SKLEAREVICI, I.A. [Shklyarevich, I.A.]

Application of high vacuum for the intensification of agglomeration process. Analele metalurgie 16 no.3:15-18 Jl-S '62.

SHKLYAREVICH, I.A.

"Equipment of sintering plants for ferrous metallurgy" by A.E.Seleznev. Reviewed by I.A. Shkliarevich. Stal' 22 no.10:889-890 O'62.
(MIRA15:10)

1. Vsesoyuznyy nauchno-issledovatel'skiy i proyektnyy institut mekhanicheskoy obrabotki poleznykh iskopayemykh.
(Sintering—Equipment and supplies)
(Selezne, A.E.)

SHKLYAREVICH, I.A.

Intensifying the sintering process. Met. i gornorud. prom. no.2: 16-18 Mr-Ap '65. (MIRA 18:5)

SHKLYAREVSKIY, I.N.; MILOSLAVSKIY, V.K.; GOLOYADOVA, V.I.

Wide-aperture interference of light. Opt. i spektr. 17 no.5: 765-770 N '64. (MIRA 17:12) [illegible], [illegible]., [illegible] Sci--([illegible]) "Uterine disfunction hemorrh- [illegible] treatment with intramuscular injections of placental blood." [illegible], [illegible]. [illegible] ([illegible] Inst), 200 copies ([illegible], 107)

APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R001549630001-2"

SHKLYAREVICH, V.M., assistent

Malignant theco-folliculoma. Zdrav.Belor. 4 no.3:63 Mr '58.
(MIRA 13:7)

1. Iz akushersko-ginekologicheskoy kliniki (zaveduyushchiy kafedroy - dotsent I.S. Legenchenko) Minskogo instituta usovershenstvovaniya vrachey.
(GENERATIVE ORGANS, FEMALE--TUMORS)

BODULIN, V.P., prof.; SHKLYAREVSKAYA, Ye.V., kand. med. nauk; YEROMYSH'YAN, G.A., student.

Topical diagnosis of pulmonary echinococcosis. Uch. zap. Stavr. gos. med. inst. 8:177-187 '63 (MIRA 17:7)

1. Kafedra obshchey khirurgii (zav. - prof. V.P. Bodulin) Stavropol'skogo meditsinskogo instituta (rektor zasluzhennyy deyatel' nauki, prof. V.G. Budylin).

SHKLYAREVSKIY, A. I.

PA 227T46

USSR/Geophysics - Irrigation Specialists   Jun 52

"Chronicles: Conference on the Problem Concerning Methods for Irrigation of Agricultural Cultivation," A.I. Shklyarevskiy

"Gidrotekh i Melio" No 6, pp 75-80.

During 12 - 14 Mar 52, in Moscow, the Hydrotechnics and Amelioration Sec of the All-Union Acad of Agri Sci imeni Lenin held a plenum, with participation of agricultural and hydrological administrators, directors, and main agronomists of MTS (machine-tractor stations),

besides presidents of kolkhozs in irrigated districts of Kuybyshev and Saratov Oblasts. Discussed were problems of utilizing irrigated lands under conditions met beyond the Volga and in other new regions being irrigated. Reports were heard from 22 lecturers: I.A. Minkevich, substitute for Minister of Agri USSR; Prof V.A. Shaumyan, substitute for the director of scientific part of All-Union Sci Res Inst of Hydrotechnics and Amelioration; I.P. Kurylev, head, Kuybyshev Oblast Water Econ; I.A. Isakov, Chief Agronomist, Georgiyev MTS; Dorokhin, Pres, "Krasnaya Znamya" Kolkhoz; Kharitonov, Chief Agronomist, Saratov Oblast Land Admin; Prokhorov, Chief Agronomist, Saratov Oblast MTS; Pakhomov, pres "Komsomolets" Kolkhoz; Yershov, Pres, Kuybyshev Oblast Exec Committee; Ye.G. Petrov, Cand Agr Sci, All-Union Sci Res Inst of Hydrotechnics and Amelioration; Yegorshilov, Engr; N.P. Samsonov, Sr Sci Assoc, All-Union Sci Res Inst of Hydrotechics, and Amelioration; Nesterov, Pres, "Zarya" Kolkhoz; V.G. Kornev; Ostovskiy, Sr Sci Assoc of Ukrainian Exptl Sta; etc.

227T46

ASTAPOV, Sergey Vasil'yevich, professor; SPENGLER, Valentina Vasil'yevna; SHKLYAREVSKIY, A.I., redaktor; PERESYPKINA, Z.D., tekhnicheskiy redaktor; ARISTAKESOVA, S.L., tekhnicheskiy redaktor

[Prevention and control of salinity and sqamping in irrigated lands] Preduprezhdenie i bor'ba s zasoleniem i zabolachivaniem oroshaemykh zemel'. Moskva, Gos. izd-vo selkhoz. lit-ry, 1956. 158 p. (MLRA 9:12)
(Salinity) (Swamps)

SHKLYAREVSKIY, A.I.

OFFENGENDEN, Samuil Rafailovich, kandidat tekhnicheskikh nauk; PANADIADI, A.D., kandidat sel'skokhozyaystvennykh nauk; TROMBACHEV, S.P., inzhener, [deceased]; YARUSHIN, M.I., inzhener; KREMENETSKIY, N.D. kandidat sel'skokhozyaystvennykh nauk; KAGAN, G.S., inzhener; NIKOLAYEV, I.G., inzhener; TRUBACHEVA, Ye.G., kul'turtekhnik; SHKLYAREVSKIY, A.I., redaktor; FEDOTOVA, A.F., tekhnicheskiy redaktor.

[Operation of irrigation and drainage systems] Ekspluatatsiia gidromeliorativnykh sistem. Pod red. S.R. Offengendena. Moskva, Gos.izd-vo sel'khoz.lit-ry, 1956. 535 p. (MLRA 10:6)

(Irrigation) (Drainage)

AUTHOR: Shklyarevskiy, A.I., Engineer SOV/99-59-1-8/13

TITLE: The Kotaykskaya Irrigation System is in Operation (Kotaykskaya orositel'naya sistema vstupila v stroy deystvuyushchikh)

PERIODICAL: Gidrotekhnika i melioratsiya, 1959, Nr 1, pp 33-37 (USSR)

ABSTRACT: The author describes how, under very difficult conditions, Armenian workers in a short time built the Kotaykskaya irrigation system. This system will irrigate 7,500 hectares, serviced by 116 km of permanent canals. A total of 23,000 cu m of concrete and 700 tons of metal structure were used in the construction. In November 1958, the Arzni-Shamiramskaya irrigation system with a 17 km long canal was put into operation. There are 8 photographs.

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SOV/99-59-3-10/10

30(1)

AUTHORS: Lapidovskiy, K.M., and Shklyarevskiy, A.I., Engineers

TITLE: In the Scientific and Technical Council of the Ministry of Agriculture of the USSR (V nauchno-tekhnicheskom sovete ministerstva sel'skogo khozyaystva SSSR)

PERIODICAL: Gidrotekhnika i melioratsiya, 1959, Nr 3, pp 60-64 (USSR)

ABSTRACT: The article is concerned with a meeting of the Scientific and Technical Council of the Ministry of Agriculture of the USSR held during the period 12 - 15 January 1959, and devoted to full mechanization of cotton cultivation and harvesting. The meeting was attended by specialists in cotton growing of Uzbekistan, Turkmeniya, Azerbaydzhan, Kazakhstan, and Tadzhikistan, by research workers of the cotton-producing republics, by representatives of the plants making cotton-tilling machinery, by scientific workers of the Vsesoyuznaya akademiya sel'skokhozyaystvennykh nauk imeni Lenina (All-Union Academy of Agricultural

Card 1/5

SOV/99-59-3-10/10

In the Scientific and Technical Council of the Ministry of Agriculture of the USSR

Sciences imeni Lenin), and by specialists of the organizations affiliated with water economy, hydraulic engineering, etc. The meeting was also attended by representatives of the Gosudarstvennyy nauchno-tekhnicheskiy komitet Soveta Ministrov SSSR (State Scientific and Technical Committee of the Ministers' Council of the USSR), those of the Uzbek and Kirgiz SSR; the Gosplan USSR, the Ministerstvo sel'skogo khozyaystva SSSR (Ministry of Agriculture of the USSR), and the ministries of agriculture and water economy of the cotton-producing republics. The meeting was opened by G.A. Borkov, Deputy Minister of Agriculture of the USSR, whose short speech was followed by reports made by the following personalities: 1) T.G. Zinin, Deputy Director of the Uzbekskiy nauchno-issledovatel'skiy institut mekhanizatsii i elektrifikatsii sel'skogo khozyaystva (Uzbek Research Institute for the Mechanization and Electrification of Agriculture); 2) V.A. Tyupko, of the Sredneaziatskaya MIS (Central Asian

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SOV/99-59-3-10/10

In the Scientific and Technical Council of the Ministry of Agriculture of the USSR

MIS); 3) M.Ya. Topada, Chief Engineer of the Pakhta-Aral sovkhoz; 4) N. Bekirov, of the "Bayaut Nr 4" sovkhoz, Tashkent oblast ; 5) I.I. Meleshko , Director of the Sredneaziatskaya mashino-ispytatel'naya stantsiya (Central Asian Machine Testing Station); 6) B.Ye. Arkhangel'skiy, Chief Designer of the Lipetskiy traktornyy zavod (Lipetsk Tractor Plant); 7) Ye.A. Sarkisyants, Chief Designer of the Vladimirskiy traktornyy zavod (Vladmimir Tractor Plant); 8) N.I. Popov, Chief Specialist of the Nauchno-tekhnicheskiy komitet Soveta ministrov Uzbekskoy SSR (Scientific and Technical Committee of the Ministers' Council of the Uzbek SSR); 9) Ye.V. Radkevich, Chief Designer of the SKB for Cotton of the Tashkent Sovnarkhoz); 10) B.P. Firsov, Deputy Chief Inspector for Cotton of the MSKh SSSR; 11) A.N. Askochenskiy, Academician and Secretary of the Otdeleniye gidrotekhniki i melioratsii VASKhNIL (Hydraulic Engineering and Melioration Department of VASKhNIL); 12) K.K. Shub-

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SOV/99-59-3-10/10

In the Scientific and Technical Council of the Ministry of Agriculture of the USSR

ladze, Deputy Chief of Glavvodkhoz MSKh USSR; 13) N.N. Bukov, Senior Scientific Worker of VNIIGiM; 14) L.D. Stonov, NIUIF; 15) M.F. Kulikov, Fergans-kaya opytnaya stantsiya (Fergana Testing Station); 16) S.D. Robichev, Gosplan SSSR; 17) N.I. Fershtat, Deputy Minister of Agriculture of the Uzbek SSR; 18) A.A. Troitskiy, Deputy Minister of Agriculture of the Tadzhik SSR, 19) M.A. Matveyev, GosNIIGVF; 20) N.I. Kostyuk, MSKh of the Kirgiz SSR; 21) S.M. Shakh-muryadyan, VIM; 22) M. Khalilov, MSKh of the Azer-baydzhan SSR; 23) K.A. Gularyan, ArmNIIZ; 24) A.A. Karimov, GNTK of the Sovet Ministrov Uzbekskoy SSR (Ministers Council of the Uzbek SSR); 25) N.I. Depta, Tashkent sovnarkhoz; 26) M.N. Anan'yev, Giprovodkhoz; 27) I.P. Panov, Tashsel'mash; 28) Ivanov, GOSNITI; and 29) V.A. Kaufman, Glavnoye upravleniye mekhanizatsii i elektrofikatsii MSKh SSSR (Central Administration of the Mechanization and Electrofication of the MSKh USSR). Among the organizations only

Card 4/5

SOV/99-59-3-10/10

In the Scientific and Technical Council of the Ministry of Agriculture of the USSR

mentioned in the above reports yet not listed above are the following: 1) Vsesoyuznyy nauchno-issledovatel'skiy institut gidrotekhniki i melioratsii imeni A.N. Kostyakova (All-Union Research Institute of Hydraulic Engineering and Melioration imeni A.N. Kostyakov); 2) Gidroproyekt; and 3) VNIIStroydormash.

Card 5/5

SHKLYAREVSKIY, A.I., inzh.

Kotaiksk irrigation system went into operation. Gidr. i mel. 11 no.1:33-37 Ja '59. (MIRA 12:1)
(Armenia--Irrigation)

SHKLYAREVSKIY, A.I.

Plenum of the Section for Hydraulic Engineering and Soil Improvement at ehe Lenin All-Union Academy of Agrucultural Sciences. Gidr. i mel. 14 no.4:57-63 Ap '62. (MIRA 15:5)
(Irrigation) (Drainage)

BODULIN, V.P., prof.; SHKLYAREVSKAYA, Ye.V., kand. med. nauk

Topical diagnosis of hydatids of the lungs. Uch. zap. Stavr. gos. med. inst. 12:205 '63. (MIRA 17:9)

1. Kafedra obshchey khirurgii (zav. prof. Yu.S. Gilevich) Stavropol'skogo gosudarstvennogo meditsinskogo instituta.

24(5),21(7) SOV/56-36-5-29/76

AUTHOR: Shklyarevskiy, G. M.

TITLE: Single-Particle Mechanism in Photonuclear Reactions (Odnochastichnyy mekhanizm v fotoyadernykh reaktsiyakh)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 36, Nr 5, pp 1492-1496 (USSR)

ABSTRACT: In the introduction the problem as well as a number of earlier papers are discussed in short. It is pointed out that there exist experimental facts which do not fit into the framework of the two-particle model (the existence of photoprotons with energies that are nearly equal to the maximum energy in the γ-spectrum, shifting of the maximum of angular distribution towards the angular range of 20-50°, and direct observation of (γp)- and (γn)-reactions at high photon energies). Therefore, the direct single-particle mechanism, especially in the range of gigantic resonance, is of great interest. To investigate it for nuclear photo-reactions at high energies of the emitted nucleons ($\gtrsim$20 Mev) on the basis of the shell model is the aim to be achieved by the present paper. Satisfying the momentum conservation law warrants also consideration of the momentum of the nucleon bound in the nucleus, and, at the same time,

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Single-Particle Mechanism in Photonuclear Reactions SOV/56-36-5-29/76

makes it possible to explain the forward shift of the angular distribution like in the case of the atomic photoeffect. The author bases upon the following assumptions: The nucleus in the ground state is assumed to consist of nucleons moving independently in a centrally-symmetric potential field; the state of each nucleon is assumed to be characterized by the orbital momentum l, its projection m, and the binding energy ε_l. Spin and magnetic moment of the nucleon are neglected, which amounts to a neglect of spin-orbit splitting. In consequence of the neglect of nucleon interaction, only "hole" excitations of the residual nucleus are possible; the energy of these excitations is contained in the binding energy of the nucleon. The description of the interactions in the final state is carried out by means of the optical nuclear model. Calculations are carried out in momentum approximation. Basing on the operator of the interaction between nucleus and electromagnetic field, expressions are derived for the matrix element M in the reaction cross section formula $d\sigma = \frac{2\pi}{\hbar}|M|^2 \varrho(E)$. Theoretical and experimental results are compared.

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Single-Particle Mechanism in Photonuclear Reactions SOV/56-36-5-29/76

It is shown that interaction in the final state can be described by the optical model and that 2 effects, above all, occur: 1.) The existence of an imaginary part in the potential leads to a reduction of the cross section of the direct photo process at the expense of the development of intranuclear cascades and (or) the occurrence of excited states of the type of a compound nucleus. 2.) The nucleon after photon absorption is elastically scattered on the real part of the potential, which leads to a certain "smearing-out" of the angular distribution. The author finally thanks Professor L. A. Sliv and Professor I. M. Shmushkevich for their valuable comments. There are 1 figure and 13 references, 2 of which are Soviet.

ASSOCIATION: Fiziko-tekhnicheskiy institut Akademii nauk SSSR (Physico-Technical Institute of the Academy of Sciences, USSR)

SUBMITTED: November 20, 1958

Card 3/3

APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R001549630001-2"

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S/056/60/039/004/025/048
B006/B063

24.6520

AUTHOR: Shklyarevskiy, G. M.

19

TITLE: Theory of Photonuclear Reactions of Light Nuclei With Emission of Deuterons

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960, Vol. 39, No. 4(10), pp. 1031 - 1038

TEXT: In the present paper, the author gives a theory of the γd-reaction of light nuclei within the framework of the independent-pair model in small-correlator approximation. This model takes into account both the general self-consistent field and the pair interaction leading to nucleonic motion correlations. The wave function in this model is formulated as follows: $\Psi = |\psi_{\alpha_1}(1)\psi_{\alpha_2}(2) \dots \psi_{\alpha_n}(n)|(1 + \sum \chi_{ij})$, where ψ_{α_i} (i=1,2..n) is the single-particle wave function, and χ_{ij} the correlators. At distance of the order of the mean nucleon distances in the nucleus, $\chi_{ij} \ll 1$ holds in the approximation used. The mechanism of

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Theory of Photonuclear Reactions of Light Nuclei With Emission of Deuterons

S/056/60/039/004/025/048
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excitation of the product nucleus as a result of quick variation of the self-consistent field of the nucleus during emission of a pair of nucleons is considered, and the excitation probability in the region of the continuous spectrum is calculated for the case of independent particles. It is shown that correct values for the γd cross sections of light nuclei and also for the shapes of energy spectra and angular distributions can be obtained by employing published values of the parameters involved in the theory. The results obtained are compared with experimental data on C^{12} and Be^9 nuclei. Data on the $\sigma_{\gamma d}/\sigma_{\gamma p}$ ratio were given by V. P. Chizhov and L. A. Kul'chitskiy. The experimental data are graphically compared with various theoretical curves. Fig. 1 shows $d\sigma/d\Omega = f(E_d)$ calculated for transitions without a change of the nuclear configuration (Curve 1), for transitions taking account of single-particle excitations (Curve 2) and two-particle excitations (Curve 3) for C^{12} with $\hbar\omega(C^{12})$ = 15.2 Mev, $\hbar\omega(B^{10})$ = 17.0 Mev, and $E_{\gamma max}$ = 80 Mev; Fig. 2 shows the same for Be^9 with $\hbar\omega(Be^9)$ = 16.2 Mev, $\hbar\omega(Li^7)$ = 18.9 Mev, and

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Theory of Photonuclear Reactions of Light Nuclei With Emission of Deuterons

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$E_{\gamma max}$ = 90 Mev. Fig. 3 shows a comparison between the experimental and theoretical angular distributions of the reactions $C^{12}(\gamma d)$ and $Be^9(\gamma d)$ normalized for $\theta = 60^o$. $R = 1.5A^{1/3}.10^{-13}$ cm was assumed for all the calculations. The author thanks S. V. Maleyev, A. D. Piliya, and Professor L. A. Sliv for discussions and comments, and also V. P. Chizhov for a discussion of experimental data. Migdal, L. E. Pargamanik, and V. V. Ul'yanov are mentioned. There are 3 figures and 16 references: 4 Soviet, 6 US, 2 British, 1 Swiss, and 3 German.

ASSOCIATION: Leningradskiy fiziko-tekhnicheskiy institut Akademii nauk SSSR (Leningrad Institute of Physics and Technology of the Academy of Sciences, USSR)

SUBMITTED: April 30, 1960

SHKLYAREVSKIY, G.M.

Nucleon correlations and photonuclear reactions. Part 1: Photo-disintegration of He^4. Zhur.eksp.i teor.fiz. 41 no.1:234-238 Jl '61. (MIRA 14:7)

1. Leningradskiy fiziko-tekhnicheskiy institut AN SSSR.
(Photonuclear reactions) (Nucleons) (Helium—Isotopes)

SHKLYAREVSKIY, G.M.

SHKLY-AREVSKIY, G. M.

Dissertation defended for the degree of Candidate of Physicomathematical Sciences at the Physics imeni P. N. Lebedev in 1962:

"Correlations of Nucleons, and Simple Photonuclear Reactions."

Vest. Akad. Nauk SSSR. No. 4, Moscow, 1963, pages 119-145

ACCESSION NR: AP4019238 S/0056/64/046/002/0690/0694

AUTHOR: Shklyarevskiy, G. M.

TITLE: Inelastic scattering of photons by a Coulomb field accompanied by electron-positron pair production

SOURCE: Zhurnal eksper. i teor. fiz., v. 46, no. 2, 1964, 690-694

TOPIC TAGS: Compton effect, inelastic photon scattering, scattering by Coulomb field, electron positron pair production, Weizsacker-Williams method, proton polarizability, proton polarizability correction

ABSTRACT: In this investigation the energies of the incident photons are assumed much larger than the electron mass and the energy losses are assumed to be small. The analysis of the scattering is by the Weizsacker-Williams method in its invariant formulation given by Gribov et al. (ZhETF v. 41, 1839, 1961). This scattering process

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ACCESSION NR: AP4019238

has not been treated in the literature before. It is shown that this process occurs in a lower order of perturbation theory than other processes involving the Compton effect on protons or other nuclei, and that at small angles it appreciably exceeds the correction to the Compton effect on a proton due to the polarizability of the nucleus. Furthermore, it exerts a decisive effect on the background which interferes with the measurement of the Compton-effect cross section in the small-angle region. The results are compared with some experimental data. The cross section of the disintegration of a photon into two photons by interaction with the Coulomb field of the proton is two orders of magnitude smaller at all angles (except the largest ones) than the cross section of the investigated process. "I am grateful to I. M. Shmushkevich and V. M. Shekhter for a discussion of the work and for critical remarks." Orig. art. has: 17 formulas, 1 figure, and 1 table.

ASSOCIATION: Fiziko-tekhnicheskiy institut im. A. F. Ioffe AN SSSR

ACCESSION NR: AP4019238

(Physicotechnical Institute, AN SSSR)

SUBMITTED: 15Jul63 DATE ACQ: 27Mar64 ENCL: 00

SUB CODE: PH NO REF SOV: 005 OTHER: 001

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L 58532-65 EWT(m)/T/EWA(m)-2

UR/0181/65/007/005/1331/1334

13
10

ACCESSION NR: AP5012537

AUTHOR: Shklyarevskiy, G. M.

19

B

TITLE: Dynamic polarization of protons in hydrated paramagnetic salts by the method of multiple fast adiabatic passage through the forbidden line

SOURCE: Fizika tverdogo tela, v. 7, no. 5, 1965, 1331-1334

TOPIC TAGS: electron paramagnetic resonance, proton polarization, dynamic polarization, paramagnetic salt, adiabatic fast passage

ABSTRACT: It is proposed to effect the dynamic polarization of photons in paramagnetic salts by multiple fast adiabatic passage through the forbidden electron paramagnetic resonance line. This causes inversion of the populations of the corresponding levels of the energy spectrum of the electron system. The conditions which the fast adiabatic passage of the forbidden epr line must satisfy are determined and it is shown that under such conditions the method makes it possible to obtain practically 100% polarization, in contrast with the method of saturation of the forbidden line, proposed by T. J. Schmugge and C. D. Jeffries (Phys. Rev. Lett. v. 9, 268, 1962). It is shown by means of a numerical example that in the case of

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ACCESSION NR: AP5012537

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the lanthanum double nitrate in which ~ 1% of the La atoms is replaced by the Nd, the number of cycles necessary to obtain full polarization is $s_0 \geq 10^3$, corresponding to ~ 50 seconds. "I thank B. S. Neganov and V. I. Lushchikov for a discussion of the work." Orig. art. has: 11 formulas.

ASSOCIATION: Fiziko-tekhnicheskiy institut im. A. F. Ioffe AN SSSR, Leningrad (Physicotechnical Institute, AN SSSR)

SUBMITTED: 06Oct64 ENCL: 00 SUB CODE: SS, NP

NR REF SOV: 000 OTHER: 002

Card 2/2

SHKLYAREVSKIY, G.M.

Dynamic polarization of protons in hydrated paramagnetic salts by the method of multiple rapid adiabatic crossing of the forbidden line. Fiz. tver. tela 7 no.5:1331-1334 My '65. (MIRA 18:5)

1. Fiziko-tekhnicheskiy institut imeni Ioffe AN SSSR, Leningrad.

SHKLYAREVSKIY, I.I.

*[Optical] Phase Relations at a Dielectric/Metal Interface. I. I. Shklyarevsky (*Zhur. Tekhn. Fiziki*, 1958, 28, (2), 333–342).—[In Russian]. (1) The magnitude and sign of the phase discontinuity which takes place when light is reflected from a dielectric/metal interface are obtained by several independent methods. Most of the values of these quantities given in the literature are shown to be wrong. (2) Measurements are given of the dispersion of phase discontinuity obtained when light is reflected from an air/Ag interface. (3) An instructive formula is derived for determining the thickness of thin films by an interference method. (4) A new interference method is given for determining the opt. const. of a metal. 18 ref.—A. F. B.

L 15986-66 EWT(1)/EWT(m)/T/EWP(e) IJP(c) WH

ACC NR: AP6005475 SOURCE CODE: UR/0368/66/004/001/0065/0067

49
B

AUTHOR: Shklyarevskiy, I. N.; Korneyeva, T. I.; Ryazanov, A. N.

ORG: none

21,44,55
15

TITLE: An interferometer method for determining the refractive indices of mica

SOURCE: Zhurnal prikladnoy spektroskopii, v. 4, no. 1, 1966, 65-67

TOPIC TAGS: refractive index, mica, interferometer, spectrum

ABSTRACT: A method is proposed for determining the dispersion of birefringence in silvered mica from a single interference pattern by measuring the wavelengths of the interference lines. The procedure is a modification of a previously proposed method (I. N. Shklyarevskiy, Opt. i spektr., 6, 780, 1959), and may be used for measuring the dispersion of refractive indices μ_γ and μ_β of mica in the visible region of the spectrum. Equations are derived for determining these indices and dispersion curves for the indices of refraction are given. The results agree satisfactorily with the tabulated values for the indices of refraction of Ural muscovite. Orig. art. has: 4 figures, 5 formulas.

SUB CODE: 20/ SUBM DATE: 19Apr65/ ORIG REF: 004/ OTH REF: 002
UDC: 535.417

Card 1/1 20

L 31535-66 EWT(1)/FCC GW
ACC NR: AT6005154 SOURCE CODE: UR/2789/65/000/066/0073/0080

46
B+1

AUTHOR: Korobov, M.G.; Shklyarevskiy, V.G.

ORG: Central Aerological Observatory (Tsentral'naya aerologicheskaya observatoriya)

TITLE: A study of the topography of the upper boundary of cloudiness by the stereophotogrammetric method

SOURCE: Tsentral'naya aerologicheskaya observatoriya. Trudy, no. 66, 1965. Aerosinopticheskiye i aerologicheskiye issledovaniya (Aerosynoptic and aerological research), 73-80

TOPIC TAGS: stereophotography, aerial photography, atmospheric cloud

ABSTRACT: The stereophotogrammetric method applied in geodesy is employed for the topographic study of the upper surface of clouds, using aerial photography. Disregarding the physical factors in the origin of the nonuniformities on the cloud surfaces, the method makes it possible to determine the altitude of the clouds with sufficient accuracy. It is feasible to measure the height of cloud elements over other cloud elements by means of aerial photography. Knowledge of the scale of the photographs makes it possible to determine the length of the cloud waves as well. The calculations performed in the article show that the correction device of the stereometer may satisfactorily serve only small-scale aerial photographs. In conclusion, an evaluation is made of the accuracy of the determination of the excesses of the cloud elements obtained by the stereophotogrammetric method. Orig. art. has: 4 figures and 14 formulas.

SUB CODE: 04, 14 /SUBM DATE: none / ORIG REF: 004 / OTH REF: 001

Card 1/1 ZC

[illegible], Ye. F. Cand. Tech. Sci.

Dissertation: "Investigation of the Causes for Fractures in the Spring Lugs of Two-Axle Freight Cars." Moscow Order of the Labor Red Banner Electromechanical Inst of Railroad Engineers imeni F. F. Dzerzhinskiy, 19 Nov 47.

SO: Vechernyaya Moskva, Nov, 1947 (Project #17836)

SOV/137-58-12-24910

Translation from: Referativnyy zhurnal Metallurgiya, 1958, Nr 12, p 128 (USSR)

AUTHORS: Vintsel, G., Shklyarinskis, D.

TITLE: On the Preparation of High-grade Manganese Plating by Electrolysis (K voprosu polucheniya kachestvennykh pokrytiy pri elektroosazhdenii margantsa)

PERIODICAL: Uch. zap. Vil'nyussk. un-t. Ser. matem., fiz. i khim. n., 1957, Vol 7, pp 133-137

ABSTRACT: The electrolytic deposition of Mn from a sulfate electrolyte (E) was investigated. A study was made of the effect of the cathode cd, the temperature, pH of the solution, concentration of Mn^{2+} and additives on the current efficiency expressed in terms of the yield of metal and the quality of the coating (C). A glass membrane was used in the electrolysis; Cu was used for the anode and graphite for the cathode. The optimum composition of the E and the parameters of the electrolysis were established. The catholyte was (in g/liter): $MnSO_4 \cdot 4H_2O$ 250, $(NH_4)_2SO_4$ 100; the anolyte was $(NH_4)_2SO_4$ 100; pH 3.2 - 8.8; the E was stirred. High-grade C are produced within a narrow range of the cathode-cd/temperature curve (within

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On the Preparation of High-grade Manganese Plating by Electrolysis

the range of cathode cd = 8 - 23 amp/dm^2 and 0.5 - 20^oC); at any given temperature the corresponding cathode cd should be selected. A deviation in either sense results in a sharp deterioration of the quality of C. The current efficiency increases with the increase in the cathode cd. The pH of the solution rises with the progress of electrolysis; at pH > 8.8 the quality of the deposits deteriorates and E should be acidulated with H_2SO_4. A decrease in the concentration of Mn^{2+} ions and Mn ions of a different valence exercises a negative effect on the quality of C and current efficiency. At 18^o and cathode cd = 20 amp/dm^2 the current efficiency is 21% when the concentration of $MnSO_4 \cdot 4H_2O$ is 83 g/liter and 33.3% when it is 250 g/liter. Dendrites form on the edges and corners of the cathode as the growth in thickness of the deposit progresses. Addition of glycerol (40-50 g/liter) improves the quality of C, whereas addition of joiner's glue lowers it.

A. L.

Card 2/2

SHKLYARNIK, V., mladshiy serzhant

Training device for shooting from a tank. Voen. vest. 38 no.11: 80-82 N '58. (MIRA 11:12)

(Tank warfare)

N

GALKIN, O.; SHKLYAREVS'KIY, I.M.

Change in the optical constants of tin during transition into a state of superconductivity. Dop.AN URSR no.6:445-447 '54. (MIRA 9:9)

1.Fiziko-tekhnichniy institut AN URSR i Kharkivs'kiy derzhavniy universitet. Predstaviv diysniy chlen AN URSR K.D.Sinel'nikov.

(Tin--Optical properties)

SHKLYAREVSKIY, I.N.

An interference method of determining the refraction of
liquid and solid bodies. I. N. Shklyarevskii and V. K.
Miloslavskii. *Zhur. Tekh. Fiz.* 24, 1387-91(1954).—A
semitransparent mirror reflects the light of a point light
source on a set of interferometric plates consisting of glass
plates coated with Al. The plates are held by a micrometer
arrangement in such a way that the spaces form wedges that
are filled with the liquid to be tested. The reflected light
is measured with a spectroscope. *n* can be detd. to the 4th
decimal. Curves are presented showing *n* as a function of
the wave length for ZnS (wedge evapd. on the glass plate
and aluminized), iodomethylene, and a 2% soln. of an
astraphloxine-fuchsin dye. S. Pakswer

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(1)

SHKLYAREVSKIY, I.N.

K

USSR / Optics

Abs Jour: Referat Zhur-Fizika, 1957, No 4, 10340

Author : Sinel'nikov, K.D., Shklyarevskiy, I.N., Skorobogatov, B.S.
Inst : Not Given
Title : Determination of the Optical Constants of Germanium.

Orig Pub: Uch. zap. Kharkovsk. un-ta, 1955, 6, 135-140

Abstract: The index of refraction μ of thin germanium films was measured by the germanium-wedge method, coated in vacuum on glass or on silver. The average value $\bar{\mu}$ in the given region of the wedge thickness was obtained from the equation $\bar{\mu} = \lambda / 4 (t_{k\,min} - t_{k\,max})$ where $t_{k\,min}$ and t_{kmax} are the thicknesses of the germanium wedge in the locations of the k'th interference minimum and maximum for a given wavelength. For λ = 590 mμ the value of μ is independent of t all the way up to t on the order of 4×10^{-6} cm and equals 3.6 This shows that the structure of the films does not change with thickness. For λ = 690 and 550 mμ, the value of μ is 4.1 and 3.4μ

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SHKLYAREVSKIY I.N.

K-5

Category : USSR/Optics - Physical Optics

Abs Jour : Ref Zhur - Fizika, No 2, 1957, No 4938

Author : Shklyarevskiy, I.N., Miloslavskiy, V.K., Pakhomova, O.S., Ryazanov, A.N.

Title : Interferometric Method for Determining the Dispersion of Liquids in the Ultraviolet Region

Orig Pub : Uch. zap. Khar'kovsk. un-ta, 1955, 6, 147-150

Abstract : The previously described (Referat Zh. Fizika, 1955, 23123) interferometric method for determining the dispersion of liquids and solids, based on the application of the lines of equal chromatic order, has been expanded to determine the dispersion of liquids in the ultraviolet region. The investigated liquid is introduced into a gap between aluminized quartz plates, which are attached to the slit of an ISP-22 quartz spectrograph. The thickness of the gap is regulated by means of screws. The resultant spectrogram is used to determine the wavelengths of many interference lines, to determine their interference order, and knowing the thickness of the gap, to calculate the index of refraction for many wavelengths. The order of the interference is determined by filling the gap half with

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VERKIN, B.I.; MIL'NER, A.S.; ROZENTSVEYG, L.N.; FAYNBERG, Ya.B.; KHOTKEVICH, V.I.; SHKLYAREVSKIY, I.N.

Sections of Experimental, Theoretical, and General Physics at the Department of Physics and Mathematics, 1930-1955. Uch.zap.KHGU 60:63-79 '55. (MIRA 10:1)

(Kharkov University--History)
(Physics)

SHKLYAREVSKIY, I. N.

SINEL'NIKOV, K.D.; SHKLYAREVSKIY, I.N.; KENR, E.A.

Interference of light in thin silver foils. Uch.zap. KHGU. 64 no.6:127-134 '55. (HLRA 10:7)
(Interference (Light)) (Metallic films--Optical properties)

SINEL'NIKOV, K.D.; SHKLYAREVSKIY, I.N.; SKOROBOGATOV, B.S.

Determination of the optical constants of germanium. Uch.zap. KHGU 64 no.6:135-140 '55. (MIRA 10:7)
(Germanium--Optical properties)

SHKLYAREVSKIY, I. N.

K-5

USSR/Optics - Physical Optics.

Abs Jour : Referat Zhur - Fizika, No 3, 1957, 7698

Author : Sinel'nikov, K.D., Shklyarewskiy, I.N., Lupashko, Ye.A.

Title : Optical Properties of Intermetallic Compounds. Zinc-Antimony Compound.

Orig Pub : Uch. zap. Khar'kovsk. un-ta, 1955, 64, 141-144

Abstract : The antimonoid of zinc (I) was obtained with S.A. Vekshinskiy's method by simultaneous sublimation of zinc and antimony on glass in vacuum. A portion of the complex film corresponding to I was obtained by measuring the specific conductivity, which for I is 2.5×10^{-3} ohm^{-1} cm^{-1}. Such portions have an increased transparency T and at thicknesses $t > 1{,}000$ A they have a brown hue in transmitted light. The dependence of T on λ was measured with the SF-4 spectrophotometer in the 350 -- 1100 mμ region in a large number of films of different t, and the absorption coefficient $\mu\chi$ was calculated

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USSR/Optics - Physical Optics.

Abs Jour : Referat Zhur - Fizika, No 3, 1957, 7698

from the equation $\mu\chi = \lambda \ln (T_1/T_2) / 4\pi (t_2 - t_1)$. Films were selected with such value of t as to make the light interference negligible and to make it possible to assume the coefficient of reflection of the various films to be the same. The curve $\mu\chi = f(\lambda)$ increases rapidly towards the shorter waves, indicating the presence of an absorption band in the ultraviolet region of the spectrum. The optical density in the region of 400 -- 1,000 mμ is independent of the temperature in the range from 20 -- 100°.

Card 2/2

SHKLYAREVSKIY, I.N.

The problem of phase relations on the boundary dielectric-metal. I. N. Shklyarevskii. *Soviet Phys., Tech. Phys.* 1, 327-36(1956)(English translation).—See *C.A.* 51, 12g.
B. M. R.

USSR/Optics - Physical Optics, K-5

Abst Journal: Referat Zhur - Fizika, No 12, 1956, 35731

Author: Sinel'nikov, K. D., Shklyarevskiy, I. N., Vlasenko, N. A.

Institution: None

Title: Optical Characteristics of Complex Interference Light-Filters

Original Periodical: Zh. tekhn. fiziki, 1956, 26, No 1, 96-101

Abstract: For the green region of the spectrum, complex interference light filters were prepared, consisting of 3 reflecting layers and 2 dielectric layers between them. The dielectric used was barium fluoride, and the reflecting layers were silver. In some cases the third reflecting layer was a multilayer dielectric coating. The optical characteristics of such light filters were investigated using a matching method previously proposed (Uch. zap. Khar'kovsk. gos. un-ta., Tr. fiz. otd., 1955, 6, 147). The transmission band was recorded with a DFS-4 spectrometer with a diffraction grating having 600 lines/mm. It was shown that the transmission band of

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USSR/Optics - Physical Optics, K-5

Abst Journal: Referat Zhur - Fizika, No 12, 1956, 35731

Abstract: complex light filters is 5-10 times narrower than in simple interference filters (30-100 A instead of 200-400 A), and the transparency is 1.5-2 times better (30-60% instead of 20-30%). The use of a multilayer dielectric coating instead of a silver reflecting layer improves the quality of the filters. Further improvement in the optical characteristics lies along the path of replacing of all the silver layers with multiple-layer dielectric coatings.

Card 2/2

SHKLYAREVSKIY, I.N.

Phase correlations on the dielectric-metal boundary. Zhur.tekh. fiz. 26 no.2:333-342 F '56. (MLRA 9:6)
(Dielectrics--Optical properties)(Metals--Optical properties)

SHKLYAREVSKIY, I.N.

535.323

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6081. MEASUREMENT OF THE REFRACTIVE INDICES OF THIN LAYERS OF ZINC SULPHIDE AND CRYOLITE.
I.N.Shklyarevskii and A.N.Ryazanov.
Zh. tekh. Fiz., Vol. 26, No. 3, 659-63 (1956). In Russian.

Contrary to the findings of Schulz and Scheibner (Abstr. 1762/1951), the authors have found that the refractive index of thin ZnS films (as used in multi-layer coatings) is equal to that of ZnS in bulk, whereas the refractive index of cryolite films depends on their thickness. The "filling" factor of (porous) cryolite films, whose pores have been filled with a liquid, calculated from the equation $n^2 = q_1n_1^2 + q_2n_2^2$ [where n, n_1 and n_2 are the refractive indices of the total film, its cryolite substance and the substance in its pores respectively, while q_1 and q_2 are the fractional volumes of the cryolite and the pores $(q_1 + q_2 = 1)$], has been found to closely agree with experiment; this finding proves, in turn, that the liquids used (glycerol, paraffin oil, nitrobenzene, iodomethylene) fill thoroughly the pores in ZnS.

F.Lachman

SHKLYAREVSKIY, I.N.

Measurement of the indexes of refraction of thin films of zinc sulfide and cryolite. I. N. Shklyarevskii and A. N. Ryazanov. *Soviet. Phys., Tech. Phys.* 1, 634-8(1957)(English translation).—See *C.A.* 50, 16243*f*. B. M. R.

2

PM

MT

SHKLYAREVSKIY, I.N.

51-4-20/25

AUTHORS: Sinel'nikov, K.D., Shklyarevskiy, I.N. and Vlasenko, N.A.

TITLE: Complex interference optical filters with improved characteristics. (Slozhnyye interferentsionnyye svetofil'try s uluchshennymi kharakteristikami).

PERIODICAL: "Optika i Spektroskopiya" (Optics and Spectroscopy) 1957, Vol.2, No.4, pp.534-536 (U.S.S.R.)

ABSTRACT: This note describes construction of several types of optical filters and is the continuation of earlier work by Sinel'nikov et al. (Uchenye zapiski Kharkovskogo gosudarstvennogo Universiteta, Trudy fizicheskogo otdeleniya, Vol.6, 147, 1955; Zh. tekh. Fiz., Vol.26, 96, 1956). $M_1D_1M_2D_2M_3$ filters (M's are reflecting layers and D's dielectric layers) were prepared as follows: to an $M_1D_1M_2$ filter (D_1 of barium fluoride) an M_3 layer in the form of a glass plate was attached and D_2 was a wedge-shaped layer of air between M_2 and M_3. The filter was made "consistent" by illumination with white light, observation of the resulting interference pattern via a spectroscope and appropriate adjustment of D_2. No numerical values of the characteristics are given. $M_1D_1M_2D_2M_2D_1M_1$ filters, with D_1 of barium fluoride and D_2 a layer of air, similar to those of A.Hermansen (Nature, 174, 218, 1954) were prepared. With reflection coefficients R_1 = 83% and

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Complex interference optical filters with improved characteristics. (Cont.)

R_2 = 93% for M_1 and M_2 respectively, an overall transmission of 30% was obtained with a pass band (centred on 5000 Å) of only 45 Å and "contrast" of about 10^5. A method of preparation of filters, similar to that for Fabry-Perot etalons, is also described. Two high-quality glass flats were covered with the usual layers (silver and barium fluoride) by vacuum evaporation; they were the $M_1D_1M_2$ systems. A wedge-shaped layer of air D_2 was left between the two plates. Light from a monochromator (of wavelength of the maximum of the filter pass-band) was made parallel by means of a lens focussed on the exit slit of the monochromator. This light was directed on to the filter. When D_2 was wedge-shaped hundreds of interference lines were visible. When the two surfaces M_2 became parallel the lines disappeared and the illumination became uniform. Then, keeping the plates parallel, they were adjusted by screws to give maximum uniform illumination ("consistent state). There are 1 table and 6 references (4 of which are Slavic.)

ASSOCIATION: Kharkov State University. (Khar'kovskiy Gosudarstvennyy Universitet.

SUBMITTED: September 15, 1956.

ard 2/2 AVAILABLE: Library of Congress

ively, and were obtained for a sample shown in Fig.1a. The upper diffuse lines are due to Al-ZnS-air; the lower lines are due to Al-ZnS-Al, with iron lines (for calibration) superimposed on them. These lines are displaced towards short wavelengths by a value which represents a negative phase change at the boundary ZnS-Al. The phase change, denoted by ψ(ZnS-Al), is plotted against wavelength, λ, in Fig.4 (the continuous curve represents the present authors' results, the broken curve- the results calculated from optical constants of Al measured by O'Bryan, Ref.5). III and IV in Fig.3 were obtained for a sample shown in Fig.1b. The upper lines are due to Al-ZnS-Al (thin layer:-195 Å). They are displaced towards longer wavelength which indicates that the phase change on reflection at a thin Al layer is less than at a thick layer. Fig.3, V was obtained for an even thinner Al layer (50 Å) and the phase change was found to be still less than in III and IV. On decrease of layer thickness to 50-80 Å the displacement of the equal-chromatic-order lines was greater than in the absence of such layers. Presence of such layers on ZnS deterioriates the sharpness of these lines. With decrease of the layer

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thickness the phase change becomes negative (Fig.5, where numbers at each curve denote layer thickness in angstroms). Fig.6, I, shows dependence of the phase change ψ on thickness t (in Å) for $\lambda = 5500$ Å. Curve II in Fig.6 is calculated from the optical constants for bulk Al given by O'Bryan (5). At the top right-hand corner of Fig.6 two parallel dashes denote the value of ψ for bulk Al. The results in Fig.6 are taken by the authors as an indication that the optical constants of thin Al films vary with thickness. This conclusion forms the basis of the authors' explanation of the observed behaviour of Al films. The authors thank Prof. K.D. Sinel'nikov for advice. There are 7 figures, 13 references, 8 of which are Slavic.

ASSOCIATION: Khar'kov State University. (Khar'kovskiy Gosudarstvennyy Universitet)

SUBMITTED: October 15, 1956.

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51-5-16/26

Double refraction of fluoride films.

The absolute size of the particles, so long as it is smaller than light wavelength, is not important. For many substances the dimensions of microcrystallites and the distances between them are considerably smaller than visible light wavelength, and therefore in that region one would expect anisotropy of the film. Double refraction was, in fact, found by the authors in films of CaF_2, BaF_2, LiF, PbS, V_2O_5 and other substances obtained by deposition on a glass base in vacuum. On introducing such a film between two crossed nicols one can observe fairly strong transmission in the field of vision. This transmission is at maximum when the glass with film on it is so oriented that the direction given by the cross section of the plane of the base with the plane of incidence of the evaporated molecular beam is at an angle of 45° to the direction of polarisation of the nicols. Wetting of the film by liquids of various refractive indices decreases the intensity of the transmitted light. The transmission becomes zero on wetting with a liquid whose refractive index is equal to the refractive index μ_1 of the bulk substance. Double refraction of the fluoride films may be also studied by an interferometric method. On a glass plate a semi-transparent silver layer is deposited. On silver a calcium fluoride layer in a form of a

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Double refraction of fluoride films. 51-5-16/26

symmetrical hill is deposited which is then covered by another semitransparent silver layer. In monochromatic light a system of double rings is observed (Fig.2). The equal chromatic order lines are split in a similar way. (Fig.3). The results show that the fluoride layers possess biaxial double refraction and that the plane of the optical axes coincides with the plane of incidence of the molecular beam. The orientation of the refractive index ellipsoid relative to the layer of the film depends on the angle of incidence of the molecular beams on to the base in the process of the deposition of the film. The magnitude of the double refraction also depends on this angle of incidence. The results are shown in Figs.6 - 10. There are 10 figures, and 11 references, of which 8 are Slavic.

ASSOCIATION: Kharkov State University (Khar'kovskiy Gosudarstvennyy Universitet)

SUBMITTED: October 15, 1956.

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Card 3/3

51-5-17/26

Measurement of the Optical Constants of Tin by an Interferometric Method.

and mica were used. ZnS was deposited in vacuum at 5×10^{-5} mm Hg. Thin leaves of mica were all obtained from the same sample. The sample was fixed in front of a Tolansky (Ref.4) spectrograph. The interference fringes were photographed in reflected light. As a result of the phase-change differences at the boundaries dielectric-silver and dielectric-studied metal, the interference bands due to the system Ag-D-M are displaced with respect to the bands due to the system Ag-D-Ag. The interferometric method described here is applicable only to those metals for which the refractive index μ and the absorption coefficients $\mu\chi$ are of the same order when the reflection coefficient of the metal is not less than 50 to 60%. At small coefficients of reflection the interference lines were recorded immediately after the preparation of samples. Figs.2, 3 show interference for one of the samples. Fig.2 corresponds to wavelengths 6500-4800 Å and Fig.3 to 5000 to 4100 Å. The upper lines correspond to the Ag-ZnS-Ag part of the sample and the lower lines to the Ag-ZnS-Sn system. For

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51-5-17/26

Measurement of the Optical Constants of Tin by an Interferometric Method.

where λ = wavelength in μ. The results are given in the adjoining table and they yield a value of 2.5 conduction electrons per atom. Students L.Sukhacheva and E.Pavlova carried out the experimental work. The authors thank Prof. K.D. Sinelnikov for valuable advice and interest. There are 5 figures and 7 references, 4 of which are Slavic.

ASSOCIATION: Khar'kov State University (Khar'kovskiy Gosudarstvennyy Universitet)

SUBMITTED: October 15, 1956.

AVAILABLE: Library of Congress.

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51-4-11/26

A New Modification of the Polarization Method of Measurement of the Optical Constants of Metals.

for the refractive index μ and the absorption coefficient $\mu\chi$ in terms of measurable quantities: angle of incidence φ, azimuth of reduced (relative) polarization ψ, and phase difference between the p and s components after one reflection Δ. The apparatus used is shown in Fig.1. A monochromatic, parallel, linearly polarized (by polarizer P, at an angle of 45° to the plane of incidence) beam falls on plates (1) and (2) with mirrors of the studied metal deposited on them. The two plates are attached to a goniometer table; one of them is fixed and the other can be moved parallel to it. The light, reflected three times by the metallic surfaces, falls on an analyser, A, whose angle of rotation can be read down to 2 minutes of arc. R is a receiver of radiation. First the second plate is in the position 2'. Its displacement to position 2 makes it possible to obtain quintuplet reflection if necessary. In the visible region the source of light is the exit slit (5) of a monochromator YM-2. Nicol prisms serve as the

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A New Modification of the Polarization Method of Measurement of the Optical Constants of Metals.

the receiver. This angle of incidence was measured several times, and a mean value was taken. Mean values of Ψ were also obtained. Knowing φ, Ψ and Δ = - 60°, the optical constants of the metal could be calculated from Eqs. 6 and 7. Measurements of the optical constants of metals for light falling from the glass side (Fig.2) did not differ in principle from measurements using light falling from the air side. The authors applied the method to measurement of the optical constants of aluminium in the visible region. These constants were measured earlier by O'Bryan (Ref.1), in vacuo because a layer of oxide is always present on aluminium in air. To exclude the effect of oxide the present authors used the apparatus of Fig.2. Aluminium layers were deposited on the surfaces AA' and CC' at 5 x 10^{-5} mm Hg. To avoid any contamination, for the first few moments aluminium was evaporated on a special screen and only then on the surface of the prism of Fig.2. Table 1 gives the results of measurements thus obtained (triple reflection with Δ = - 60°). This table gives (in

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A New Modification of the Polarization Method of Measurement of the Optical Constants of Metals.

This shows the great influence of the oxide layers in measurement of the optical constants from the air side. The highest values of the optical constants were obtained from the glass side. O'Bryan's results are lower; results for samples measured on the air side after 6 hours are still lower, and the results for samples measured 50 days after deposition are the lowest of all. The authors concluded that aluminium surfaces used by O'Bryan, although prepared and measured in vacuo, were covered by an oxide layer about 25 Å thick. Samples measured in air after 6 hours and those measured after 50 days are estimated to have had oxide layers 74 and 97 Å thick respectively. The oxide thicknesses estimated by the present authors for freshly prepared samples (6 hours after deposition) were several times higher than those calculated by Hass (Ref.10). This is because Hass did not take into account the oxide layer formed in vacuo. The authors thank Professor K.D. Sinel'nikov for valuable discussions and his interest. There are 2 figures, 2 tables and 10 references, 4 of which are Slavic.

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Shklyarevskiy, I.N.

51-6-13/25

AUTHOR: Shklyarevskiy, I. N.

TITLE: A New Interferometric Method for Determination of the Optical Constants of Metals. (Novyy interferometricheskiy metod opredeleniya opticheskikh postoyannykh metallov.)

PERIODICAL: Optika i Spektroskopiya, 1957, Vol. III, Nr. 6, pp. 638-640. (USSR)

ABSTRACT: This paper describes a new interferometric method for determination of the optical constants of metals, based on the measurement of the difference of phase-shifts of the p- and s-components of polarized light at two angles of incidence onto a surface of the metal studied (deposited on interferometer plates). On oblique incidence of light on the interferometer plates a splitting of the equal-chromatic-order lines is observed (Refs.3,4). The magnitude of this splitting depends on the angle of incidence φ, increasing with increase of that angle. The long-wavelength components obtained on splitting are found to be polarized in the plane of incidence, and the

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A New Interferometric Method for Determination of the Optical Constants of Metals.

short-wavelength ones - perpendicularly to the plane of incidence. Splitting of the interference lines is due to the difference of the phase-shifts of the p- and s-components, which are produced on reflection from the metal. Splitting of the equal-chromatic-order lines can be used to find Δ , the difference between the phase-shifts of the p- and s-components, for any angle of incidence φ. From two pairs of values of Δ and φ the refractive index μ and the absorption coefficient $\mu\chi$ may be found at any given wavelength using the well-known equation relating Δ , φ, μ and $\mu\chi$ (Eq.6 on p.639). This equation is valid for bulk metal, while the layers on the interferometer plates are thin and semitransparent. To avoid errors due to the thinness of the interferometer layers the following method was adopted. Measurements were made on two identical semitransparent silver films at two angles of incidence.

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SOV/51-4-6-13/24

AUTHORS: Shklyarevskiy, I.N., Starunov, N.G. and Padalka, V.G.

TITLE: Measurement of Optical Constants of Silver in the Infrared Spectral Region (Izmereniye opticheskikh postoyannykh serebra v infrakrasnoy oblasti spektra)

PERIODICAL: Optika i Spektroskopiya, 1958, Vol IV, Nr 6, pp 792-795 (USSR)

ABSTRACT: Optical constants of metals are of great interest in the electron theory of metals if they are measured in the frequency region which satisfies the inequality given by Eq. 1 on p. 792: $\nu_0^2 \ll \omega^2 \ll \omega_0^2$, where ν_0 is the frequency of electron collisions with the crystal lattice and ω_0 is the frequency corresponding to the upper limit of the internal photoeffect. This frequency region lies usually in the infrared part of the spectrum. The present paper reports measurements of optical constants of silver in the 1-12 μ region using the methods described earlier (Refs 1, 2). In the first of these methods (Ref 1) the phase difference $\Delta = \delta_p - \delta_s$ between the p- and s- components is made equal to -180° by multiple reflection of light by two identical samples. The apparatus used is shown in Fig 1. Here S is the exit slit of a monochromator SMR-2; Z_1, Z_2, Z_3 and Z_4 are aluminized

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mirrors; P and A are a polarizer and an analyser, respectively, made of piles of six selenium plates which are placed at an angle of the order of 70° to the light-beam; M_1 and M_2 are the samples of the studied metal; B is a receiver. A parallel beam of monochromatic light passes through a polarizer, which is positioned at an angle of 45° to the plane of incidence, and falls at an angle φ on to samples M_1 and M_2. The angle of incidence is chosen to make $m\Delta = -180°$, where m is the number of reflections from metal samples. Under these conditions the light reflected from metal samples may be extinguished by the analyser. Position of the analyser gives the value ψ', which is related to the azimuth of restored polarization ψ by the relationship $\tan \psi = \sqrt[m]{\tan \psi'}$. Knowing the angle of incidence φ, the phase difference Δ and the azimuth ψ the optical constants can be easily calculated. The second method of "rotating analyser" (Ref 2) is based on a conversion of elliptically polarized into circularly polarized light. The apparatus is the same as in Fig 1. By a suitable choice of the angle of incidence φ, for a given wavelength, the condition $m\Delta = -90°$ is satisfied and the amplitudes of the p- and s-components are made equal by a suitable rotation of the polarizer. Then the light reflected from metal surfaces

SOV/51-4-6-13/24

Measurement of Optical Constants of Silver in the Infrared Spectral Region

is circularly polarized. The modulated component which has passed through the rotating analyser disappears and the recording instrument shows only a constant signal. The azimuth of the restored polarization is obtained as in the first method, but ψ now represents the angle between the chief direction of the polariser and the plane of incidence of light. From measured values of φ, Δ and ψ the optical constants μ (refractive index) and $\mu\chi$ (absorption coefficient) are obtained. The optical constants of silver layers produced by evaporation in vacuum were measured by both these methods. The results are shown in the table on p. 795 whose columns give respectively the wavelength (in μ), the angles of incidence φ, the number of reflection m, the phase differences $-\Delta$, the azimuth ψ, the refractive indices μ and the absorption coefficients $\mu\chi$. Fig 2 compares the values of the refractive index and the absorption coefficient (curves 1 and 2 respectively) obtained by the present authors (shown by open circles) with those of Forsterling and Freedericksz (Ref 7, shown by black dots) and those of Motulevich and Shubin (Ref 6 shown by half-black dots). All these values are shown as a function of wavelength and they agree well with each other, except for values of the refractive index in

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the 3.5-6 μ region reported in Ref 6. In the spectral region where the inequality given by Eq. 1 on p. 792 is satisfied the conduction electron density N is independent of the wavelength λ. If N is constant it follows that $(\mu\chi)^2 - \mu^2 + 1 = f(\lambda^2)$ which should be a straight line. Such a straight line is shown in Fig 3. In the region 5-12 μ the slope of this line gives the conduction electron density as $7.4 \times 10^{22} cm^{-3}$. The experimental points in Fig 3 in the region 1-6 μ also lie on a straight line whose slope gives the conduction electron density as $5.2 \times 10^{22} cm^{-3}$, which is the same as the number of atoms of silver in 1 cm^3. The authors thank K.D. Sinel'nikov for his interest and advice. There are 3 figures, 1 table and 8 references, 4 of which are Soviet, 2 English, 1 German and 1 American.

ASSOCIATION: Khar'kovskiy gosudarstvennyy universitet im. A.M. Gor'kogo (Khar'kov State University imeni A.M. Gor'kiy)

SUBMITTED: November 15, 1957

SOV/51-5-5-19/23

AUTHOR: Shklyarevskiy, I.N.

TITLE: On the Problem of Measurement of Thickness of Thin Layers Using Equal Chromatic Order Lines (K voprosu ob izmerenii tolshchin tonkikh plenok s pomoshch'yu liniy ravnogo khromaticheskogo poryadka)

PERIODICAL: Optika i Spektroskopiya, 1958, Vol 5, Nr 5, pp 617-619 (USSR)

ABSTRACT: In 1945 Tolansky applied equal chromatic order lines to the study of topography of almost plane surfaces, using white light. Later Sinel'nikov and Rapp (Ref 2) applied Tolansky's method to measurement of thin films deposited in vacuo on glass plates. A scratch is made across such a film. The film is then covered (by vacuum deposition) by an opaque layer of silver which repeats the scratch contours forming a small step. The height of this step is equal to the original film thickness. A second glass plate is covered by a semi-transparent layer of silver. The two plates are pressed together and are placed in front of a spectrograph slit in such a way as to place the step, referred to above, at right angles to the slit. These plates are illuminated with a parallel beam of white light; details of the apparatus are given in Refs 3, 4. An achromatic lens is used to focus

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On the Problem of Measurement of Thickness of Thin Layers Using Equal Chromatic Order Lines SOV/51-5-5-19/23

the air gap between the glass plates on to a spectrograph slit. In the focal plane of the spectrograph camera objective two systems of equal chromatic order lines are observed (Fig 1). The separation between the two systems of lines is a function of the original film thickness. Wavelengths of both systems of lines were measured in the spectral region 5000-6500 Å. For each of the systems a graph of the function $m\lambda/2 = f(\lambda)$ is constructed. Here $m = k - 1$, where k is the interference order of a particular line. Fig 3 shows such functions obtained from the interferogram of Fig 1. The difference between ordinates of the two straight lines shown in Fig 3 is equal to the original film thickness t (in the present case it was 260 Å). When film thickness is of the order of several wavelengths the air gap between the interference plates is chosen to make the m-th line of one system to coincide with the n-th line of the other system, as shown in Fig 2. Then $t = \lambda_1(m - n)/2$, where t is the original film thickness and λ_1 is the wavelength at which the m-th and n-th lines of the two systems

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On the Problem of Measurement of Thickness of Thin Layers Using Equal Chromatic Order Lines

coincide. For the case given in Fig 2 λ_1 = 6176 Å, m - n = 4 and t = 1.225 μ. The author thanks K.D. Sinel'nikov for his advice. There are 3 figures and 5 references, 4 of which are Soviet and 1 English.

SUBMITTED: April 29, 1958

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1. Thin films--Measurement 2. Thin films--Testing equipment 3. Spectrophotometers--Performance 4. Mathematics 5. Silver --Applications

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SOV/58-59-7-16481

Translation from: Referativnyy Zhurnal Fizika, 1959, Nr 7, p 259 (USSR)

AUTHOR: Shklyarevskiy, I.N.

TITLE: Measuring the Optical Constants of Metals in the Infrared Region of the Spectrum Using the "Rotating Analyzer" Method

PERIODICAL: Uch. zap. Khar'kovsk. un-t, 1958, Vol 98, Tr. Fiz. otd. fiz.-matem. fak., Vol 7, pp 325 - 328

ABSTRACT: In order to determine the optical constants of metals in the infrared region, the author used the rotating polarizer method of Konn (Russ. spelling) and Eaton (RZhFiz, 1956, Nr 2, 14657) in conjunction with the repeated reflection of light from two identical surfaces of the metal to be investigated. Light from the monochromator passes through the polarizer (a selenium pile), is reflected from the two parallel samples, and passes through the slowly rotating analyzer and on to the radiation receiver. By gradually varying the angle of incidence of the light on the samples, an angle of incidence is found at which the reflected light is circularly polarized, i.e., the signal at the analyzer is constant. Then the optical constants are calculated from the known

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SHKLYAREVSKIY, I. N. Doc Phys-Math Sci -- (diss) "Certain problems of metallooptics." Khar'kov, 1959. 22 pp (Min of Higher and Specialized Secondary Education UkSSR. Khar'kov Order of Labor Red Banner State Univ im A. M. Gor'kiy), 150 copies. List of author's works at end of text (26 titles) (KL, 44-59, 125)

51-6-1-13/30

AUTHORS: Shklyarevskiy, I.N. and Padalka, V.G.

TITLE: Measurement of the Optical Constants of Copper, Gold and Nickel in the Infrared Region of the Spectrum (Izmereniye opticheskikh postoyannykh medi, zolota i nikelya v infrakrasnoy oblasti spektra)

PERIODICAL: Optika i Spektroskopiya, 1959, Vol 6, Nr 1, pp 78-84 (USSR)

ABSTRACT: The optical constants of copper, gold and nickel were measured in the region of 1-12 μ by means of the method described by Shklyarevskiy et al. (Refs 4, 5). Measurements were made on a number of pairs of samples and in each case reproducible values of the refractive index μ and the absorption index μχ were obtained. The results of measurements are given in Tables 1-3. The seven columns of each table give the wavelength λ, the angle of incidence of the light φ, the number of reflections n, the phase shift Δ, the azimuth ψ, the refractive index μ and the absorption index μχ. The optical constants were calculated from the usual formulae (Eqs 5 and 6) which give μ and μχ in terms of φ, ψ and Δ. Thick layers of copper were prepared by vacuum deposition on glass plates. Measurements of the optical constants of copper were made within five days. Control measurements carried out on freshly prepared samples yielded the same optical constants as the measurements

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Measurement of the Optical Constants of Copper, Gold and Nickel in the Infrared Region of the Spectrum

carried out after five days. The effect of a layer of copper oxide was neglected; according to Hodgson (Ref 6) such a layer should not affect the optical constants by more than a few per cent. The results obtained for copper are given in Table 1 and the derived optical constants are shown in Fig 1, where the open circles represent the authors' results and the black dots represent those of Försterling and Freederichsz (Ref 7). Layers of gold 1.5-2 μ thick were deposited on glass plates by vacuum deposition. No differences were found between optical constants derived from measurements made seven days after evaporation and optical constants derived from measurements carried out one month after preparation of the samples. The results are given in Table 2 and the derived optical constants are shown in Fig 2. Again open circles denote the present authors' results and the black dots those of Försterling and Freederichsz (Ref 7). Thin layers of nickel were deposited by vacuum deposition on glass plates. The results obtained are given in Table 3 and the derived optical constants in Fig 3, where open circles denote the present authors' values, and triangles show the optical constants obtained by Ingersoll (Ref 8) at $\lambda = 2$ μ.

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Measurement of the Optical Constants of Copper, Gold and Nickel in the Infrared Region of the Spectrum

Using the classical Drude theory of free electrons in metals the authors calculated densities of free electrons, relaxation times and d.c. conductivities of copper, gold, nickel and silver. They are given in Table [illegible] together with results taken from Hodgson's and Beattie and Conn's work (Refs 8, 10). From the known values of μ and μχ it is possible to calculate the value of the absorption coefficient A given by

$$A = 1 - R = \frac{4\mu}{(\mu + 1)^2 + (\mu\chi)^2}$$

where R is the reflection coefficient of the metal. Dependence of the absorption coefficient A on wavelength is given for copper, silver, gold and nickel in Fig 7. The ordinate axis I applies to copper, gold and silver and the axis II applies to nickel. Acknowledgments are made to Professor K.D. Sinel'nikov for his advice. There are 7 figures, 4 tables and 13 references, 6 of which are Soviet, 3 English 2 German 1 Dutch and 1 translation.

SUBMITTED: March [illegible]

Card 3/3

24(4), 24(6) SOV/51-6-4-19/29

AUTHORS: Shklyarevskiy, I.N., Avdeyenko, A.A. and Padalka, V.G.

TITLE: Measurement of the Optical Constants of Antimony in the Infrared Spectral Region at Temperatures of 290 and 110°K. (Izmereniye opticheskikh postoyannykh sur'my v infrakrasnoy oblasti spektra pri temperature 290 i 110°K)

PERIODICAL: Optika i Spektroskopiya, 1959, Vol 6, Nr 4, pp 528-532 (USSR)

ABSTRACT: The optical constants of antimony were measured at the wavelengths of 1-12 μ and at temperatures of 290 and 110°K, using the technique described by Avery (Ref 3) which is essentially a measurement of

$$\rho^2 = R_p/R_s,$$

at two angles of incidence φ (R_p and R_s are the coefficients of reflection for light polarized in the plane of incidence and at rightangles to it). Avery obtained the refractive (μ) and absorption ($\mu\chi$) indices from a system of two equations

$$\rho_1^2 = f_1(\mu, \mu\chi, \varphi_1) \text{ and } \rho_1^2 = f_2(\mu, \mu\chi, \varphi_2).$$

This method of calculation is laborious and the authors used the method of intersecting circles (Ref 4). The procedure described here is applicable to the optical constants of metals for which $\mu \approx \mu\chi$; the optical constants of antimony satisfy this condition. The

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SOV/51-6-4-19/29

Measurement of the Optical Constants of Antimony in the Infrared Spectral Region at Temperatures of 290 and 110°K

apparatus used for measurement of the optical constants of metals in the infrared region was described earlier (Ref 1). The apparatus used in studies of antimony differed from that described earlier (Ref 1) in one particular: instead of two samples on the gonometer table a cryostat was used with one sample in it. Fig 1 shows the external view of the apparatus. The following details are marked in Fig 1: the slit (S) of a monochromator ZMR-2, a polarizer P and an analyser A, the cryostat K and a receiver B (a photoresistor or a bolometer). The polarizer and analyser consisted each of a pile of selenium plates which had to be replaced every 3-4 months. Details of the cryostat are shown schematically in Fig 2. Measurements were made at 290 and 110°K (using liquid oxygen in the jacket of the cryostat). The apparatus had to be adjusted very carefully in order to avoid serious errors: first the selenium piles were adjusted and then the sample. Measurements were made on four samples; the values of the optical constants of the individual sample differed by no more than 5-8%. Control measurements, carried out using other methods (Ref 5), gave similar results. Fig 3 shows the refractive (curves a) and absorption (curves б) indices of antimony as a function of wavelength between 1 and 12 μ at temperatures of 290 (curves 1a, 1б) and 110°K

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Measurements of the Optical Constants of Antimony in the Infrared Spectral Region at Temperatures of 290 and 110°K

(curves 2a, 2б). The same figure contains the values of μ and $\mu\chi$ of antimony, obtained at room temperature and 2.45 μ wavelength, by Domanskiy and Moskov (Ref 6); these are shown as points 3a and 3б. From the mean values of the optical constants the authors constructed the wavelength dependence of the real $[\mu^2 - (\mu\chi)^2]$ and imaginary $[2\mu(\mu\chi)]$ components of complex permittivity; this is shown in Fig 4. Fig 5 shows the wavelength dependence of the absorption coefficient A calculated from

$$A = 4\mu/[(\mu + 1)^2 + (\mu\chi)^2].$$

The $A = f(\lambda)$ curves exhibit clear maxima which are due to interband transitions. From the positions of the maxima on the A curves the interband energy gap was calculated. It was found to be 0.18 eV at room temperature and 0.15 eV at 110°K. This compares well with the

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Measurements of the Optical Constants of Antimony in the Infrared Spectral Region at Temperatures of 290 and 110°K

values of 0.05 to 0.20 eV at room temperature reported by Smith (Ref 7). Acknowledgment is made to K.D. Sinel'nikov for his advice. There are 5 figures and 7 references, 5 of which are Soviet and 2 English.

SUBMITTED: May 19, 1958

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SOV/51-6-5-19/34

24(4)

AUTHORS: Shklyarevskiy, I.N. and Avdeyenko, A.A.

TITLE: Reduction of Reflection of Metallic Coatings (Prosvetleniye metallicheskikh pokrytiy)

PERIODICAL: Optika i Spektroskopiya, 1959, Vol 6, Nr 5, pp 678-684 (USSR)

ABSTRACT: It is very desirable to reduce reflection at the glass-metal boundary in the Fabry-Perot interferometer plates, keeping the reflectivity at the air-metal boundary unchanged. This would improve transmission of the plates and consequently increase their speed, contrast and resolving power. Such a reduction can be achieved by evaporating a thin film (100-150 Å) of silver on a glass plate heated to 300-400°C and then depositing the main aluminium layer. Transmission of semi-transparent aluminium coatings on glass pre-treated in this way is increased by a factor of 2 to 4 in the wavelength region 600-1100 mμ (Fig 5). Transmission of semi-transparent coatings of silver can be improved by a factor of 1.5 to 2.8 when these coatings are deposited on glass plates previously covered with 100-150 Å silver films (deposited at 300-400°C) on top of which very thin aluminium layers were evaporated (Fig 7). Reduction of reflection of interferometer plates produces a reversal of interference lines (Fig 8). The intensities of the reverse lines are higher than the intensities of lines reversed by

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Reduction of Reflection of Metallic Coatings

cutting out the "zero-order" lines. This makes it possible to use reflection interferometers with a second opaque coating in studies of hyperfine structure. One section of the paper deals with the optical properties of thin silver films deposited on glass plates heated to 100, 200, 300 and 400°C. The optical constants of such films were found to be similar to the constants recorded earlier for thick silver layers deposited on hot substrates. These films are granular in structure as shown in Fig 2. Acknowledgment is made to K.D. Sinel'nikov for his advice. There are 9 figures and 13 references, 8 of which are Soviet, 3 German, 1 English and 1 translation from English into Russian.

SUBMITTED: November 10, 195[illegible]

Card 2/2

SOV/51-6-6-9/34

24(4), 24(3)

AUTHORS: Shklyarevskiy, I.N. and Padalka, V.G.

TITLE: The Anomalous Skin-Effect and the Optical Constants of Copper, Silver, Gold and Nickel in the Infrared Region (Anomal'nyy skin-effekt i opticheskiye postoyannyye medi, serebra, zolota i nikelya v infrakrasnoy oblasti spektra)

PERIODICAL: Optika i spektroskopiya, 1959, Vol 6, Nr 6, pp 776-779 (USSR)

ABSTRACT: Recently the authors measured the optical constants of copper, silver, gold and nickel at infrared wavelengths and interpreted their results in terms of the classical free-electron theory of Drude (Refs 1, 2). From these optical constants the authors had deduced, inter alia, the d.c. electrical conductivities of these metals. These conductivities were found to be considerably smaller than the values obtained directly on massive samples. The reason for this discrepancy lies in the use of dispersion formulae of Drude which are valid only for the normal skin-effect, when the inequality $\ell \ll \delta$ is satisfied (ℓ is the mean free path of electrons and δ is the depth of the "skin" layer). For good conductors at room temperature the mean free path of electrons may be of the order of the depth of the skin layer, and at low temperatures this path may be considerably larger than δ, i.e. anomalous skin-effect

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The Anomalous Skin-Effect and the Optical Constants of Copper, Silver, Gold and Nickel in the Infrared Region

conditions apply. Dingle (Refs 4-6) gave the theory of the anomalous skin effect and derived the dispersion formulae for the optical constants of metals in the infrared region. Dingle allowed for the fact that electrons can be reflected from the metal surface both specularly and diffusely. His theory involves a coefficient of specularity p; p = 1 for specular reflection and p = 0 for diffuse reflection. In real metals p lies between 1 and 0. The authors used Dingle's theory and the values of the optical constants of copper, silver, gold and nickel, determined earlier, (Refs 1, 2), to calculate the conduction electron densities N, the relaxation times τ and the values of (1 - p)v for these metals (here v is the electron velocity at the Fermi surface). All these quantities are listed in the table on p 779, cols 5, 6 and 8 respectively. These calculations were made on the assumption that the electrical conductivity of thick metal films deposited in vacuo is equal to the conductivity of massive samples. Acknowledgment is made to K.D. Sinel'nikov for his advice. There are 3 figures, 1 table and 8 references, 4 of which are Soviet, 3 English and 1 translation from English into Russian.

SUBMITTED: November 26, 1958

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SOV/51-6-6-10/34

24(4)

AUTHOR: Shklyarevskiy, I.N.

TITLE: A New Interferometric Method of Measuring Dispersion of Liquids (Novyy interferometricheskiy metod izmereniya dispersii zhidkostey)

PERIODICAL: Optika i spektroskopiya, 1959, Vol 6, Nr 6, pp 780-783 (USSR)

ABSTRACT: The author et al had already described an interferometric method of measuring dispersion of liquids and solids (films) in the visible (Ref 1) and ultraviolet (Ref 2) regions. It was shown (Refs 1-3) that, although the method has the advantage of high speed compared with the method described by Obreimov (Ref 4), it was not very accurate because the phase shift at the dielectric-metal boundary was neglected. The present paper describes a modified method which does not have this disadvantage. The effect of dispersion of the phase shift is allowed for in the same way as in measurement of thickness of thin films (Ref 5). One of the interferometer plates is polished in such a way as to form a step of 2-3 thickness (Fig 1a). The second plate is an optical flat. The internal surfaces of the two plates are covered by semi-transparent layers of silver or aluminium (the latter is used for measurements in the ultraviolet region). The metal coating on the plate with the step is ruled in several places (Fig 1б). The scratches P so formed are used later as

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the datum marks. The two plates are pressed against each other and placed in front of a spectrograph slit, as shown in Fig 2. In the focal plane of the objective of the spectrograph camera two systems of equal-chromatic order lines are observed; they are due to the two different thicknesses of the air gaps t_1 and t_2, shown in Fig 1a. The plates are placed on an object table and are moved in a horizontal direction parallel to the plane of the spectrograph slit. When one of the scratches P is focused on the slit, the interference pattern disappears. When this happens the reading of the drum of the micrometer screw of the object table is noted and in this way two or three positions of the scratch marks are recorded. The height of the step is determined exactly at several places between the scratches. This height is deduced from

$$t = (m - n)(\lambda/2),$$

where λ is the wavelength at which two interference lines of order m and n (one from each system) coincide (Ref 7). Since the wavelength can be found to within 0.1 Å, the step height may be also determined with the same accuracy. To find dispersion of a liquid it is placed in the gap between the interference plates, and the interference pattern is recorded for one of the places where the step height t is known exactly. The refractive index of the liquid is deduced from the difference between the ordinates of the following two curves: $m\lambda/2t = f(\lambda)$ and $n\lambda/2t = \varphi(\lambda)$. Such a procedure excludes the effect of the dispersion of the phase shift at the dielectric-metal boundary. The order of interference is determined as follows. Let λ_0 and λ_1 be the wavelengths of two neighbouring lines. If the corresponding refractive indices of the liquid μ_0 and μ_1 do not differ too much, then

$$m = \lambda_1/(\lambda_0 - \lambda_1).$$

The value of m should be rounded out to the nearest integer. The true order of interference is equal to (m - 1), as shown in Ref 3. The method described above is suitable also for measurements in the ultraviolet region. In this case the source may be an iron arc or spark. The experimental technique for this case has already been described (Ref 2). G.M. Polyakova and S.T. Verkhovtseva took part in experiments designed to try out the method described above. Acknowledgment is made to K.D. Sinel'nikov for his advice. There are 3 figures and 6 Soviet references.

SUBMITTED: December 26, 1958.

APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R001549630001-2"

SOV/51-7-4-23/32

AUTHORS: Shklyarevskiy, I.N., Verkhovtseva, E.T. and Polyakova, G.N.

TITLE: On the "Vernier Effect" Observed when the Thickness of Thick Layers is Measured Using an Interferometric Method.

PERIODICAL: Optika i spektroskopiya, 1959, Vol 7, Nr 4, pp 566-568 (USSR)

ABSTRACT: In a preceding paper Shklyarevskiy (Ref 1) described an interferometric method of measuring thickness of thin and thick films. Two plates were used, distance t_1 apart. A layer of thickness t deposited on, say, one half of one of the plates, reduced the air gap locally to t_2, i.e. $t = t_1 - t_2$. If these plates were placed in front of a spectrograph slit and illuminated with a parallel beam of white light, then two systems of equal-chromatic-order lines were observed in the focal plane of the spectrograph camera. By selecting the air gaps t_1 and t_2 it was possible to make one line of m-th order of one system to coincide with an n-th order line of the second system. The wavelength λ_0 of the coincident lines and their interference orders determine the layer thickness:

$$t = (m - n)\lambda_0/2. \qquad (1)$$

This formula is independent of the phase shifts (Ref 1). A new coincidence between lines of the equal-chromatic-order systems should

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On the "Vernier Effect" Observed when the Thickness of Thick Layers is Measured Using an Interferometric Method

occur after k lines of one system and (k + 1) lines of the second system, i.e. the so-called vernier effect should be observed. The authors show that the exact vernier effect would be possible only if the dispersion of the phase shift was absent. If such dispersion occurs exact coincidence of more than one pair of lines is impossible. When not even one pair of lines is coincident on an interferogram, the film thickness can be calculated using

$$t = t_1 - t_2 = \frac{m\lambda_0}{2} - \frac{n\lambda_0'}{2}, \qquad (10)$$

where n and m are the orders and λ_0, λ_0' are the wavelengths of the two lines which almost coincide. Neglect of the phase shifts in Eq (10) leads to an error in the fifth place. This is unimportant in measurement of thicknesses of the order of several microns as shown by the practical example of a ZnS layer whose interferogram is given in a figure on p 568. The wavelengths and the interference orders of the almost coincident lines

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On the "Vernier Effect" Observed when the Thickness of Thick Layers is Measured Using an Interferometric Method

shown in the figure, are listed in a table on p 568. The mean thickness of the ZnS layer, calculated using Eq (10) was 49998.45 Å, which differs only slightly from 50 000.2 Å calculated using Eq (1) for the λ = 5263.18 Å. Acknowledgment is made to K.D. Sinel'nikov for his advice. There are 1 figure, 1 table and 5 references, 2 of which are Soviet, 2 English and 1 translation from English into Russian.

SUBMITTED: March 27, 1959

Card 3/3

SIMEL'NIKOV, L.D.; SMILYAREVSKIY, I.M.; GLADKOVA, I.V.

Colors of wrinkled transparent films on metal surfaces. Opt. i spektr. 7 no. 6:846-848 D '59. (MIRA 14:2)
(Films (Chemistry))

68889
S/051/60/008/02/016/036
E201/E391

AUTHORS: Shklyarevskiy, I.N. and Sharanov, A.I.

TITLE: ~~A Photographic~~ Method of Measuring Optical Constants of Metals

PERIODICAL: Optika i spektroskopiya, 1960, Vol 8, Nr 2, pp 239 - 242 (USSR)

ABSTRACT: The paper describes a photographic method of measuring optical constants of metals in the visible and ultra-violet regions. This method is a modification (in experimental technique and in calculations) of the Shklyarevskiy et al polarization method of measuring optical constants of metals in the visible (Ref 1) and infrared (Refs 2,3) regions, based on the use of multiple reflection of light from two parallel identical samples. The apparatus used is shown schematically in Figure 1. While light from a source O proceeds via an achromatic lens L_1 and a polarizer P to reach a sample (2) from which it is reflected to another sample (1). Several such reflections occur between the two samples and then the light proceeds via an analyser

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A Photographic Method of Measuring Optical Constants of Metals

A , another achromatic lens L_2 to a spectrograph slit S . By suitable selection of the angle of incidence on the samples φ' one can find a certain wavelength λ' for which the phase difference mΔ after m reflections from the samples will be -180 °C. The wavelength λ' is extinguished by a suitable rotation of the analyser and the value of λ' is found by comparing the extinguished band (line) with a calibration spectrum. The procedure is repeated for a different angle of incidence φ'' and a corresponding wavelength λ'' is found. In this way we can construct a curve representing $\varphi = f_1(\lambda)$ for $\Delta_1 = -60^\circ$ (triple reflection, m = 3) . Similarly, a curve representing $\varphi = f_2(\lambda)$ can be constructed for five-fold reflection, when $\Delta_2 = -36^\circ$. Using these two curves we can find, for any given wavelength, two pairs of values:

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φ_1, $\Delta_1 = -60^\circ$ and φ_2, $\Delta_2 = -36^\circ$. The refractive index μ and the absorption index $\mu\chi$ are given by:

$$\mu = \left[\frac{1}{2}(a^2 - b^2 + \sin^2\varphi) + \frac{1}{2}\sqrt{(a^2 - b^2 + \sin^2\varphi)^2 + 4a^2b^2}\right]^{1/2}$$

$$\mu\chi = \left[-\frac{1}{2}(a^2 - b^2 + \sin^2\varphi) + \frac{1}{2}\sqrt{(a^2 - b^2 + \sin^2\varphi)^2 + 4a^2b^2}\right]^{1/2} \quad (3)$$

where:

$$b = \frac{\mathrm{tg}\,\Delta_1 \mathrm{tg}\,\Delta_2(\sin^2\varphi_1 \mathrm{tg}^2\varphi_1 - \sin^2\varphi_2 \mathrm{tg}^2\varphi_2)}{2(\mathrm{tg}\,\Delta_2 \sin\varphi_1 \mathrm{tg}\,\varphi_1 - \mathrm{tg}\,\Delta_1 \sin\varphi_2 \mathrm{tg}\,\varphi_2)} \quad (4)$$

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A Photographic Method of Measuring Optical Constants of Metals

$$a = \sqrt{\sin^2\varphi_1 tg^2\varphi_1 - b^2 - 2b.ctg\,\Delta_1 \sin\varphi_1\, tg\,\varphi_1} \quad (5)$$

and

$$\sin^2\varphi = \frac{1}{2}(\sin^2\varphi_1 + \sin^2\varphi_2) \quad . \quad (6)$$

If $\sin^2\varphi_1 \approx \sin^2\varphi_2 \ll |\mu^2 - (\mu\chi)^2|$, then $\mu = a$ and $\mu\chi = b$. The optical constants can be found also graphically. To check the method suggested the authors measured the optical constants of antimony in the visible region of the spectrum. The following values were obtained:

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A Photographic Method of Measuring Optical Constants of Metals

λ = 650 mμ	μ = 2.69	μϰ = 3.92
= 600	= 2.31	= 3.89
= 550	= 2.01	= 3.69
= 500	= 1.75	= 3.44
= 450	= 1.46	= 3.14 .

The authors measured also the optical constants of antimony using the original unmodified polarization method (Ref 1) and found that these constants agreed with the values quoted above. The optical constants of antimony obtained by the authors differ somewhat from those reported by Quincke (Ref 7). N. Ya. Seraya and L. Ya. Seraya took part in measurements of the optical constants of antimony. Acknowledgment is expressed to K.D. Sinel'nikov for his advice. There are 2 figures and 8 references, 5 of which are Soviet and 3 German.

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Shklyarevskiy, I.N.

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AUTHORS: Padalka, V.G. and Shklyarevskiy, I.N.

TITLE: A Contribution to the Technique of Measurements of the Optical Constants of Metals at Low Temperatures

PERIODICAL: Optika i spektroskopiya, 1960, Vol 9, Nr 1, pp 119-121 (USSR)

ABSTRACT: The authors describe a cryostat suitable for low-temperature measurements of the optical constants of metals, using one of the published polarization methods (Refs 2-6). The cryostat is in the form of a copper cylinder, fitted with windows. Samples are placed in this cylinder in such a way that they are in good contact with copper reservoirs in which liquid nitrogen is circulated. The sample positions can be adjusted from outside and the cryostat can be evacuated down to 5×10^{-5} mm Hg. Two cross-sections through the cryostat are shown in Fig 1 and its photograph is given in Fig 2. There are 2 figures and 9 references, 7 of which are Soviet and 2 English.

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Card 1/1

SHKLYAREVSKIY, I.N.; VLASENKO, N.A.; MILOSLAVSKIY, V.K.; NOSULENKO, N.A.

Value and sign of the phase difference $\Delta = \delta_p - \delta_s$. Opt. i spektr. 9 no.5:640-643 N '60. (MIRA 13:11)
(Reflection (Optics)) (Metals--Optical properties)