H = 9700 and 128°, $\Delta\tau/\tau$ becomes unobservably small at 0.2 cm./sec. The satn. value of $\Delta\tau/\tau$ is practically the same, about 260-275%, for 3 different values of P, 0.3, 0.5, and 1.0 g./sq. cm., corresponding to, resp., 0.21, 0.52, and 1.10 cm./sec. The expts. were made in a plane capillary of brass, of very nearly rectangular section 0.6 × 1 mm.; the foregoing observations are valid for a magnetic field perpendicular to the flow but parallel to the velocity gradient; in a field perpendicular to the gradient, that is parallel to the longer side of the rectangular section of the capillary, the effect is much smaller: at P = 3 g./sq. cm., at 120°, the satn. value of $\Delta\tau/\tau$, attained at H = 10,000 oersteds, is only 30%. In longitudinal fields of that intensity, τ is somewhat shortened, by about 15%. In a longitudinal field, or in the absence of a magnetic field, Poiseuille's law holds at medium rates of flow of 0.05 to 40 cm./sec. In transverse fields, the law holds only at satn. and above, where the orientation of the axes of the mol. parallel to the field is complete; below satn., the product $P\tau$ is not const. Denoting $\eta_\parallel$, $\eta_\perp$, and $\eta'_\perp$, resp., the viscosity in a longitudinal field, in a transverse field with the mols. oriented parallel to the velocity gradient, and in a transverse field with the mols. oriented perpendicular to both the flow and the velocity gradient, one has for *p*-azoxyanisole: $\eta_\perp$ = 3.6$\eta_\parallel$ and $\eta'_\perp$ = 1.2$\eta_\parallel$, at 120°. In a transverse elec. field parallel to the velocity gradient, the increase of τ with increasing elec. field strength E is smaller the higher the frequency ν. For d.c. (ν = 0), $\Delta\tau/\tau$ is 100% at E = 10,000 v./cm. and continues to rise with further increasing E. In a.c., satn. is the same as in a magnetic field, but the final value of $\Delta\tau/\tau$ is markedly less and decreases with increasing ν; above 10[6] cycles/sec., τ is not affected by the field at all. The elec. field acts in two ways: as a result of the dielec. anisotropy of *p*-azoxyanisole, the mol. axes are oriented parallel to the field, the effect being independent of the frequency; on the other hand, the field gives rise to a macroscopic motion of the liquid between the electrodes, diminishing with increasing ν. The satn. observed in this case does not mean complete orientation of the mols. but indicates equil. between the two elec. field effects. Measurements of the dielec. const. ϵ on flowing *p*-azoxyanisole in a magnetic field showed that increased rate of flow counteracts and compensates the increase of ϵ due to the magnetic field. At H = 700 oersteds, the compensation is complete at 0.3 cm./sec.; in stronger magnetic fields, considerably higher rates of flow are required to bring about the same satn. result. The curves show that at H = 2800, at a mean rate of flow of 4-5 cm./sec., the orientation of the mol. axes perpendicular to the field attains 97-98%. Statistically, starting from G. B. Jeffery's equation for the moment acting on an ellipsoidal particle in a velocity-gradient field, introducing the moment due to the magnetic and the elec. field, and dis-

General Physics

1068

538.22

Relaxation Phenomena in Anisotropic Liquids in a Rotating Electrical Field. V. N. Tsvetkov (*Bull. Acad. Sci. U.R.S.S., sér. phys.*, 1941, Vol. 5, No. 1, pp. 57-67. In Russian, with English summary.) An investigation of the properties of anisotropic liquids composed of long chain molecules, in a rotating electric field. It is found that the relaxation time in such liquids depends upon two factors, the time of polarization of a molecular group and the time of its revolution in the field. If the first of these factors is of the order of 10^{-10} sec (as is usual in polar liquids) then the second factor is a few tenths of a second for magnetic fields of several thousand gauss, or for electric fields of several c.g.s. units.

Molecular arrangement in the anisotropic liquid phase. V. Zvetkov (*Acta Physicochim. U.R.S.S.*, 1942, **16**, 132—147).—The conditions of existence of the anisotropic liquid state and the transformation from this to the amorphous state have been investigated. An anisotropic liquid is regarded as a system of mols. with axial symmetry with an ordering of the mol. axes extending over considerable distances. The magnetic and optical properties of an anisotropic liquid substance are discussed in connexion with the ordering of mols. The transformation from the anisotropic to the amorphous state is accompanied by a sudden change in the degree of ordering and is a transformation of the first kind, involving a change of heat capacity (an expression for which is given), an increase in vol., and absorption of heat. A. J. M

CA

2

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Diamagnetic anisotropy of crystalline liquids. V. Tsvetkov and A. Sosnovskii. *Acta Physicochim. U. R. S. S.* 18, 358-69; *J. Exptl. Theoret. Phys.* (U. S. S. R.) 13, 353-60(1943)(in English).—The authors consider the further development and application of the method of rotating magnetic field to measurements of the diamagnetic anisotropy of liquid crystals. Eight anisotropic liquid substances were examd. The results obtained show that the magnetic anisotropy is proportional to the no. of benzene rings in the mol., as is easily explained in terms of Pauling's theory. Exptl. data for *methoxycinnamic acid*, *azoxyanisole*, *azoxyphenetole*, *anisaldehyde azine*, *p-acetoxybenzaldehyde azine*, *p-anisylideneaminoazobenzene*, *dibenzylidenebenzidine* and *dianisylidenebenzidine* are shown in 2 tables and 3 figs.

F. H. Rathmann

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2

Magnetic and dynamic double refraction in the iso-
tropic phase of substances capable of forming liquid
crystals. V. N. Tsvetkov. *J. Exptl. Theoret. Phys.*
(U.S.S.R.) 14, 35-45(in Russian); *Acta Physicochimica*
U.R.S.S. 19, 86-103(1944)(in English).—The magnetic
and dynamic birefringence in the isotropic phase of certain
liquid crystals are measured. A high magneto-optical
and dynamo-optical effect is found, the magnitude of
which increases as the temp. approaches the transition
point into the anisotropic liquid phase. The temp. de-
pendence of both effects is the same, which indicates that
they are both due to the same cause. It is assumed that
embryonic nuclei of the liquid cryst. phase are formed in
the isotropic phase of liquid crystals. The dimensions of
the swarms are detd. by a comparison of exptl. data with
the results of heterophase fluctuations which can be calcd.
with the help of the Frenkel theory. The shape of the
swarms is discussed. The application of the theory of
dynamic birefringence to the exptl. data shows that the
swarms are practically spherical. Exptl. data are given
on the substances *p-azoxyanisole*, *p-azoxyphenetole*,
anisal-p-aminoazobenzene, and the *ethyl ester of azoxy-*
benzoic acid. F. H. Rathmann

ASA-SLA METALLURGICAL LITERATURE CLASSIFICATION

The nature of dynamic double refraction in rubber solutions and the shape of rubber molecules. V. N. Tsvetkov and A. Petrova. *J. Tech. Phys.* (U.S.S.R.) **14,** 280-313(1944); cf. *C.A.* **37,** 3632. —The flow bire- fringence Δn of low-mol. polymers, e.g., polyisoprene with a mol. wt. *M* between 20,000 and 35,000 in gasoline or of Buna-S with *M* between 30,000 and 11,000 in CCl_4, is pro- portional to the rate of shear *g*. The Δn of high polymers, e.g., polyisobutylenes, e.g., Oppanol, *M* 165,000, and Vistanex, *M* 75,000, in gasoline, increases with *g* more than linearly. For these compds. the theoretical const.: Δn/gCη (*C* is the concn. of the polymer in basic g.-mol. per l., and η the macroscopic viscosity of the soln.) is the smaller the greater is *C*. this is due probably to the micro- scopical viscosity being smaller than the macroscopical one. It is found that the magnitude $Z = \Delta n/gC(\eta\eta_0)^{1/2}$ is independent of *C*. η_0 is the viscosity of the solvent. *Z* of Vistanex in tetrahydronaphthalene is independent of temp. between 12 and 48°, and decreases when the temp. is further increased. Solns. of com. divinyl polymers often show an abnormal variation of *Z* with *C*, which seems to be caused by impurities (talc from mastication, etc.). When *g* increases up to 15,000 sec.⁻¹, the extinction angle slowly decreases for low-mol. polymers, rapidly decreases for high polymers, and varies irregularly for com. divinyl polymers. The value of *Z* depends on the refractive index *n* of the solvent; e.g., for Vistanex, *n* = 1.5, *Z* passes through a min. (3.10⁻⁴) at *n* = 1.49. The excess of *Z* over Z_{min} must be due to an anisotropy of the polymer mol. This anisotropy must be produced by a deformation of the mol. since Δn increases with *g* even when the angle of extinction is near 0, and the elec. birefringence is many times smaller than that for a straight polymer mol. From the *Z* values the ratio of the long and the short axis of the mol. is calcd.; for 1 group of polymers it is the greater the higher the degree of polymerization; for divinyl polymers it is the greater (100–130) the fewer the free vinyl groups (30–40%) in the polymer. J. J. Bikerman

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Bc

A-1

Magnetic and dynamic double refraction in the isotropic phase of substances capable of forming liquid crystals. V. Zvetkov (*Acta Physicochim. U.R.S.S.*, 1944, 19, 86—103).—The effect of a magnetic field on the birefringence of *p*-azoxy-anisole and -phenetole, anisylidene-*p*-aminoazobenzene, and Et azoxybenzoate is very considerable, and is ∝ (field strength)^2. The variation of magnetic double refraction with temp. is also investigated. There is a sharp increase of $\Delta n = n_e - n_o$ at lower temp., indicating a considerable development of the "pretransition" structure under these conditions. Δn for the isotropic liquids is ≫ that for normal liquids. Streaming double refraction was also studied with the above substances. In the case of azoxyanisole, the streaming double refraction is very great, and may be compared with that of conc. solutions of high-polymeric polystyrenes. Δn increases linearly with velocity gradient. The effect of temp. is similar to that on the magnetic double refraction. To explain these results it is assumed that in the isotropic phase embryonic nuclei of the liquid-crystal phase are formed. The dimensions of the swarms are calc. by the Frenkel theory of heterophase fluctuations. The results agree satisfactorily with vals. calc. from the effect of temp. on magnetic and streaming birefringence. The swarms are of comparatively small dimensions. The shape of the swarms is also considered. The abnormally large birefringence in a stream of azoxyanisole would appear to indicate that the swarms are not spherical, but the theory of Boeder (A., 1932, 571), applied to find the transverse and longitudinal dimensions, shows that they are almost spherical, the two dimensions differing by ~2%. It is considered that the deviation from the purely spherical shape is due to the motion of the particles in the stream.

A. J. M.

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2

The magnetic double refraction of polystyrene. V. N. Tsvetkov and E. Frisman. *Acta Physicochim. U.R.S.S.* 19, 323-7(1944)(in English).—The magnetic double refraction (I) of polystyrene of various degrees of polymerization was detd. by the method previously described (*C.A.* 39, 1336[9]) in a field of 19,500 oersteds. Measurements of d. and η were also made. The I remained const. even after 17-hr. thermal polymerization at 60°, during which η increased many thousands of times. Only when the polymer had become almost hard was a decrease noted in I. These results support the hypothesis of a cluster-like mol. structure for the polymer in preference to a chain or rod structure, for both of which an enormous value of I, decreasing with increasing degree of polymerization, is to be expected. The constancy of I until almost complete polymerization was attained is attributed to a certain freedom of rotation of the benzene nucleus within the polymer mol. The possibility of a slightly bent chain-like mol. consisting of polar monomeric links and devoid of any resulting moment is not excluded. T. H. D.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

Birefringence of polyisobutylene solutions under feew. V. N. Tsvetkov and E. Frisman (Leningrad State Univ.). *Acta Physicochim. U.R.S.S.* 20, 61-96(1945).—In con• trast to viscometric measurements the investigation of the birefringence of a colloidal soln. under flow leads to con- clusions not only concerning the bulk of the suspended particles but also their configuration, magnitude, optical anisotropy, and dissymmetry. Simultaneously the flow birefringence (Δn), the extinction angle α, and the viscos- ity at the same velocity gradients (g) at which the optical measurements were made, were measured in 4 polyiso- butylene (I) solns. in the gasoline fraction boiling at 120– 40°. All measurements were made at 10°; the app. was described in a former paper (Tsvetkov and Petrova, *C.A.* 37, 3032[4]). For I, which forms typical chain mols. with- out side branches, the configuration is detd. by a single factor, the degree of curvature of the chain of principle valences. At ordinary temps. I is already in a rubberlike state. To characterize the mol. wt. of the samples, η of their solns. was studied. From Eilers equation (*C.A.* 37, 6523[9]) the bulk, V, was detd. By plotting V as a func- tlon of $1/c$, (c = bulk concn.) and extrapolating, V_0 was obtained. By use of $K_m = 3.07 \times 10^{-4}$ the mol. wts. were detd. from Staudinger's equation; the values for the four samples were 28,700 (II), 32,800 (III), 47,000 (IV), and 133,000 (V). V yielded solns. having a large structural η whereas I and II varied markedly with g only at high concns. and small velocity gradients. From Staudinger's, de Waele's (*C.A.* 18, 3501), and Ostwald's (*C.A.* 19, 2288) formulas the following equation is derived: log $\eta_r = \mu(K_m c_m/2.3026) - \gamma \log (p/p_0)$, where γ is the structural viscosity index of the soln.; c_m = mol. concn. of the soln.; p_0 is initial pressure; μ = mol. wt. When log η_r is plotted as a function of log (p/p_0), the points give a straight line the slope of which is the value of γ for the given soln. From the graph of γ vs. c_m it is seen that γ is proportional to c_m and $\gamma_0 = d\gamma/dc_m$, obtained from the slope of the straight lines in this graph. γ rises with increasing mol. wt. By plotting Δn as $f(g)$ for the four polymers it was found that for II Δn increases in direct ratio to g up to values of g reaching several tens of thou- sands sec.$^{-1}$; at $g \sim$ 50,000–70,000 sec.$^{-1}$ Δn increases at a more rapid rate; for III this curvature is noticed at somewhat lower values of g and for IV this effect is ex- hibited at $g \sim$ 3000-5000 sec.$^{-1}$. For V the curve is no longer linear at the lowest values of g avellable (100 sec.$^{-1}$). Signer (*C.A.* 30, 2461[7]) found a similar effect for poly- styrenes of high mol. wt. The authors attribute the de- parture from proportionality between Δn and g to the elongation of the mol. under the action of the deformation stress experienced by the mol. under flow; thus the rapid change of the slope of the curve $\Delta n = f(g)$ for the polymer of high mol. wt. means that its mols. suffer an abrupt elon- gation on reaching a definite "critical" velocity gradient (g_k). By use of the available data of the correct order of magnitude g_k values are obtained from Frenkel's (*C.A.* 39, 1340[9]) theoretically derived formula. On further in- crease of g, V experiences an irreversible change resulting in a lowering of η and the magnitude of the birefringence. From the plots of α vs. g it is seen that α diminishes with

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increasing values of g; that for solns. of the same polymer the curve was lower the greater the concn., i.e. the η of the soln. Data revealed the absence of a direct and simple relation between the orientation of the mols. under flow and the structural viscosity. The hydrodynamic force factor, $g\eta_0$, corresponding to a definite value of α was about the same for different concns. The exptl. relation $\alpha = f(g)$ does not follow Boeder's equation (*C.A.* 26, 3981[1]), α decreasing with increasing values of g more slowly than that required by theory; these deviations for solns. of I may be due to a large extent to the deformatic and tension of the mols. Z, the dynamo-optical con... was calcd. by the formula $Z = \Delta n/cg\eta_0$... or quantity ($cg\eta_0 V/V_0$), where η_0 is the solvent η. The graph Δn ~ $\Delta n/g$ was calcd. for values of g at which the ... IV. $f(g)$ was still rectilinear (II, III, g = 3000 sec.$^{-1}$;

V, g = 1000 sec.$^{-1}$). Values of Z obtained agree over a wide concn. range. The fact that Z is proportional to $\eta^{1/2}$ and not η_0 is assocd. with the interaction of mols. in concd. soln. resulting in a decrease of the "effective vol." Extrapolation of curve $Z = f(g)$ for solns. of V gives $Z = 4 \times 10^{-7}$. By measuring Δn simultaneously with α for a given concn. the optical anisotropy $n_1 - n_2$ was detd. The mol. anisotropy rose linearly with increasing values of g; the slope increased with increasing concn. The birefringence observed experimentally under flow of gasoline solns. of I was mainly a photoelastic effect. The contribution of anisotropy occasioned by the shape of the mol. and the intrinsic anisotropy of the particle substance is considerably less and decreases with increasing mol. wt. of the rubber and its concn. in the soln. From the data several conclusions were drawn regarding the shape of the mols. of I in soln.; the mol. chain is highly entangled but the configuration of an individual mol. in soln. is not spherical. For II the length is 20 times the diam., also the elongation increases with the degree of polymerization. The greater the mol. wt. of the polymer, the more loosely its mols. are built up and the greater is the amount of solvent bound with it, in agreement with Kuhn's theory (*C.A.* 31, 6031[1]). Also in *J. Exptl. Theoret. Phys.* (U.S.S.R.) 10, 270-300.

Bernard Wolnak

CA

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Effect of solvents on the Maxwell dynamo-optical effect in polyisobutylene solutions. V. N. Tsvetkov and E. Frisman. *Acta Physicochim. U.R.S.S.* 20, 363-85 (1945)(in English); cf. *C.A.* 40, 788[1].—"Viscometric and dynamo-optical investigations of solns. of polyisobutylenes in 10 solvents are reported. Apart from the "structural" effect of the solvents, the Maxwell effect is found to depend upon the *n* of the solvent. This dependence is in accord with the Wiener and Peterlin-Stuart theories and not with Sadron's results. By studying simultaneously the value of the birefringence Δn and the extinction angle α in various solvents it was possible to separate from the overall Δn the effect of the inherent anisotropy of mols., the effect of their shape, and the photoelastic effect under flow. For the difference between the two principal *n*s of the macromol. an order of magnitude 10^{-4} is found, which is in good agreement with Kuhn's conceptions. From the measured Δn of form it is possible to calc. the vol. and shape of mols. in soln. The results obtained agree with the values found by measuring α and the photoelastic Δn." Oscar T. Quimby

PROCESSES AND PROPERTIES INDEX

Depolarization of light scattered in solutions of rubber-like polymers. V. N. Tsvetkov and E. Frisman (Leningrad State Univ.). *Compt. rend. acad. sci. U.R.S.S.* 47, 554-7; *Doklady Akad. Nauk S.S.S.R.* 47, 571-4 (1945). Depolarization factors are given for solns. of natural rubber, butadiene rubber, polystyrene, Vistanex, and Oppanol. Depolarization $\Delta_v < 1$ is considered to be a property that is general for solns. of all rubberlike polymers. All of the above solns. also show a small degree of depolarization Δ_v, which indicates that the optical anisotropy of their mols. in soln. is negligible. J. R. Hill

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1ST AND 2ND ORDERS

PROCESSES AND PROPERTIES INDEX

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Dynamic and acoustic birefringence of some liquids. V. N. Tsvetkov, A. Mindlina, and G. Makarov (Leningrad State Univ.). *Acta Physicochim. U.R.S.S.* 21, 135-58(1946)(in English).—A quant. study was made of the dynamic (streaming) and acoustic (ultrasonic) birefringence of oils and of solns. of high-mol.-wt. polymers. Pure oils, e.g. castor, cedar, sesame, linseed, paraffin oil and cod-liver, showed a linear relation between the magnitude of dynamic birefringence (Δn) and the velocity gradient g, with a const. extinction angle of 45°. Oils contg. colloidal impurities showed a variation in extinction angle, decreasing with g. With increasing temp., $\Delta n/g$ decreased rapidly; furthermore, the anisotropy of the liquid particles diminished. The acoustic birefringence (Lucas effect, *Compt. rend.* 206, 827(1938)) was measured by passing a light beam 1 cm. above the surface of a quartz emitter immersed in the liquid, and observing the rotation angle of an analyzer. A linear relation was found between the acoustic birefringence ($\Delta n'$) of oils and the amplitude of the waves. Furthermore, $\Delta n'$ increased directly with the frequency and varied inversely with the temp. A method for detg. the absolute magnitude of the energy of ultrasonic vibrations was developed. The relaxation time for solns. of polystyrene and polyisobutylene was found greatly to exceed 10^{-6} sec., and the factors in the depolymerizing action of ultrasonic vibrations were reviewed.

M. L. Nielsen

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

1ST AND 2ND ORDERS

PROCESSES AND PROPERTIES INDEX

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Depolarization of light scattered by polystyrene. E. Frisman and V. N. Tsvetkov (Leningrad State Univ.). *Acta Physicochim. U.R.S.S.* 21, 188-9(1940)(in English). --The depolarization of light scattered at right angles by polystyrene was studied as a function of time of polymerization. For the first 8-10 hrs., depolarization remained const. Thereafter, a sharp decrease was observed in ρ_u and ρ_v (the natural and vertically polarized incident beams) followed by a gradual increase. Throughout the expt. ρ_h (the horizontally polarized beam) remained equal to 1. The results are interpreted as indicating that the macromols. play an important part in the scattering, and are optically much less anisotropic than the monomeric mols. The constancy of ρ_h indicates that the macromols. are smaller than the wave length of the light.

Henry C. Thacher, Jr.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

Styrene: polymerisation kinetics: study by double refraction of flow. W. ZVETKOV and E. FRISMAN (Acta Physicochim., U.S.S.R., 1946, 21, 978-1000; J. Text. Inst., 1947, 38, 325A).—Investigations of double refraction, of the degree of depolarisation of scattered light, and of viscosity were carried out with styrene at different stages of polymerisation. The anomalous dynamo-optical properties displayed in the initial stages of polymerisation are readily accounted for on the basis of the polydispersion of the system. The results of extinction angle and viscosity measurements lead to values for the concentration and mean molecular weight of the polymerised part. It appears that the polymer molecular weight attains its maximum at a very early stage of polymerisation and decreases as the polymerisation proceeds. The variation of the calculated dynamo-optical constant with the course of polymerisation is similar to that of the molecular weight.

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PA 54T32

TSVETKOV, V.

USSR/Chemistry - Polymerization Nov/Dec 1946
Chemistry - Kinetics

"The Double Refraction of Flow as a Method of Studying Polymerization Kinetics," V. Tsvetkov, E. Frisman, Phys Inst, Leningrad State U, 22 pp

"Acta Physicochimica URSS" Vol XXI, No 6

Investigations of double refraction, of degree of depolarization of scattered light and of viscosity, carried out at different stages of polymerization for styrene. In initial stage anomalous dynamo-optical properties discovered. Concentration and mean molecular weight of polymerized part determined. Received, 7 Jul 1946.

54T32

Physical methods of investigation of the structure of polymer molecules in solution. V. N. Tsvetkov. *Vestnik Leningrad. Univ.* 1947, No. 1, 81-102 (in Russian). Crit. review (111 references) and summarizing exposition particularly of the author's recent work in the field. Thom

A method for the production of gutta-percha films. A. N. Tsvetkov and M. S. Sycheva. *Legkaya Prom.* 7, No. 1, 24-6(1947); *Chem. Zentr.* 1947, II, 757; cf. C.A. 43, 6855d.—The production of films of gutta-percha 0.2 mm. thick as a thermoplastic adhesive layer for shoe manuf. is described. The plasticizing is done either by preheating and subsequent milling or by direct refining. In the latter case only gutta-percha contg. less than 8% moisture can be used. Tests of shoes showed an increase in adhesive strength of 8-10% over that obtained by the use of gutta-percha sol. Tests on exptl. material showed an increase of 50% when the film was used. M. G. Moore

The introduction of fillers into gutta-percha films to increase their thermal stability. V. N. Tsvetkov and M. S. Sycheva. *Legkaya Prom.* 7, No. 2, 27-9(1947).—In an attempt to stretch the available gutta-percha supply and, at the same time, make superior products, various additives were tested. Pure gutta-percha gave a value of 82° in the ring-and-ball test for thermal stability; 10% rosin decreased the value to 81°, 15% milkweed increased it to 85°, 15% tau-saghyz to 94°, 25% tau-saghyz to 91°, 25% kok-saghyz to 89°, 15% Sovprene (chloroprene rubber) to 100°, and 25% Sovprene to 100°. Marshall Sittig

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

The depolarization of light scattered in solutions of rubberlike polymers. V. N. Tsvetkov and E. Frisman (Leningrad State Univ., U.S.S.R.). *Rubber Chem. and Technol.* 20, 912-15(1947).—See *C.A.* 40, 4240.
C. C. Davis

ASA-SLA METALLURGICAL LITERATURE CLASSIFICATION

TSVETKOV, V.

PA-2T5 0

USSR/Physical Chemistry
Polymerization

Mar 1947

"Birefringence in a Current as a Method for Investigating the Kinetics of Polymerization," V Tsvetkov, and E Frisman, 11 pp

"Zhurn Fiz Khim" Vol XXI, No 3

Theoretical discussion, experimental data and evaluation of latter. Illustrated with graphs, tables and formulae.

2T50

1ST AND 2ND ORDERS

3RD AND 4TH ORDERS

PROCESSES AND PROPERTIES INDEX

Flow birefringence as a method of studying polymerization kinetics. V. N. Tsvetkov and E. Frisman (State Univ., Leningrad). *J. Phys. Chem.* (U.S.S.R.) 21, 261-70(1947); cf. *C.A.* 40, 788[9], 6313[6]. Flow birefringence of polymerizing styrene was detd. in the annular space between two coaxial cylinders, one of which was rotated; the clearance was 0.1 mm. The birefringence $n_1 - n_2$, divided by the velocity gradient *g*, was pos. for the monomer and neg. for partly polymerized styrene. The change of sign occurs at the same degree of polymerization as the sudden drop of the degree of depolarization and the sudden change of the extinction angle α. The curves $n_1 - n_2$ against *g* are linear for the monomer and for mixts. the relative viscosity η_r of which is greater than 10. For mixts. of a lower degree of polymerization the curves are convex toward the *g* coördinate. The α is ~45° for the monomer and has a small pos. value for partly polymerized styrene. This value depends on *g*. From the values of $(n_1 - n_2)/g$ and α for partly polymerized styrene the corresponding values for the pure polymer are calcd. by means of Sadron's equations (*C.A.* 33, 2014[7]). From α, the friction between a polymer mol. and the solvent is calcd., and from the friction the mol. wt. of the polymer is estd. It is found that the mol. wt. decreases when polymerization proceeds. E.g., when η_r is 9, the mol. wt. is 230,000, and when η_r is 15, it is 94,000.

J. J. Bikerman

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION