

KOST, A. N.; SHEYNKMAN, A. K.; KAZARINOVA, N. F.

Interaction of acetylpyridinium salts with dialkyl anilines.  
Zhur. ob. Khim. 34 no.6:2044-2049 Je '64. (MIRA 17:7)

1. Donetskoye otdeleniye Instituta organicheskoy khimii AN UKrSSR  
i Moskovskiy gosudarstvennyy universitet imeni Lomonosova.

SHEYNKMAN, A.K.; PRELEFSKAYA, A.M.; KOLOMOYTSEV, L.P.; KOST, A.N.

Quaternary salts of 4- $\beta$ -dialkylaminophenyl pyridinium. Vest.  
Mosk. un. Ser. 2: Khim. 19 no.6:74-82 N-D '64. (MIRA 18:3)

1. Kafedra organicheskoy khimii Moskovskogo universiteta.

CHERKASSKIY, Ye.S.; SELOCHNIK, N.N.; SHEYNEMAN, A.K.

Fungicidal properties of some 1-substituted pyridines.  
Dokl. AN SSSR 156 no. 5:1197-1200 Je '64. (MIRA 17:6)

1. Glavnyy botanicheskiy sad AN SSSR i Donetskoye otdeleniye  
Instituta organicheskoy khimii AN SSSR. Predstavleno akademikom  
N.V.TSitsinym.

KOST, A.N.; SHEYNKMAN, A.K.; ROZINBERG, A.N.

Condensation of l-acylpicolinic salts with aromatic aldehydes.  
Zhur. ob. khim. 34 no.12:4046-4054 D '64 (MIRA 18:1)

I. Moskovskiy gosudarstvennyy universitet imeni M.V. Lomonosova.

CHERKASSKIY, Ye.S.; KOLOMEYTSSEV, I.R.; SHEYNKMAN, A.K.; KORNEYEVA, I.I.

Antiviral activity of quaternary salts of 4-n-dialkylaminophenylpyridines and chlorine-copper complexes of pyridine bases of the carbonaceous tar. Dokl. AN SSSR 161 no.5:1208-1211 Ap '65. (MIRA 18:5)

1. Submitted August 27, 1964.

KOLOMOYTSEV, L.R.; GEONYA, N.I. [Heonia, N.H.]; STRANGOVSKAYA, N.V.  
[Stranhovs'ka, N.V.]; SHEYNKMAN, A.K.

Effect of quaternary salts of 4(n-dialkylaminophenyl)-pyridines  
on dysentery bacteriophage. Mikrobiol. zhur. 27 no.2:56-60 '65.  
(MIRA 18:5)

1. Donetskii meditsinskiy institut.

SHEYNKMAN, A.K.; KOST, A.N.

1-Alkyl-2,3-dihydroindoles. Metod. poluch. khim. reak. i prepar.  
no.11:5-7 '64.

1-Alkyl-5-(4'-pyridyl)-2,3-dihydroindoles. Ibid.:8-11  
(MIRA 18:12)

1. Donetskij filial Vsesoyuznogo nauchno-issledovatel'skogo  
instituta khimicheskikh reaktivov i osobo chistykh khimicheskikh  
veshchestv i Moskovskiy gosudarstvennyy universitet imeni M.V.  
Lomonosova. Submitted May 1964.

KOST, A.N.; SHEYNKMAN, A.K.; PRILEPSKAYA, A.N.

1-Alkyl-6-(4'-pyridyl)-1,2,3,4-tetrahydroquinolines. Metod.  
poluch. khim. reak. i prepar. no.11:12-15 '64.

(MIRA 18:12)

1. Donetskii filial Vsesoyuznogo nauchno-issledovatel'skogo  
instituta khimicheskikh reaktivov i osobo chistykh khimicheskikh  
veshchestv i Moskovskogo gosudarstvennogo universiteta M.V.  
Lomonosova. Submitted May 1964.



SHEYNKMAN, G., inzhener.

Using a colorimeter to determine the color of flour and baked bread. Muk.-elev.prom. 23 no.3:21 Mr '57. (MLRA 10:5)

1. Laboratoriya Moskovskogo tresta Glavnogo upravleniya khlebopekarnoy promyshlennosti RSFSR.  
(Flour--Analysis)

SOV/79-29-4-47/77

5(3)

AUTHORS:

Levchenko, Ye. S., Sheynkman, I. E.

TITLE:

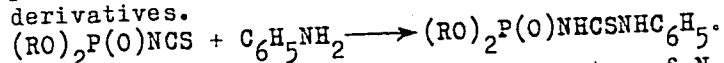
Esters of N-arylthiocarbamide-N'-phosphoric Acids (Efiry  
N-ariltiokarbamid-N'-fosfornykh kislot)

PERIODICAL:

Zhurnal obshchey khimii, 1959, Vol 29, Nr 4, pp 1249-1254  
(USSR)

ABSTRACT:

As was shown by Levchenko and coworkers (Ref 1), the esters of isothiocyanate phosphoric acid react with amines, and particularly with aniline, in such a way as to form thiourea derivatives.



One of these compounds, the diethyl ester of N-phenylthiocarbamide-N'-phosphoric acid,  $(C_2H_5O)_2P(O)NHCSNHC_6H_5$ , possesses insecticide and anti-tuberculous properties. It was therefore of interest to prepare esters of N-arylthiocarbamide-N'-phosphoric acid with various substituents in the aromatic nucleus and to examine their physiological properties. The diethyl ester of isothiocyanate phosphoric acid (Ref 1) was caused to react with p- and o-toluidine, p- and o-anisidine, :

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SOV/79-29-4-47/77

## Esters of N-arylthiocarbamide-N'-phosphoric Acids

p-phenetidine, o-, m-, and p-chloro aniline, m-aminophenol, p-fluoro aniline, p-aminophenylsulfamide, p-sodiumaminosalicylate, and phenylhydrazine. The diethyl esters of N-arylthiocarbamide-N'-phosphoric acids obtained are colorless compounds with acid properties. They are slightly soluble in water, benzene, ether, and  $\text{CCl}_4$ , and can be recrystallized from alcohol and

acetone. The diethyl- and diphenyl ester of isothiocyanate phosphoric acid and the diphenyl ester of isothiocyanate thiophosphoric acid form similar thiourea derivatives with o-aminothiophenol. These compounds are, however, unstable and cyclize as soon as they are left undisturbed for some time, while benzothiazole derivatives and  $\text{H}_2\text{S}$  form (Scheme 2). N-(benzothiazolyl-

2)-diphenyl-diisobutylphosphamate and -diphenylthiophosphamate are colorless crystalline compounds. N-methyl-o-aminothiophenol reacts as easily with the esters of isothiocyanate thiophosphoric acid and results, via the thiourea derivative, in the derivatives of 3-methylbenzothiazolidene-2. The corresponding diphenyl ester of the same acid results in N-(3-methylbenzothiazolidene-2)-diphenylthiophosphamate according to scheme 3.  $\alpha$ -aminopyridine and N-methylbenzothiazolonimine result, by

Card 2/3

SOV/79-29-4-47/77

Esters of N-arylthiocarbamide-N'-phosphoric Acids

reaction with the diethyl ester of isothiocyanate phosphoric acid, in the corresponding thiourea derivatives (Scheme 4). The esters of arylthiocarbamide phosphoric acids proved to be weakly insecticide and anti-tuberculous agents, with the exception of the diethyl ester of N-(p-chlorophenyl)-thiocarbamide-N'-phosphoric acid and the diethyl ester of N-phenylthiocarbamide-N'-phosphoric acid. There are 1 table and 3 references, 1 of which is Soviet.

ASSOCIATION: Institut organicheskoy khimii Akademii nauk Ukrainskoy SSR  
(Institute of Organic Chemistry of the Academy of Sciences  
Ukrainskaya SSR)

SUBMITTED: January 6, 1958

Card 3/3

5(3)  
AUTHORS:Levchenko, Ye. S., Sheynkman, I. E.,  
Kirsanov, A. V.

SOV/79-29-5-14/75

TITLE:

Preparation of Phosphorus-Diiodide and -Triiodide (Polucheniye  
dvukhyodistogo i trekhyodistogo fosfora)

PERIODICAL:

Zhurnal obshchey khimii, 1959, Vol 29, Nr 5, PP 1474-1477 (USSR)

ABSTRACT:

In the work under review the authors devised a harmless and - as to preparation - convenient method for the production of phosphorus diiodide and at the same time a method for the production and purification of phosphorus triiodide without use of white phosphorus and carbon disulfide. After numerous experiments it was found that phosphorus diiodide and phosphorus triiodide can be obtained in absolutely pure form directly from iodine and red phosphorus with subsequent crystallization from suitable solvents. The reaction may be carried out by fusing iodine and phosphorus or by boiling of iodine and phosphorus in solvents applicable to crystallization. Butyl iodide and bromide, dichloro ethane, ethyl iodide and other alkyl- and alkene halogens can be used for the crystallization of phosphorus diiodide. Chloro benzene is the most suitable one. The phosphorus iodide obtained represents rather large, orange, longish lamina with a melting point of 126-127°. Higher quantities of this preparation

Card 1/2

Preparation of Phosphorus-Diiodide and -Triiodide

SOV/79-29-5-14/75

can be prepared without difficulties. Carbon tetrachloride, chloroform, butyl iodide can be used for the recrystallization of phosphorus triiodide, but most suitable is dichloro-ethane. Phosphorus triiodide is obtained in the form of rather large brilliant, dark-red crystals with a melting point of 60-61°. There are 5 references, 2 of which are Soviet.

ASSOCIATION: Institut organicheskoy khimii Akademii nauk Ukrainskoy SSR  
(Institute of Organic Chemistry of the Academy of Sciences,  
Ukrainian SSR)

SUBMITTED: May 6, 1958

Card 2/2

LEVCHENKO, Ye.S.; SHEYNKMAN, I.E.; KIRSANOV, A.V.

Phenylamides of N-dianilidophosphinylareniminosulfonic acids.  
Zhur.ob.khim. 30 no.6:1941-1946 Je '60. (MIRA 13:6)

1. Institut organicheskoy khimii Akademii nauk Ukrainskoy SSR.  
(Amides) (Sulfonic acids)

LEVCHENKO, Ye.S.; SHEYNKMAN, I.E.; KIRSANOV, A.V.

N-dichlorophosphinylalkanaminosulfonic acid chlorides. Zhur.  
ob.khim. 33 no.10:3315-3323 0 '63. (MIRA 16:11)

1. Institut organicheskoy khimii AN UkrSSR.



SHEYNMAN, L.S.

36892. TUMANOVSKIY, M.N., SHEYNMAN, L.S. i CHAKINA, L.A. Mostorynaya i senzornaya khronoskiya v serdech'nykh bol'nykh s bolyami v oblasti serdtsa. Trudy Med. in-ta (Izhev. gos. med. in-t), t. IX, 1949, c. 228-32

SO: Letopis' Akhurnal Nykh Staty, Vol. 50, Moskva, 1949

SHEYNKMAN, M. K.

11 Oct 52

USSR/Physics - Photoconductivity

"Photoresistances of CdS Monocrystals and Their Photoactivation," V. Ye. Lashkarev, Acting Mem, Acad Sci Ukrainian SSR, V. S. Medvedev, A. I. Skopenko, G. A. Fedorus, M. K. Sheynkman, Inst of Phys, Acad Sci USSR

"Dok Ak Nauk SSSR" Vol 86, No 5, pp 905-907

At 7th Conference of Semiconductors in 1950 (cf. Lashkarev et al., "Iz AN SSSR, Ser Fiz" 16,81 (1952) photoactivity of CdS monocrystals was reported activated by light. Show that photoresistance of CdS is only one exhibiting, in addition to high sensitivity, practically horizontal spectral characterisitcs within band 0.4 to 0.2 $\mu$ . Received 5 Aug 52.

PA 245T94

Sheynkman, M. K.

24(+)

Академія наук України, Інститут фізики

Photoelectricity: i opticheskoye yavleniye v poluprovodnikakh... Kiyev, 20-26

Additional Sponsoring Agency: Akademiya nauk SSSR, Prezidium, Komissiya po poluprovodnikam.

Ed. of Publishing House: I. V. Kisina; Tech. Ed.: A. A. Misyuchenko; Resp. Ed.: V. Ya. Lashkarev, Academician, Ukrainian SSR, Academy of Sciences.

PURPOSE: This book is intended for scientists in the field of semiconductor physics, solid state spectroscopy, and semiconductor devices. The collection will be useful to advanced students in universities and institutes of higher technical training specializing in the physics and technical application of semiconductors.

COVERAGE: The collection contains reports and information bulletins (the latter are indicated by asterisks) read at the First All-Union Conference on Optical and Photoelectric Phenomena in Semiconductors. A wide range of problems in semiconductor physics and technology is considered: photoconductivity, photoemission, and photovoltaic effects; the action of hard and soft x-ray radiations, photoresistors, thin films and complex structures; the properties of thin films and complex structures prepared by E. I. Shaboy, O. V. Smitko, K. B. Polpygo, P. Labchenko, and M. K. Sheynkman. References and discussions follow each article.

OF SEMICONDUCTORS

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Photoelectric and Optical Phenomena (Cont.) SOV/3140
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Gross, Ye. P., and M. A. Yakobson, Luminescence of CdS
Card 4/16

SHEYNKMAN, M.K.

Distr: ~~Lj/Lic~~

Decrease of the photosensitivity of cadmium sulfide mono-  
 crystals in the region of their natural absorption. V. E.  
 Lashkarev, E. A. Sul'kov, G. A. Fedorus, and M. K. Sheynk-  
 man. ~~From: Fiz. Zhur. 1, 261-23(1957)~~ --The spectral  
 dependence of the photocurrent, the photocurrent output,  
 the mobility and the lifetime of the photocarriers, and the  
 coefficients of reflection and transmission of CDS monocrystals  
 were studied. It was found that: in the range from 4000 to  
 5200 Å the carrier mobility was independent of the wave  
 length of the exciting light. The reflection coeff. in the  
 range of natural absorption does not exceed 20%. The  
 spectral function of the lifetime  $\tau(\lambda)$  of the photocarriers  
 upon transition from the short-wave part of the spectrum to  
 the max. of the photocurrent is different for the different  
 samples; it can increase, remain const., or decrease, and in  
 this latter case reaches its max. at the max. of the photocur-  
 rent. This finds its explanation in that  $\tau(\lambda)$  is a concn. func-  
 tion. The photocurrent output, detd. according to several  
 methods, is similar in the shape of its curve to the shape of  
 the spectral function of the photocurrent, and this is why  
 the photosensitivity decreases in the range of natural ab-  
 sorption. An explanation is furnished by the hypothesis of  
 nonphotoactive exciton annihilation at the crystal surface  
 when absorbing the strongly absorbed light. The photoef-  
 ficiency  $\beta$  at the max. of the photocurrent is 0.4, but in the  
 short wave-length region,  $\beta$  will drop to 0.02. It is shown  
 that if such functions are measured by aid of photocurrent  
 equalization as recommended by Bube (C.A. 59, 9856) cr-  
 eaduous results can be obtained. 23 references.

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Inst. Physics  
AS USSR

OK 11/11

*SHEYNEMAN, M. K.*

LASHKAROV, V.Ye. [Lashkar'ov, V.IE.]; FEDORUS, G.A. [Fedorus, H.A.];  
SHYNYEMAN, M.K.

Diffusion of photocarriers in CdS single crystals. Ukr. fiz. zhur.  
2 no.4:374-375 O-D '57. (MIRA 11:3)

1. Institut fiziki AN URSR.  
(Cadmium sulfide--Electric properties) (Photoconductivity)

20-114-6-18/54  
AUTHORS: Lashkarev, V. Ye., Member of the Academy of Sciences of the  
Ukrainian SSB, Sal'kov, Ye. A., Fedorus, G. A., Sheynkman, M.K.

TITLE: The Shape of the Spectral Distribution of Photoconductance  
by Single Crystals of CdS (O forme spektral'nogo raspredeleniya  
fotoprovodimosti monokristallov CdS)

PERIODICAL: Doklady Akademii Nauk SSSR, 1957, Vol. 114, Nr 6, pp. 1203-1205 (USSR)

ABSTRACT: The experiments were carried out with monocrystals of Cd which  
were obtained by a synthesis of Cd vapors and sulfur. The  
electrodes were produced by vaporizing of indium in vacuo.  
A UM-2 monochromator with a special incandescent lamp (340 Watt)  
served as light source. The spectral characteristic of the  
photocurrent was determined at stationary illumination of the  
sample. The investigation of the spectral dependence of the  
proper time of the photocarrier is also described here. The  
authors shortly discuss the measurements of the following  
quantities: momentary proper time  $\tau_0$  of the decrease of the  
photocurrent at the moment of the emission of light, the yield  
of the photocurrent  $a_0$ , the mobility of the photocarrier.

Card 1/3

*Sheynkman, M.K.*  
LASHKAREV, V.Ye. [Lashkar'ov, V.IE]; SAL'KOV, Ye.A. [Sal'kov, IE.A.];  
FEDORUS, G.A. [Fedorus, H.A.]; SHEYNKMAN, M.K.

Study of the spectral characteristics of cadmium selenide crystals  
[in Ukrainian with summary in English]. Ukr. fiz. zhur. 3 no.2:  
204-215 Mr-Apr '58. (MIRA 11:6)

1. Institut fiziki AN URSR.  
(Cadmium selenide--Spectra) (Photoelectricity)

AUTHORS: E.I.Rashba, M.K.Sheynkman SOV/57-23-9-3/33

TITLE: Influence of Surface Recombination Upon the Kinetics of Photoconductivity in Semiconductors (Vliyaniye poverkhnostnoy rekombinatsii na kinetiku fotoprovodimosti v poluprovodnikakh)

PERIODICAL: Zhurnal tekhnicheskoy fiziki, 1958, Vol 28, Nr 9, pp. 1883 - 1889 (USSR)

ABSTRACT: This is a study of the kinetics of photoconductivity in a semiconductor under the most simple premises with respect to the recombination mechanism intended to present a clear and illustrative explanation of the influence of surface recombination upon the course taken by photocurrent relaxation at different values of the light absorption factor. The surface recombination is essential even in the early stages of the photocurrent relaxation processes. In order to make this influence accessible to measurement the values  $T_0$  are given at which  $\beta^*$  which is computed according to formula (3) is about  $2/3$  of  $\beta_0$ .  $\beta^*$  denotes the effective quantum yield and  $\beta_0$  the real quantum yield. This report

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Influence of Surface Recombination Upon the Kinetics  
of Photoconductivity in Semiconductors

SOV/57-25-9-3/33

covers an investigation of the spectral distribution of the stationary photocurrent, of the effective quantum yield and of the effective life which were recorded by methods described in publications. It is believed that the spectral dependence found in connection with the investigation of the quantum yield has a physical meaning and that it is not connected with the insufficiently short period during which the yield was measured. There is every indication that the CdS monocrystals actually exhibit such a real spectral dependence of quantum yield. V.Ye. Lashkarev, Member, Academy of Sciences, Ukr SSR proposed the subject for this study.

V.Yu. Fedorchenko assisted in the calculations. There are 9 figures and 14 references, 13 of which are Soviet.

ASSOCIATION: Institut fiziki AN USSR Kiyev (Institute of Physics, AS UkrSSR, Kiyev)

SUBMITTED: December 6, 1957  
Card 2/3

SOV/57-28-10-7/40

24(6)  
AUTHORS: Broude, V. L., Yeremenko, V. V., Sheynkman, M. Z.

TITLE: Investigation of the Spectral Distribution of Photoconductivity of CdS ~~Single-Crystals~~ at 77 and 20°K (Issledovaniye spektral'nogo raspredeleniya fotoprovodimosti monokristallov CdS pri 77 i 20°K)

PERIODICAL: Zhurnal tekhnicheskoy fiziki, Vol 28, Nr 10, pp 2142-2151 (USSR)

ABSTRACT: This is a presentation of the results of an investigation of the spectral distribution of the photocurrent and of the eigentime of the photocarriers at 77 and 20°K, and of the relation of these quantities to the coefficients of light absorption for different wave lengths. The four functions, that of the spectral distribution of the photocurrent  $I_{ph}(\lambda)$ , that of the eigentime  $\tau^0(\lambda)$ , and that of the ratio  $I_{ph}(\lambda)/\tau^0(\lambda)$  on the one hand, and that of the light absorption coefficient  $\kappa$  at the limit of intrinsic absorption on the other were compared carefully. It appeared that no unique relation can be established between these quantities. Hence the dependence of the photosensitivity upon the absorption coefficient is obviously superimposed by a

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SOV/57-28-10-7/40

Investigation of the Spectral Distribution of the Photoconductivity of CdS  
Single-Crystals at 77 and 20°K

dependence upon the wavelength of the absorbed light. It results that the fine structure of the spectral distribution of the photosensitivity at low temperatures cannot be explained by a mechanism which is connected with the value of the absorption coefficient, with the influence of the crystal surface and similar phenomena. The explanation is apparently afforded by a parallel action of several mechanism effective either in the absorption of light or in the creation or annihilation of photocarriers. Special notice is given to the little pronounced structure of the spectral distribution of  $\tau^0(\lambda)$  at 77°K in a range where the spectral structure of the photocurrent is expressly evident. This may offer evidence for the fact that it is not possible to explain the spectral structure of photoconductivity by a simple surface recombination of the free carriers. From the considerations advanced in this paper it proceeds that it is necessary to introduce a relation between the quantities determining the photosensitivity of crystals and the frequency of the exciting light. The experimental parameters which are available at present are insufficient for giving a

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SOV/57-28-10-7/40

Investigation of the Spectral Distribution of the Photoconductivity of CdS  
Single-Crystals at 77 and 20°K

unique answer to the question how such a relation should be established. In this paper only a few possibilities can be mentioned. A careful confrontation of the spectral distribution of the steady photocurrent with the absorption spectra showed the absence of any immediate connection between photoconductivity and the narrow absorption lines. V. Ye. Lashkarev, Member, Academy of Sciences, UkrSSR, and A. F. Prikhot'ko, Corresponding Member of the Academy of Sciences, UkrSSR, showed constant interest in this work. E. I. Rashba discussed the work with the authors. There are 5 figures, 2 tables, and 28 references, 16 of which are Soviet.

SUBMITTED: December 16, 1957

and 3/5

SHEYNKMAN, M. K. Cand Phys-Math Sci -- (diss) "Study of the photoconductivity of monocrystals of the cadmium-sulfide type." Kiev, 1959. 14 pp (Acad Sci UkSSR. Inst of Physics), 110 copies. List of author's works at end of text (15 titles) (KL, 44-59, 125)

41072  
S/058/62/000/008/081/134  
A062/A101

24.2600  
7.4177

AUTHORS: Lashkarev, V. Ye., Lazarev, D. P., Sheynkman, M. K.  
TITLE: On the passage mechanism of through photocurrent in a metal-semi-conductor contact

PERIODICAL: Referativnyy zhurnal, Fizika, no. 8, 1962, 29, abstract 8E219  
(In collection: "Fotoelektr. i optich. yavleniya v poluprovodnikakh"  
Kiyev, AN USSR, 1959, 20 - 32)

TEXT: Investigations were made of the phenomena that take place on a metal-semiconductor contact at a uniform and probe illumination of monocrystalline CdS samples. The generation of large photocurrents, many times exceeding the dark currents on the metal, is explained by the idea of a gate - a thin ( $10^{-7}$  cm) double layer (the electrons on the metal, the holes on the semiconductor), formed upon the illumination of the crystal and reducing the inner work function in the metal  $\rightarrow$  semiconductor direction. Observations of the potential distribution along the CdS crystal with Au (non ohmic) contacts have indicated the presence of potential jumps at the electrodes attaining 40 - 70 % of the total voltage drop on the sample. The ob-

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A062/A101

On the passage mechanism of through...

served potential drop at the cathode embraces not only the gate region, but also a portion of the semiconductor volume (the so-called photocurrent barrier layer). With an increase of illumination the barrier potential jumps increase on the cathode and decrease on the anode. When illuminating an ohmic In contact one observes either a reduction of the "antibarrier ability" thereof or even a transition to the "barrier ability", analogous to the increase of the barrier jump on a gold cathode. The probe characteristics of the samples, that is, the magnitudes of the stationary currents traversing the sample as a function of the position of the luminous probe between the electrodes, were investigated. A small photocurrent drop is observed when displacing the luminous probe from the cathode to the anode (length of the sample: 1 - 1.5 mm). The time of setting up of the stationary photocurrent on probe illumination of an In anode (cathode of gold) is 10 times longer than in the case of a Au anode (cathode of indium). The unusual inertness on the anode illumination when the cathode is a barrier electrode (Au) serves, in the authors' opinion, as a direct confirmation of the hypothesis on the necessity of accumulating holes to form a gate. Illuminating a cathode of indium as well as of gold reduces by entire orders of magnitude the photocurrent rise time in comparison with the illumination of the anodes. For that reason,

C.

Card 2/3

SAL'KOV, Ye.A.; FEDORUS, G.A.; SHEYNKMAN, M.K.

Effect of surface processing on some photoconductivity characteristics  
of CdS monocrystals. Fiz. tver. tela 1 no.4:579-582 '59.  
(MIRA 12:6)

1. Institut fiziki AN USSR, Kiyev.  
(Cadmium sulfide crystals) (Photoconductivity)



37382

S/120/60/000/004/024/028  
E073/E435

9,4160(3201,1003,1105)

AUTHORS:

Golynnaya, G.I., Fedorus, G.A. and Sheynkman, M.K.

TITLE:

Sulphur-Cadmium Photoresistances With Improved Contacts

FSK-M1 (FSK-M1)

PERIODICAL: Pribory tekhnika eksperimenta, 1960, No.4. pp.141-142

TEXT: The developed technology of producing electrodes on CdS, CdSe and CdSe-CdSe single crystals consists of treating the sub-electrode surface of the crystal in a glow discharge prior to depositing the metal (Ref.2). The discharge is produced between two aluminium discs, under a vacuum hood or in the case of special cuts in air at a pressure of  $10^{-1}$  to  $10^{-2}$  mm Hg. The crystals are placed on the lower disc and are in electrical contact with it. After treating the crystals in the discharge for several minutes with an average discharge current density of several tens of  $\text{mA/cm}^2$  the vacuum is increased to  $10^{-5}$  to  $10^{-6}$  mm Hg  $\text{cc1}$ , and the aluminium electrodes are deposited on the surface of the crystals by evaporation. Aluminium deposited by evaporation bonds closely to the surface of the crystal and to the mica to which the crystal is glued, it is mechanically strong and will not corrode in air, even at elevated temperatures. Investigation of the physical

card 1/4

87382

S/120/60/000/004/024/028  
E073/E435

Sulphur-Cadmium Photoresistances  $\Phi$ CK-M1 (FSK-M1) With Improved  
Contacts

illumination of the crystal. The photoresistances FSK-M1  
produced by IFAN UkrSSR are supplied only with aluminium contacts  
produced according to the here-described method. There are  
2 figures and 4 references (Soviet).

ASSOCIATION: Institut fiziki AN UkrSSR  
(Institute of Physics AS UkrSSR)

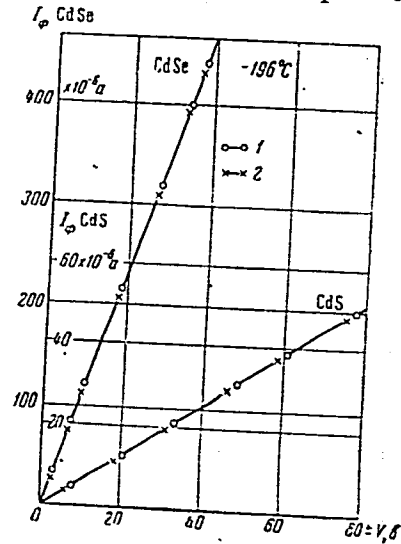
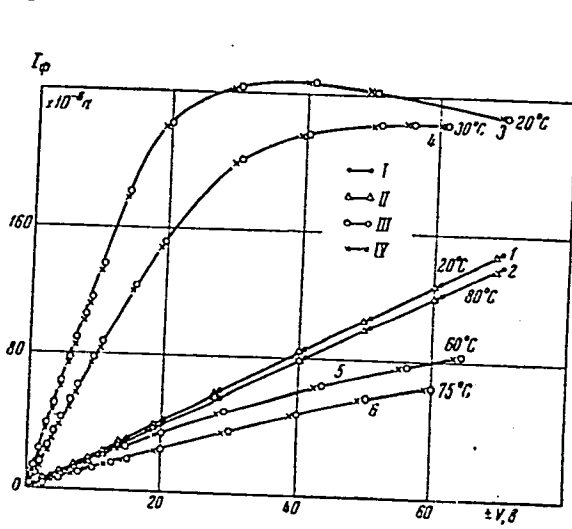
SUBMITTED: May 27, 1959

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87382

S/120/60/000/004/024/028  
E073/E435

Sulphur-Cadmium Photoresistances ФСК-М1 (FSK-M1) With Improved Contacts



Card 4/4

Fig.1.

Fig.2.

81633  
S/181/60/002/06/21/050  
B006/B056

24,3950  
AUTHOR:

Sheynkman, M. K.

TITLE:

The Mechanism of the Photoconductivity in CdS-Type Single Crystals

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 6, pp. 1155-1159

TEXT: The author already interpreted experimental results in previous papers (investigation of the spectral dependence of the steady photocurrent and of the quantum yield of the photocurrent at various temperatures) to the effect that excitons participate in the occurrence of photoconductivity in CdS-type single crystals. Most scientists still today are inclined to believe that in these crystals light absorption has exciton character; the fine structure of the absorption bands, the diamagnetic shifting of the bands, the hydrogen-like character of the blue luminescence bands, and a number of other effects are brought into connection with the occurrence of excitons. One of the most important proofs for the occurrence of excitons and their influence upon photoconductivity effects was given by V. Ye. Lashkarev and G. A. Fedorus

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81633

The Mechanism of the Photoconductivity  
in CdS-Type Single Crystals

S/181/60/002/06/21/050  
B006/B056

(Ref. 9), who found the dependence of the quantum yield of the internal photoeffect upon the concentration of the photocarriers in the crystal. The simplest model that is based upon the participation of excitons in photocarrier production is the scheme of double optical transitions, with the aid of which the new photoelectric peculiarities of CdS-type single crystals may be explained. On the basis of this exciton hypothesis also other experimental results are analyzed, as e.g. the lux-ampere characteristics of the photocurrent  $I_{ph}(L) \sim L$ , the dependence of the photocurrent yield upon the light intensity  $a_g(L) \sim L$ , as well as the function  $\tau^0(L) \sim L$  ( $\tau^0$  is the relaxation time of the photocurrent); these three functions are represented in Fig. 1. It immediately shows that the scheme of double optical transitions is not able to explain these functions. The endeavor is therefore made to explain all these effects by using a different model representation. The function  $\tau^0 \sim L^{-1}$  was found to be explainable by quasibimolecular photocarrier recombination, and the increase of the photocurrent yield  $a_g \sim L$  by a triple-impact model in the production of photocarriers from excitons, for which there again exist

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The Mechanism of the Photoconductivity  
in CdS-Type Single Crystals

81633

S/181/60/002/06/21/050  
B006/B056

three possibilities, one of which is schematically represented in Fig. 2: The interaction between an exciton and a phonon within the region of a charged electron trap. In the transition scheme shown in Fig. 2, level I represents the electron traps which are slightly filled in the dark and are neutral if they contain no electrons; II - recombination levels which are nearly filled up in the dark with electrons. This scheme is analyzed, and it is shown to be able to explain a number of effects such as the kinetic effects of photoactivation. The new scheme ought, if it represents real conditions, to entail a number of new phenomena to be verified experimentally (the photosensitivity of the samples should grow with trap concentration; the electron concentration in the traps would have to be proportional to  $a_g$ , etc.). The author finally thanks V. Ye. Lashkarev, Academician of the AS UkrSSR, for his interest and discussions. There are 2 figures and 9 references: 6 Soviet, 2 German, and 1 French.

ASSOCIATION: Institut fiziki AN USSR, Kiyev (Institute of Physics of the AS UkrSSR, Kiyev)

SUBMITTED: October 12, 1959

Card 3/3

X

25567

S/185/60/005/002/002/022  
D274/D304

9,4177

AUTHORS: Sal'kov, Ye.A., Fedorus, G.A. and Sheynkman, M.K.

TITLE: On the role of contacts in the effects of photoactivation and infrared extinction of photoconductivity in CdS single crystals

PERIODICAL: Ukrayins'kyy fizychnyy zhurnal, v. 5, no. 2, 1960, 141-148

TEXT: The question is examined whether the peculiar features of photoconductivity of CdS single crystals are properties of the semiconductor or whether (and to what extent) they belong to the contact between semiconductor and metal. Photoactivation and infrared extinction were studied on CdS single crystals with ohmic (strongly anti-depletion) contacts, obtained by applying melted In or Ga to the surface, and on specimens with depletion contacts, obtained by Al-spraying of the unprocessed surface. The main result of the experiments was that the investigated effects are related to the semiconductor itself, and not to the contacts. Fig. 3 shows a block-

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S/185/60/005/002/002/022  
D274/D304

On the role of contacts...

diagram of the measuring device. A variable voltage was applied to the specimen, of frequency 100 kc and amplitude 1.65 v. With given parameters of the circuit, capacitance of specimens equal to 0.1 pFar., and ohmic contacts, no dependence whatsoever of the photocurrent on the frequency of the applied voltage was observed even at frequencies of 200 kc. In studying the photoactivation, the specimen was simultaneously illuminated from both monochromators. The light from one monochromator was modulated, whereas the light from the other was fixed. The dependence of the photocurrent-amplitude on the light-intensity was measured at both constant and variable (100 to 200 kc) voltages). The displacement of the photocarriers in the specimens did not exceed, as a rule, 1/40 of the distance between the electrodes (which was 2mm) when a variable voltage (100 kc) was applied. Hence the effects observed in this case were not related to contacts. Constant-voltage measurements were carried out on more than 20 specimens with different contacts; the ordinary method of measurement was used. V.E. Lashkarev, Ye.A. Sal'kov, G.A. Fedorus, M.K. Sheynkman (Ref. 11: UFZh, 2, 261, 1957; 3, 207, 1958; DAN SSSR, 114, 1203, 1957). The spectral distribution

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4301  
S/185/60/005/002/002/022  
D274/D304

On the role of contacts...

of infrared extinction of the photocurrent on ohmic specimens is not dependent on the frequency of the applied voltage (from 0 to 200 kc). The lux-ampere relationship, the kinetics of the photocurrent, the photoactivation, and the infrared extinction are related to the semiconductor and not the contacts. Hence the assumption formulated by various authors is correct; among these: A. Rosa (Ref. 6: Proc. IRE, 43, 1850, 1955) and R.H. Bube (Ref. 7: Phys. and Chem. Solids, 1, 234, 1957). Photoactivation and extinction were observed at both constant and variable voltage. Whereas in ohmic specimens the photocurrent does not depend on the frequency, the photocurrent in non-ohmic specimens is frequency-dependent. In the case of non-ohmic (depletion) contacts, the effects measured at constant voltage give results entirely different from measurements at variable voltage. Photoactivation is often observed at variable voltage only, and not at constant. Hence measurements of photocurrent characteristics on ohmic specimens permits determining the internal and surface properties of semi-conductors, whereas measurements on specimens with depletion contacts - determination of the properties of the contacts. The frequency characteristic of the

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S/185/60/005/002/002/022  
D274/D304

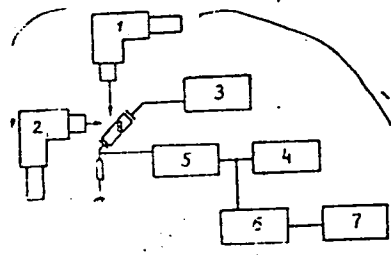
On the role of contacts...

photocurrent in specimens with depletion contacts apparently corroborates the assumption of "sluice" formation at such contacts. There are 10 figures and 12 references: 8 Soviet-bloc and 4 non-Soviet-bloc. The references to the English-language publications read as follows: R.H. Bube, Phys. Rev., 99, 1105, 1955; A.Rosa, Proc. IRE, 43, 1850, 1955; R.H. Bube, Phys. and Chem. Solids, 1, 234, 1957; I. Lambe, Phys. Rev., 98, 985, 1955.

ASSOCIATION: Instytut fizyki AN USSR (Physics Institute, AS Ukr SSR)

SUBMITTED: July 3, 1959

Fig. 3 Legend: 1 & 2 - monochromators;  
3 - sinusoidal voltage generator;  
4 - millivoltmeter; 5 - amplifier;  
6 - rectifier; 7 - oscillograph;  
8 - specimen



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22052

S/181/61/003/004/018/030  
B102/B214

14,7500 (1136,1143,1160)

AUTHORS: Pisarenko, Zh. G. and Sheynkman, M. K.

TITLE: Visualization of dislocations in CdS single crystals  
by etching

PERIODICAL: Fizika tverdogo tela, v. 3, no. 4, 1961, 1152-1157

TEXT: It is known that on the (0001) plane of CdS single crystals, etch patterns of hexagonal form appear, which are attributed to dislocations. However, no methods of visualizing this for other planes, e.g., (1120) or (1010) are known. Such a method is suggested here. The CdS single crystals were obtained by synthesis and sublimation. First, their orientation was determined by X-rays. They were, for the most part, plane-parallel plates (5 x 3 x 0.01 mm) which were partly smooth like glass and partly striated. Some diverged from this orientation by a few minutes up to 15°. Before and after etching the surfaces were studied by metallographic microscopes, МММ-5 (МММ-5) and МММ-8 (МММ-8), visually and by means of microphotos. The best results were obtained by etching in hot hydrochloric acid vapor. Concentration of the acid,

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S/181/61/003/004/018/030  
B102/B214

X

Visualization of dislocations ...

temperature, and duration of etching were varied to determine the optimum conditions. It was found that the results were most favorable under the following conditions: The crystals were exposed to vapor for 1-1.5 min at 100°C and placed 4-5 cm above the acid surface; the acid concentration was 25-30%. After etching the crystals were rinsed in water. During etching the crystals were placed in a fine molybdenum net. The relationship between etching pits and dislocations was also investigated. The following conclusions were drawn: As in many other crystals, the etching pits are arranged in terrace form, their shape depending on the face indices. If the etching time is extended, no new pits will appear. This indicates that the etching pits correspond to dislocation lines. On studying thin crystals (up to 10  $\mu$ ) it was found that the etching pits were arranged antiparallel on opposite faces (11 $\bar{2}$ 0). One can assume that these were on one of the dislocation lines passing through the whole crystal. A characteristic feature of dislocations is their behavior on thermal treatment. Experiments of this kind (700°C, He atmosphere, 4 hours) showed that the etching-pit density rises up to 100 times on heat treatment. It was also found that the dislocation densities at the center and at the edges of the crystal were very different.

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S/181/61/003/004/018/030  
B102/B214

Visualization of dislocations ...

This shows that the introduction of impurities by diffusion from the surface leads to a highly inhomogeneous distribution of the impurities. Further experiments will show whether there is any relationship between the dislocations of CdS-type crystals and their electrical and photo-electrical properties. The authors thank V. Ye. Lashkarev, Member of the AS UkrSSR, for his interest; and V. N. Vasilevskaya and L. I. Datsenko for discussions and help. There are 5 figures and 6 references: 2 Soviet-bloc and 4 non-Soviet-bloc. The three most important references to English-language publications read as follows: M. Kikuchi, S. Jizima, J. Phys. Soc. Japan, 14, 1638, 1959; D. C. Reynolds, S. J. Chysak, J. Appl. Phys. 31, 94, 1960; J. Nishimura, J. Phys. Soc. Japan, 15, 732, 1960.

ASSOCIATION: Institut fiziki AN USSR Kiyev (Institute of Physics,  
AS UkrSSR, Kiyev)

SUBMITTED: August 2, 1960 (initially) and October 26, 1960 (after  
revision)

Card 3/3

25684 S/181/61/003/007/006/023  
B102/B202

~~247700~~ (1035, 1138, 1482)

AUTHORS: Lashkarev, V. Ye., Sal'kov, Ye. A., and Sheynkman, M. K.

TITLE: Study of the photoactivation of the photocurrent yield in CdS single crystals

PERIODICAL: Fizika tverdogo tela, v. 3, no. 7, 1961, 1973 - 1982

TEXT: The authors attempted to study the activation of the photocurrent yield in CdS-type single crystals in a temperature range of from - 70 to + 115°C. The method consists in the following: the specimen is exposed to short rectangular pulses and, independently thereof, also subjected to an exposure constant with time; the experiment shows that with increasing intensity of illumination the slope of the first part of the curve of growth of the photocurrent determining the photocurrent yield increases. The photoactivation of CdS single crystals has been discovered and described by Lashkarev and G. A. Fedorus (Izv. AN SSSR, ser fiz. 16.81, 1952). It has been observed by the authors also in CdSe and CdS-CdSe. Several attempts have been made to a theoretical study and explanation of this effect. Thus, e. g., L. G. Paritskiy and

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25684 S/181/61/003/007/006/023  
B102/B202

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Study of the photoactivation ...

S. M. Ryvkin (FTT, II, 545, 1960) explained the photoactivation in CdS-single crystals by the presence of fast adhesion levels for photo-carriers. The authors found that in these crystals the curves of growth of the photocurrent consist of two parts with different slopes and that the exposure influences only the slope of the second part. In some cases the concepts on photoactivation strongly diverge. In view of the experimental results this process is obviously complicated. The present paper is intended to contribute to the explanation of these problems. The main possibilities of explaining the effect of photoactivation consist in the explanation of the relationship between the actual quantum yield  $G$  and the light intensity  $L$  as well as in an application of the concepts on the fast adhesion levels to the kinetics of the photocurrent. In order to explain the nature of the photoactivation, a so-called "discriminating experiment" is necessary which admits the clear determination of the proper mechanism. It is demonstrated that different mechanisms of photoactivation may lead to different shapes of the curves  $G_f(N)$  where  $G_f$  is the slope of the second part of the curve of growth of the photocurrent and  $N$  the electron concentration. Three mechanisms are studied

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S/181/61/003/007/006/023  
B102/B202

Study of the photoactivation ...

more thoroughly. a) Existence of fast adhesion levels (discrete level of depth  $U_1$ , and concentration  $\chi_1$ ).  $G_f(N)$  is then given by

$$G_f = \left[ 1 + \frac{\chi_1 Q_1}{(Q_1 + N)^2} \right]^{-1} G(1) \text{ where } Q_1 = Q \exp(-U_1/kT), Q \text{ is a statistical factor}$$

of the conduction band equal to  $3 \cdot 10^{19} \text{ cm}^{-3}$  at room temperature, when  $m_{\text{eff}} = m_e$ . b) The fast adhesion levels form not one discrete level but an energy band from  $U_1$  to  $U_2$  in which they are irregularly distributed with the density  $\chi(U)$ ;

$$G_f = \left[ 1 + \frac{\chi(U)}{Q_2 + N} \right]^{-1} G, \tag{2}$$

$$Q_2 = Q e^{-\frac{U_2}{kT}}; \quad Q_1 = Q e^{-\frac{U_1}{kT}}$$

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S/181/61/003/007/006/023  
B102/B202

Study of the photoactivation ...

then holds. c) The occurrence of carriers is the result of a photoactive exciton decay on an occupied slow electron level (concentration  $\kappa_1$ , depth  $U_1$ ). Then,  $G_f = \frac{N}{Q_1 + N} G_{max}$  (3) where  $G_{max}$  is the maximum quantum yield,  $Q_1 = Q \exp(-U_1/kT)$ . These three cases are theoretically studied in detail in the  $G_f(x)$  curves, where  $x = N/\kappa_1$ , are compared. Experimental studies were made with non-treated CdS-single crystals (grown from vapor). Indium sputtered in a vacuum served as electrodes thus warranting the linearity of the volt-ampere characteristics in a wide range of voltage and concentration. Also, the lux-ampere characteristics were measured in all specimens. A Kerr cell served as light modulator. The curve of growth of the photocurrent a typical specimen is shown in Fig. 3. The  $G_f(I_{phot})$  curves were taken from several specimens. According to the course of these curves the specimens could be divided into two groups. Compared to the theoretical results, the experiments show that in the CdS-single crystals with linear lux-ampere characteristic photoactivation.

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25684

S/181/61/003/007/006/023  
B102/3202

Study of the photoactivation...

is caused by the existence of fast adhesion levels of either discrete or continuous energy distribution. Photoactivity which is connected with a change of the actual quantum yield as the result of a change of the exposure intensity could not be observed. There are 6 figures and 9 references: 8 Soviet-bloc and 1 non-Soviet-bloc.

ASSOCIATION: Institut poluprovodnikov AN USSR Kiyev (Institute of Semiconductors AS UkrSSR, Kiyev)

SUBMITTED: January 28, 1961

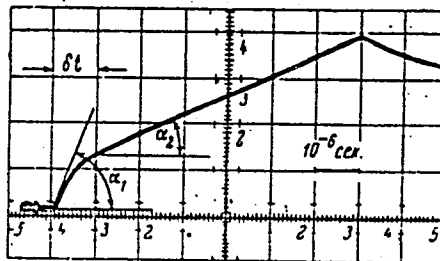


Fig. 3

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9.4177 (1035/1951)

30802  
S/81/61/003/011/049/056  
B138

26.421  
AUTHORS:

Kynev, St., and Sheynkman, M. K.

TITLE:

Effect of a strong electric field on the kinetics of photocurrent in single crystals of SiS

PERIODICAL:

Fizika tverdogo tela, v. 3, no. 11, 1961, 3539-3541

TEXT: During the measurements of the increase in photocurrent the specimens were either in a vacuum ( $10^{-6}$  mm Hg) or in air. When steady photocurrent had been established after illumination ( $\lambda = 5200-5300 \text{ \AA}$ ), the light was switched off and the specimen remained in darkness for a certain period of time  $\Delta t_d$  ( $\Delta t_d = 20-600 \text{ sec}$ ). The light was again switched on and the curve of the increase in photocurrent was observed on the screen of an  $\text{ЭНО-1}$  (ENO-1) oscilloscope. The time  $\tau_{50\%}$  required for a 50% increase was calculated. The experiments were repeated with the same periods of darkness and light, but during the dark period a sinusoidal voltage with a frequency of 70-100 kc/sec and an amplitude of 0.5 kv was applied to the side electrodes. It was found that  $\tau_{50\%}$  was considerably longer in this

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Effect of a strong electric ...

case than in the absence of a high-frequency field. In some cases this increase was 200 times. Heating the specimen had no effect on  $\tau_{50\%}$ . The  $\tau$  value increased with the amplitude, the high frequency field, and the length of the dark period. The large increase in  $\tau$  is attributed to destruction of electron adhesion levels and hole trapping and adhesion levels by the electric field causing redistribution between the various recombination levels, followed by rapid recombination. The  $\tau$  values are given to Academician AS UkrSSR V. Ye. Lashkarev for discussions. There are 1 figure and 12 references: 6 Soviet and 6 non-Soviet. The three most recent references to English-language publications read as follows: I. T. Steinberger. I. Phys. Chem. Solids, 15, 354, 1960. W. W. Egan, F. E. Williams. Solid State Physics, 6, 95, 1958. R. N. Dexter. J. Phys. Chem. Solids, 8, 494, 1959.

ASSOCIATION: Institut poluprovodnikov AN USSR Kiev (Institute of Semiconductors AS UkrSSR, Kiev)

SUBMITTED: March 31, 1961 (initially) July 28, 1961 (after revision)

Card 2/32

17

28443

On the spectral dependence of ...

S/185/61/006/002/019/020  
D210/D304

ASSOCIATION: Instytut napivprovidnykiv AN URSR, m. Kyiv (Insti-  
tute of Semiconductors, AS UkrSSR, Kiyev) X

SUBMITTED: January 2, 1961

Card 3/3

24.7700

37806

S/120/62/000/002/037/047  
E140/E163

AUTHORS:

Kynev, St., Sheynkman, M.K., Shul'ga, I.B.,  
and Fursenko, V.D.

TITLE:

Contactless method of measuring the parameters of  
certain semiconductors

PERIODICAL:

Pribory i tekhnika eksperimenta, no.2, 1962, 154-159

TEXT:

Essentially, the method consists in placing the  
sample of semiconductor between two capacitor plates in a  
Hartley oscillator circuit and measuring the change of grid  
current. This can be calibrated in terms of the change of grid  
conductivity of the sample. The oscillator operates at about  
10-15 Mcs. The electrodes are shaped so that the sample can be  
illuminated, for determining its photoelectric properties.  
Some applications are: acceptance testing of samples for their  
photoelectric properties, under conditions eliminating the  
distorting effects of electrodes in contact with the sample;  
study of just these distorting effects; study of samples in an  
enclosed volume without requiring their exposure to the  
atmosphere; study of the kinetics of infra-red extinction of a  
Card 1/2

24.2600

37931

S/181/62/004/005/020/055  
3125/3108AUTHORS: Sheynkman, M. K., and Luk'yanchikova, N. B.

TITLE: Some features of the photocurrent noises in the exciton mechanism of carrier production in insulating photoconductors

PERIODICAL: Fizika tverdogo tela, v. 4, no. 5, 1962, 1213-1221

TEXT: Starting from the spectral density  $S(f) = 4 \int_0^{\infty} \psi(\theta) \cos \omega \theta d\theta$ ,  $\omega = 2\pi f$  of the intensity of fluctuations and using the correlation function  $\psi(t-t_0) = \overline{\Delta n(t) \Delta n(t_0)}$ ,  $\theta = t-t_0$ , the authors derive the spectrum

$$S_n(f) = \frac{4\gamma_{11}\tau_1(\overline{\Delta n^2}\gamma_{22} - \overline{\Delta n\Delta h}\gamma_{12})}{D(1+\omega^2\tau_1^2)} + \frac{4\gamma_{12}\tau_2(-\overline{\Delta n^2}\gamma_{21} + \overline{\Delta n\Delta h}\gamma_{11})}{D(1+\omega^2\tau_2^2)} \quad (10)$$

of the photocurrent noises for (a) the exciton mechanism of production (rate of production  $aLh\nu$ ) and (b) the direct band-band excitation (rate of production  $L$ ). The authors use the correlation method of K. M. Van Vliet and I. Blok (Physica, 22, 231, 1956). From (10) the expressions

Card 1/1 4

Some features of the photocurrent ...

S/181/62/004/005/020/055  
B125/B108

$$S_n^*(f) = \frac{4\tau_1^2 \left( \overline{\Delta n^2} - \frac{1}{2} B_{11}^* \tau_2 \right)}{(\tau_1 - \tau_2)(1 + \omega^2 \tau_1^2)} + \frac{4\tau_2^2 \left( -\overline{\Delta n^2} + \frac{1}{2} B_{11}^* \tau_1 \right)}{(\tau_1 - \tau_2)(1 + \omega^2 \tau_2^2)} \quad (13)$$

$$\overline{\Delta n^{2*}} = \frac{B_{11}^* \left[ -a_{12}^* a_{21}^* + a_{11}^* a_{22}^* + (a_{22}^*)^2 \right] - 2B_{12}^* a_{12}^* a_{22}^* + B_{22}^* (a_{12}^*)^2}{2(a_{11}^* + a_{22}^*)(a_{12}^* a_{21}^* - a_{11}^* a_{22}^*)} \quad (14)$$

$$\left. \begin{aligned} B_{11}^* &= 2\delta(n + n^0)(\mathcal{Q}\lambda - h) + 2 \frac{n + n^0}{\tau}; \\ B_{22}^* &= 2\delta(n + n^0)(\mathcal{Q}\lambda - h); \\ B_{12}^* &= B_{21}^* = -\delta(n + n^0)(\mathcal{Q}\lambda - h) - gh. \end{aligned} \right\} \quad (15)$$

with

$$\| a_{ij} \| \| \overline{\Delta n_i \Delta n_j} \| + \| \overline{\Delta n_i \Delta n_j} \| \| \bar{a}_{ij} \| = - \| B_{ij} \|, \quad (11)$$

Card 2/5 4



Some features of the photocurrent ...

S/181/62/004/005/020/055  
B125/B108

and

$$B_{ii} = 2 \sum_{k=1}^{s+1} p_{ik}, \quad i=1, 2, \dots, s; \quad B_{ij} = -p_{ij} - p_{ji}, \quad i \neq j=1, 2, \dots, s; \quad (12)$$

are derived. The index  $j$  refers to exciton mechanism. Fig. 1 gives the scheme of transitions.  $n$  is the concentration of the additional (photo-) electrons,  $\mathcal{N}$  the concentration of the trapping levels (denoted by I) for electrons that are in heat exchange with the conduction band,  $h$  - the total number of electrons on these levels,  $\xi = \delta Q e^{-u/kT}$  - the probability of ejection into the band,  $Q = 2(2\pi m^* kT)^{3/2} / h^3$  - the statistical factor of the conduction band,  $u$  - the depth of the levels I. The levels II are carrier recombination levels.  $n_0$  is the number of the dark current carriers in the conduction band. Fig. 2 shows the dependence of the zero frequency noise  $S_0$  on the electron concentration for the cases (a) and (b). The

quantity  $(\Delta n^2 / n)^{exc}$  has a sharp maximum in a certain region of  $n$ . The "self-sustaining" of the fluctuations in the conduction band causes a sharp increase of the decay time  $\tau_1^{exc}$  of the fluctuations. The exciton

Card 5/5 (

Some features of the photocurrent ...

S/181/62/004/005/020/055  
B125/B108

photocurrent noise can be much greater than the noise in the absence of excitons. The photocurrent increases rapidly with the illuminance in the region of intense photocurrent fluctuations. These phenomena are caused by the instability of the quantum yield which leads to a positive feedback. There are 4 figures. f

ASSOCIATION: Institut poluprovodnikov AN SSSR Kiyev (Institute of Semiconductors AS USSR, Kiyev)

SUBMITTED: December 25, 1961

Fig. 1: The scheme of the transitions in an insulating photoconductor (e. g. CdS type).

Fig. 2: Dependence of the low-frequency noises  $S_0$  (1) and  $S_0^{exc}$  (2) and of the correlation times  $\tau_1$  (3) and  $\tau_1^{exc}$  (4) on the concentration  $n$  of photocarriers.

Card 4/6 4

35203  
S/185/62/007/002/015/016  
D299/D302

24.7780 (1043, 1055, 1144)

AUTHORS: Shenkman, M.K., and Luk'yanchykova, N.B.

TITLE: On determining the mechanism of the photoeffect in  
semiconductors by studying photocurrent noises

PERIODICAL: Ukrayins'kyy fizychnyy zhurnal, v. 7, no. 2, 1962,  
223 - 225

TEXT: A theoretical analysis was made of photocurrent noises in  
the presence of various exciton mechanisms of photocarrier genera-  
tion. The conclusion is reached that the exciton mechanism of pho-  
tocarrier generation can be experimentally determined by measuring  
the photocurrent noises are greatly affected by a mechanism of pho-  
tocarrier generation which involves the decay of an exciton into a  
hole-electron pair in the vicinity of a charged electron trapping-  
level with phonon absorption. The transition scheme for this case  
is shown. The noise was determined by means of the correlation func-  
tion. This function was obtained from Langevin's equation. The quan-  
tities  $\Delta n^2$  and  $\Delta n \Delta h$ , which enter the correlation function, (n  
Card 1/3

X

S/185/62/007/002/015/016  
D299/D302

On determining the mechanism of ...

denoting the conduction electrons and  $n$  - the number of electrons at the trapping levels), are determined by the Fokker-Planck method. Thereby the important noise-characteristic  $\Delta n^2/n$  is obtained. The frequency spectrum of the noises  $S$  is determined from the (already known) correlation function by means of Wiener-Khinchin's theorem. A comparative calculation was made of the noises in the same transition scheme, for the case of an exciton mechanism of carrier generation and without such a mechanism; parameter values, met in actual calculations, were used. The comparison showed that, starting with a concentration  $n^0 = 10^6 \text{ cm}^{-3}$ , the exciton noises greatly exceeded those of a mechanism without excitons. At the maximum of the  $S_0$ -vs.- $n$  curve, the difference in the value of  $S_0$  (with- and without excitons), was up to 6 orders of magnitude. With a further increase in  $n$ , the exciton noises decrease, reaching almost the same values as those without excitons. The quantity  $\Delta n^2/n$  which equals unity (without an exciton mechanism), is considerably larger if excitons are present; in fact, at the maximum, it reaches several thousand. Thus, the quantities  $S_0$  and  $\Delta n^2/n$ , related to the noises, differ considerably, depending on the presence or ab-

Card 2/3

37186  
S/185/62/007/004/010/018  
D407/D301

24.3500

AUTHORS:

Svyechnykov, S. V., Chalaya, V. ~~K.~~, and  
Sheynkman, M. K.

TITLE:

On the probe characteristics of X-ray and  
photoelectric current in CdS-type single  
crystals

PERIODICAL:

Ukrayins'kyy fizychnyy zhurnal, v. 7, no. 4,  
1962, 396-402

TEXT: The dependence was studied of the photocurrent on the position of the probe (between the electrodes) during the excitation of CdS, CdSe, CdS<sub>x</sub>·CdSe<sub>1-x</sub> single crystals by a narrow light or X-ray probe. The influence of the following processes on the conductivity of the single crystals under local excitation was considered: electron drift from the lighted to the dark side of the crystal, bipolar diffusion of photocarriers, exciton

Card 1/3

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D407/D301

On the probe...

diffusion, resonance energy transfer in dipole-dipole interactions, reabsorption of the luminescence light, etc. It was found that no definite conclusion can be reached for the dominant photo-current component and the role of the hole component by considering the stationary probe characteristic of the photo-current only. The probes were 0.1 mm thick, which is by one order of magnitude less than the distance between the electrodes. Visible light of various wavelength was used; the wavelength of the X-rays was 0.708 and 2.285 Å. It was found that the maximum of the probe characteristic can be located (for both the light and the X-rays) at the cathode, anode, and also between them. The value of the photocurrent at the maximum of the probe characteristic near the cathode is about  $10^{-6}$  -  $10^{-8}$  amp. This is about 4 - 5 orders of magnitude higher than the calculated values. The trapping factor  $q$  was estimated ( $q = 10^3$ ). The photocurrent at the anode was also larger than predicted by theory. The

Card 2/3

SAL'KOV, Ye.A.; SHEYNKMAN, M.K.

A method for determining the parameters of recombination levels in monopolar photoconductors. Fiz. tver. tela 5 no.2: 397-404 F. '63. (MIRA 16:5)

1. Institut poluprovodnikov AN UkrSSR, Kiyev.  
(Photoconductivity)(Cadmium sulfide--Electric properties)

SAL'KOV, Ye. A.; SHEYNKMAN, M. K.

Some properties of contacts between a metal (In, Ga) and a  
photoconductor (CdS). Fiz. tver. tela 5 no.1:237-239 Ja '63.  
(MIRA 16:1)

1. Institut poluprovodnikov AN UkrSSR, Kiyev.

(Photoconductivity)



TROFIMENKO, A.P.; SHEYNKMAN, M.K.

Effect of an electric field on the thermally stimulated  
conductivity of CdS single crystals. Fiz.tver.tela 4 no.7:  
1963-1965 J1 '62. (MIRA 16:6)

1. Institut poluprovodnikov AN UkrSSR, Kiyev.  
(Cadmium sulfide crystals) (Photoconductivity).  
(Electric fields)

KYNEV, St.; SHEYNKMAN, M.K.; SHUL'GA, I.B.; FURSENKO, V.D.

Method for noncontact measurement of the parameters of certain  
semiconductors. Prib. i tekh. eksp. 7 no.2:154-159 Mr-Ap  
'62. (MIRA 15:5)

1. Institut poluprovodnikov AN USSR.  
(Semiconductors--Measurement)

SHEYNKMAN, M.K.; LUK'YANCHIKOVA, N.B.

Some characteristics of photocurrent noise due to the exciton mechanism of carrier generation in insulating photoconductors. Fiz. tver. tela 4 no.5:1213-1221 My '62. (MIRA 15:5)

1. Institut poluprovodnikov AN SSSR, Kiyev.  
(Photoconductivity--Noise)  
(Excitons)

SHEYNKMAN, M.K.

A New possible mechanism of recombination in semiconductors. Ukr. fiz.  
zhur. 7 no.12:1364-1365 D '62. (MIRA 15:12)

1. Institut polyprovodnikov AN UkrSSR, Kiyev.  
(Semiconductors—Electric properties)

L 18024-63 EWT(l)/EWP(q)/EWT(m)/BDS AFETC/ASD/ESD-3 JD/JG  
ACCESSION NR: AP3003873 S/0181/63/005/007/1805/1813

AUTHORS: Trofimenko, A. P.; Fedorus, G. A.; Sheynkman, M. K.

66  
63

TITLE: Dependence of thermoelectric conductivity on illumination conditions for single crystals of CdS treated in sulfur fumes

SOURCE: Fizika tverdogo tela, v. 5, no. 7, 1963, 1805-1813

TOPIC TAGS: thermoelectric conductivity, illumination, Cd, S, fumes, coulomb barrier, activation energy, sulfur, cadmium

ABSTRACT: In their investigation the authors varied the temperature, duration, and conditions of illumination (samples cooled to test temperature during uninterrupted illumination, or cooled to test temperature in darkness and then illuminated). In the region of -100 to -85C, the maximums of thermoelectric conductivity observed at -10 or +18C with a duration of 20 sec depend exponentially on the test temperature of the sample. They have activation energies ranging from 0.7 to 1 ev, depending on the sample. The dependence of the thermoelectric current on the duration of illumination proved to be exponential, varying as the 3rd to 4th power of the duration. The authors discovered that the position of thermoelectric-current peaks depends on the conditions of illumination: only

Card 1/2

L 18024-63

ACCESSION NR: AP3003873

3  
one peak appears at +65C during continuous illumination; illumination at temperatures below -50C gives two peaks (at -10 and +18C), and the peak at +65C is either absent or very small. These peculiarities in the thermoelectric conductivity may be explained on the basis of a complex structure center having several nearby trapping levels surrounded by a single repulsive coulomb barrier. "The authors express their deep thanks to Academician V. Ye. Lashkarev of the Academy of Sciences, Ukrainian SSR for his interest in the work and his very valuable discussions, and they thank I. V. Markevich for aid in making the measurements." Orig. art. has: 6 figures and 2 formulas.

ASSOCIATION: Institut poluprovodnikov AN UkrSSR Kiev (Institute of Semiconductors, Academy of Sciences, Ukrainian SSR)

SUBMITTED: 28Jan63

DATE ACQ: 15Aug63

ENCL: 00

SUB CODE: PH

NO REF SOV: 006

OTHER: 006

Card 2/2

SHEYNKMAN, M.K.

Possible mechanism of recombination on multiply charged centers in  
semiconductors. Fiz. tver. tela 5 no.10:2780-2785 0 '63.  
(MIRA 16:11)

1. Institut poluprovodnikov AN UkrSSR, Kiyev.

LASHKAREV, V.Ye.; GOLYNAYAYA, G.I.; SHEYNKMAN, M.K.

Fast recombination channel on the surface of CdS single crystals. Fiz.  
tver. tela 5 no.12:3420-3425 D '63. (MIRA 17:2)

1. Institut poluprovodnikov AN UkrSSR, Kiyev.



SHEYNKMAN, M.K.; LUK'YANCHIKOVA, N.B. [Luk'ianchykova, N.B.]

Effect of mobility fluctuations on photocurrent noise.  
Ukr. fiz. zhur. 8 no.10:1103-1109 0 '63. (MIRA 17:1)

1. Institut poluprovodnikov AN UkrSSR, Kiyev.

KOLOMIYETS, B. T.; MAMONTOVA, T. N.; LEBEDEV, E. A.; MAZETS, T. F.; STEPANOV, G. I.;  
LASHKAREV, V. Ye.; SALKOV, Ye. A.; SHEYNKMAN, M. K.

"Fast recombination processes in single crystals of CdS and CdSe."

report submitted for Intl Conf on Physics of Semiconductors, Paris, 19-24  
Jul 64.

KORSUNSKAYA, N.Yo. [Korsun's'ka, N.Yo.]; SAL'KOV, Yo.A. [Sal'kov, E.A.];  
CHERNIVOLENKO, A.A.; SICHYNKIV, M.K.

Determining the quantum yield of the internal photoeffect in  
CdS single crystals using a short light pulse. Ukr. fiz. zhur.  
9 no.7:807-810 J1 '64. (MIRA 17:10)

1. Institut poluprovodnikov AN UkrSSR, Kiyev.

YEHRMOLICH, I.B. [Ermolovych, I.B.]; SHEYNKMAN, M.K.

Determining the parameters of recombination centers in single  
crystals of CdS, CdSe, and  $CdS_x-CdSe_{1-x}$ . Ukr. fiz. zhur. 9  
no.10:1153-1157 O '64 (MIRA 18:1)

1. Institut poluprovodnikov AN UkrSSR, Kiyev.

L 53639-65 EWT(d)/EWT(1)/EWT(m)/EPF(c)/EWP(1)/EWA(d)/EWP(v)/T/EWP(t)/EEC(b)-2/  
ENF(k)/ENF(h)/ENF(b)/ENP(1)/ENA(h) Pf-4/Pr-4/Peb/Pi-4 IJP(c) JD/GG/GS/AT

ACCESSION NR: AT5010255

UR/0000/65/000/000/0112/0116

AUTHORS: Sheynkman, M. K.; Shul'ga, I. B.

TITLE: Device for remote measurement of parameters of thin semiconductor films

SOURCE: Mashiny i pribory dlya ispytaniya metallov i plastmass (Machines and instruments for testing metals and plastics); sbornik statey. Moscow, Izd-vo Mashinostroyeniye, 1965, 112-116

TOPIC TAGS: semiconductor, semiconductor research, semiconductor material, semiconducting film/ 6NZP lamp, ENO 1 oscillograph

ABSTRACT: A device for rapid measurement of parameters of semiconductor films is described. The apparatus removes the need for direct contact of electrodes upon test specimens and permits the study of parameter distribution along the film, as well as the investigation of kinetic photoelectric processes. The method of measurement is based upon the use of a three-node generator originally proposed by Ye. K. Zavoyakiy (Metod izmereniya potentsialov vzbuzhdeniya atomov i molekul. - Eksperimental'naya i teoreticheskaya fizika, T. 6., Vyp. 1, 1936). A circuit diagram of the device is given. Special elements in its network include a 6NZP lamp and an ENO-1 oscillograph. The authors describe in detail the functions of the more

Card 1/2

L 53639-65

ACCESSION NR: AT5010255

important items in the network, paying particular attention to the use of electrodes on two types of measurement condensers. A discussion of the variation of network current with different semiconductor film sizes and types is given. Orig. art. has: 4 figures.

ASSOCIATION: none

SUBMITTED: 15Dec64

ENCL: 00

SUB CODE: EC,SS

NO REF SOV: 001

OTHER: 000

*llc*  
Card

2/2

SHEYNKMAN, M.K.

Possibility of Auger-recombination on multiply charged centers  
in germanium and silicon. Fiz. tver. tela 7 no.1:28-32 Ja '65.  
(MIRA 18:3)

1. Institut poluprovodnikov AN UkrSSR, Kiyev.

L 2197-66 EWT(1)/EWT(m)/EWP(t)/EWP(b) IJP(c) JD

ACCESSION NR: AP5014571

UR/0181/65/007/006/1717/1732

AUTHOR: Lashkarev, V. Ye.; Lyubchenko, A.V.; Sheynkman, M.K.

TITLE: Comprehensive investigation of the kinetics of the processes of recombination and infrared quenching of photocurrent and cadmium sulfide

SOURCE: Fizika tverdogo tela, v. 7, no. 6, 1965, 1717-1732

TOPIC TAGS: recombination luminescence, recombination radiation, ir radiation, luminescence quenching, cadmium sulfide, cadmium selenide

ABSTRACT: In view of the fact that earlier studies of infrared quenching and recombination in CdS were limited only to stationary or slow transient processes, the authors propose new independent methods of determining the various parameters characterizing the centers of slow and fast recombination in a unipolar photoconductor. It is shown in particular, that the initial sections of the infrared quenching relaxation curves can yield additional information on the parameters of the various recombination centers in CdS. The methods are based on a simultaneous study of the kinetics of the photo-

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1/3



L 2197-66

ACCESSION NR: AP5014571

current and its infrared quenching in the presence of additional illumination produced by short duration light pulses of varying intensities and varying spectral contents. The measurements were made on thin single crystals of CdS and CdSe, grown by various methods. The constant illumination was produced with an incandescent lamp and a set of filters, and the additional light pulse was a flash lamp with pulse duration  $2.5 \times 10^{-6}$  sec and a set of filters. Longer pulses were produced with a mechanical disc shutter and an infrared monochromator. The pulse methods were supplemented with an analysis of the lux-ampere characteristic of the material. The parameters determined were the concentrations of the vacancies and of the electrons at the r- and s-levels, the concentrations of the levels themselves, the fractions of the various carriers captured at the r- and s-levels, and the cross section for the capture of an infrared photon by an unfilled r-center. The methods for obtaining the various parameters are indicated. The values of the recombination-center parameters measured by various methods, in single crystal CdS, and in part also in CdSe are in good agreement. Orig. art. has: 7 figures, 26 formulas, and 3 tables.

Card 2/3

L-2197-66

ACCESSION NR: AP5014571

ASSOCIATION: Institut poluprovodnikov AN UkrSSR, Kiev (Institute of Semicon-  
ductors, AN Ukr SSR) 4/55

SUBMITTED: 22Dec64

ENCL: 00

SUB CODE: 88, OP

NR REF SOV: 009

OTHER: 006

Card

3/3 DP

3

L 2296-66 EWT(1)/T/EWA(h) IJP(c) AT

ACCESSION NR: AP5014582

UR/0181/65/007/006/1790/1794

54  
39  
B

AUTHOR: Tolpygo, Ye. I.<sup>44, 55</sup>; Tolpygo, K. B.<sup>44, 55</sup>; Sheynkman, M. K.<sup>44, 55</sup>

TITLE: Auger recombination with participation of carriers bound to different centers

SOURCE: Fizika tverdogo tela, v. 7, no. 6, 1965, 1790-1794

TOPIC TAGS: electron recombination, impurity level, semiconductor carrier<sup>21.44.55</sup>

ABSTRACT: This is a continuation of earlier work by one of the authors (Sheynkman, FTT v. 7, 28, 1965 and earlier), where the Auger recombination mechanism was proposed for multiply- and singly-charged centers, wherein the capture of a minority carrier is accompanied by the emission into the band of another carrier of opposite sign, localized on the same center. In the present article the authors present a quantum-mechanical calculation of the cross section for the capture of minority carriers by shallow singly-charged neutral particles, when the energy released is transferred to the majority carrier,

Card 1/3

L 2296-66

ACCESSION NR: AP5014582

12

which is localized on a neighboring center having the same ionization energy or larger. This carrier is emitted into the nearest band. The capture of carriers by deep centers is also discussed. Numerical estimates show that Auger recombination processes can become comparable with or even larger than radiative and other types of recombination at sufficiently low temperatures and at high impurity concentrations. Values on the order of  $10^{-21}$  --  $10^{-22}$  are obtained for semiconductors of the Ge, Si, or GaAs type in the case of shallow levels, and of the order of  $10^{-19}$  --  $10^{-20}$  for capture by deep levels. This indicates that a capture of a carrier by a shallow center of large radius, with transfer of the energy to a carrier of opposite sign localized on a neighboring deep center, would be most effective. The authors thank E. I. Rashba for valuable critical remarks, and V. Ye. Lashkarev, S. G. Kalashnikov, and V. L. Bonch-Bruyevich for interest in the work and a discussion.

44. 5

Orig. art. has: 1 figures and 5 formulas.

ASSOCIATION: Institut poluprovodnikov AN UkrSSR, Kiev (Institute of Semi-

Card 2/3

L 2296-66

ACCESSION NR: AP5014582

conductors AN UkrSSR) 44/85

SUBMITTED: 14Jan65

ENCL: 00

SUB CODE: 88

NR REF SOV: 005

OTHER: 002

3

Card

3/3 DP

L 31048-65 EWT(l)/EWT(m)/EWT(t)/T/BEC(t)/EWT(b) Pa-5 IJP(c) JD/AT  
ACCESSION NR: AP5004320 S/0185/65/010/001/0027/0038

34  
31  
B

AUTHOR: Luk'yanchykova, N. B. (Luk'yanchikova, N.B.); Markevych, I.V. (Markevich, I.V.);  
Fedorus, H.A. (Fedorus, G.A.); Sheynikman, M.K.

TITLE: Investigation of photocurrent noise of CdS single crystals with various contacts

SOURCE: Ukrayins'kyy fizychnyy zhurnal, v. 10, no. 1, 1965, 27-38

TOPIC TAGS: cadmium sulfide, single crystal, photocurrent, noise spectrum, photo-response spectrum

ABSTRACT: The contact noise of CdS single crystals equipped with various ohmic electrodes was investigated. Unlike in other studies, the contact noise was separated from the volume noise by using a probe method of noise measurement. The spectrum of the photoresponse to a weak sinusoidally modulated light of constant intensity was plotted simultaneously with the noise spectrum measurements. The methods of preparing the photosensitive CdS crystals and of depositing the current contacts on the crystals are described. The form of the investigated samples and their electrodes is illustrated in Fig. 1 of the Enclosure, which shows also the

Card 1/2

I. 31048-55

ACCESSION NR: AP5004320

3

block diagram of the measurement set-up. The noise and photoresponse spectra were taken in the frequency range from 2 cps to 1 kcs. At 2 cps the equivalent noise impedance of the measuring set-up was 20 kilohms. The results indicate that it is possible to obtain noiseless ohmic contacts on thin and thick CdS single crystals either by welding-on indium or by cathode sputtering of cadmium. Other methods of electrode preparation resulted in noisy contacts. The noise spectrum and the square of the photoresponse were found to differ from theoretical, and large values of  $\Delta N^2/N \gg 1$  ( $N$  -- number of carriers in the sample,  $\Delta N^2$  -- dispersion of the carrier number) were observed, whereas ordinary theory yields  $\Delta N^2/N = 1$ . The measurements have shown that the value of  $\Delta N^2/N$  is not connected with the quality of the contacts, since values both less than unity and appreciably larger than unity (for example, 500) were obtained. Many facts indicate that the variations in these quantities are due to inhomogeneities in the crystals. "The authors are thankful to Academician V. Ye. Lashkar'ov for valuable remarks." Orig. art. has: 6 figures, 7 formulas, and 1 table.

ASSOCIATION: Instytut napivprovidnykiv AN UkrSSR, Kiev (Institute of Semiconductors,  
AN UkrSSR)

Card 2/4

SUBMITTED: 7 MAY '64

L 3352-66 EWT(l)/EWT(m)/T/EMP(t)/EMP(b)/EWA(c) IJP(c) JD/HW/GG

ACCESSION NR: AP5013482

UR/0185/65/010/005/0572/0573

AUTHOR: Ayvazov, V. Ya.; Holynnaya, H. I.; Sheynkman, M. K. / 44

TITLE: The effect of alloying surface monocrystals of CdS with admixtures of groups III and VIII, upon the spectral characteristics of photoconductivity

SOURCE: Ukrayins'kyi fizychnyy zhurnal, v. 10, no. 5, 1965, 572-573

TOPIC TAGS: cobalt containing alloy, aluminum containing alloy, indium containing alloy, luminescent crystal

ABSTRACT: The authors studied CdS monocrystals in the form of mirror-smooth films of average dimensions 2 x 4 x 0.01 cm, obtained by the synthesis method from the vapor phase with various admixtures were applied to their surfaces. The admixtures chosen were In, Ga and Al of group III, and Fe, Ni and Co of group VIII; the former are readily ionizable donors in CdS, the latter greatly alter the luminescence of ZnS-CdS phosphor crystals and eliminate photoconductivity in the long-wave range. The admixtures were applied by evaporation in a high vacuum, so that several mono-atomic layers were built up. One portion of the crystals was not subjected to further treatment (surface alloying), the other was placed in a vacuum for a short time

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L 3352-66

ACCESSION NR: AP5013482

(near=surface alloying). For the first group of additives, annealing was continued for 2-3 minutes at temperatures of 240-260°C; in the second group it was continued for 5-6 minutes at 130-150°C; Orig. art. has: 3 figures. 3

ASSOCIATION: Instytut Napivprovidnykiv AN URSR, Kiev (Institute of Semiconductors, AN URSR)

SUBMITTED: 30Jan65 44.55

ENCL: 03

SUB CODE: SS, OP

NO REF SOV: 009

OTHER: 002

Card 2/5

L 3352-66

ACCESSION NR: AP5013482

ENCLOSURE: 01

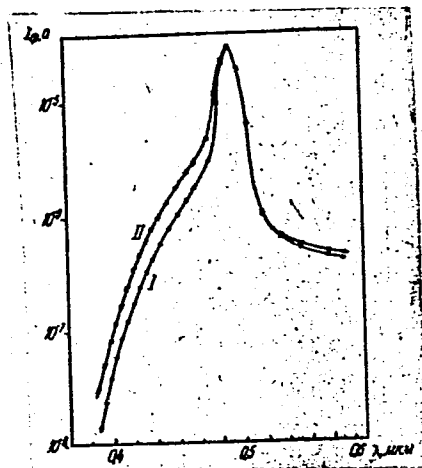


Fig. 1. Typical spectral characteristic of a stationary photocurrent  $I_p(\lambda)$  before (curve I) and after<sup>φ</sup> (curve II) alloying the surface of a CdS monocrystal with In (with annealing). (Wavelength is plotted on the X-axis in microns.

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L 3352-66

ACCESSION NR: AP5013482

ENCLOSURE: 02

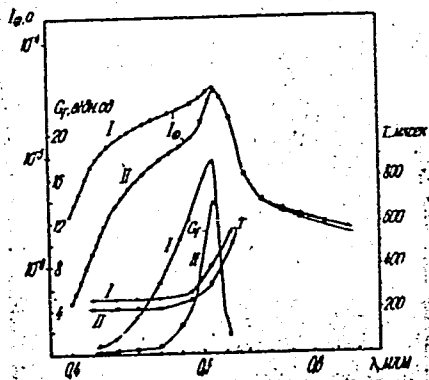


Fig. 2. Spectral characteristics of  $I_{\phi}(\lambda)$ ,  $\tau(\lambda)$  relaxation time and  $G_F(\lambda)$  (phenomological quantum yield), before (curve I) and after (curve II) alloying the surface of the CdS monocrystal with Fe (with annealing). Wavelength is plotted on the X-axis in microns, relaxation time on the right-hand ordinate scale in microseconds.

Card 4/5

L 3352-06

ACCESSION NR: AP5013482

ENCLOSURE: 03

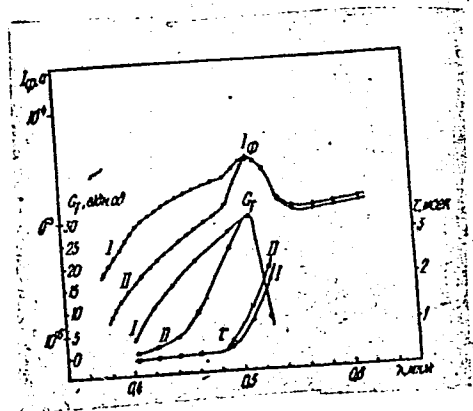


Fig. 3. Same information as in Fig. 2, in the case of alloying with Ni, with annealing. Curves I show data before alloying, curves II--after alloying.

Card 5/5 DP

L 64309-65 EWA(h)/EWT(m)/T IJP(c) AT

ACCESSION NR: AP5012762

UR/0020/65/161/006/1310/1312

AUTHORS: Lashkarev, V. Ye. (Academician AN UkrSSR); Lyubchenko, A. V.; Sheynkman, M. K.

TITLE: Determination of the parameters of recombination centers in cadmium sulfide with the aid of the kinetics of infrared photocurrent quenching

SOURCE: AN SSSR. Doklady, v. 161, no. 6, 1965, 1310-1312

TOPIC TAGS: cadmium sulfide, radiative recombination, recombination reaction, capture cross section, IR photoconductor

ABSTRACT: Since earlier investigations of infrared quenching of photocurrent in semiconductors of the type  $A_{II}B_{VI}$  have been made under stationary conditions or under slow transient conditions (on the order of several seconds or minutes), the authors investigated the kinetics of the infrared quenching by using short pulses, to be

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L 64309-65

ACCESSION NR: AP5012762

3

able to determine the cross section for the capture of electrons by the recombination centers, and to determine the cross section for the capture of an infrared photon by a slow-recombination r-center. The theory of the phenomenon is discussed briefly. Pulses of 2.5  $\mu$ sec from an infrared lamp (0.93  $\mu$  wavelength) were used. The cross section for the capture of an infrared photon by the r-level was found to be  $0.8 \times 10^{-16} \text{ cm}^2$ , which is of the same order as the geometrical dimension of the atom. The probabilities for electron capture by s-centers and r-centers were found to be  $(4--20) \times 10^{-10}$  and  $(3--5) \times 10^{-13} \text{ cm}^3/\text{sec}$ , the latter being close to those obtained by the authors by another method earlier (Fiz. tverd. tela v. 5, 387, 1963). Orig. art. has: 2 figures.

ASSOCIATION: Institut poluprovodnikov Akademii nauk UkrSSR (Institute of Semiconductors, Academy of Sciences, UkrSSR)

SUBMITTED: 11Dec64

ENCL: 00

SUB CODE: SS,OF

NR REF SOV: 003

OTHER: 002

Card 2/2 *RC*

L 1561-66 EWT(l)/EWT(m)/T/EWP(t)/EWP(b)/EWA(c) IJP(c) GG/JD

ACCESSION NR: AP5018642

UR/0185/65/010/007/0808/0809

AUTHORS: Halushka, O. P.; Yermolovych, I. B.; Korsuns'ka, N. Ye;  
Konozenko, I. D.; Sheynkman, M. K.

TITLE: Some properties of CdS single crystals grown by zone sublimation

SOURCE: Ukrayins'kyy fizychnyy zhurnal, v. 10, no. 7, 1965, 808-809

TOPIC TAGS: cadmium sulfide, optic activity, activated crystal, single crystal growing, electron trapping, recombination luminescence, luminescence quenching

ABSTRACT: The mobility measurements of majority carriers and activation energies of trapping levels, the infrared quenching of the photocurrent, the concentration of slow recombination r-centers and their electron capture cross section were investigated in single crystals of CdS obtained by zone sublimation. The crystals were cut from a large single crystal parallel to the (1010) and (1120) planes in the

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L 1561-66

ACCESSION NR: AP5018642

form of parallelepipeds and polished with an etching solution. The mobility of the majority carriers was measured with the aid of the Hall effect in light and darkness from 100 to 350 K. At room temperature the mobility varied between 70--320 cm<sup>2</sup>/v-sec for different samples, there being as a rule no difference between measurements under illumination and in darkness. With decreasing temperature the mobility increased initially. After that the mobility changed little with temperature. At about 220--250K the curves of the temperature dependence of the mobility under illumination and in darkness coalesce. At low temperatures the mobility is lower under illumination. This is apparently connected with the appreciable scattering by ionized impurities and microinhomogeneities. The occupancy of the centers changes upon illumination. The thermally stimulated conductivity was also measured. In thick single crystals trapping levels were found with activation energies 0.13--0.16 and 0.42--0.46 eV and concentrations of  $8 \times 10^{15}$  and  $3 \times 10^{15}$  cm<sup>-3</sup>. The filling of these centers with electrons on lowering the temperature affected the mobility. The concentration of deep recombination levels and their electron capture cross section was measured by the method of light 'shock.' The

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L 1561-66

ACCESSION NR: AP5018642

concentrations were found to be  $4 \times 10^{14}$  --  $8 \times 10^{14} \text{ cm}^{-3}$ . The electron capture cross sections of these recombination centers, determined from the infrared photocurrent quenching spectra exhibited two maxima (at 1.5 and 0.9 eV). The spectra were shifted somewhat towards shorter wavelengths. The slow recombination r-centers are apparently the same in thick as in thin CdS crystals. Orig. article has: 2 figures. 6

ASSOCIATION: Instytut fizyky AN URSR [Institut fiziki AN UkrSSR] (Institute of Physics, AN UkrSSR); Instytut napivoporvidnykiv AN URSR, Kiev [Institut poluprovodnikov AN UkrSSR] (Institute of Semiconductors, AN UkrSSR) 44:55

SUBMITTED: 24Mar65

ENCL: 00

SUB CODE: SS, OP

NR REF SOV: 003

OTHER: 002

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OP

L 10577-66 EWT(d)/EWT(l)/EWT(m)/EPF(n)-2/EWP(t)/EWP(b)/EWA(m)-2 IJP(c)  
ACC NR: AP5025407 JD/WW/AT SOURCE CODE: UR/0181/65/007/010/3134/3136

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TITLE: <sup>21, 44, 55</sup> Effect of temperature on the cross sections for <sup>21, 44, 55</sup> capture of electrons by re-combination centers in CdS and CdSe

SOURCE: <sup>21, 44, 55</sup> Fizika tverdogo tela, v. 7, no. 10, 1965, 3134-3136

TOPIC TAGS: cadmium sulfide, cadmium selenide, single crystal, semiconductor re-search, capture cross section, photoelectric property

ABSTRACT: Three recently proposed methods are used for studying the relationships between temperature and the cross sections for capture of electrons by r-centers and various s-centers in CdS and CdSe single crystals in the 110-330°K temperature range. The methods used are based on a study of the photocurrent kinetics when the crystals are illuminated: a) by a powerful short pulse of light--the "luminous shock" method; b) by constant radiation and a weak pulse of stimulating light--the "natural pulse" method; c) by constant illumination and a weak pulse of infrared light which quenches the photocurrent--the "IR pulse" method. The "light shock" and "natural pulse" methods were used for measuring the cross sections for capture by r-centers. Both methods gave extremely close values for  $S_r$ . The values of  $S_g(T)$  were determined by

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ACC NR: AP5025407

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the "natural pulse" method. High-resistance undoped photosensitive single crystals of cadmium sulfide and cadmium selenide were studied. The cross sections for capture by various r-centers in these crystals are extremely weakly dependent on temperature. The values of  $S_g$  are also only slightly sensitive to temperature near 110°K; however a further increase in temperature results in an exponential increase in  $S_g(T)$  with an activation energy lying between 0.1 and 0.2 ev for various s-centers in CdS and CdSe. This increase in  $S_g(T)$  starts long before the beginning of temperature quenching of photocurrent in these crystals. A theoretical model is proposed to explain the relationship between temperature and the capture cross section. The authors thank V. Ye. Lashkarev for valuable consultation. Orig. art. has: 1 figure.

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OTH REF: 004

HW  
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L 10778-66 EWT(1)/EWT(m)/EWP(t)/EWP(b) IJP(c) JD/AT

ACC NR: AP5028925

SOURCE CODE: UR/0185/65/010/011/1263/1265

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68  
65

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TITLE: Effect of doping with group I elements on the spectral photoconductivity characteristics of cadmium sulfide.

SOURCE: Ukrayins'kyi fizychnyy zhurnal, v. 10, no. 11, 1965, 1263-1265

TOPIC TAGS: cadmium sulfide, copper, gold, silver, photoconductivity, crystal property

ABSTRACT: In this work the effect of <sup>21, 44, 55</sup> Cu, Ag, and Au on the photoelectric properties of CdS crystals was investigated. These additives produce in CdS deeply seated acceptor levels which serve as recombination centers. The surface of 2x4x0.01 cm<sup>3</sup> single crystals of CdS was alloyed with Cu, Ag, or Au by evaporation of these metals in a high vacuum in the amount which would produce several monolayers. The deposited metal film had practically no effect on the dark current. Some of the specimens were not further treated, whereas others were heat treated in a high vacuum over a short period of time. The heating time was 30 sec at 130-150C for Cu and Au and at 200C for Ag. The alloyed layer, calculated on the basis of the diffusion coefficient, was about 0.15 microns thick. The measurements of stationary photocurrent I<sub>0</sub> and photocurrent relaxation time  $\tau_{10\%}$  were made before and after alloying. It is shown that alloying lowers the photocurrent in the shortwave part of the spectrum. Authors express their gratitude to Academician AN UkrSSR V. E. Lashkar'ov

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