LISITSYN, M.P.

KONDILENKO, I.I.; LISITSYA, M.P.

A new high-brightness hydrogen lamp. Nauk. zap. Kiev. un. 13 no.7:131-143 '55. (MLRA 9:12)

(Hydrogen--Spectra) (Electric lamps, Arc)

USSR/Optics - Physical Optics, K-5

Abst Journal: Referat Zhur - Fizika, No 12, 1956, 35791

Author: Lisitsa, M. P., Shishlovskiy, A. A.

Institution: None

Title: The Calculation, Preparation and Investigation of a Polarization Pile

Original Periodical: Nauch. zap. Kiivs'k. un-t, 1955, 14, No 8, 141-157

Abstract: A theory is given for a multilayer polarizer consisting of any number (m) different non-absorbing thick plane-parallel layers. A separate analysis given for the case of identical absorbing layers. Equations are obtained for the intensities of the light beams, reflected or transmitted through the multilayer pile, and equations are given permitting calculation of the degree of polarization (P_{d_m}) in the absence of absorption, using a glass pile as an example. Its suitability is shown for all the working range of angles φ. The following results are obtained:

Card 1/2

USSR/Optics - Physical Optics, K-5

Abst Journal: Referat Zhur - Fizika, No 12, 1956, 35791

Abstract: (a) In the range $0 \leqslant \varphi \leqslant \pi/2P_{d_m}$ there is a maximum, the position of which shifts as m increases toward the region of smaller angles; as m becomes infinite it corresponds to the Brewster angle. (b) At $\varphi = \pi/2$ we obtain P_{d_m} = const, regardless of m. The value of P_{d_m} is determined in this case only by the index of refraction n. It is shown that the degree of polarization depends substantially on the absorption, leading to an increase in P_{d_m}. Investigation of selenium piles ($m = 1$, $m = 4$) absorbing in the visible portion of the spectrum ($\lambda = 589$ mμ), led to results that are in good agreement with the calculated data. The authors propose that the established dependence can be used to measure the absorption of solid isotropic substances. A description of the technology of preparing a selenium pile, intended for polarization of infrared radiation, is given.

Card 2/2

LISITSA, M.P.

KONDILENKO, I.I.; LISITSA, M.P.

[redacted]

A new intense-light hydrogen lamp. Izv. AN SSSR. Ser. fiz. 19 no.1:87-88 Ja-F '55. (MLRA 8:9)

1. Kafedra eksperimental'noy fiziki i optiki Kiyevskogo gosudarstvennogo universiteta imeni T.G.Shevchenko.
(Spectrum analysis) (Spectrometer)

LISITSA, M. P.

USSR/Optics - Photometry. Colorimetry. K-10

Abs Jour : Referat Zhur - Fizika, No 3, 1957, 8077

Author : Kondilenko, I.I., Lisitsa, M.P.
Title : New Hydrogen Lamp of High Brightness

Orig Pub : Zh. tekhn. fiziki, 1955, 25, No 7, 1316-1322

Abstract : Description of the construction, technology of manufacture, and test results of an hydrogen arc tube of low pressure. The cathode is a nickel hemisphere 15 mm in radius. Its internal surface is covered with oxide. Heating is indirect. The electrons emitted by the cathode are incident on the anode through an opening 3 mm in diameter, made in the center of a molybdenum disk, tightly covering the cathode hemisphere. The anode is made of a molybdenum plate in the form of a saucer with an opening in the middle (diameter 5 mm), which is attached to a nickel ring. The maximum discharge current without water cooling

Card 1/2

USSR/Optics - Photometry. Colorimetry. K-10

Abs Jour : Referat Zhur - Fizika, No 3, 1957, 8077

is 17 amp, and the current density is 240 amp/cm^2. The most favorable hydrogen pressure is 1.6 -- 4.2 mm mercury. Increasing the discharge current causes the radiation intensity to increase linearly, and the energy distribution over the spectrum remains constant. The dependence of the discharge current and of the voltage drop across the tube on the change in the hydrogen pressure was investigated. In the pressure range between two and 12 mm mercury the tube operates as a rectifier. Increasing the pressure decreases the difference between the firing and arcing potentials.

Card 2/2

LISITSA, M.P. [Lysytsia, M.P.]; SHISHLOVSKIY, O.A. [Shyshlovs'kyi, O.A.]

Spectrophotometric method for determining the polarization degree of alloys. Nauk povid. KDU no.1:21 '56. (MIRA 11:4)
(Alloys--Spectra)
(Polarization (Light))

LISITSYN, M.P.

LISITSYN, M.P.; SHISHLOVS'KIY, O.A.

Concerning certain characteristics of interference light filters. Nauk.zap.Kiev.un. 15 no.5:13-18 56. (MLRA 10:7)
(Light filters) (Interference (Light))

LISITSYA, M.P.

DIMARS'KIY, Ya.S.; LISITSYA, M.P.

Effect of interference on the polarization properties of multilayer films. Nauk.zap.Kiev.un. 15 no.5:19-26 '56. (MIRA 10:7)
(Interference (Light)) (Polarization (Light))

LISITSA, M.P.; TSVELYKH, N.G.

Interferential microscope for measuring thin coatings and the phase shift. Zav. lab. 22 no.9:1072-1075 '56. (MLRA 9:12)

1. Kiyevskiy gosudarstvennyy universitet imeni T. G. Shevchenko.
(Interferometry) (Microscope) (Metals--Testing)

Kiev State UNIV im Shevchenko MT

PRIKHOT'KO, A.F.

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

L'vov. Universytet

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

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

Card 1/30

Card 8/30

LISITSA, M.P.

AUTHOR: Lisitsa, M.P. and Shishlovskiy, A.A. 51-5-14/26

TITLE: Polarisation of Light Reflected by a Pile (of Glass Plates)
(Polyarizatsiya sveta, otrazhennogo stopoy)

PERIODICAL: Optika i Spektroskopiya, 1957, Vol.2, No.5,
pp.637-644 (USSR)

ABSTRACT: The degree of polarisation of a pile of m plane-parallel glass plates, each of a refractive index n is given by:

$$P = \frac{a(n^2 - 1)^2 \sin^2\varphi \cos\varphi}{[(n^2\cos\varphi - a)^2 + (a - \cos\varphi)^2 n^2] a \cos\varphi + m(n^2\cos\varphi - a)^2(a - \cos\varphi)^2} \quad (4)$$

where φ = the angle of incidence and $a = (n^2 - \sin^2\varphi)^{1/2}$

A pile of plates is used since only about 7% of the incident light is reflected by a single plate. The incident beam is usually divergent, so that only axial rays can be made to satisfy Brewster's condition for complete polarisation:

$$\sin\varphi = \frac{n}{\sqrt{n^2 + 1}}, \quad \cos\varphi = \frac{1}{\sqrt{n^2 + 1}} .$$

For the above reasons, it is of interest to find the dependence of P on m and n.

Card 1/3

51-5-14/26

Polarisation of Light Reflected by a Pile (of Glass Plates).

Figs. 1 and 2 show dependence of P on φ for piles consisting of 1 plate (I), 3 plates (II) and 10 plates (III). In Fig. 1, n = 1.516 (glass); in Fig.2 n = 2.92 (a theoretical value). These two figures show that an increase of m causes narrowing of Δφ, the range of incident angles at which maxima of P occur. Increase of the refractive index (n) makes this effect of m on Δφ very pronounced. Fig.3 shows good agreement between the experimental values (dashed curves) and the theoretical ones (continuous curves) for m = 1, 3 and 10, respectively. The authors studied the way in which, in a single plate, the incident ray is broken up by multiple reflections into secondary rays. The number of these secondary rays, k, depends on the plate thickness, its length and the angle of incidence of the original ray. The effect of k on polarisation P in a single plate is shown in Figs. 4 and 5. Fig. 6 shows calculated P = f(φ) curves for a five-layer pile of selenium (n = 2.42 in infrared); curve III is calculated from eq. (4) on p.637, which includes the effect of all the secondary rays; other curves (I - II, IV - VIII) take into account only selected secondary rays. Fig. 7 shows dependence of polarised-light intensity on φ for the same selenium pile; curve I includes the effect of all the secondary rays, II-V only some selected

Card 2/3

Polarisation of Light Reflected by a Pile (of Glass Plates). 51-5-14/26

ones. A student of Kiyev University, V.A. Andreyeva helped in the experimental work.

There are 7 figures and 1 Slavic reference.

ASSOCIATION: Kiyev State University (Kiyevskiy Gosudarstvennyy Universitet).

SUBMITTED: September, 25, 1956.

AVAILABLE: Library of Congress.

Card 3/3

LISITSA, M.P.

AUTHOR: Lisitsa, M.P. and Tsvelykh, N.G. 51-5-23/26

TITLE: Thin-layer Optics (Optika tonkogo sloya) I. Phase Shift on Reflection of Light from Thin Films of Silver, Germanium, Tellurium and Selenium. (I. Sdvig fazy pri otrazhenii sveta ot tonkikh plenok serebra, germaniya, tellura i selena)

PERIODICAL: Optika i Spektroskopiya, 1957, Vol.2, No.5, pp. 674 - 676 (USSR)

ABSTRACT: By thin films, the authors understand transparent or non-transparent layers whose properties depend on their thickness and differ from the properties of bulk samples. This paper studies quantitatively the phase-shifts of the reflected light for films of silver, germanium, tellurium and selenium when the thickness of these films changes. The phase-shift δ was studied on wedge-shaped samples. The samples were prepared by deposition in vacuum on glass plates. Purities of the materials deposited were as follows: silver - 99.98%, tellurium - 99.7%, selenium - 99.5%. The purity of germanium can be inferred from its resistivity which was 50 Ω.cm. The phase-shift is measured by the method described in Ref.7. Results are shown in Figs. 1 (silver), 2 (tellurium), 3 (germanium) and 4 (selenium). In the figures, the thickness d is given in Å. All these results refer to reflection of the 5464 Å wavelength.

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51-5-23/26

Thin-layer Optics I. Phase-shift on Reflection of Light from Thin Films of Silver, Germanium, Tellurium and Selenium.

Comparison of the four figures shows that in each case, at the lowest thicknesses, there is a phase-shift minimum. In addition to that minimum, there is at least one maximum of phase-shift for each substance. Silver differs from the other three semi-conducting substances by reaching a value $\delta = 1.2\pi$ at about 100 Å and this value does not materially vary with further increase in thickness. Semiconductors, on the other hand, show further minima and maxima in the phase-shift with increase in thickness. These differences may be related to the structure of the films (it is known that silver and tellurium films are crystalline, selenium and germanium are amorphous). The results quoted in this paper are not sufficient for firm conclusions on this point. There are 4 figures and 15 references, of which 6 are Slavic.

ASSOCIATION: Kiyev State University (Kiyevskiy Gosudarstvennyy Universitet)

SUBMITTED: January 7, 1957

AVAILABLE: Library of Congress

Card 2/2

LISITSA, M.P.

120-3-13/40

AUTHORS: Lisitsa, M.P., Malinko, V.N.

TITLE: Quantitative Spectral Absorption Studies of Liquids in the **Fields** of Strong Vibrational Bands (Kolichestvennyye spektroabsorbtsionnyye issledovaniya zhidkostey v oblastyakh intensivnykh kolebatel'nykh polos)

PERIODICAL: Pribory i Tekhnika Eksperimenta, 1957, Nr 3, pp.52-54 (USSR)

ABSTRACT: There is not much information on the infrared absorption of liquids, particularly in those parts of the spectrum where the coefficient of absorption, k , reaches tens of thousands cm^{-1} . This is mainly due to experimental difficulties which occur when one tries to use the law $I = I_0 \exp(-kd)$ directly. Already at $k = 10^4 cm^{-1}$, d is of the order of a μ for $kd \sim 1$. No one has managed to obtain such small thicknesses. In the present paper a possible way of removing this difficulty is considered. If the absorption of the liquid is large, then, instead of a container of the usual type, it is possible to use one which does not include spacers, i.e., the thin layer of liquid is held between the plates by surface tension forces. Such a method has already been used in transmission measurements (Ref. 3). By regulating the degree of closeness of the plates it

Card 1/2

120-3-13/40

Quantitative Spectral Absorption Studies of Liquids in the **Fields** of Strong Vibrational Bands.

is easy to change the thickness of the layer. Furthermore, the effect of reflection must be excluded. This method was used to obtain the absorption curve for liquid CCl_4 near 12 µ. The thickness of the layer was varied between 0.5 - 1.5 µ. Results of measurements are shown in Fig.2. The curve consists of two components with maxima at 762 and 784 cm-1. The splitting is equal to 22 cm^{-1} and is due to Fermi resonance. There are 2 figures and 8 references, of which 1 is Russian, 5 English, 1 German and 1 French.

ASSOCIATION: **Kiyev** State University im. T.G.Shevchenko(Kiyevskiy gosudarstvennyy universitet im T.G.Shevchenko)

SUBMITTED: December 3, 1956.

AVAILABLE: Library of Congress.

Card 2/2 **1. Liquids-Infrared absorption-Analysis**

LISITSA, M.P.

Spectrophotometric analysis of dispersion and absorption by solid substances. Fiz. sbor. no.3:97-98 '57. (MIRA 11:8)

1. Kiyevskiy gosudarstvennyy universitet im. T.G. Shevchenko.
(Absorption spectra) (Gypsum--Spectra)

LISITSA, M.P.

51-3-14/14

AUTHORS: Lisitsa, M. P. and Malinko, V. N.

TITLE: An Interference-cum-Graphical Method of Calibration of Infrared Prism Spectrometers. (Interferentsionno-graficheskiy metod graduirovki infrakrasnykh prizmennykh spektrometrov.)

PERIODICAL: Optika i Spektroskopiya, 1957, Vol.III, Nr.3, pp.294-296. (USSR)

ABSTRACT: If a sufficiently thin plane-parallel layer of a transparent or weakly absorbing substance is placed in front of a spectrometer slit, interference bands are obtained in the continuous spectrum of the light source. A layer of air is suitable for calibration of infrared spectrometers. The authors show that the order N' of the interference maximum observed is proportional to the wave-number ν. Using known emission or absorption spectrum, up to 10 points are found on the straight line N'(ν). This straight line can then be extra-polated in both directions (see Fig.2). Since to each maximum there corresponds a definite position of the spectrometer

Card 1/2

LISITSYA, M.P.

39120
S/058/62/000/006/046/136
A061/A101

24.3300

AUTHOR: Lysytsya, M. P.

TITLE: Germanium polarizers. I

PERIODICAL: Referativnyy zhurnal, Fizika, no. 6, 1962, 11, abstract 6G89 ("Visnyk Kyyivs'k. un-tu", 1958, no. 1, ser. fiz. ta khimiyi, no. 1, 9 - 14, Ukrainian; Russian summary)

TEXT: A combined polarizer, in which each component consists of a three-layer Ge-Si-Ge film, is described. The theory of this type of polarizer is given, and the results of an experimental study of its optical characteristics are presented. It is shown that three films are perfectly sufficient for the full polarization of the light that has passed through. Thus, the polarizing qualities of the new device are better than those of a selenium pile which is the most widespread polarizer of infrared radiation. A distinguishing feature of combined films is their greater mechanical strength as compared with selenium films. However, they fall behind the latter as to transparency.

[Abstracter's note: Complete translation]

Card 1/1

LISITSYA, M.P.

39121
S/058/62/000/006/047/136
A061/A101

24.3300

AUTHOR: Lysytsya, M. P.

TITLE: Germanium polarizers. II. Mirror polarizers

PERIODICAL: Referativnyy zhurnal, Fizika, no. 6, 1962, 11, abstract 6G90 ("Visnyk Kyyivs'k. un-tu", 1958, no. 1, ser. fiz. ta khimiyi, no. 1, 15 - 22, Ukrainian; Russian summary)

4

TEXT: Some designs of new rigid polarizers made with Ge are described. The best characteristics are displayed by polarizers of the interference type operating on reflection or transmission. The most accomplished design of a reflecting polarizer consists of two mirrors, whose reflecting elements are provided by thin Ge layers (d = 1,100 Å), applied to a rock salt backing by evaporation in vacuum. This system is characterized by high light-gathering power and by a degree of polarization that practically attains 100%. About the same characteristics apply to the most efficient interference polarizer, which operates on transmission. It consists of a plane-parallel rock salt plate, either face of which is coated with a thin Ge layer. All calculations and measurements of

Card 1/2

S/058/62/000/006/047/136
A061/A101

Germanium polarizers. II. Mirror polarizers

optical characteristics are performed for the Brewster angle. Part I see abstract 6089.

[Abstracter's note: Complete translation]

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Card 2/2

LISITSA, M.P. [Lysytsia, M.P.]; MALINKO, V.N. [Malynko, V.M.]

Effect of aggregate state on the intensity and structure of certain absorption bands of carbon tetrachloride in the presence of Fermi resonance [with summary in English]. Ukr.fiz.zhur. 3 no.4:482-487 Jl-Ag '58. (MIRA 11:12)

1. Kiyevskiy gosudarstvennyy universitet.
(Carbon tetrachloride--Spectra) (Molecules)

51-4-3-14/30

AUTHORS: Lisitsa, M.P. and Tsvelykh, N.G.

TITLE: Optics of Thin Films. II. Properties of Tellurium. (Optika tonkogo sloya. II. Svoystva tellura.)

PERIODICAL: Optika i Spektroskopiya, 1958, Vol.IV, Nr.3, pp. 373-377 (USSR)

ABSTRACT: Films of tellurium were prepared (by evaporation on glass plates) as wedges whose thickness varied from 0 to 1000 Å. The authors obtained curves of variation of the coefficients of reflection R (on the air-film side) and R' (on the glass-film side), the transmission coefficient T, the real (n) and imaginary(κ) parts of the complex refractive index, with change of the film thickness d. Measurements of the reflection coefficients R and R' and of the transmission coefficient T were made using a monochromator UM-2. A silver-sulphide photoelement was used as the receiver. Measurements were made on freshly prepared films (up to one day old). The transmission coefficient T was measured with an error of 3%. The errors in measurement in R and R' were 2-6%. Calculations of n and κ were made following

Card 1/3

51- 4 -3-14/30

Optics of Thin Films. II. Properties of Tellurium.

the Abeles method: from three measured quantities T, R and R' three unknowns n, κ and d are found. Fig.1 gives the variation of the coefficients T, R and R' with thickness d. Fig.2 gives the variation of T and R with thickness d at three wavelengths: 700, 560 and 460 mμ. Figs.3 and 4 give the dependences of n and of κ on film thickness d for the same three wavelengths as in Fig.2. Figs.5 and 6 give the dispersion (dependence on wavelength) of n and κ for various film thicknesses from 45 to 370 Å. Fig.7 gives the absorption of energy (in %) by tellurium films as a function of film thickness. From the results obtained the authors make the following conclusions: (1) on deposition of tellurium on glass at room temperature, an amorphous film is formed up to about 30 Å; (2) with increase of thickness the amorphous phase is transformed into fine-grain crystalline structure with grain size increasing with increase of film thickness; this does not contradict conclusions from electrical properties of tellurium films and of electron diffraction and electron microscope investigations; (3) separate

Card 2/3

51-4-3-14/30

Optics of Thin Films. II. Properties of Tellurium.

grains join up to form a continuous film at about 400 Å; (4) resonance effects are observed in optical characteristics of thin films of tellurium; (5) since calculations of n and k carried out in the present paper were based on the theory which holds only for thick layers, the values of these quantities should be regarded as qualitative rather than quantitative. There are 7 figures and 6 references, of which 3 are Soviet, 2 French and 1 English.

ASSOCIATION: Kiyev State University imeni T.G. Shevchenko. (Kiyevskiy gosudarstvennyy universitet im. T.G. Shevchenko.)

SUBMITTED: June 3, 1957.

1. Tellurium films--Properties

Card 3/3

Sov/51-4-4-5/24

AUTHORS: Lisitsa, M.P. and Malinko, V.N.

TITLE: Frequencies and Intensities of the Infra-red Spectrum of Carbon Tetrachloride (Chastoty i intensivnosti v infrakrasnom spektre chetyrekhkhloristogo ugleroda)

PERIODICAL: Optika i Spektroskopiya, 1958, Vol IV, Nr 4, pp 455 - 467 (USSR).

ABSTRACT: The present paper reports results of measurements of the infra-red absorption by liquid CCl_4 in the region of $470 - 12\,500$ cm^{-1} and identification of all the observed frequencies. For the fundamental band ν_3 and its first harmonic spectra of vapours were also obtained. The absorption spectra were measured using an autocollimating spectrophotometer IKS-6 at room temperature. Precision of measurement of the wave numbers and the absorption maxima is limited primarily by the precision of calibration of the spectrophotometer (see Table 1). To exclude the effects of reflection, the measurements were made using pairs of cells; thickness of one cell in such a pair was approximately double the thickness of the other cell. Thicknesses of cells for liquid CCl_4 were between 0.8 - 1.5 μ in the region of the fundamental

Card1/4

absorption band (about 12 µ) and up to 10 cm in the regions of very weak absorption bands. Very thin layers of CCl_4 liquid for studies in the regions of very intense absorption were obtained by compressing a drop of liquid between two well-polished plates of rock-salt. To obtain the coefficient of absorption of the CCl_4 vapour, the aithors measured absorption of a cell filled with gas and absorption of an empty (evacuated) cell. In the region of pressures used in the studies of vapours (up to 7 mmHg) the effect of pressure on absorption does not exceed the experimental error. The error in determination of the absorption coefficient for the majority of bands and harmonics does not exceed 7-10%. For the fundamental band ν_3 the error reaches 15-20% and at the longest wavelengths, the error increases to 30%. Figure 1 shows the absorption of CCl_4 in the region of the fundamental band ν_3; Curve 1 represents liquid and Curve 2 - vapour. Figure 2 shows the structure of the long-wavelength component of Fermi resonance doublet for gaseous CCl_4. Figure 3 shows the

Frequencies and Intensities of the Infra-red Spectrum of Carbon Tetrachloride

splitting in the region of the fundamental band ν_3. Figures 4 - 7 show absorption by liquid CCl_4. Figure 8 shows absorption by liquid (Curve 1) and gaseous (Curve 2) CCl_4 in the region of the first harmonic of the ν_3 vibration. Table 2 gives splitting of vibrational levels due to the presence of CCl_4 molecules with difference isotopic composition and difference symmetries. Table 3 gives the structure of the Fermi resonance doublet in the 750-800 cm^{-1} region for liquid and gaseous CCl_4 at 293 °K. Table 4 gives the frequencies of fundamental vibrations of CCl_4 used by various authors in the identification of the CCl_4 spectrum. The present authors use the tetrahedral model of the CCl_4 molecule in identification of its infra-red absorption frequencies. This identification is given in Table 5, together with the results given in Refs 7, 10 and 14. The present authors obtained the absorption coefficients for all

Sov/51-4-4-5/24

Frequencies and Intensities of the Infra-red Spectrum of Carbon Tetrachloride

the frequencies observed and for some frequencies, they calculated the integral absorption and the band half-widths (Table 6). There are 8 figures, 6 tables and 35 references, 20 of which are in English, 6 Soviet, 4 German, 3 French, 1 Dutch and 1 translation of a Western work into Russian.

ASSOCIATION: Kiyevskiy gosudarstvennyy universitet im. T.G. Shevchenko (Kiyev State University imeni T.G. Shevchenko)

SUBMITTED: May 4, 1957

Card 4/4

1. Carbon tetrachloride--Spectra

SOV/51-5-2-13/26

AUTHORS: Lisitsa, M.P., Mayevskiy, V.M. and Tsvelykh, N.G.

TITLE: Thin-Layer Optics (Optika tonkogo sloya). III. Properties of Selenium (III. Svoystva selena)

PERIODICAL: Optika i Spektroskopiya, 1958, Vol 5, Nr 2, pp 179-183 (USSR)

ABSTRACT: The paper gives results of measurement of the reflection coefficients and the transmission coefficient of selenium layers of various thicknesses. These layers were prepared by sublimation as described in Ref 1. Standard methods of measurement of the coefficients of reflection on the air side (R) and on the base side (R') and the transmission coefficient (T) were employed (see Ref 2). The authors used wedge-shaped plates with 1.52 refractive index for the sample supports. The coefficient R, R' and T were measured only for layers produced using a symmetrical evaporation source, but in the study of variation of the phase-shift δ a spherical evaporation source was used. The method of determination of δ was described in Ref 3. The errors in measurement of T reached 5% and those in measurement of R and R' were sometimes in excess of 10%. All measurements were made immediately after preparation of the layer, at four separate wavelengths in the visible region: 540, 595, 620 and 700 mμ. Calculations of n and K

Card 1/3

SOV/51-5-2-13/26

Thin-Layer Optics. III Properties of Selenium

(the refractive index and the absorption coefficient respectively) were made using Abeles' method described in Ref 4, except that the layer thickness d was measured independently (Ref 3). The results obtained may be divided into two groups. The first group includes δ, R, R', T and absorption A = 1 - R - T. All these parameters were obtained by direct measurements and they are subject to experimental errors only. The second group includes n and κ, which were calculated using theoretical considerations, and therefore their values are affected by the approximations of the theory used. The results are given in Figs 1-6. In all figures, except Fig 5, the four wavelengths: 540, 595, 620 and 700 mμ are represented by curves marked 1, 2, 3 and 4 respectively. Figs 1 and 2 give the dependences of R and R' on the layer thickness d respectively. Figs 3 and 4 give the values of T and A as functions of d. Fig 5 gives the phase-shift δ as a function of the layer thickness d for one wavelength (546 mμ). The results obtained lead to the following conclusions. (A) The optical properties of selenium layers vary with thickness in a wide range of thicknesses. (B) In the range of

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SOV/51-5-2-13/26

Thin-Layer Optics. III Properties of Selenium

thickness studied here (up to 1000 Å) the coefficients R and R' behaved similarly. This indicates that there are considerable differences in the topography of the selenium layers at the boundaries air--layer and layer--glass. (C) The phase-shift δ depends on the form of the evaporation source used to prepare the selenium layers studied. The shape of this source affects the form and dimensions of the grains of which the layer is made. (D) The interaction of light with selenium layers near 160 Å in thickness is of resonance nature. There are 6 figures and 7 references, 3 of which are Soviet, 2 French, 1 German and 1 English.

ASSOCIATION: Kiyevskiy gosudarstvennyy universitet (Kiyev State University)

SUBMITTED: September 25, 1957

Card 3/3

1. Selenium films--Optical properties 2. Mathematics--Applications

SOV/51-5-5-21/23

AUTHORS: Lisitsa, ~~M.P.~~ and Tsvelykh, N.G.

TITLE: Thin-Layer Optics. (Optika tonkogo sloya). IV. The Properties of Germanium (IV. Svoystva germaniya).

PERIODICAL: Optika i Spektroskopiya, 1958, Vol 5, Nr 5, pp 622-624 (USSR)

ABSTRACT: Germanium layers were prepared by evaporation in vacuo from a tantalum boat. Other conditions of preparation of these layers are described in Ref 1. The technique of measurement of the reflection coefficients R (on the air side) and R' (on the substrate side), and of the transmission coefficient T is described in Ref 2. The effect of multiple reflections in the substrate was dealt with as described in Ref 3. All measurements were made on freshly prepared layers. The transmission coefficient T was measured within 5%. For R and R' the error did not exceed 10%. Fig 1 shows the dependence of the transmission coefficient T on thickness d (in Å). The four curves represent measurements at the following wavelengths: (1) 555 mμ, (2) 630 mμ, (3) 720 mμ and (4) 750 mμ. Fig 2 shows the dependence of the reflection coefficients R and R' on the layer thickness d. The four curves in each case were obtained at the wavelengths given in Fig 1. The absorption coefficient A = 1 - R - T is given in Fig 3 as a function of the layer thickness d (the four curves were obtained at the wavelengths given in

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SOV/51-5-5-21/23

Thin-Layer Optics. IV. The Properties of Germanium.

Fig 1). From the experimental values of T, R and R' the real (n) and imaginary (κ) parts of the complex refractive index $\tilde{n} = n - i\kappa$ were determined. The method of calculation is given in Refs 2, 4. The results are shown in Fig 4 where curves 1 and 2 represent n for the wavelengths of 630 and 720 mμ respectively and curve 3 represents κ. In the range of thicknesses from 300 to 500 Å the values of n and κ obtained by the present authors are of the same order as those reported in Refs 5 and 6. There are 4 figures and 10 references, 6 of which are Soviet, 1 German, 1 French, 1 American and 1 English.

SUBMITTED: May 15, 1958

Card 2/2

1. Germanium--Optical properties 2. Thin films--Preparation
3. Mathematics

AUTHORS: Lisitsa, M. P., Malinko, V. N. SOV/48-22-9-29/40

TITLE: Influence of Temperature and of the State of Aggregation on the Infrared Absorption of Carbon Tetrachloride (Vliyaniye temperatury i agregatnogo sostoyaniya na infrakrasnoye pogloshcheniye chetyrekhkhloristogo ugleroda)

PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, 1958, Vol 22, Nr 9, pp 1117 - 1121 (USSR)

ABSTRACT: Such investigations are of paramount importance for the determination of the factors which influence the intensity, the half-width, the shape, and the structure of the oscillation bands. Individual absorption bands of carbon tetrachloride were chosen by the authors as vehicles of their investigation. They were studied at different states of aggregation and at temperatures near the point of transformation. The spectrum of CCl_4 is at present thoroughly investigated and the majority of frequencies has already been identified (Refs 1,2). A method which was developed already earlier was used in the quantitative measurement in the range of an extremely

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Influence of Temperature and of the State of Aggregation on the Infrared Absorption of Carbon Tetrachloride SOV/48-22-9-29/40

intensive absorption (Ref 3). First the very intensive double band was investigated as to its temperature dependence. One of the components of this band ($\nu = 784$ cm^{-1}) corresponds to the treble degenerated fundamental oscillation ν_3 and the second ($\nu = 762$ cm^{-1}) corresponds to the compound oscillation $\nu_1 + \nu_4$. Owing to a Fermi resonance this oscillation band attains an intensity comparable to that of the fundamental oscillation. For the temperature investigation two isolated doublets were chosen from several dozens of compound bands. A Fermi resonance was found to occur between its components. The separation of the doublets into their components is not difficult if both components are assumed to have a symmetrical shape. The data known at present are by far insufficient for an explanation of the temperature dependence of the intensities of the bands of infrared absorption and are even more inadequate for a construction of a theory which agrees with the experimental evidence.

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Influence of Temperature and of the State of Aggregation on the Infrared Absorption of Carbon Tetrachloride SOV/48-22-9-29/40

The only statement which can be made must be limited to the fact that in this case a temperature reduction leads to decrease of the matrix elements of the transitions. The magnitude of the latter is not only dependent upon the type of molecule but also upon its surroundings. Supplementary investigations were carried out in order to determine the influence of the state of aggregation upon the intensity of the compound absorption bands. A computation of integral intensities has shown that $\int K_\nu d_\nu$ is reduced by almost to half its original value for the long-wave component of each doublet at the transition from liquid to vapor. With short-wave components and in particular with the band $\nu_1 + \nu_3$ this reduction is insignificant. The weakened resonance interaction leads to a more pronounced reduction of the intensity of the relatively weaker component in the case of oscillations $\nu_1 + \nu_4$ as well as in the case of ν_3.

Card 3/4 The circumstance that the half-width of each component

Influence of Temperature and of the State of Aggregation on the Infrared Absorption of Carbon Tetrachloride SOV/48-22-9-29/40

remains practically constant in the phase transition in question is a characteristic feature, although the maximum of the long-wave component changes to an isotopic structure by splitting into 2-3 components. There are 3 figures, 2 tables, and 7 references, 4 of which are Soviet.

ASSOCIATION: Kiyevskiy gos. universitet im. T.G.Shevchenko (Kiyev State University imeni T.G.Shevchenko)

Card 4/4

24,3000

S/058/62/000/005/056/119
A057/A101

AUTHORS: Lisitsa, M. P., Mayevskiy, V. M., Tsvelykh, N. G.

TITLE: Optical properties of thin films of some semiconductors

PERIODICAL: Referativnyy zhurnal, Fizika, no. 5, 1962, 6, abstract 5G46 (V sb. "Fotoelektr. i optich. yavleniya v poluprovodnikakh", Kiyev, AN USSR, 1959, 227-232)

B

TEXT: Quantitative data are presented on investigations of optical properties of Se and Te. Results are given on the investigation of phase shifts, which arise when light is reflected from the interface air-layer of Ag and Ge.

[Abstracter's note: Complete translation]

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05455
SOV/120-59-3-26/46

AUTHORS: Lisitsa, M. P., and Mayevskiy, V. M.

TITLE: A Semi-empirical Method of Measuring Thicknesses Along a Wedge-Shaped Layer (Poluempiricheskiy metod opredeleniya tolshchin vdol' klinoobraznogo tonkogo sloya)

PERIODICAL: Pribory i tekhnika eksperimenta, 1959, Nr 3, pp 113-118 (USSR)

ABSTRACT: The first part of the paper presents a rather inconclusive theory of deposition from an evaporator (Fig 1 and Eqs (1) - (12')); the results from this theory, which give the thickness C as a function of the angle α, have to be checked by some independent method in the first instance. The equations from (11") to (14) deal with one way of checking the results; thicknesses d_1 and d_2 are measured at two different points. The equations down to (17) introduce corrections for non-sphericity of the source. The next section deals with cylindrical sources rather briefly. Fig 2 shows d and $C(l)$ (curves 1 and 2 respectively) for selenium. Fig 3 gives results for two layers of selenium deposited from a

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05455
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A Semi-empirical Method of Measuring Thicknesses Along a Wedge-Shaped Layer

semi-cylindrical evaporator; in each case theory and experiment agree well. There are 3 figures and 4 references 3 of which are Soviet and 1 English.

ASSOCIATION: Kiyevskiy gosudarstvennyy universitet (Kiyev State University)

SUBMITTED: March 10, 1958

Card 2/2

SOV/120-59-4-25/50

AUTHORS: Lisitsa, M. P., Tsyashchenko, Yu. P.

TITLE: Dispersion Measurements in Regions of Strong Infrared Absorption

PERIODICAL: Pribory i tekhnika eksperimenta, 1959, Nr 4, pp 108-112 (USSR)

ABSTRACT: The method described here is based on reflection and is intended for use with liquids. The cells are hermetically sealed in order to eliminate interference from the vapour (the examples given relate to $CHCl_3$ and CCl_4). Fig 1 shows reflection curves for CCl_4 near 12 μ; the top curve is for a properly sealed cell, while the bottom one relates to a cell with a vapour leak. The window used to seal off the liquid is an optically worked plane-parallel plate (e.g. of rock salt); Eq (1) gives R , the measured reflecting power, in terms of I_r (the reflected intensity) and I_0 (the incident intensity), or in terms of R_{12} (the reflection coefficient at the outer surface of the plate) and of R_{23} (the reflection coefficient at the inner surface). Eq (2) gives R_{12} as a function of n , which is known accurately

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Dispersion Measurements in Regions of Strong Infrared Absorption

and so Eq (3) gives R_{23} . Then Eq (4) gives R_{23} in terms of the parameters of the liquid and plate, and Eq (5) gives n for the liquid. Fig 2 shows the reflection unit; Fig 3 shows the optical system used (the angle of incidence does not exceed 10°). Here P_3 is a mirror and C is the cell. Fig 4 shows results for CCl_4 , and Fig 5 does the same for $CHCl_3$. The values of x are taken from Ref 5 in the case of CCl_4 , and have been measured by the method given in Ref 5 (but not described here) in the case of $CHCl_3$. The paper concludes with a brief theoretical note on the interference method of measuring n for the wings of the absorption curve; a thin film of liquid is used to form interference bands by multiple reflection. The method is suitable for regions in which the absorption is too strong for a prism to be used, but is too weak for the method above to be suitable. There are 5 figures and 12 references, 1 of which is German, 4 French, 6 English and 1 Soviet.

ASSOCIATION: Kiyevskiy gosudarstvennyy universitet (Kiyev State Univ.)

SUBMITTED: May 12, 1958.

Card 2/2

24(7), 24(4) SOV/51-6-5-8/34

AUTHORS: Lisitsa, M.P. and Tsyashchenko, Yu.P.

TITLE: Quantitative Studies of Infrared Absorption and Dispersion of Chloroform (Kolichestvennyye issledovaniya infrakrasnogo poglоshcheniya i dispersii khloroforma)

PERIODICAL: Optika i Spektroskopiya, 1959, Vol 6, Nr 5, pp 605-615 (USSR)

ABSTRACT: Although the amount of published work on $CHCl_3$ is large (Refs 1-18), a complete and systematic account of data on the infrared spectrum and its interpretation is still lacking. Dispersion of chloroform is dealt with in an even smaller amount of published work (Refs 19, 20). The present authors determined the absorption coefficients of liquid $CHCl_3$ in the 470-11500 cm^{-1} region and the dispersion curve in the region of the most intense band (corresponding to the fundamental vibration ν_3). The absorption coefficients were measured using an infrared spectrometer IKS-6. The absorption coefficients were calculated from $I_1/I_2 = \exp\left[-K(d_1 - d_2)\right]$, where I_1 and I_2 are the intensities of a light beam which has passed through thicknesses d_1 and d_2 of $CHCl_3$. The values of K and of the integral absorption $\int K_\nu d\nu$ were determined to within 6-10%, except in the ν_3-band region where the error was 15-20%.

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To measure dispersion of $CHCl_3$ in the ν_5-band region a special reflection method was developed (Ref 26), in which the effect of vapour was eliminated (vapours may affect the measured reflectivity of a free surface of volatile liquids). In the regions neighbouring with the ν_5-band the refractive index was determined by an improved interference method (Ref 26). The error measurement of n in the ν_5-band region did not exceed 12-15% and outside the band it was 5-8%. The absorption curves of liquid $CHCl_3$ (the absorption coefficient K plotted against wavelength) are shown in Figs 1-7. The wave-numbers of various vibrations, their interpretation and symmetry, the absorption coefficients at the band maxima, the integral absorption ($\int K_\nu d\nu$) and the band half-width σ in the range 250-16500 cm^{-1} are collected in Table 2. This table includes also frequencies measured by other workers (Refs 2, 3, 5, 6, 10-15). It is found that the partial identification reported by various workers (Refs 2, 5, 11, 13, 15, 16) agrees entirely with the identification deduced by the present authors. This identification was based on the C_{3v} symmetry group model of the $CHCl_3$ molecule. The spectrum shown in Figs 1-7 and the data of Table 2 indicate that the most intense band is due to degenerate vibrations of the C--Cl bonds with a frequency ν_5. The integral absorption of the

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Quantitative Studies of Infrared Absorption and Dispersion of Chloroform

fully symmetric vibrations ν_1, together with its satellite, is much smaller than the integral absorption of the vibrations ν_3 and ν_4. This is due to the fact that the C--H bond is essentially homopolar (covalent) while the C--Cl bond is more ionic. The dispersion curve of $CHCl_3$ in the ν_3-band region is shown in Fig 8 together with the absorption index curve (the absorption index is given by $\varkappa = K/4\pi\nu$). The dispersion curve (denoted by n in Fig 8) is seen to be strongly asymmetric. There are 8 figures, 2 tables and 30 references, 7 of which are Soviet, 7 French, 6 English, 5 German, 2 Italian, 1 Japanese and 1 translation from English into Russian.

SUBMITTED: May 8, 1958

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24(7) SOV/51-6-5-23/34

AUTHORS: Lisitsa, M.P. and Malinko, V.N.

TITLE: On the Temperature Dependence of Intensities of the Combination Frequencies $\nu_1 + \nu_3$ and $\nu_1 + (\nu_1 + \nu_4)$ of Gaseous CCl_4 (O temperaturnoy zavisimosti intensivnostey sostavnykh tonov $\nu_1 + \nu_3$ i $\nu_1 + (\nu_1 + \nu_4)$ gazoobraznogo CCl_4)

PERIODICAL: Optika i Spektroskopiya, 1959, Vol 6, Nr 5, pp 694-696 (USSR)

ABSTRACT: Vol'kenshteyn, Yel'yashevich and Stepanov's theory (Ref 1) of the temperature depedence of intensities of vibrational absorption bands has not yet been verified, because of great experimental difficulties. The present note reports the first attempt at verification of this theory for the combination frequencies $\nu_1 + \nu_3$ and $\nu_1 + (\nu_1 + \nu_4)$ of gaseous CCl_4. The theoretical temperature coefficients for these vibrations are given by Eq (1). The expressions of Eq (1) can be used to construct theoretical curves but their comparison with experiment is difficult because the bands $\nu_1 + \nu_3$ and $\nu_1 + (\nu_1 + \nu_4)$ overlap strongly forming a close doublet. For this reason the total integral absorption of the doublet was determined and compared with the corresponding calculated curves. The absorption curves of the doublet were obtained between 20 and 200°C; three of these curves obtained at 20, 135 and 200°C

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are given in Fig 1. Fig 1 shows that increase of temperature leads to a slight increase of the total intensity, broadening of each component of the doublet and a fairly strong rise of the absorption maximum of the long-wavelength component. The curves of Fig 1 show only a qualitative agreement of theory with experiment. This is confirmed by the data of Fig 2, where curve 1 was obtained experimentally and curve 2 theoretically. Although curves 1 and 2 of Fig 2 are similar in appearance, the theoretical curve indicates a stronger temperature dependence of the total integral absorption than that found empirically. The authors could not suggest a reason for the difference between curves 1 and 2. They did establish, however, that the increase of the partial pressure of CCl_4 vapour with temperature cannot explain this disagreement. There are 2 figures and 4 Soviet references.

SUBMITTED: October 8, 1958

Card 2/2

SOV/51-7-4-7/32

AUTHORS: Lisitsa, M.P. and Strizhevskiy, V.L.

TITLE: On the Temperature Dependence of the Vibrational Absorption Band Intensities in Gases in the Case of Fermi Resonance.

PERIODICAL: Optika i spektroskopiya, 1959, Vol 7, Nr 4, pp 478-481 (USSR)

ABSTRACT: Earlier studies of the temperature dependence of the intensities of two vibrations of gaseous carbon tetrachloride (Ref 1) confirmed qualitatively the correctness of Vol'kenshteyn, Yel'yashevich and Stepanov's theory (Ref 2). Complete quantitative agreement was not obtained: the theory predicted a faster rise of the integral absorption with increase of temperature than was found experimentally. Among many factors which may be responsible for this difference between theory and experiment the most important is the resonance interaction between vibrational levels $E^{o}_{\nu_1+\nu_3}$ and $E^{o}_{\nu_1+(\nu_1+\nu_4)}$ (the superscript o denotes unperturbed state). Transitions to these two levels produce bands of the vibrations studied. Allowance for this interaction was expected to produce quantitative agreement between theory and experiment. This was found to be true when the authors modified Vol'kenshteyn's et al theory by inclusion of the Fermi resonance, since this led to better agreement

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SOV/51-7-4-7/32

On the Temperature Dependence of the Vibrational Absorption Band Intensities in Gases of Fermi Resonance

between the calculated and experimental values of integral absorption in the resonance doublet $\nu_1 + \nu_3$ and $\nu_1 + (\nu_1 + \nu_4)$ of carbon tetrachloride (table on p 481). The differences between the calculated and experimental values lay between 3.6 and 5.8%, i.e. within the experimental error, which was 10%. There are 1 table and 4 Soviet references.

SUBMITTED: February 17, 1959

Card 2/2

SOV/51-7-4-19/32

AUTHORS: Lisitsa, M.P. and Tsvelykh, N.G.

TITLE: Thin-Layer Optics. V. Properties of Silicon

PERIODICAL: Optika i spektroskopiya, 1959, Vol 7, Nr 4, pp 552-557 (USSR)

ABSTRACT: Wedge-shaped layers of silicon, convenient for studies of the dependence of the optical constants on thickness, were prepared by vacuum sublimation. The layer thickness (d) varied from near zero to 1200 Å. Since tungsten, tantalum and molybdenum are all dissolved by liquid silicon, a carbon crucible was used in the form of a parallel plate of 0.5 mm thickness and 5-6 mm width. The original material contained up to 0.2% of impurities. To reduce the amount of impurities this material was melted several times in vacuo which removed the more volatile admixtures. The technique of measuring the transmission coefficient T (light incident from the layer side) and the reflection coefficients R and R' (light incident from the base side) was the same as that described earlier (Ref 4). Multiple reflections in the base were allowed for (Ref 5). The final value of T was correct, to within 5%; for R and R' the errors reached 10%. The transmission curves (T in %) are shown in Fig 1; here and in Figs 2, 3 and 4 curves 1, 2, 3, 4 represent measurements at the following four wavelengths: 580, 640, 700, 760 mμ. At $d < 200$ Å, the transmission coefficient T is

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Thin-Layer Optics. V. Properties of Silicon

greater than 90% but with increase of d it falls gradually forming a wide minimum near d~600 Å. Position of this minimum is different for different wavelengths. Its displacement towards greater values of the thickness d on increase of wavelength shows that the minimum is due to interference. The same applies to a maximum at d~1000 Å. Two small maxima of T at d~200 Å are due to relaxation effects. The latter effects are also responsible for minima of R near d~200 Å (Fig 2); no such relaxation minima are observed on the R' curves (Fig 3) near d~200 Å. The dependence of R and R' on d is in general similar to that observed in the case of selenium and germanium layers. In all of them the interference maximum, which occurs at d~750 Å in silicon, is split into two components. This splitting is a structure effect: at thicknesses of 500-600 Å silicon layers are still "granulated" (discontinuous) and this is responsible both for the resonance extrema and splitting of the interference maximum. The absorption coefficient A is shown as a function of the thickness d in Fig 4. Below 420 Å the value of A was so small that it could not be measured. On increase of wavelength towards the infrared region the value of A was found to fall considerably. It is, therefore, suggested that silicon layers may be used to make non-absorbing multi-layer coatings, e.g. anti-reflection

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Thin-Layer Optics. V. Properties of Silicon

coatings, for the infrared region. Abeles' formulae relating the values of T, R and R' and the optical constants n and $\varkappa$ (Ref 10) were found to be inapplicable in the case of thin silicon layers. Using a different method (Ref 11) the authors determined the refractive index n for comparatively thick layers of silicon ($d > 1000$ Å). The refractive index was calculated from

$$n = \frac{\lambda}{4(d_{min} - d_{max})}, \qquad (2)$$

where d_{min} and d_{max} are the thicknesses at which minima and maxima occur on the curves R(d) and R'(d). The calculated values of n are given in a table on p 556. For $\lambda = 540$ mμ n = 2.6-3.97, for 580 mμ n = 2.64-4.2, for 640 mμ n = 2.6-4.1 and for 760 mμ n = 2.71-4.32; the higher values of n correspond to lower layer thicknesses. The authors point out that the refractive index rises, in general, with increase of λ and that in thick layers the value of n is close to 3.5 reported for monocrystalline silicon (Ref 9). The authors found also that after several days the originally amorphous layers of silicon with $d > 900$ Å crystallized spontaneously; such crystallization did not occur in thinner layers ($d < 900$ Å). There are 4 figures, 1 table and 11 references, 7 of which are Soviet, 1 English and 3 French.

Card 3/3

SUBMITTED: February 17, 1959

LISITSA, M.P.

Polarization-photometric method for measuring the refraction indices for transparent semiconductors. Prib. i tekh. eksp. no.3:125-127 My-Je '60. (MIRA 14:10)

1. Kiyevskiy gosudarstvennyy universitet.
(Semiconductors) (Refractometry)

LISITSA, M.P.

82553

S/181/60/002/007/035/042
B006/B060

24.7700

AUTHORS: Korsunskiy, V. M., Lisitsa, M. P.

TITLE: Infrared Absorption and Hole Band Structure of Tellurium

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 7, pp. 1619-1623

TEXT: L. I. Korovin and Yu. A. Firsov suggested the use of data on infrared absorption for clarifying some particulars concerning the valency zone structure of tellurium. Their group-theoretical investigations revealed that two variants are relevant for the form of the energy spectrum of the hole band: one ellipsoid in the center of the Brillouin zone or two ellipsoids in the C-direction. A decision can be made when the form of the band, which is established by the type of isoenergetic planes is known. To determine such a form was the main task confronting the investigations. In the course of them, the authors examined the edge of characteristic absorption for two directions of the light vector and background absorption. The test pieces used for the purpose were made of tellurium single crystals, that had been produced at the Leningradskiy institut poluprovodnikov (Leningrad Institute of Semiconductors). Foils were cut in parallel

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Infrared Absorption and Hole Band Structure of Tellurium

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B006/B060

to the C-axis, then ground and polished. As a consequence of such treatment, differently oriented microcrystals formed on the surface of the test pieces, so that the reflection coefficients of the latter were practically the same for both polarizations ($E \parallel C$, $E \perp C$) in the whole spectral range. The experimental error in the determination of the reflection coefficient did not exceed 5%. On taking account of all other factors, the total error was found to be $\Delta k/k \simeq 15\%$. In Fig. 1, the transmissivity and reflectivity curves are shown for natural and polarized light for two specimens (Specimen 1: 0.83 mm thick, impurity concentration $\simeq 10^{14}\,\mathrm{cm}^{-3}$, Specimen 2: 0.37 mm thick, impurity concentration $\simeq 10^{16} - 10^{17}\,\mathrm{cm}^{-3}$). Only the curves D and $D_{\parallel}$ (penetrability in the ordinary or in the $E \parallel C$-polarized light, respectively, for Specimen 1) exhibit a minimum at $\lambda = 11\,\mu$. By making use of these data and results from Ref. 7, the authors calculated the absorption curves for polarized light; they are shown in Fig. 2. The position of the absorption edge was then determined from the point of inflection (1st line of the table) and by means of the extrapolation of the linear part of the curve to the point of intersection with the abscissa (2nd line).

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The results are:

$\nu_{\parallel}$ cm^{-1}	$h\nu_{\parallel}$ ev	$\nu_{\perp}$ cm^{-1}	$h\nu_{\perp}$ ev
2800	0.39	2600	0.32
2530	0.315	2470	0.308

The thermal width of the forbidden band was found to be 0.33 ± 0.01 ev. Some problems concerning the structureless background bordering with the characteristic absorption edge and extending far into the longwave region, are discussed next. It appears certain that it is closely related to the free carriers. That the absorption coefficient in the background is dependent on polarization, is explained by the dependence of the effective carrier mass on the direction. The main issue is then first discussed, namely, the hole absorption band shape in the region $\lambda = 11\ \mu$. It is shown in Fig. 3. The three possible functions (4), (5), and (6) for $k(\nu)$, based on the one- or the two-ellipsoid model, are written down. A number of experimental results admits only (5) and (6) for selection, and the fact that the absorption band is symmetrical

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Infrared Absorption and Hole Band Structure of Tellurium

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B006/B060

and has a Gaussian form (Fig. 3, Curve 2) shows that only the k(ν) function given by (6) describes the experiments satisfactorily, and hence, that the model of the two ellipsoids must be preferred. The authors thank Yu. A. Firsov and L. I. Korovin for their interest and for having supplied the tellurium single crystals. There are 3 figures, 1 table, and 12 references: 6 Soviet, 4 US, 1 Hungarian, and 1 Japanese.

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ASSOCIATION: Kiyevskiy gosudarstvennyy universitet im. Shevchenko (Kiyev State University im. Shevchenko)

SUBMITTED: November 9, 1959

Card 4/4

81072
S/181/60/002/009/013/036
B004/B056

26.1512

AUTHORS: Lisitsa, M. P., Kholodar', G. A.

TITLE: The Infrared Absorption and the Energy Structure of Cuprous Oxide

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 9, pp. 2117 - 2125

TEXT: The authors aimed at interpreting the absorption bands of Cu_2O in the infrared region at various temperatures, taking the presence of excess oxygen into account. The infrared spectra were recorded by ИКС-6 (IKS-6), ИКС-11 (IKS-11), and a Perkin-Elmer-12B spectrometer in the region $\lambda = 0.6 - 24\ \mu$. The samples made from pure copper, which had been produced by Yu. I. Gritsenko, had a thickness of 30, 80, 200, and 350 μ. They were oxidized, the thinnest lamella being heated at 1050°C in air in order that they absorb additional oxygen. The temperature dependence of the spectra was investigated on 20-200 μ thick samples. Some of them were single crystals produced according to the method developed by Yu. I. Gritsenko (Ref. 3). The experimental data are shown in Fig. 1

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The Infrared Absorption and the Energy Structure of Cuprous Oxide

S/181/60/002/009/013/036
B004/B056

(light transmissivity of the Cu_2O polycrystals at room temperature) and Fig. 2 (absorption of the polycrystal 80 μ at 20°K. This measurement was carried out at the Institut fiziki AN USSR (Institute of Physics of the AS UkrSSR) on O. V. Fialkovskaya's apparatus); Fig. 3 (absorption of the polycrystal in the region λ = 8.9 μ between 138 and 289°K); Fig. 4 (dto. at 198 - 440°K); Fig. 5 (absorption within the region λ = 12.6 μ at 162 - 291°K); Fig. 6 (dto. for single crystals at 209 - 458°K); Fig. 7 (position of the maxima of the 8.9 and 12.6 μ bands as a function of temperature); Fig. 8 (bands between 15 and 17 μ at room temperature and 140°K). It follows from Fig. 1 that the thinnest sample, which, however, contained excess oxygen, showed the greatest absorption. The maximum of the 8.9 μ band decreases with rising temperature (Figs. 3,4). This band is attributed to vibrations of the ion lattice. The increasing intensity of the 12.6 μ band with increasing temperature, however, corresponds to an absorption on three holes. The band between 15 - 17 μ is narrowed by a decrease of temperature. This brightening, which is of particular distinctness on the longer-wave edge of the band, remains conserved after subsequent heating to room temperature. A superposition of

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The Infrared Absorption and the Energy Structure of Cuprous Oxide

the vibrational band is carried out by a band that is based upon the photoexcitation of the polaron. Basing on S. I. Pekar's theory (Ref. 8), the excitation energy for the transition of the polaron from the s- to the p-state is calculated to be 0.067 ev and λ = 18.5 μ, which agrees satisfactorily with the experimental data λ = 17.6 μ, 0.071 ev. These data are not sufficient for interpreting the new maxima found within the region 9 - 11.6 μ. Ye. F. Gross, N. A. Karryyev (Ref. 1), and I. Pastrnyak (Ref. 2) are mentioned. The authors thank V. M. Korsunskiy and O. V. Vakulenko for their assistance. There are 8 figures and 9 references: 7 Soviet, 1 US, and 1 German.

ASSOCIATION: Kiyevskiy gosudarstvennyy universitet im. T. G. Shevchenko (Kiyev State University imeni T. G. Shevchenko)

SUBMITTED: May 4, 1959 (initially)
March 18, 1960 (afte: revision)

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86805.

S/185/60/005/001/004/018
A151/A029

24.6100 (1043, 1395, 1138)

AUTHORS: Lisitsya, M.P.; Strizhevskiy, V.L.

TITLE: On the Fermi Resonance in the Case of Carbon Tetrachloride

PERIODICAL: Ukrayins'kyy Fizychnyy Zhurnal, 1960, Vol. 5, No. 1, pp. 34 - 39

TEXT: The paper deals with the problem of the Fermi resonance in the case of carbon tetrachloride. Its aim is to show that for CCl_4 the existing theory is in a satisfactory agreement with the experimental data referring to the Fermi resonance. A comparison is made of the theory with the experiment for three Fermi resonant doublets of CCl_4. It was ascertained that in the case of gaseous CCl_4 the theoretical value of the splitting χ and the intensity ratios of the resonating component are in satisfactory agreement with the experimental data. A determination was also made of the distance Δ between the unperturbed levels, as well as of the unperturbed frequencies of the fundamental oscillations of molecules of gaseous and liquid CCl_4. The results of the experiment together with the non-perturbed levels of an isolated molecule of CCl_4 are given in a table. A comparison of the frequencies shows that in case of the phase transition gas - liquid a general tendency appears toward a decrease of frequencies. This result is

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S/185/60/005/001/004/018
A151/A029

On the Fermi Resonance in the Case of Carbon Tetrachloride

observed as a rule in all molecular compounds. The data of the table give a qualitative proof for the assumption that the maxima of the fundamental absorption bands shift in the case of the mentioned phase transition (see also Ref. 8). In closing, the suthors point out that the results obtained in this work prove that it is possible to do away with the nonharmonious members of the potential energy in the case when the Fermi resonant is absent. There is 1 table and 9 references: 8 Soviet and 1 German.

ASSOCIATION: Kyyivs'kyy dershavnyy universytet im. T.H. Shevchenka (Kiyev State University imeni T.H. Shevchenko).

SUBMITTED: July 1, 1959

Card 2/2

S/051/60/008/04/006/032
E201/E691

AUTHORS: Gaponova, N. Ye., Lisitsa, M.P. and Tsyashchenko, Yu. P.

TITLE: Frequencies and Intensities in the Infrared Spectrum of Bromoform

PERIODICAL: Optika i spektroskopiya, 1960, Vol 8, Nr 4, pp 465-470 (USSR)

ABSTRACT: The absorption spectrum of bromoform ($CHBr_3$) was investigated in the region 460-11700 cm^{-1} using a technique described earlier (Refs 10, 11). The absorption spectrum obtained is shown in Fig 1. The interpretation, symmetry, absorption coefficients at the band maxima (K_{max}), half-widths (Γ) and integral absorption (S) are listed in a table on pp 466-7. The values of S and Γ are given only for the fundamental vibrations and for isolated bands which can be easily separated into symmetrical components. The table includes also the published (Refs 4, 8) frequencies of various band maxima. The intensities of the fundamental vibrations and harmonics were explained in terms of the degree of polarity of the chemical bonds. Comparison of the absorption spectra of $CHBr_3$ and $CHCl_3$ showed that the integral absorption of the

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S/051/60/008/04/006/032
E201/E691

Frequencies and Intensities in the Infrared Spectrum of Bromoform

fundamental vibration bands depends on the degree of polarity of the bonds which determine the forms of these vibrations. There are 2 figures, 1 table and 16 references, 7 of which are Soviet, 3 English, 4 French, 1 Italian and 1 translation from English into Russian.

SUBMITTED: June 29, 1959

Card 2/2

LISITSA, M.P.

"Optics of thin-layer coatings" by G.V.Rozenberg. Reviewed by M.P.Lisitsa. Opt.i spektr. 9 no.1:130-132 Jl '60.
(MIRA 13:7)

(Films (Chemistry)) (Optics, Physical)
(Rozenberg, G.V.)

LISITSA, M.P.; TSYASHCHENKO, Yu.P.

Effect of temperature on the intensities of vibrational absorbtion bands of liquid bromoform. Opt. i spektr. 9 no.2:188-194 Ag '60. (MIRA 13:8)

(Bromoform--Spectra)

S/051/60/009/004/004/034
E201/E191

AUTHORS: Lisitsa, M.P., and Tsyashchenko, Yu.P.

TITLE: The Temperature Dependence of the Infrared Absorption Band Intensities of Liquid Chloroform

PERIODICAL: Optika i spektroskopiya, 1960, Vol 9, No 4, pp 438-445

TEXT: The authors made a quantitative study of the temperature dependence of total infrared absorption in the fundamental vibration bands ν_1 and ν_4, the most intense harmonics $2\nu_1$ and $2\nu_4$, as well as the combination frequencies $\nu_1 + \nu_4$, $\nu_2 + \nu_6$ and $\nu_3 + \nu_6$ of liquid chloroform. These measurements were carried out at five temperatures: -58, -30, +20, +40, and +60 °C. A cell used in this study was described earlier (Ref 1); between 20 and 60 °C it was heated in an electric furnace and below 20 °C it was cooled in a cryostat shown in Fig 1. Some results are given in Fig 2, which shows the fundamental vibration bands ν_1 (Fig 2a), ν_4 (Fig 2б), combination frequencies $\nu_2 + \nu_6$ (Fig 2в), $\nu_1 + \nu_4$ (Fig 2г), and a harmonic $2\nu_1$ (Fig 2д). The intensities of the bands ν_1 (Fig 3, curve 1),

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E201/E191

The Temperature Dependence of the Infrared Absorption Band Intensities of Liquid Chloroform

ν_4 (Fig 3, curve 2), $\nu_1 + \nu_4$ (Fig 4, curve 1), $\nu_2 + \nu_6$ (Fig 4, curve 2), $\nu_3 + \nu_6$ (Fig 4, curve 3) all fell linearly with increase of temperature. The intensities of the harmonics $2\nu_1$ and $2\nu_4$ were independent of temperature. Comparison of the temperature variations of the vibrational absorption bands of $CHCl_3$, $CHBr_3$, CCl_4 and CBr_4, established a correlation between the volume expansion coefficient of each liquid and the mean temperature coefficient of the intensity of the bands. There are 4 figures and 20 references: 10 Soviet and 10 English.

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SUBMITTED: January 4, 1960

Card 2/2

LISITSA, M.P.; TSYASHCHENKO, Yu.P.

Effect of temperature on the absorption in certain vibrational bands of gaseous chloroform and bromoform. Opt. i spektr. 9 no.6:742-746 D '60. (MIRA 14:1)

(Chloroform--Spectra) (Bromoform--Spectra)

LISITSA, M. P.

Doc Phys-Math Sci - (diss) "Intermolecular interactions and infrared spectra." Minsk, 1961. 34 pp; (Ministry of Higher, Secondary Specialist, and Professional Education Belorussian SSR, Belorussian State Univ imeni V. I. Lenin); 200 copies; free; list of author's works on pp 33-34 (35 entries); (KL, 6-61 sup, 191)

S/051/61/010/001/004/017
E201/E491

AUTHORS: Lisitsa, M.P. and Strizhevskiy, V.L.

TITLE: The Temperature Dependence of the Intensities of Vibrational Absorption Bands in Gases

PERIODICAL: Optika i spektroskopiya, 1961, Vol.10, No.1, pp.48-54

TEXT: The authors consider theoretical aspects of the temperature dependence of the integrated intensities of vibrational absorption bands of gases. Apart from the "Boltsmann factor" (Ref.4), the authors consider the effect of anharmonicity of internal molecular vibrations and the effect of light emission on the intensity of vibrational bands. Formulae are derived which give the temperature dependence of the integrated absorption. The new formulae differ somewhat from the usual expression. Comparison of the available experimental data on carbon tetrachloride, bromoform, chloroform and other molecules (Ref.1 to 3) with the new formulae showed fairly good agreement but further work is necessary for reliable conclusions. There are 15 references: 14 Soviet and 1 non-Soviet (translated

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E201/E491

The Temperature Dependence of the Intensities of Vibrational Absorption Bands in Gases

into Russian).

SUBMITTED: March 30, 1960

Card 2/2

LISITSA, M.P.; TSYASHCHENKO, Yu.P.

Temperature dependence of the vibrational absorption bands of crystalline chloroform and bromoform. Opt. i spektr. 10 no.2:157-164 F '61. (MIRA 14:2)
(Chloroform—Spectra) (Bromoform—Spectra)

KIREY, G.G.; LISITSA, M.P.

Infrared absorption spectrum and molecular symmetry of hexaethyldisiloxane. Opt.i spektr. 11 no.1:55-60 Jl '61. (MIRA 14:10)

(Siloxane--Spectra)

LISITSA, M.P.; KHALIMONOVA, I.N.

Absorption band frequencies and intensities of monosubstiteted benzenes in the region of the valence oscillations of C - Harom bonds. Opt. i spektr. 11 no.2:185-191 Ag '61. (MIRA 14:8)

(Benzene)
(Aromatization)

VAKULENKO, O.V.; KIREY, G.G.; LISITSA, M.P.

Temperature effect on the infrared spectra of organosilicon compounds. Part 1. Crystalline hexaethyldisiloxane. Opt. i spektr. 11 no.2:196-202 Ag '61. (MIRA 14:8)
(Infrared rays) (Disiloxane—Spectra)

✓

LISITSA, M.P.; KHALIMONOVA, I.N.

Temperature effect on the adsorption of benzene monosubstitutes in the region of valence oscillations of C - H bonds. Opt. i spektr. 11 no.3:332-341 S '61. (MIRA 14:9)

(Benzene—Spectra)

LISITSA, M.P. [Lysytsia, M.P.]; STRIZHEVSKIY, V.L. [Stryzhevs'kyi, V.L.];
KHALIMONOVA, I.N. [Khalimonova, I.M.]

Temperature dependence of the intensities of vibration absorption bands of molecular liquids. Ukr. fiz. zhur. 7 no.10:1090-1100 O '62. (MIRA 16:1)

1. Kiyevskiy gosudarstvennyy universitet i Institut poluprovodnikov AN UkrSSR.

(Molecular spectra)

LISITSA, M.P.

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D234/D308

24.6111

AUTHORS: Lysytsya, M. P., Stryzhevs'kyy, V. L. and Khalimonova, I. M.

TITLE: Temperature dependence of the intensities of vibrational absorption bands of molecular liquids

PERIODICAL: Ukrayins'kyy fizychnyy zhurnal, v. 7, no. 10, 1962, 1090-1099

TEXT: Measurements were made in the whole temperature range where liquid phase exists, for fundamental vibrational bands and their combinations. The liquids were CCl_4, hexaethyldisiloxane, octamethyltrisiloxane, toluene, chlorobenzene, nitrobenzene, aniline and bromobenzene. The intensity of any absorption band varies according to

$$S_T = S_0 + \alpha(T - T_0), \qquad (1)$$

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D234/D308

Temperature dependence of ...

the temperature coefficient being negative. For the first overtones of the vibrations, the integral absorption does not depend on temperature. Theoretical calculation (using the Frank-Condon principle) gives

$$\alpha \approx \frac{k}{2} \sum_{qj} \omega\,' \frac{1}{2} \frac{\partial^2 S(0)}{\partial Q^2_{qj}} \qquad (16)$$

and the sign of α is estimated to be negative. There are 4 figures.

ASSOCIATION: Kyyivs'kyy derzhuniversytet; Instytut napivprovidnykiv AN URSR (Kiev State University; Institute of Semiconductors, AS UkrSSR)

KIREY, O.G.; LISITSA, M.P.

Temperature effect on the infrared spectra of silicon organic compounds. Part 2: Liquid hexaethyldisiloxane. Opt. i spektr. 12 no.3:376-380 Mr '62. (MIRA 15:3)
(Silicon organic compounds--Spectra)

KIREY, G.G.; LISITSA, M.P.

Temperature effect on the infrared spectra of organosilicon compounds. Part 3. Octamethyltrisiloxane. Opt. i spektr. 12 no.6:714-717 Je '62. (MIRA 15:5)

(Siloxane--Spectra)

S/020/62/145/006/008/015
B181/B102

AUTHORS: Lisitsa, M. P., Strizhevskiy, V. L., and Khalimonova, I. N.

TITLE: Anomalous intensity-distribution of vibration bands from Fermi resonance

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 145, no. 6, 1962, 1262-1264

TEXT: The Fermi resonance in absorption spectra of multiatomic molecules was studied theoretically, paying special attention to intermolecular interaction (A. S. Davydov, Teoriya pogloshcheniya sveta v molekulyarnykh kristallakh - Theory of light absorption in molecular crystals - Kiyev, 1951). It has been found that the doublet lines must be polarized at right angles to one another. Measurements made in polycrystalline layers of CCl_4 showed that both lines are polarized equally. Absorption in the region of vibration from plane deformation of the symmetry B_1 with the complex term of the same symmetry were studied in the case of liquid and crystalline iodobenzene and chlorobenzene. The intensity ratio of the two doublet lines $I_{v'}/I_v$ is almost 1 for CCl_4, for the liquid benzenes < 0.1,

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Anomalous intensity-distribution...

S/020/62/145/006/008/015
B181/B102

for iodobenzene crystal ($T = -35$ to $-167°$) about 10, and for crystallized chlorobenzene about 1. The anomalous intensity ratio can be explained by the results arrived at in an earlier paper (V. L. Strizhevskiy, Optika i spektroskopiya, 8, 165, 1960). If v and v' are resonance terms and if $I_{v'}/I_v > 1$, then the condition $\frac{2L_{vv'}}{\delta} < -\frac{k^2-1}{k}\frac{\delta}{|\delta|}$, $k \gg 1$; (1) is obtained where $L_{vv'}$ is the matrix element of the vibration energy transfer from molecule to molecule, δ is the "natural" distance of the splitting components $k = p^o_{ov}/p^o_{ov'}$, p^o_{ov} and $p^o_{ov'}$ are the matrix elements of the dipole moment for the corresponding transitions. If $L_{vv'} < 0$ and $\delta > 0$, then $\sqrt{\left(\frac{\varkappa}{\delta}\right)^2 - 1} > \frac{k^2-1}{k}$ (2) is obtained from (1) where $\varkappa$ is the distance of the doublet maxima. From (1) and (2) it follows that a migration of the vibration excitation in the crystal, which makes intermolecular resonance possible, is the cause of the anomalous intensity ratio. There are 3 figures.

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Anomalous intensity-distribution... S/020/62/145/006/008/015
B181/B102

ASSOCIATION: Kiyevskiy gosudarstvennyy universitet im. T. G. Shevchenko (Kiyev State University imeni T. G. Shevchenko)

PRESENTED: April 13, 1962, by I. V. Obreimov, Academician

SUBMITTED: April 10, 1962

LISITSA, M.P. [Lysytsia, M.P.]; VALAKH, M.Ya.

Infrared absorption and the structure of CdS zones. Ukr. fiz. zhur. 8 no.10:1142-1149 O '63. (MIRA 17:1)

1. Institut poluprovodnikov AN UkrSSR, Kiyev.

L 11166-63 EWP(j)/EPF(c)/EWT(m)/BDS--Pc-4/Pr-4--RM/WW
ACCESSION NR: AP3002786 S/0051/63/014/006/0793/0797

61

AUTHOR: Lisitsa, M. P.; Khalimonova, I. N.

TITLE: Dispersion of crystalline diphenyl acetylene in the infrared region

SOURCE: Optika i spektroskopiya, v. 14, no. 6, 1963, 793-797

TOPIC TAGS: oscillator strengths, dispersion, absorption, diphenyl acetylene

ABSTRACT: The purpose of the work was to measure the dispersion and absorption of crystalline diphenyl acetylene in the 0.75 to 17 my wavelength region, calculate the oscillator strengths on the basis of the dispersion and absorption data and compare the resultant values. The dispersion curves were obtained by the reflection procedure. The values of the index of refraction were calculated by means of a formula involving the reflection at the crystal-air interface and the absorption coefficient, which allows of determining the index with an error of 15%. The frequency dependences of the index of refraction and absorption coefficient are consistent with classical electronic theory. The oscillator strengths were calculated on the basis of the absorption by means of the usual formula and on the basis of the dispersion by means of two formulas based on the Kramers relations. The oscillator strengths computed on the basis of the absorption and dispersion

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ACCESSION NR: AP3002786

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data agree well for the most intense longer wavelength bands at 690 and 759 cm sup -1, but show significant divergence for the weaker shortest wavelength band (1077 cm sup -1). The divergence is partly explained by the distortion of the dispersion curve in the region of relatively weak bands; additional factors are the use of the free electron mass and charge in the computation formulas (instead of an effective mass and effective charge) and the possible influence of exciton effects. Orig. art. has: 8 formulas, 5 figures and 1 table.

ASSOCIATION: none

SUBMITTED: 06Oct62 DATE ACQD: 15Jul63 ENCL: 00

SUB CODE: 00 NO REF SOV: 004 OTHER: 003

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Card 2/2

[illegible]

[illegible]

[illegible]

TITLE: Absorption of infrared radiation by free carriers in silicon at high temperatures

SOURCE: Fizika tverdogo tela, v. 6, no. 9, 1964, 2880-2882

TOPIC TAGS: optical phonon, acoustic phonon, phonon scattering, [illegible] absorption, silicon

ABSTRACT: In order to determine the role of optical phonons in the [illegible] free carrier [illegible] the infrared absorption spectrum of p-Si in the region 1--15 μ at [illegible] above the characteristic temperature for the excitation [illegible] optical phonons. The Si [illegible] [illegible] ature, and the measurements were [illegible] The increase in absorption beyond the absorption edge was

[illegible]

ACCESSION NR: AP4044978

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found to be proportional to the wavelength raised to the (1.4 ± 0.2) power, and is in good agreement with theoretical results based on the assumption that the carriers are scattered by acoustic phonons. The results also indicate that scattering by optical phonons is negligible. Orig. art. has: 2 figures and 5 formulas.

None

12Dec63

NP, OP NR REF SOV [illegible]

[illegible]7-65 EWT(m)/EWP(b)/EWP(t) IJP(c) JD

ACCESSION NR: AP5001530 S/0185/64/009/012/1300/1305

10
9
B

AUTHOR: Vakulenko, O. V.; Lysytsya, M. P. (Lisitsa, M. P.)

TITLE: Investigation of infrared absorption in silicon at high temperatures

27

SOURCE: Ukrayins'kyy fizychnyy zhurnal, v. 9, no. 12, 1964, 1300-1305

TOPIC TAGS: silicon infrared absorption, silicon optical phonon, silicon free carrier, free carrier scattering

ABSTRACT: The infrared absorption spectrum p-Si (3 [illegible] Ohm-cm) from [illegible] μ was investigated at temperatures exceeding the characteristic temperature of the excitation of optical phonons (783, 881, and 904K) in order to determine the role of optical phonons in the absorption [illegible] free carriers in silicon. Even though silicon at such temperatures [illegible] its own conductivity, a typical structure absorption was not [illegible]. A gradual change in the absorption coefficient caused by [illegible] carriers is described by Schmidt's formula [illegible], which assumes the scattering of carriers is due to lattice phonons. It is

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ACCESSION NR: AP5001550

shown that the temperature dependence is also in agreement with the above formula. This results from the fact that the width of the forbidden zone obtained from the dependence of [illegible] at some definite [illegible] wavelengths (λ = 2, 4, 8, [illegible]) does not differ substantially [illegible] the generally known value for this magnitude. The absolute value [illegible] proved to be three times greater than the [illegible]. Yakovlev's [illegible] assumes that the influence of the optical phonons on [illegible] absorption by electrons in silicon is substantial and thus predicts [illegible] steeper increase of K with λ, was not confirmed. Orig. art. [illegible] figures and 11 formulas.

ASSOCIATION: Kyyivsk'kyy derzhuniversytet im. T. G. Shevchenka (Kiev [illegible] University)

SUBMITTED: 27Jun64 ENCL: 00 SUB CODE: OP, SS

NO REF SOV: 003 OTHER: 012 ATD PRESS: 3166

ACCESSION NR: AP4020933

S/0051/64/016/002/0297/0303

AUTHOR: Vlasenko, N.A.; Lisitsa, M.P.

TITLE: Optical constants of photosensitive lead sulfide layers

SOURCE: Optika i spektroskopiya, v.16, n0.2, 1964, 297-303

TOPIC TAGS: optical constant, reflection, transmittance, transmission, absorption, absorption coefficient, index of refraction, lead sulfide, lead sulfide coating, exciton absorption

ABSTRACT: In view of the potential value of PbS films and coatings, prepared by chemical procedures, for detection of infrared radiation, there were measured the optical constants of such layers in the approximate range from 0.4 to 5.5 μ. A further purpose of the work was to elucidate the nature of the long wavelength plateau adjacent to the fundamental absorption edge. The thickness d of the layers were determined to within 1% by an interferometric method. The transmittance T was measured by means of SF-4 spectrophotometer in the 0.4 to 1.2 μ interval and by means of IKS infrared spectrometer in the 1 to 5.5 μ range. The reflection coefficients R from the layer side and R' from the substrate side were determined by comparison of

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ACCESSION NR: AP4020933

the reflection from the specimen with the reflection from a standard mirror with a known R; a UM-2 monochromator with an AgS photocell was used for the visible region measurements; an IKS-6 spectrophotometer for the measurements in the infrared. The values of the absorption coefficient k and the index of refraction n were calculated on the basis of the measured values of T, R, R' and d by means of formulas adduced in the paper. The inferred values are presented in the form of curves and a table for n, and compared with the corresponding constants for PbS single crystals, taken from the literature. In the 1 to 4 μ region the index of refraction changes little, but remains consistently below the value for single crystals. In the wavelength region below 3 μ the absorption spectrum of the films agrees with the absorption spectrum of single crystals, but in the longer wavelength region exhibits additional absorption that depends to some extent on the size of the crystallites. This additional absorption is tentatively attributed to the presence in layer crystals of a high concentration of structure defects, for this absorption tends to decrease with increasing crystallite size. The nature of the absorption plateau is discussed and the absorption in this region is associated with an exciton mechanism. "The authors are sincerely grateful to V.Ye.Lashkarev for his interest in the work and discussion of the results, and to P.P.Pogoretskiy and I.N.Khalimonova for

Card 2/3

ACCESSION NR: AP4020933

assistance in carrying out the measurements." Orig.art.has: 7 formulas, 4 figures and 1 table.

ASSOCIATION: none

SUBMITTED: 29Apr63 DATE ACQ: 02Apr64 ENCL: 00

SUB CODE: PH NR REF SOV: 005 OTHER: 008

Card 3/3

L 3154-66 EWT(d)/EWT(l)/EWP(c)/EWP(v)/T/EWP(k)/EWP(l)/ETC(m) IJP(c) WW

ACCESSION NR: AP5016043 UR/0368/65/002/005/0409/0414
535.89

44,55 46
B

AUTHORS: Berezhinskiy, L. I.; Lisitsa, M. P. 44,55

TITLE: Control of the quality of plane optical surfaces 21,44,55

SOURCE: Zhurnal prikladnoy spektroskopii, v. 2, no. 5, 1965, 409-414

TOPIC TAGS: quality control, optic research, surface property

ABSTRACT: A procedure and apparatus are described for the control of the quality of the flat optical surfaces with accuracy not lower than 0.01 of the wavelength of visible light. The procedure is based on multi-frequency multipath interference, first used by D. R. Herriott (JOSA v. 51, 1142, 1961). The smoothness and planeness of the entire surface can be checked simultaneously by illuminating the sample with a set of monochromatic light beams of nearly equal frequencies. An optical diagram of the apparatus is shown in Fig. 1 of the Enclosure. The monochromatic set of beams was generated by means of a single monochromator (UM-2), with a set of equidistant slits placed in the

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plane of the entrance slit. The interference fringes were measured with the aid of a microscope (MIR-12). The apparatus was thus made up of inexpensive and readily available parts. Surface defects could be readily detected with accuracies 0.005μ if the mid-section of the visible spectrum was used. The apparatus can be used to control surface inhomogeneities not only of transparent but also of opaque objects. Orig. art. has: 4 figures, 7 formulas and 1 table.

ASSOCIATION: None

SUBMITTED: 07Jul64 ENCL: 01 SUB CODE: OP

NR REF SOV: 001 OTHER: 002

Card 2/3