DEVYATKOV, N.D.

LYUBIMOV, Mikhail L'vovich; DEVYATKOV, N.D., red.; SHAMSHUR, V.I., red.; MEDVEDEV, L.Ya., tekhn.red.

[Joining metal with glass] Spai metalla so steklom. Pod red. N.D. Deviatkova. Moskva, Gos.energ.izd-vo, 1957. 205 p. (MIRA 11:2)

1. Chlen-korrespondent AN SSSR (for Devyatkov)
(Glass-metal sealing)

DEVYATKOV, N.

DEVYATKOV, N.; RUKMAN, G., kand.tekhn.nauk.

Vacuum electronics. Radio no.11:31-33 N '57. (MIRA 10:10)

1. Chlen-korrespondent AN SSSR (for Devyatkov).
(Electronics)

DEVYATKOV, N. D.

AUTHOR: Devyatkov, N.D. (Moscow). 24-2-12/28

TITLE: Development of very high frequency electronic instruments. (Razvitiye elektronnykh priborov sverkhvysokikh chastot).

PERIODICAL: Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, 1958, No.2, pp. 104-113 (USSR).

ABSTRACT: This paper was read at the Scientific Meeting of the Technical Sciences Section, Ac.Sc. USSR devoted to the 40th anniversary of the October revolution. The main trends in the field of very high frequency electronic apparatus are discussed. Brief descriptions are given of some of the apparatus developed and manufactured in the Soviet Union, namely, the following: "spinatron tube" (travelling wave tube with a centrifugal electrostatic focusing of the electron fluxes), for which the dependence of the coefficient of amplification of the wave length is graphed in Fig.4, p.108; metallo-ceramic triodes; reflex klystrons. Zusmanovskiy, S.A. and his team developed a klystron for linear accelerators of charged particles, the pulse power of which exceeds 20 MW and it was shown that still more powerful klystrons can be developed. There are 10 figures and 8 references, all of which are Russian.

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SUBMITTED: September 16, 1957.

AVAILABLE: Library of Congress

DEVYATKOV, M.D.

SUBMITTED: December 7, 1957

AUTHORS: Golubkov, P.V. and Tsimring, Sh. Ye. SOV/109-3-3-22/23

TITLE: The Second All-Union Conference on Radioelectronics of the Ministry of Higher Education of the USSR (Vtoraya vsesoyuznaya konferentsiya MVO SSSR po radioelektronike) - News Item

PERIODICAL: Radiotekhnika i Elektronika, 1958, Vol 3, Nr 3, pp 440 - 444 (USSR)

ABSTRACT: The conference took place during September 23 - 29, 1957, at Saratovskiy gosudarstvennyy universitet imeni N.G. Chernyshevskogo (Saratov State University imeni N.G. Chernyshevskiy). Apart from the universities, the conference was attended by the representatives of some scientific research institutes of the Soviet and Ukrainian Academies of Science, various industrial establishments and the interested ministries. This arrangement stimulated the discussion and evaluation of the papers presented and permitted the determination of plans for the future research to be carried out by the universities in the field of radioelectronics.

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During the plenary session on September 23, two papers were read: "Development Trends of UHF Electronics in the Soviet Union" by N.D. Devyatkov and "Electromagnetic Waves in the System of Vari-directional Electron Beams" by V.M. Lopukhin. N.D. Devyatkov presented numerous factual data illustrating the rapid development of the U.H.F. electronics in the Soviet Union and the vast contribution of the Soviet scientists to the theoretical foundations of this science; he also discussed the development trends of U.H.F. electronics in the immediate future. The paper described a number of original Soviet U.H.F. devices. The work of V.M. Lopukhin was concerned with the theoretical investigation of the phenomena taking place in multi-ray devices whose electron beams have different directions. The author showed that the presence of the electron beams which are perpendicular to the axis x facilitates the appearance of the solutions which are increasing functions of x for the case of n rays directed along the axis x ; it also leads to the

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appearance of exponentially increasing solutions in the presence of one beam in the above direction. The Electronics Section comprised 50 papers; more than one-third of these were concerned with the theoretical and experimental investigation of wide-band electronic devices for U.H.F. The lecture by V.N. Shevchik, L.Ya. Mayofis and L.D.Pokrovskiy dealt with the extension of the known theories of travelling-wave tubes and backward-wave tubes to the practically important cases when the delay structure necessitated the taking into account of the discrete character of the interaction of the electron beam with the high-frequency field. The lecture by V.C. Stal'makhov, V.N. Shevchik and Yu.D. Zharkov was devoted to the simplified analysis of the operation of a backward-wave tube by employing the cosinusoidal approximation of the given field. The papers by V.B. Braginskiy, A.S. Gorshkov, A.I. Kostiyenko, G.P. Lyubimov, I.T. Trofimenko and V.V. Anisimov were concerned with the detailed experimental and theoretical investigation of the possibility (first indicated by V.N. Shevchik in 1954) of expanding the bandwidth of the electronic trimming of reflex klystrons by means of the

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mutual synchronisation of several klystron tubes. The operation of reflex klystrons with multi-circuit resonant systems was also investigated. The results of experimental and theoretical investigation of two-ray amplifying and multiplying tubes were given in the communication by L.Z. Aitova, V.M. Lopukhin, L.A. Shkudova and in the communication of V.I. Kanavets. Some of the papers in the Electronics Section dealt with the investigations which were concerned with the development of novel U.H.F. devices, suitable for the generation and amplification of the wave-forms in the millimetre and sub-millimetre ranges. The papers of great interest were: "Experimental Investigations of the Radiation of the Electron Bunches in the Vicinity of Non-homogeneities" by V.B. Braginskiy and Ye.P. Mustel', "Comparison of the Efficiency of Certain Methods of the Generation of Millimetre Waves" by A.S. Tager and "Application of the Higher Spatial Harmonics of the Electromagnetic Field in Slowing-down Systems" by A.S. Tager and V.A. Solntsev.

MINTS, A.L., akademik, glavnyy red.; BURDUN, G.D., red.; VOL'PERT, A.R., red.; GORON, I.Ye., red.; GUTENMAKHER, L.I., prof., red.; GRODNEV, I.I., red.; DEVYATKOV, N.D., red.; ZHEKULIN, L.A., red.; KATAYEV, S.I., red.; NEYMAN, M.S., red.; SIFOROV, V.I., red.; CHISTYAKOV, N.I., red.; GESSEN, L.V., red.izd-va; MARKOVICH, S.G., tekhn.red.

[One hundredth anniversary of the birth of A.S.Popov; jubilee session] 100 let so dnia rozhdeniia A.S.Popova; iubileinaia sessiia. Moskva, Izd-vo Akad.nauk SSSR, 1960. 312 p. (MIRA 14:1)

1. Nauchno-tekhnicheskoye obshchestvo radiotekhniki i elektrosvyazi. (Information theory)

LABEDEV, Igor' Vsevolodovich; DEVYATKOV, N.D., prof., red.; SHAMSHUR, V.I., red.; BORUNOV, N.I., tekhn. red.

[Super-high frequency engineering and equipment] Tekhnika i pribory sverkhvysokikh chastot. Pod red. N.D.Deviatkova. Moskva, Gos. energ. izd-vo. Vol.1. [Super-high frequency engineering] Tekhnika sverkhvysokikh chastot. 1961. 510 p. (MIRA 14:11)

1. Chlen-korrespondent AN SSSR (for Devyatkov).
(Microwaves)

GUBENKO, T.P.; DEVYATKOV, N.D.; DOMANSKIY, B.I.; DONSKOY, A.V.; YEFREMOV, I.S.; ZHEZHERIN, R.P.; KAGANOV, I.L.; MANDRUS, D.B.; NETUSHIL, A.V.; PODGURSKIY, Ye.L.; ROZENFEL'D, V.Ye.; SVENCHANSKIY, A.D.; CHUKAYEV, D.S.; SHLYAPOSHNIKOV, B.M.

Professor G.I. Babat; obituary. Elektrichestvo no.1:94 Ja '61.
(MIRA 14:4)

(Babat, Georgii Il'ich, 1911-1961)

DEVYATKOV, N.D.; GRODNEV, I.I.; ROGINSKIY, V.N.; GAL'PERIN, Ye.I.

An All-Union session. Radiotekhnika 16 no.10:77-80 O '61.
(MIRA 14:10)

1. Rukovoditel' sektsii elektroniki Nauchno-tekhnicheskogo obshchestva radiotekhniki i elektrosvyazi imeni Popova (for Devyatkov). 2. Rukovoditeli sektsii provodnoy svyazi Nauchno-tekhnicheskogo obshchestva radiotekhniki i elektrosvyazi (for Grodnev, Roginskiy). 3. Rukovoditel' sektsii poluprovodnikovykh priborov Nauchno-tekhnicheskogo obshchestva radiotekhniki i elektrosvyazi (for Gal'perin).
(Electronics)

L 1948-66 EWA(h) GS/JM
ACCESSION NR: AT5018648 UR/0000/65/000/000/0279/0292

AUTHOR: Devyatkov, N. D. (Corresponding member AN SSSR)

TITLE: Electron devices

SOURCE: Radio 70 let (Seventy years of radio); nauchno-tekhnicheskiy sbornik. Moscow, Izd-vo Svyaz', 1965, 279-292

TOPIC TAGS: electron device, electron tube

ABSTRACT: Soviet and Western modern electron devices, particularly microwave tubes, are briefly reviewed with the role of Soviet researchers in their development indicated. These types are specifically discussed or mentioned: Bantam and subminiature receiving tubes. Semi-demountable high-power (up to 500 kw) and uhf (3000 Mc, 10 kw) tubes. Microwave metal-ceramic triodes and tetrodes including resnatrons. Klystrons and reflex klystrons (Soviet priority in their invention is claimed). Magnetrons including platinotrons. TW tubes and

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BW tubes; spiratrons are claimed to have been invented in the Institute of Radio Engineering and Electronics, AN SSSR. Metal-ceramic permanent-magnet millimeter-wave BW tubes (up to 4000 v, 100 Mw). Gas discharge tubes: a 20-kv 500-amp pulse metal-glass hydrogen-filled thyratron; a 50-kv 2500-amp pulse metal-ceramic thyratron; corona-type stabilivolts (10—30 kv, 50—1500 μa). A neon-helium-filled gas laser (1—3 mw, beam angle, 6—7'). [Abstracter's Note: No explanation is offered as to why allegedly Soviet inventions have such "Slavic" names as klystron and spiratron.] Orig. art. has: 17 figures.

ASSOCIATION: none

SUBMITTED: 04May65 ENCL: 00 SUB CODE: EC

NO REF SOV: 000 OTHER: 000

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DEVYATKOV, S.K.

Continuous line for assembling and welding frames of electric locomotives. Biul. tekh.-ekon. inform. Gos. nauch.-issl. inst. nauch. i tekh. inform. 18 no. 12:26-27 D '65 (MIRA 19:1)

DEVYATKOV, S.K.

Mechanized continuous line for assembling and welding shock-absorber bars. Biul. tekh.-ekon. inform. Gos. nauch.-issl. inst. nauch. i tekh. inform. 18 no.10:16-18 O '65.

(MIRA 18:12)

BACHEV, Grigoriy Trofimovich; DEVYATKOV, V.A., red.; YARKOVA, F.S., tekhn.red.

[Komi-Perm region in the years of Soviet power] Komi-Permiatskii okrug za gody Sovetskoi vlasti. Kudymkar, Komi-Permiatskoe knizhnoe izd-vo, 1958. 63 p. (MIRA 12:9)
(Komi-Permyak National Region--Economic conditions)

DEVYATKOV, V.F.; RUDENKO, T.F.; ARSHINOV, I.M., redaktor; KHITROV, P.A., tekhnicheskiy redaktor.

[Handbook for railroad car masters] Rukovodstvo poezdnomu vagonnomu masteru. 5-e izd., ispr. i dop. Moskva, Gos. transp. zheleznodorozh. izd-vo, 1954. 222 p. [Microfilm] (MLRA 7:11)

1. Russia (1923- U.S.S.R.) Ministerstvo putey soobshcheniya. (Railroads--Cars)

ABASHKIN, V.V., kand.tekhn.nauk; DEVYATKOV, V.F., kand.tekhn.nauk; KUDRYAVTSEV, N.P., kand.tekhn.nauk; PAVLOV, I.V., kand.tekhn.; nauk; SHARONIN, V.S., kand.tekhn.nauk

Judging track conditions by the forces of its interaction with rolling stock. Vest.TSNII MPS 19 no.1:10-13 '60. (MIRA 13:4)

(Railroads--Track)

DRAYCHIK, I.I.; DEVYATKOV, V.F.

Introducing the use of roller bearings for rolling stock.
Zhel.dor.transp. 42 no.4:44-49 Ap '60. (MIRA 13:7)

1. Glavnyy spetsialist Gosudarstvennogo nauchno-tekhnicheskogo komiteta Soveta Ministrov SSSR(for Draychik). 2. Rukovoditel' sektora Vsesoyuznogo nauchno-issledovatel'skogo instituta zheleznodorozhnogo transporta (for Devyatkov).
(Railroads--Rolling stock)
(Roller bearings)

DEVYATKOV, V.F.; FILIPPOVA, L.S., red.; VOROTNIKOVA, L.F., tekhn. red.

[Axle box with roller bearings of a reduced size for freight cars] Buksa s rolikovymi podshipnikami umen'shennykh gabaritov dlia gruzovykh vagonov. Moskva, Vses.izdatel'sko-poligr. ob"edinenie M-va putei soobshcheniia, 1961. 15 p. (MIRA 15:2)
(Car axles) (Roller bearings)

AMELINA, Anna Aleksandrovna, inzh.; DEVYATKOV, V.F., kand. tekhn. nauk, retsenzent; MAYGOV, V.Ya., inzh., retsenzent; SARANTSEV, Yu.S., inzh., red.; KHITROV, P.A., tekhn. red.

[Arrangement and repair of car axles with roller bearings] Ustroistvo i remont vagonnykh buks s rolikovymi podshipnikami. Moskva, Vses. izdatel'sko-poligr. ob"edinenie M-va putei soobshcheniia, 1961. 223 p. (MIRA 14:9)

(Car axles)

DEVYATKOV, V.F., kand.tekhn.nauk; ABASHKIN, V.V., kand.tekhn.nauk

Experiment in the operation of axle box assemblies with roller bearings on passenger and freight cars. Trudy TSNII MPS no.221:16-24 '61. (MIRA 15:1)

(Roller bearings) (Car axles--Testing)

ABASHKIN, V.V., kand.tekhn.nauk; DEVYATKOV, V.F., kand.tekhn.nauk; PAVLOV, I.V., kand.tekhn.nauk; LOSEV, A.V., inzh.

Method of investigating the performance of the axle roller cage. Vest.TSNII MPS 20 no.3:37-40 '61. (MIRA 14:5)
(Car axles) (Roller bearings)

ABASHKIN, V.V., kand.tekhn.nauk; DEVYATKOV, V.F., kand.tekhn.nauk; LOSEV, A.V., inzh.; PAVLOV, I.V., kand.tekhn.nauk

Development of a safe design for the cage of cylindrical roller bearings. Trudy TSNII MPS no.221:85-99 '61. (MIRA 15:1)
(Roller bearings)

SHADUR, Leonid Abramovich, doktor tekhn. nauk, prof.; CHELNOKOV, Ivan Ivanovich, doktor tekhn. nauk, prof.; NIKOL'SKIY, Lev Nikolayevich, doktor tekhn. nauk, prof.; KAZANSKIY, Georgiy Alekseyevich, kand. tekhn.nauk; KOGAN, Liber Ayzikovich, kand. tekhn. nauk; DEVYATKOV, Vladimir Fedorovich, kand. tekhn. nauk; CHIRKIN, Viktor Vasil'yevich, kand. tekhn. nauk; MORDVINKIN, N.A., inzh., retsenzent; BRAYLOVSKIY, N.G., red.; MEDVEDEVA, M.A., tekhn. red.

[Designs of railroad cars] Konstruktsii vagonov. Moskva, Vses. izdatel'sko-poligr. ob"edinenie M-va putei soobshcheniia, 1962. 415 p. (MIRA 15:4)
(Railroads--Cars--Design and construction)

DEVYATKOV, V.F., kand. tekhn. nauk

Fxperience in the operation of cars with roller bearings.
Zhel. dor. transp. 46 no.4:43-48 Ap '64. (MIRA 17:6)

ACC NR: AM6004820 (A) Monograph UR/

Shadur, Leonid Abramovich (Doctor of Technical Sciences, Professor); Chelnikov, Ivan Ivanovich (Doctor of Technical Sciences; Professor); Nikol'skiy, Lev Nikolayevich (Doctor of Technical Sciences; Professor), Nikol'skiy, YEvgeniy Nikolayevich (Doctor of Technical Sciences; Professor); Proskurnev, Petr Grigor'yevich (Candidate of Technical Sciences, Docent); Kazanskiy, Georgiy Alekseyevich (Candidate of Technical Sciences); Devyatkov, Vladimir Fedorovich (Candidate of Technical Sciences)

Railroad cars; construction, theory, and design (Vagony; konstruktsiya, teoriya i raschet) Moscow, Izd-vo "Transport", 1965. 439 p. illus., biblio. 8,000 copies printed. Textbook for railroad transportation institutes.

TOPIC TAGS: railway equipment, railway rolling stock, railway transportation, railway vehicle data

PURPOSE AND COVERAGE: The book deals with the construction, strength calculations, dynamics, choice of technical-economic parameters, and sizes of railroad cars. It is intended for courses on "Railroad Cars" (construction, theory, calculation) for those specializing in "Railroad Car Construction and Railroad Car Management" of higher technical institutes for railway transport. It is designed to be a basic course for further specialization is special-purpose cars such as refrigerator cars, electric equipment of railroad cars, technology of construction and repair of railroad cars, and other specialties. It is designed for students who have some elementary information on car construction and car strength.

UDC: 625/23/.24

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ACC NR: AM6004820

TABLE OF CONTENTS [abridged]:

SUB CODE: 13/ SUBM DATE: 21Jul65/ ORIG REF: 218/ OTH REF: 010

Card 2/2

1. DEVYATKOV, V. G.

2. USSR (600)

4. Reamers

7. Floating chuck for reamers. Stan.i instr. 23 no. 11, 1952.

9. Monthly Lists of Russian Accessions, Library of Congress, March 1953, Unclassified.

L 50506-65 EWT(1)/EWT(m)/EWP(w)/EPF(c)/EPF(n)-2/EWG(m)/EWP(v)/EPR/T-2/
EWP(k) Pf-4/Pr-4/Ps-4/Pu-4 WW/EM

ACCESSION NR: AP5012086 UR/0147/65/000/002/0056/0064 38 B

AUTHOR: Devyatov, V. I.

TITLE: Study of the heat emission of two versions of turbine disk cooling 26

SOURCE: IVUZ. Aviatsionnaya tekhnika, no. 2, 1965, 56-64

TOPIC TAGS: turbine cooling system, heat emission factor, peripheral blow-through, air cooled gas turbine, heat exchange, turbine disk cooling 21

ABSTRACT: Among all the different methods for cooling turbine disks, the radial method of blowing has been studied in the greatest detail (see Figure 1, a of the Enclosure). Stream peripheral blowing (see Figure 1, c), on the other hand, has been studied considerably. At the present time, only a single function is known which can be used as a criterion for determining the mean heat emission factors for this method. Data are also lacking in the technical literature for the so-called "intermediate" methods of cooling (see Figure 1, b), in which the air is fed in streams over a larger radius than in the case of radial blowing, but smaller than for peripheral blowing. In this article, the author reports on a study of the problem of determining the local heat emission factors over the entire face with the disk cooled by a large

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quantity of streams and the air fed: a) at the periphery of the disk ($\frac{h}{l}$ = 0.875, Figure 1, c), b) by the "intermediate" method at a distance of 0.25 from the beginning of the channel ($\frac{h}{l}$ = 0.25, Figure 1, b). A schematic diagram of the rig designed for this purpose is given in the article. A steel disk, 420 mm in diameter and 40 mm thick, was placed in a heat-insulated housing and caused to rotate by means of an electric motor. The coolant (in this case, air) was fed to both sides of the disk in a balanced manner through openings. Over the cylindrical surface, the disk was heated by radiation and convection by means of electric heaters. The disk temperatures were measured by a potentiometer through a slip ring with chromel-kopel thermocouples. The latter, consisting of wires 0.5 mm in diameter, were located on both sides of the disk (20 points), along the outer cylindrical surface (5 points) and within the disk at a radius of r = 50 mm (3 points), thus permitting the investigator to obtain a picture of the change in temperature through the cross section of the disk. A description of the numerical method used for determining the temperature gradient by means of boundary conditions of the first order and special tables is also provided in the paper, along with the method of calculation for that portion of the heat which is removed from the disk by radiation. The author

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analyzes the experiments conducted with cooling by both of the above-mentioned methods ("intermediate" two-sided stream blowing and peripheral two-sided stream blowing). During these tests a study was made of the change in the temperature fields of the disk and local heat emission factors at a constant circumferential Reynold's number (as the rotating speed of the disk varied) and a constant Re number (with the air flow constant). Graphs are given to illustrate the results and an attempt is made to derive empirical criteria in the form of useful mathematical functions. In the interval of circumferential Re numbers investigated it was found that: 1) in the zone of impact of the coolant streams against the disk face there exists a region of high heat emission factors; 2) At low $Re_{circum.}$ increasing the radius of the cool air feed leads to a sharp improvement in cooling efficiency; 3) As the $Re_{circum.}$ continue to rise, there is a decline in the efficiency of peripheral stream blowing and its superiority over other blowing methods tends to disappear. Formulae and tables are given in the article which are suitable for air cooling systems geometrically similar to those considered considered in this study. Orig. art. has: 9 formulas, 1 table and 10 figures.

ASSOCIATION: none

SUBMITTED: 20Nov64 ENCL: 01 SUB CODE: PR, TD

NO REF SOV: 011 OTHER: 000

Card 3/4

DEVYATKOVA, A.M.

FEDOROV, Ye.Ye., professor; PREDTECHENSKIY, P.P.; BUCHINSKIY, I.Ye.; SEMANINOV, G.T., professor; BOSHNO, L.V.; ALISOV, B.P.; BIRYUKOV, N.N.; GAL'TSOV, A.P.; GRIGOR'YEV, A.A., akademik; EYGENSON, M.S., professor; MURETOV, N.S.; KHROMOV, S.P.; BOGDANOV, P.N.; LEBEDEV, A.N.; SOKOLOV, V.N.; YANISHEVSKIY, Yu.D.; SAMOYLENKO, V.S.; USMANOV, R.F.; CHUBUKOV, L.A.; TROTSENKO, S.Ya.; VANGENGEYM, G.Ya.; SOKOLOV, I.F.; STYRO, B.I.; TEMNIKOVA, N.S.; ISAYEV, E.A.; DMITRIYEV, A.A.; MALYUGIN, Ye.A.; LIEDEMAA, Ye.K.; SAPOZHNIKOVA, S.A.; RAKIPOVA, L.R.; POKROVSKAYA, T.V.; BAGDASARYAN, A.B.; ORLOVA, V.V.; RUBINSHTEYN, Ye.S., professor; MILEVSKIY, V.Yu.; SHCHERBAKOVA, Ye.Ya.; BOCHKOV, A.P.; ANAPOL'SKAYA, L.Ye.; DUNAYEVA, A.V.; UTESHEV, A.S.; RUDNEVA, A.V.; RUDENKO, A.I.; ZOLOTAREV, M.A.; NERSESYAN, A.G.; MIKHAYLOV, A.N.; GAVRILOV, V.A.; TSOMAYA, T.I.; DEVYATKOVA, A.M.; ZAVARINA, M.V.; SHMETER, S.M.; BUDYKO, M.I., professor.

Discussion of the report (in the form of debates) [of the current state climatological research and methods of developing it]. Inform. sbor.GUGMS no.3/4:26-154 '54. (MIRA 8:3)

1. Chlen-korrespondent Akademii nauk SSSR (for Fedorov). 2. Glavnaya geofizicheskaya observatoriya im. A.I.Voeykova (for Predtechenskiy, Lebedev, Yanishevskiy, Isayev, Rakipova, Pokrovskaya, Orlova, Rubinshteyn, Budyko, Shcherbakova, Anapol'skaya, Dunayeva, Rudneva, Gavrilov, Zavarina). 3. Ukrainskiy nauchno-issledovatel'skiy gidrometeorologicheskiy institut (for Buchinskiy).

(Continued on next card)

FEDOROV, Ye.Ye., professor; PREDTECHENSKIY, P.P., and others.

Discussion of the report (in the form of debates) [of the current state climatological research and methods of developing it]. Inform. sbor. GUGMS no.3/4:26-154 '54. (Card 2) (MIRA 8:3)

4. Vsesoyuznyy institut rastenievodstva (for Selyaninov, Rudenko). 5. Bioklimaticheskaya stantsiya Kislovodsk (for Boshno). 6. Moskovskiy gosudarstvennyy universitet im. M.V.Lomonosova (for Alisov). 7. Ministerstvo putey soobshcheniya SSSR (for Biryukov). 8. Institut geografii Akademii nauk SSSR (for Gal'tsov, Grigor'yev). 9. Geofizicheskaya komissiya Vsesoyuznogo geograficheskogo obshchestva (for Eygenson). 10. Ministerstvo elektrostantsiy i elektropromyshlennosti SSSR (for Muretov). 11. Leningradskiy gosudarstvennyy universitet im. A.A.Zhdanova (for Khromov). 12. TSentral'nyy nauchno-issledovatel'skiy gidrometeorologicheskiy arkhiv (for Sokolov, Zolotarev). 13. Gosudarstvennyy okeanograficheskiy institut (for Samoylenko). 14. TSentral'nyy institut prognozov (for Usmanov, Sapozhnikova). 15. Institut geografii Akademii nauk SSSR i TSentral'nyy institut kurortologii (for Chubukov). 16. Nauchno-issledovatel'skiy institut imeni Sechenova, Yalta (for Trotsenko). 17. Arkticheskiy nauchno-issledovatel'skiy institut (for Vangengaym).

(Continued on next card)

FEDOROV, Ye.Ye., professor; PREDTECHENSKIY, P.P., and others.

Discussion of the report (in the form of debates) [of the current state of climatological research and methods of developing it]. Inform.sbor. GUGMS no.3/4:26-154 '54. (Card 3) (MLRA 8:3)

18. Dal'nevostochnyy nauchno-issledovatel'skiy gidrometeorologicheskiy institut (for Sokolov). 19. Institut geologii i geografii Akademii nauk Litovskoy SSR (for Styro). 20. Rostovskoe upravlenie gidrometsluzhby (for Temnikova). 21. Morskoy gidrofizicheskiy Institut Akademii nauk SSSR (for Dmitriyev). 22. Vsesoyuznyy institut rasteniyevodstva (for Malyugin). 23. Akademiya nauk Estonskoy SSR (for Liedemaa). 24. Akademiya nauk Armyanskoy SSR (for Bagdasaryan). 25. Leningradskiy gidrometeorologicheskiy institut (for Milevskiy).

(Continued on next card)

FEDOROV, Ye.Ye., professor; PREDTECHENSKIY, P.P., and others.

Discussion of the report (in the form of debates) [of the current state climatological research and methods of developing it]. Inform.sbor. GUGMS no.3/4:26-154 '54. (Card 4) (MLRA 8:3)

26. Gosudarstvennyy gidrologicheskiy institut (for Bochkov). 27. Kazakhskiy nauchno-issledovatel'skiy gidrometeorologicheskiy institut (for Uteshev). 28. Upravlenie gidrometsluzhby Armyanskoy SSR (for Nersesyan). 29. Leningradskoye upravleniye gidrometsluzhby (for Mikhaylov, Devyatkova). 30. Tbilisskiy gosudarstvennyy universitet (for Tsomaya). 31. TSentral'naya aerologicheskaya observatoriya (for Shmeter).
(Climatology)

USSR.

Volkov, A. S.; Tarakov, V. V. and Deviatkova, A. V. O postanovke ucheta effektivnosti gidrometeorologicheskogo obsluzhiv[illegible]aistva v mestnykh upravleniiakh gidrometsluzhby. [The method of establishing effectiveness of the hydrometeorological service for the national economy by local administration of the hydrometeorological service.] *Meteorologiia i Gidrologiia*, No. 6:22-24, 1952. DLC—Discussion about organization and work of services. The authors discussed the system of the hydrometeorological service and method of determining its effectiveness. The necessity of collecting complete references from the customers about the use of information rendered was pointed out. *Subject Heading:* 1. Hydrometeorological services.—*N.T.Z.*

SHAPAYEVA, Ye.S.; RUSKA, T.N.; DEVYATKOVA, A.V.; DOLGASHOV, V.I., starshiy nauchnyy sotrudnik; ANTIPINA, V.I.; ROGOVSKAYA, Ye.G., red., DEVYATKOVA, Anastasiya Vasil'yevna; TSVETKOVA, Lyudmila Alekseyevna; YASNOGORODSKAYA, M.M., red.; VOLKOV, N.V., tekhn. red.

[Agroclimatic atlas of Leningrad Province] Agroklimaticheskii atlas Leningradskoi oblasti. Leningrad, Gidrometeoizdat, 1961. 16 p. (MIRA 17:3)

PANOV, P.G.; DEVYATOVA, N.K.

Qualities of large panel apartment houses of cellular concrete in the Urals. Sbor. nauch. rab. AKKH no.16:100-104 '62.

(MIRA 17:8)

DEVYATKOVA, YE. D.

CA

3

Radiation from a helium discharge tube with glowing cathode. E. D. Devyatkova and N. D. Devyatkov. *J. Tech. Phys.* (U. S. S. R.) 4, 1855 66(1934).—Data are given on the amt. of radiation of various wave lengths from 5000 to 11,000 A. in the cathode region and in the pos. column and its dependence on the current strength from 3 to 8 amp. F. H. Rathmann

ASB-SLA METALLURGICAL LITERATURE CLASSIFICATION

WE

Materials & Fabricating Techniques

537.323 : 546.817.221 **1821**

The Thermoelectric Effect in Lead Sulphide.

E. D. Devjatkova, J. P. Maslakovec & M. S. Sominskij. (*Bull. Acad. Sci. U.R.S.S., sér. phys.* 1941, Vol. 5, Nos. 4/5, pp. 400-410. In Russian with English summary.) Theoretical expressions are given for the dependence of thermoelectric force on the concentration of carriers of electricity. The temperature variations of electrical and thermal conductivities and of thermoelectric force are investigated in lead sulphide having electronic as well as 'hole' conductivity. The results obtained show that in lead sulphide the concentration of carriers of electricity equals 10^{18}-10^{19}. The electrical conductivity is determined mainly by the temperature variation of the mobility of the carriers.

8a. DEVYATKOVA, YE. D.
Section A

536.21 : 537.311.31 : 537.32

8115. **On the thermal and electrical conductivities, and the thermo-electric force, of Sb/Zn alloys, with special reference to the influence of small admixtures of other metals.** E. D. Devyatkova, Yu. P. Maslakovets and L. S. Stil'bans. *Zh. Tekh. Fiz.*, 22, 129–42 (No. 1, 1952) *In Russian.*

The authors refer to the previous studies of Sb-Zn alloys by Zhemchuzhnyi (1905) and Takei, which revealed the existence of metallic compounds SbZn, Sb_3Zn_4, and Sb_2Zn_3. When the proportion of Zn in the alloy is smaller than that corresponding to SbZn, the alloy can either be simply a mixture of different crystals or a eutectic, but when this proportion is larger, it is always a mixture of crystals. It has also been shown that Sb_3Zn_4 and Sb_2Zn_3 can crystallise into several forms (the "crystal phases," ε, ξ and η, for the former, and β and γ, for the latter) converting into each other at temperatures above 400°C. The present authors approach these metal compounds in the same way as usual in the case of semiconductors, such as PbS or PbSe, in which the relationship between the components is determined by their valencies. Smith (1911) found a sharp change of electrical conductivity, thermoelectric force and the Hall effect, when the proportions in the Sb/Zn alloy correspond to the SbZn metal compound. At the same time, they emphasize the fact that, contrary to the case of semiconductors, no change of sign of the Hall constant is observed in the metal alloys when the proportions correspond to the metal compounds, and the sharp changes at SbZn point are not observed at Sb_3Zn_4 and Sb_2Zn_3 points. The authors investigated the variations of the electrical and thermal conductivities and of the Hall constant of Sb/Zn alloys with the proportions in the neighbourhood of the metallic compounds, and also the influence of the admixtures of small quantities of Ag, Cd, In, Sn, and Te. They took special care to obtain pure alloys. From the data obtained for the Hall constant and for electric conductivities, they calculated in the usual way the electron concentrations and the concentrations of the "cavities". The influence of small admixtures of other metals to the alloy is characterised by the increase of the electrical and thermal conductivities while their proportions remain below a critical point, after which the conductivities begin to decrease. This is usually explained by the "filling

DEVYATKOVA, YE. D.

USSR/Physics - Heat Conductivity, Crystals Jun 52

"Investigation of the Effect of Atomic Admixtures on the Heat Conductivity of a Crystalline Lattice," Ye. D. Devyatkova, L. S. Stil'bans

"Zhur Tekh Fiz" Vol XXII, No 6, pp 968-972

Attempts to find the min quantity of atomic admixt ("impurity") or lattice distortion necessary to change its heat cond. Samples of KCl were tinted and the F-centers investigated. At room temp the variation of heat cond was found, but could not be established at lower temps. Received 15 May 51.

219T86

CA DEVYATKOVA, YE. D.

General & Physical Chemistry - 2

Temperature dependence of the mobility of the carriers of electricity in semiconductors. E. D. Devyatkova, Yu. P. Maslakovets, L. S. Stilbans, and T. S. Stavitskaya. *Doklady Akad. Nauk S.S.S.R.* **84**, 681-2(1952).—In contrast to the theoretical formula for the temp. dependence of the mobility $u = AT^{-3/2}$ for solids with an at. lattice (at temps. high enough for the scattering of electrons by lattice defects to be negligible), which was verified for Si, Ge, and SbZn, the theoretical formula for solids with an ionic lattice, $u = AT^{-1/2}$ (above the Debye temp. θ), has never been verified experimentally. Measurements of the elec. cond. and the Hall effect of PbSe, between 20 and 500°, gave the exptl. result $u = AT^{-2}$, entirely out of line with the theoretical formulas. By comparison of the m.ps., the heats of fusion, and the heats of formation of PbSe and PbS ($\theta \sim 50°$) it appears certain that for PbSe θ is well below 50° and, consequently, the temp. range investigated is well above θ. An analogous temp. dependence of u was found also by V. P. Zhuze, by recalcn. of the exptl. data of Busch, Wieland, and Zoller (*C.A.* 45, 5008*b*) for gray Sn. This discrepancy makes a radical revision of the theory of interaction of electrons with the thermal lattice vibrations imperative. N. Thon

DEVYATKOVA

AUTHOR: DEVYATKOVA, E.D. PA - 2533

TITLE Investigation of Pb Te Heat Conductivity (Issledovaniye teploprovodnosti telluristogo svintsa, Russian)

PERIODICAL Zhurnal Tekhn. Fiz., 1957, Vol 27, Nr 3, pp 461 - 466 (U.S.S.R.)

Received: 4 / 1957 Reviewed: 6 / 1957

ABSTRACT It was the purpose of this investigation to study a substance which can be used for the construction of a thermoelectric battery as well as to investigate the question of the possible heat conduction processes in semiconductors. First it is shown that the difference $\varkappa - \varkappa_0 = \varkappa_e$ is that part of heat conductivity which is due to the transfer of thermal energy by current carriers. According to present theories thermal resistance increases with temperature. At a certain value $T_0 \neq 0$ heat-resistance tends towards zero. Above 200° K heat resistance deviates considerably from the rectilinear temperature-dependence and becomds smaller. Therefore $\varkappa_0 - \varkappa = \varkappa_e$ is not only the heat conductivity of the lattice. Apparently there exists an additional heat-conductivity-process. In this connection it is shown that it can be assumed that in Pb Te an exiton-heat-conductivity process must exist. If the

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DEVYATKOVA, YE. D.

57-9-4/40

AUTHORS Devyatkova Ye.D., Smirnov I.A.,

TITLE On the Heat Conductivity of Germanium.
(O teploprovodnosti germaniya.-Russian)

PERIODICAL Zhurnal Tekhn.Fiz.,1957,Vol 27,Nr 9,pp 1944-1949 (U.S.S.R.)

ABSTRACT The heat conductivity of 8 samples of p- and n-germanium was measured within the range of from 80 ÷ 300 k°. It is shwon that below 200°K the heat conductivity in samples of one and the same type depends on current darrier concentration, which can be brought into connection with the dispersion of the admixtures in atoms. The p-germanium samples were found to have greater heat conductivity in comparison to those of n-germanium within the entire investigated temperature range. On the occasion of the tranformation of a sample of the n-type into the t-type its heat conductivity increased accordingly. On the strength of experimental data it may be assumed that the microstructures of p-and n- germanium monocrystals differ. There are 4 figures and 2 tables.

ASSOCIATION Institute for Semiconductors AN USSR, Leningrad.
(Institut poluprovodnikov AN SSSR, Leningrad).

SUBMITTED March 21, 1957

AVAILABLE Library of Congress.

Card 1/1

DEVYATKOVA, Ye.D.; MOYZHES, B.Ya.; SMIRNOV, I.A.

Thermal conductivity of tellurium with various concentrations of impurities in the temperature interval 80 - 480°K. Fiz. tver. tela 1 no.4:613-627 '59. (MIRA 12:6)

1. Institut poluprovodnikov, Leningrad.
(Tellurium--Thermal properties)

DEVYATKOVA, YE.D.

81943

S/181/60/002/04/01/034
B002/B063

24.7600

AUTHORS: Devyatkova, Ye. D., Smirnov, I. A.

TITLE: Thermal Conductivity of p- and n-Type Germanium With Varying Carrier Concentration in the Temperature Range 80-440°K

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 4, pp. 561-565

TEXT: Two n-type and four p-type germanium samples were examined (Table 1). The thermocouples provided to measure the temperature were soldered to small tin balls applied to the lateral surfaces of the samples in vacuo. It was shown by the experimental results that there is a difference in the thermal conductivity of n- and p-type germanium between 80°K and 340°K (Fig. 1). This phenomenon is explained by the assumption that the additional heat resistance of n-type germanium is due to dissolved gases such as O_2, H_2, and N_2. This is confirmed by the high absorption coefficient at wavelengths ranging between 7 and 10 μ. The thermal conductivity coefficient ϰ of sample No. 4, Ga-doped p-type germanium, is inversely proportional to T over the whole range investigated. The other p-type samples show dif-

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Thermal Conductivity of p- and n-Type Germanium With Varying Carrier Concentration in the Temperature Range 80-440°K

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ferent deviations starting from 320°K (Fig. 2). An attempt is made to calculate the additional thermal conductivity $\Delta \varkappa$ on the assumption that it is due to heat transfer by electromagnetic radiation. Calculated values of the absorption coefficients have the same order of magnitude as the values established experimentally (Table 2). A comparison of values found for heat resistance with those given by other authors is shown in Fig. 3. From this it follows that $1/\varkappa$ depends linearly on T for a not excessively pure germanium within a wide temperature range (from 80 to 1,000°K). The absorption coefficients of two samples were measured by G. B. Dubrovskiy; Chokhral'skiy is mentioned. There are 3 figures, 2 tables, and 22 references: 4 Soviet, 4 American, 9 British, 3 German, and 2 French.

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

SUBMITTED: May 16, 1959

Card 2/2

DEVYATKOVA, Ye.D.; PETROV, A.V.; SMIRNOV, I.A.; MOYZHES, B.Ya.

Melted quartz as a model material for measuring thermoconductivity. Fiz. tver. tela 2 no.4:738-746 Ap '60. (MIRA 13:10)

1. Institut poluprovodnikov AN SSSR, Leningrad.
(Quartz) (Heat--Conduction)

83025

S/181/60/002/008/044/045
B006/B063

24.7700

AUTHORS: Devyatkova, Ye. D., Smirnov, I. A.

TITLE: Thermal Conductivity and Change of the Lorentz Number in PbSe as a Function of the Degree of Degeneration of the Electron Gas and Temperature

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 8, pp. 1984-1991

TEXT: The authors of the present article wanted to study the thermal conductivity of PbSe at different impurity concentrations between 90° and 440°K and to determine A as a function of the degree of degeneration of the electron gas and temperature. The relation $\varkappa_{electr.} = L\sigma T$ holds for the electron component of thermal conductivity. L - Lorentz number, σ - electrical conductivity; $L = A(\frac{k}{e})^2$, where k denotes the Boltzmann constant. L depends on the degree of degeneration of the electron gas and on the mechanism of the scattering of electrons and holes. For

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Thermal Conductivity and Change of the Lorentz Number in PbSe as a Function of the Degree of Degeneration of the Electron Gas and Temperature

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several elements and alloys, A has already been determined experimentally. In this connection, the authors discuss the results obtained by A. V. Ioffe, A. F. Ioffe, Devyatkova, and Yu. A. Dunayev. Eight p-type and six n-type PbSe samples were examined. Their carrier concentrations (Table) varied from $3.3\cdot10^{17}$ to $9.6\cdot10^{19}$ cm^{-3}. Four of the n-type samples were polycrystalline, and the rest were single crystals. The thermal conductivity and the thermo-emf of all samples, on the one hand, and the temperature dependence of electrical conductivity and the Hall constant, on the other, were measured simultaneously (by Ye. D. Nensberg). Fig. 1 shows thermal conductivity as a function of temperature; the curves of all samples show similar (exponential) courses, and the value for A is nearly equal to 2. Figs. 2 and 3 show the thermo-emf as temperature functions for p-type (Fig. 2) and n-type PbSe (Fig. 3). Some of the samples had a very low thermo-emf (20 - 160 μv/deg). Fig. 4 shows the curves of $A = f(\mu^*)$ theoretically calculated for different r-values, where μ^* is the reduced chemical potential ($\mu^* = \mu/kT$). r is the

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Thermal Conductivity and Change of the Lorentz Number in PbSe as a Function of the Degree of Degeneration of the Electron Gas and Temperature

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exponent in the formula for the energy dependence of the mean free path of the electron: $l(T,\varepsilon) = l_0(T)\varepsilon^r$. Fig. 5 shows the coefficient of the thermo-emf α as a (theoretical) function of μ^*, and Fig. 6 shows A as a function of $|\alpha|$. All diagrams contain the curves for r=0, 1/2 and 1. The samples of an electron concentration of $4.5\cdot10^{17}cm^{-3}$ were found to be non-degenerate between 90° and 300°K, while those having an electron concentration of $9.6\cdot10^{19}cm^{-3}$ were completely degenerate between 90° and 360°K. In the first case $\varkappa_{electr.} = 3.554\cdot10^{-9}$ σTcal/cm.sec.deg, and in the second case $\varkappa_{electr.} = 5.84\cdot10^{-9}$ σTcal/cm.sec.deg. Fig. 7 shows the lattice-induced thermal conductivity as a function of temperature. The experimental values of all samples coincide within the limits of the accuracy measurement ($\varkappa_{total} = \varkappa_{lattice} + \varkappa_{electron}$). Fig. 8 shows A(T) for r=0, 1/2, 1 of a p-type sample of $6.2\cdot10^{18}cm^{-3}$. The experimental values calculated from the formula $A = \varkappa_{electr.}/\sigma T(k/e)^2 = (\varkappa_{total}$

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Thermal Conductivity and Change of the Lorentz Number in PbSe as a Function of the Degree of Degeneration of the Electron Gas and Temperature

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$-\varkappa_{lattice})/\sigma T(k/e)^2$ are also plotted. The results of the present article are finally summed up. Whereas the values obtained for $\varkappa_{lattice}$ of the samples coincide and no phonon scattering from impurities could be observed, the values for $\varkappa_{electron}$ follow the Wiedemann-Franz law if $r = 0$. In PbSe, the scattering from acoustic vibrations is predominant, and not the scattering from optical vibrations ($r=1$). There are 8 figures, 1 table, and 18 references: 11 Soviet, 5 British, 1 US, and 1 Japanese.

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

SUBMITTED: February 4, 1960

Card 4/4

24.5200 (1164, 1537 only)
26.2421

S/181/61/003/005/006/042
B101/B214

AUTHORS: Devyatkova, Ye. D., Petrov, A. V., and Smirnov, I. A.

TITLE: Heat transfer on bipolar diffusion of heat carriers in lead telluride and lead selenide

PERIODICAL: Fizika tverdogo tela, v. 3, no. 5, 1961, 1338-1341

TEXT: Ye. D. Devyatkova had studied the heat conductivity of PbTe in 1956 (ZhTF, v. 27, no. 3, 461, 1957) and found a deviation from the theoretical dependence $1/\kappa_1 \sim T$ in the temperature range 250-450°K, $1/\kappa_1$ being the thermal resistance of the crystal lattice. The object of the work was to study this effect in a larger temperature interval (90-800°K) and extend the investigation also to PbSe. Fine crystalline sintered samples and large crystals were used. They had been obtained by Ye. D. Nensberg by cooling the melt of stoichiometric composition. All samples were annealed at 600-900°K. The apparatuses for the measurements of heat conductivity were those described: Ye. D. Devyatkova, A. V. Petrov, I. A. Smirnov, B. Ya. Moyzhes, FTT, 2, 4, 738, 1960. Apparatus A was used for the measurement at 90-400°K, apparatus B

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at 300-800°K. The electric conductivity and thermo-emf were simultaneously measured in B; only the thermo-emf was measured in A. χ_1 was calculated as difference from the measured total heat conductivity χ_e. χ_e was calculated according to the Wiedemann-Franz law taking into account the degeneracy. Fig. 1 shows the function $1/\chi_1 = 1/(\chi - \chi_e)$ for PbTe at different hole concentrations. PbSe showed the same behavior. It is found that the deviation from the linear course is connected with the degree of purity. An additional heat conductivity by mixed conductivity and heat transfer by means of electron - hole pairs is assumed. The expression is:

$\Delta\chi = A\sigma(k/e)^2 T[\Delta E/2kT + 2]^2$ (1), where σ is the electric conductivity, ΔE the width of the forbidden zone at the temperature T, and e the electronic charge. $A = 4ab/(1 + ab)^2$, where $a = n_-/n_+$, $b = u_-/u_+$ are the ratios, the concentration, and the mobility, respectively, of the electrons and holes. Eq. (1) was checked by measuring the Hall coefficients and the electric conductivity. On the basis of the relations $n_- n_+ = n^2_{maj} = n_-(n'_+ + N)$ and $n_- = n'_+$; (n_-, n_+ are concentrations of free electrons and holes, N is the

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concentration of the minority carriers) it was calculated that $a = n_-/(n_- + N)$ for hole-type sample, and $a = n_+/(n_+ + N)$ for electron-type sample. n_{maj} for PbSe was calculated from $n_{maj} = 2(2\pi kT/h^3)^{3/2}(m_-^* m_+^*)^{3/4}\exp(-\Delta E/2kT)$, where m^* is the effective mass, $m^* \sim T^{0.4}$. Since the temperature dependence of m^* for PbTe is not accurately known, $R\sigma = (3\pi/8)u_+(1 - ab^2)/(1 + ab)$ is taken for the calculation of a, where $u_+ \sim T^{-2.5}$. It was assumed that b = 2.0 for PbTe and b = 1.1 for PbSe. For the calculation of n_{maj} and ΔXvalues of ΔE were assumed which were in the neighborhood of values obtained by optical measurements and comparable to the data of Gibbson (R. A. Smith, Physica, 20, 925, 1954) and W. W. Scanlon (see below). In good agreement with the experimental data, the calculation of (1) yielded: for PbTe ΔE = 0.32 ev in the temperature range 436-700°K; for PbSe ΔE = 0.30 ev at 500°K and ΔE = 0.34 ev at 700°K. The additional heat conductivity of PbTe and PbSe is explained as being due to heat transfer as a consequence of bipolar diffusion of majority carriers. The participation of excitons assumed in the previous work is thus not confirmed. There are 2 figures, 2 tables, and

7 references: 5 Soviet-bloc and 2 non-Soviet-bloc. The reference to English-language publication reads as follows: W. W. Scanlon, J. Phys. Chem. Sol., 8, 423, 1959.

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

SUBMITTED: December 3, 1960

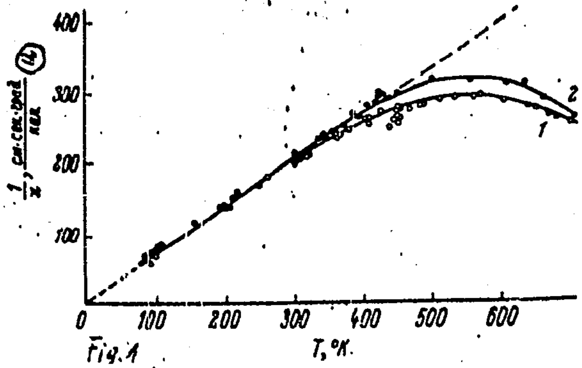

Fig. 1. Heat resistance of the crystal lattice of PbTe as a function of the temperature.
Legend: 1) $n_+ = 5.2 \cdot 10^{17}$ cm^{-1}; 2) $n_+ = 1.2 \cdot 10^{19}$ cm^{-1}; a) cm·sec·deg/cal (n_+ = concentration of impurity holes).

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27281

S/181/61/003/008/011/034
B102/B202

26.2532

AUTHORS: Devyatkova, Ye. D. and Smirnov, I. A.

TITLE: Effect of halogen impurities on the thermal conductivity of lead telluride

PERIODICAL: Fizika tverdogo tela, v. 3, no. 8, 1961, 2298 - 2309

TEXT: The thermal conductivity of PbTe has been studied already several times, however, the effect of various impurities has hitherto not been considered. Only T. L. Koval'chik and Yu. P. Maslakovets studied the effects of various impurities on the electrical properties of PbTe; they demonstrated that halogen impurities greatly increase the free-electron concentration. Samples that contain impurities in the form of $PbBr_2$ (or $PbCl_2$, PbI_2) also have a high absolute carrier mobility. Thermal conductivity, electric conductivity, Hall constant, and thermo-emf were measured in 14 pairs of single and polycrystalline PbTe samples with halogen impurities as well as in PbTe + 1% PbSe and PbTe + 1% SnTe solid solutions. The samples were produced from pure elements (lead 99.99% pure). All

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Effect of halogen... S/181/61/003/008/011/034
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single crystals studied were of the p-type. They were obtained by crystallization with slow cooling. The pressed n-type samples $PbCl_2$ + Pb, $PbBr_2$ + Pb, and PbI_2 + Pb were obtained by the ordinary cermet method. The solid solutions were produced by melting together the initial substances in a stoichiometric ratio. Prior to the measurements the samples were annealed: the single crystals at 300°C, the polycrystals at 600°C (for several hours). After examination of their homogeneity, the measurements were made. The PbTe samples alloyed with PbI_2 were the most thoroughly studied. It was found that at halogen concentrations of the order of $3\cdot10^{19} - 2\cdot10^{20}$ cm^{-3} the thermal conductivity $\varkappa_p$ of the lattice considerably decreases which may be due to the large phonon scattering cross section of the halogens. Goldsmid tried to explain the anomalously large cross section by assuming that the halogen atoms are located in interstitial sites. Other studies made by Goldsmid (in Bi_2Te_3) and Koval'chik and Maslakovets indicate that they are located in the lattice sites and occupy the sites of tellurium. Hence, the reason of their large phonon scattering cross section remains unexplained. According to

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A. F. Ioffe, $\frac{\varkappa_0}{\varkappa} = 1 + \frac{N}{N_0}\Phi\frac{l_0}{a}$, where N is the impurity concentration, N_0 the number of atoms per cm^3, a the distance between two neighboring atoms in the lattice, l_0 the mean free path for phonons in the material containing no impurities, $\Phi = s/a^2$ (s - impurity scattering cross section) $\varkappa$ and $\varkappa_0$ are the thermal conductivities in material with and without impurities. Φ was found to be between 3.00 and 3.74 for the samples studied, for the two solid solutions it was 0.73 and 0.64. Goldsmid measured $\Phi \simeq 13$ for chlorine and iodine in Bi_2Te_3. The results can be summarized as follows: Beginning at concentrations of $1\cdot10^{19}$ cm^{-3} the halogen impurities considerably reduce the thermal conductivity of the PbTe lattice. With $n \simeq 3\cdot10^{19} - 2\cdot10^{20}$ cm^{-3} the additional thermal resistance is proportional to the carrier concentration. The thermal conductivity of the lattice changes independently of the mass of the halogen added; the similar effect of the impurities can be explained by assuming a high static dielectric constant of PbTe. Phonon scattering from Se and Sn impurities is about 1/5 of the scattering from halogens. In the entire temperature range studied electric conductivity, thermo-emf,

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Effect of halogen... S/181/61/003/008/011/034
B102/B202

and thermal conductivity are independent of the type of the halogen and of the amount of excess lead. The authors thank B. Ya. Moyzhes for discussion and Yu. V. Ilisavskiy for communication of data. A. L. Efros, E. Burshteyn, P. Egli, A. A. Rudnitskiy, T. S. Stavitskaya, and Yu. P. Shishkin are mentioned. There are 10 figures, 5 tables, and 32 references: 18 Soviet-bloc and 14 non-Soviet-bloc. The two most important references to English-language publications read as follows: H. J. Goldsmid. Proc. Phys. Soc. London, 72, No. 463, 17, 1958; Y. Kanai, R. Nii. J. Phys. Chem. Sol. 8, 338, 1959.

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

SUBMITTED: February 27, 1961

Card 4/4

27282

9.4177 (1482) also 1144

S/181/61/003/008/012/034
B102/B202

AUTHORS: Devyatkova, Ye. D. and Smirnov, I. A.

TITLE: Carrier scattering mechanism in lead telluride

PERIODICAL: Fizika tverdogo tela, v. 3, no. 8, 1961, 2310 - 2318

TEXT: The exponent r in the relation $l(T,\varepsilon) = l_0(T)\varepsilon^r$ where l is the mean free path of electrons, ε the energy, characterizes the scattering mechanism. According to theory, r = 0 in the scattering of electrons from acoustic lattice vibrations which characterizes the covalent type of bond. In the scattering from optical vibrations r = 1/2 ($T < \theta$) and r = 1 ($T > \theta$) which is characteristic of the ionic bond. For scattering from impurity ions r = 2. Since the scattering mechanism of the carriers in PbTe has hitherto not systematically been studied, the authors studied it via determining r by measuring the electron contribution to the thermal conductivity and the carrier mobility as depending on temperature. They demonstrated that in PbTe scattering from acoustic lattice vibrations predominates (r = 0). This result had been obtained already by

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Carrier scattering...

S/181/61/003/008/012/034
B102/B202

E. Z. Gershteyn, T. S. Stavitskaya, L. S. Stil'bans, and I. M. Tsidel'kovskiy. S. I. Pekar, E. Burshteyn, P. Egli et al, classified PbTe as belonging to the substances with ionic bond. The authors used the experimental data of a previous paper (present periodical, p. 2298) for PbTe with iodine impurity in order to determine r. The scattering mechanism, i. e., r was determined on the following basis:

scattering mechanism	u	$\alpha^2\sigma$	for $\varkappa_{latt} \sim T^{-1}$	for $\varkappa_{latt}$ = const
thermal vibrations of ionic lattice	$T^{-1/2}$	T	T^2	T
thermal vibrations of atomic lattice	$T^{-3/2}$	const	T	const
scattering from impurity ions	$T^{3/2}$	T^3	T^4	T^3

Also the temperature dependence of mobility u, the thermo-emf α and the

Card 2/3

27282

Carrier scattering...

S/181/61/003/008/012/034
B102/B202

electric conductivity σ were measured. The proportionality obtained indicated that in PbTe scattering from acoustic lattice vibrations (r = 0) predominates. Only in samples with carrier concentrations of 10^{19} - 10^{20} cm^{-3}, r $\neq$ 0 (r>0) at low temperatures. This is explained by a scattering of the electrons from impurity ions. In an appendix a detailed report is given on the calculation of thermal conductivity ($\varkappa_p \cong \varkappa_{lattice}$ and $\varkappa_{general}$) in halogenated n-type PbTe in the entire temperature range. There are 4 figures, 4 tables, and 16 references: 13 Soviet-bloc and 3 non-Soviet-bloc. The two most important references to English-language publications read as follows: W. W. Scanlon, Sol. State Phys., 9, 83, 1959; W. W. Scanlon, Phys. Chem. Solids, 8, 1959.

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

SUBMITTED: February 27, 1961

Card 3/3

S/181/62/004/006/045/051
B108/B138

AUTHORS: Devyatkova, Ye. D., and Smirnov, I. A.

TITLE: The heat conductivity of p-type and n-type germanium

PERIODICAL: Fizika tverdogo tela, v. 4, no. 6, 1962, 1669-1671

TEXT: The heat conductivity of various p-type and n-type germanium single crystals was measured. Impurities (Ga and Sb) were introduced as the crystals were being grown. To obtain the most reliable results the thermo-emf was also measured. It was found that p-type and n-type Ge have the same heat conductivity. Earlier results showing a difference in the heat conductivities of p-type and n-type Ge were probably due to different ways of preparing the specimens. There are 2 figures and 1 table.

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

SUBMITTED: February 12, 1962

Card 1/1

S/181/62/004/007/035/037
B111/B104

AUTHORS: Devyatkova, Ye. D., and Smirnov, I. A.

TITLE: NaCl and KCl single crystals as standards in thermal conductivity measurements from 80 to 460°K

PERIODICAL: Fizika tverdogo tela, v. 4, no. 7, 1962, 1972-1975

TEXT: As pure NaCl and KCl crystals have stable values of thermal conductivity they can be used for calibrating experimental arrangements or for comparison with measured thermal conductivity values of other crystals in the alkali-halogen group. NaCl and KCl crystals must be perfectly pure (thermal conductivity is changed by moisture and impurities) and must either be stored in dry places or be annealed before measurement. The crystals were grown from a melt of X4 (KhCh) salts, annealed through 6-8 hours at 600°C and then slowly cooled to room temperature. The measuring method is that employed by Ye. D. Devyatkova et al. (FTT, 2, 738, 1960). To reduce the heat flow by 60%, the specimens were arranged between gold and nickel plates. Results are summarized in the Table. The maximum

Card 1/2

NaCl and KCl single crystals as ... S/181/62/004/007/035/037
B111/B104

error amounts to ± 3%. There are 1 figure and 1 table.

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

SUBMITTED: March 31, 1962

Card 2/3 2

34022
S/056/62/042/001/047/048
B142/B112

24,7500 (1144, 1482, 1454)

AUTHORS: Devyatkova, Ye. D., Kornfel'd, M. I., Smirnov, I. A.

TITLE: Phonon scattering from impurity ions in the NaCl crystal

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 42, no. 1, 1962, 307-308

TEXT: The principal impurities contained in the NaCl crystal are Ag^+, Br^-, and K^+. Their presence causes the lattice distortions and the formation of scattering centers for phonons. The scattering cross section is proportional to the square of the radius of the distorted domains. This means that for Ag^+, Br^-, and K^+ the ratio of their scattering cross sections will be 1 : 2.0 : 3.5 (ratio of the radii of the distorted domains = 1 : 1.4 : 1.9). In the following proof is furnished for this statement. For low impurity ion concentrations $\Delta R/R_o = f(l_o/l_w)$, where R_o = thermal resistance of the pure crystal, ΔR = additional thermal resistance due to impurities, l_o, l_w = mean free path of phonons. Since $l_o \sim 1/R_o \bar{v} C_v$ and $l_w \sim 1/SN$, $\Delta R/R_o = f(\eta)$, where $\eta = SN/R_o \bar{v} C_v$. ($\bar{v}$ = mean sound velocity,

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34022
S/056/62/042/001/047/048
B142/B112

Phonon scattering from ...

C_v = specific heat, S = phonon scattering cross section, N = number of impurity ions per unit volume. The thermal conductivity for an NaCl monocrystal containing AgCl, NaBr, and KCl impurities was measured between 100-380°K. The following values were used for calculating η: R_0 = 63 cm·sec.deg·cal^{-1}, C_v = 0.42 cal·cm^{-3}, $\bar{v}$ = 3.2·10^5 cm·sec^{-1}, N = c·N_0, c = molar concentration of impurity ions, N_0 = 2.23·10^{22} cm^{-3}. S was set equal to the square of the radius of the distorted domain and was determined for Ag^+, Br^-, and K^+ from nuclear magnetic resonance at 300°K. The values obtained are 2.48, 4.85, and 8.75·10^{-14} cm^2. The resulting curve $\Delta R/R_0 = f(\eta)$ was drawn and compared with measurements and was found to agree fairly well not only for the data obtained at 300°K but also for other values. The results show that the radius of the distorted domain is practically independent of temperature. V. V. Lemanov is thanked by the authors for his assistance. There are three figures and three references: 2 Soviet and 1 non-Soviet.

X

ASSOCIATION: Institut poluprovodnikov Akademii nauk SSSR (Institute for Semiconductors of the Academy of Sciences USSR)

SUBMITTED: November 30, 1961

Card 2/2

40888

24.7600.

S/181/62/004/009/024/045
B104/B186

AUTHORS: Devyatkova, Ye. D., and Smirnov, I. A.

TITLE: Temperature dependence of the heat-transfer resistance of some crystals close to the Debye temperature

PERIODICAL: Fizika tverdogo tela, v. 4, no. 9, 1962, 2507-2513

TEXT: With a view to establishing the factors that determine the variations occurring in the temperature dependence of the heat-transfer resistance of various crystals, the thermal conductivity of KBr, NaI, and CdT was exactly determined within the range 80 - 460°K, and the values so obtained were compared with published data (Devyatkova, Smirnov, FTT, 2, 1984, 1960; FTT, 3, 2298, 1961; FTT, 4, 7, 1962) relating to PbSe, PbTe, KCl, and NaCl. In order to prevent lateral loss of heat during the measurement, the lateral faces of the single crystals were coated with a dull black color. Above and below the Debye temperature, the heat-transfer resistance can be accurately described by the straight lines $1/\kappa_p$ = AT and $1/\kappa_p$ = BT. The compounds can be grouped in three

Card 1/2

classes: (1) The thermal conductivity of CdTe, KCl, and NaCl decreases around the Debye temperature; (2) the thermal conductivity of PbSe, NaI, and KBr increases around the Debye temperature; (3) the thermal conductivity of PbTe remains constant. Conclusions: Below the Debye temperature, the optical branches of the oscillations are not excited, the heat being passed on by acoustic phonons only. Around the Debye temperature, however, the optical branches of the oscillations become excited. The thermal conductivity increases if optical oscillations contribute largely to the heat conduction, but decreases if a strong interaction between optical and acoustic oscillations occurs. When the optical branches of the oscillations are dispersed only slightly and if the two modes of oscillation do not interact, the thermal conductivity will remain constant. There are 8 figures and 1 table.

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

SUBMITTED: May 4, 1962

S/181/62/004/012/046/052
B125/B102

AUTHORS: Devyatkova, Ye. D., Kornfel'd, M. I., and Smirnov, I. A.

TITLE: Phonon scattering from impurity ions of Ag, Br, K, Li, I, and Rb in sodium chloride crystals

PERIODICAL: Fizika tverdogo tela, v. 4, no. 12, 1962, 3669-3670

TEXT: The heat conduction of NaCl-crystals was measured at room temperature with added Li^+, I^- and Rb^+. The local distortions of the NaCl-lattice near the impurity ions listed have been investigated by M. I. Kornfel'd, V. V. Lemanov (ZhETF, 43, 2021, 1962). The relative changes of the thermal resistance $\Delta R/R_0$ for the samples with impurities of Li^+, I^-, Rb^+ (present paper) and Ag^+, Br^-, and K^- as a function of the dimensionless $\eta = SN/R_0\bar{v}C_v$ fit the same curve very well. The values 0, 1.0, 2.0, 3.0, 4.0 and 5.0 of η correspond with the values ~0.32, ~0.48, ~0.62, ~0.74 and ~0.85 of $\Delta R/R_0$. S is the cross section of the distorted zone, N the number of impurity ions per unit volume, $\bar{v}$ the mean sound velocity, C_v the specific heat. There is 1 figure.

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Phonon scattering from impurity... S/181/62/004/012/046/052
B125/B102

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

SUBMITTED: August 2, 1962

Card 2/2

DEVYATKOVA, Ye.D.; SMIRNOV, I.A.

Thermal conductivity of p and n-germanium. Fiz. tver. tela 4 no.6: 1669-1671 Je '62. (MIRA 16:5)

1. Institut poluprovodnikov AN SSSR, Leningrad.
(Germanium--Thermal properties)

DEVYATKOVA, Ye.D.; SMIRNOV, I.A.

NaCl and KCl single crystals as standard materials in thermal conductivity measurements in the 80 -460 K temperature range. Fiz.tver.tela 4 no.7:1972-1975 Jl '62. (MIRA 16:6)

1. Institut poluprovodnikov AN SSSR, Leningrad.
(Salt crystals--Thermal properties)
(Potassium chloride crystals--Thermal properties)

On thermal conductivity of the system of solid solutions PbTe-PbS. Ye. D. Devyatkova, V. V. Tikhonov, N. A. Smirnov.

Change of the electrical properties of PbSe, PbTe, and PbS under close pressure. A. D. Averkin, A. A. Andreyev, I. G. Dombrovskaya, B. Ya. Moyzhes, E. D. Nensberg.

Report presented at the 3rd National Conference on Semiconductor Compounds, Kishinev, 16-21 Sept 1963

DEVYATKOVA, Ye.D.; SMIRNOV, I.A.

Heat conductivity of plastically deformed NaCl single crystals. Fiz. tver. tela 5 no.7:2032-2034 Jl '63. (MIRA 16:9)

1. Institut poluprovodnikov AN SSSR, Leningrad.
(Sodium chloride crystals—Thermal properties)

ACCESSION NR: AP4013500 S/0181/64/006/002/0430/0435

AUTHORS: Devyatkova, Ye. D.; Zhuze, V. P.; Golubkov, A. V.; Sergeyeva, V. M.; Smirnov, I. A.

TITLE: The thermal conductivity of Sm, P, and their simple chalcogen compounds

SOURCE: Fizika tverdogo tela, v. 6, no. 2, 1964, 430-435

TOPIC TAGS: thermal conductivity, samarium, praseodymium, chalcogen, crystal lattice conductivity, rare earth

ABSTRACT: This paper stems from a lack of thermal-conductivity information on rare-earth compounds and their compounds that have been recently studied in considerable detail for other properties. The compounds studied (PrS, PrSe, PrTe, and SmS) were synthesized from the constituent elements by the method described in Rare Earth Research (p. 135, 223, Ed. by E. V. Kleber, N. Y., 1961), and the thermal conductivity was measured on the "A" setup of Ye. D. Devyatkova, A. V. Petrov, I. A. Smirnov, and B. Ya. Moyzhes (FTT, 2, 738, 1960). Measurements on Sm, Pr, and the indicated compounds were made in the temperature interval 80-460K.

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ACCESSION NR: AP4013500

The authors found that a considerable part of the total thermal conductivity (up to 30-50%) in these substances is crystal-lattice conductivity. The temperature dependence of this lattice conductivity may be explained by two scattering processes: phonons by phonons and phonons by electrons. Orig. art. has: 6 figures, 2 tables, and 5 formulas.

ASSOCIATION: Institut poluprovodnikov AN SSSR, Leningrad (Institute of Semiconductors AN SSSR)

SUBMITTED: 30Jul63 DATE ACQ: 03Mar64 ENCL: 00

SUB CODE: IC, SS NO REF SOV: 004 OTHER: 009

ACCESSION NR: AP4039673 S/0181/64/006/006/1813/1817

AUTHORS: Devyatkova, Ye. D.; Golubkov, A. V.; Kudinov, Ye. K.; Smirnov, I. A.

TITLE: The effect of spin phonon interaction on the thermal conductivity of MnTe

SOURCE: Fizika tverdogo tela, v. 6, no. 6, 1964, 1813-1817

TOPIC TAGS: Neel temperature, spin phonon interaction, phonon phonon collision, thermal conductivity, magnon, manganese telluride

ABSTRACT: The authors have measured the thermal conductivity, the thermoelectromotive force, and the resistivity of a number of MnTe samples, both above and below the Néel temperature. The samples were prepared at a pressure of 8000 kg/cm^2 and then annealed in argon at 650C for 60 hours. The temperature dependence of the thermal resistance may be represented by two straight lines, one for temperatures below the Néel temperature (100-200K) and one for temperatures above (310-480K). Between these occurs a transition zone. At the lower temperatures, thermal resistance is determined by phonon interaction, and it increases normally with temperature. Transfer of heat by magnons may also contribute to heat conduction.

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ACCESSION NR: AP4039673

At temperatures considerably greater than the Néel temperature, phonon-magnon scattering is ineffective, and thermal conductivity is determined by phonon-phonon collisions. The thermoelectromotive force and the resistivity both increase sharply in the temperature region of 200-300K. The cause of the increase in thermoelectromotive force is not clear. It may be due to complex structure or it may be due to entrainment of electrons by magnons. Orig. art. has: 2 figures.

ASSOCIATION: Institut poluprovodnikov AN SSSR, Leningrad (Institute of Semiconductors, AN SSSR)

SUBMITTED: 15Jan64 DATE ACQ: 19Jun64 ENCL: 00

SUB CODE: EC, SS NO REF SOV: 004 OTHER: 006

Card 2/2

L 2521-66 EWT(1)/EWT(m)/ETC/EWG(m)/EPA(w)-2/EWP(t)/EWP(b)/EWA(m)-2 IJP(c)
ACCESSION NR AP5014578 RDW/JD/AT UR/0181/65/007/006/1770/1776

44,55 44,55 54

AUTHOR: Devyatkova, Ye. D.; Tikhonov, V. V.

21,44,55 51

TITLE: Scattering of phonons and electrons in solid solutions

B

SOURCE: Fizika tverdogo tela, v. 7, no. 6, 1965, 1770-1776

21

TOPIC TAGS: electron scattering, phonon scattering, solid solution, lead compound, selenium containing alloy, tellurium containing alloy, thermal conduction, temperature dependence

21

ABSTRACT: This is a continuation of earlier work by the authors (FTT v. 4, 2507, 1962 and earlier) and is devoted to a study of the thermal conductivity of solid solutions x PbSe. (1 - x) PbTe (0.05 ≤ x ≤ 0.95) (carrier density from 1.1 x 10^{17} to 8.9 x 10^{19} cm^{-3}) in the temperature interval 90--390K. The study encompasses an analysis of the electronic component of the conductivity, the influence of an electrically-active impurity on the magnitude of the thermal resistance of the lattice, the temperature dependence of the effective mass and of the electric conductivity was and the character of the scattering of the electrons by neutral impurities and by photons. The temperature dependence of the thermal resistance is

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linear, independently of the composition, with the exception of x = 0.2. The maximum of the thermal resistance of the lattice is near x = 0.4 — 0.5. The electrically-active impurity exerted a stronger influence on the solid solution than on the initial components. It is concluded that the carrier mean free path in solid solutions is independent of the energy. The effective mass depends little on the composition of the solid solution, but depends on the temperature. Orig. art. has: 3 figures, 2 tables, and 1 formula.

ASSOCIATION: Institut poluprovodnikov AN SSSR Leningrad (Institut of Semiconductors AN SSSR) 44,55

SUBMITTED: 31Dec64 ENCL: 00 SUB CODE: SS ,NP

NR REF SOV: 011 OTHER: 004

Card 2/2

L 10567-66 EWT(1)/EWT(m)/T/EWP(t)/EWP(b) IJP(c) JD/AT

ACC NR: AP5025408 SOURCE CODE: UR/0181/65/007/010/3136/3138

AUTHOR: Saakyan, V. A.; Devyatkova, Ye. D.; Smirnov, I. A.

ORG: Institute of Semiconductors AN SSSR, Leningrad (Institut poluprovodnikov AN SSSR)

TITLE: Determining the high-temperature width of the forbidden band in PbTe

SOURCE: Fizika tverdogo tela, v. 7, no. 10, 1965, 3136-3138

TOPIC TAGS: semiconductor research, lead compound, telluride, polycrystal, forbidden zone width, semiconductor theory

ABSTRACT: The authors measure and calculate E_g for polycrystalline specimens of lead telluride in the 400-700°K temperature range. Ordinary powder metallurgy methods were used for producing *n*- and *p*-type specimens with current carrier concentrations of $\sim 5 \cdot 10^{18}$ and $\sim 1.7 \cdot 10^{18}$ cm^{-3} respectively. The formula used for calculating the width of the forbidden band is given. The calculated data are used for plotting $E_g(T)$. The curve is compared with the data obtained by other authors using various methods. Satisfactory agreement is observed. The change in E_g with temperature is

Card 1/2

L 10597-66

ACC NR: AP5025408

3

close to $4 \cdot 10^{-4}$ electron volts per degree. It is pointed out that calculation for the case of p-PbTe is complicated by the presence of two bands with light and heavy holes. The authors are grateful to B. Ya. Moyzhes for discussing the results. Orig art. has: 1 figure, 1 formula. 44,55

SUB CODE: 20/ SUBM DATE: 24May65/ ORIG REF: 005/ OTH REF: 007

beh

Card 2/2

L 41591-66 EWT(m)/EWP(w)/T/EWP(t)/ETI IJP(c) RDW/JD/JG

ACC NR: AP6018537 SOURCE CODE: UR/0181/66/008/006/1761/1771

AUTHOR: Golubkov, A. V; Devyatkova, Ye. D.; Zhuze, V. P.; Sergeyeva, V. M.; Smirnov, I. A.

ORG: Institute of Semiconductors, AN SSSR, Leningrad (Institut poluprovodnikov AN SSSR)

TITLE: Thermal conductivity of lanthanum and its monochalcogenites

SOURCE: Fizika tverdogo tela, v. 8, no. 6, 1966, 1761-1771

TOPIC TAGS: lanthanum, lanthanum compound, thermal conduction, rare earth metal, crystal lattice, thermal emf, temperature dependence, phonon scattering, electron scattering

ABSTRACT: This is a continuation of earlier research by the authors (FTT v. 6, 430, 1964) on the thermal conductivity of rare-earth metals and their compounds, and is devoted to a separation of the electronic and lattice components of the thermal conductivity of La, LaTe, LaSe, and LaS. The lanthanum monochalcogenites were synthesized from the constitutent elements by a method described in detail in the literature (Rare Earth Research, 223. Ed. by E. V. Kleber, NY, 1961; A. V. Golubkov et al., Neorg. mat. v. 2, 77, 1966) and were pressed into briquettes at high pressure followed by annealing. The measurement apparatus was described by the authors earlier (FTT v. 2, 738, 1960). The theoretical expressions for the two thermal-conductivity components are derived. From an analysis of the experimentally measured

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L 41591-66

ACC NR: AP6018537

thermal conductivity, resistivity, and thermal emf and their temperature dependence it is deduced that an appreciable fraction of the total thermal conductivity is due to the crystal lattice. The temperature dependence of the lattice component can be attributed to the presence of two scattering mechanisms, phonons by phonons and phonons by conduction electrons. The low carrier mobility observed in the experiments is due essentially to strong electron-phonon interaction. The presently available data on LaTe, LaSe, and LaS are summarized in a table. The authors thank A. I. Zaslavskiy and T. B. Zhukova for the x-ray analysis, V. M. Muzhdaba and Ye. V. Goncharova for supplying data on the residual resistance and on the concentration, and Doctor Suchat for information on the degree of ionicity of the materials measured in this study. Orig. art. has: 7 figures, 7 formulas, and 5 tables.

SUB CODE: 20/ SUBM DATE: 03Nov65/ ORIG REF: 010/ OTH REF: 022

Card 2/2 mlp

1ST AND 2ND ORDERS   PROCESSES AND PROPERTIES INDEX   3RD AND 4TH ORDERS

BU

2-4

Chemical method for determining vitamin-*C*. V. A. DEVIATNIN and V. M. DOROSCHENKO (Compt. rend. Acad. Sci. U.R.S.S., 1935, 3, 177—180).—The following modification of the method of Tillmans *et al.* (A., 1932, 310, 658) removes the reducing activity of most foreign substances in extracts of vitamin-*C*. The material is boiled with 5% AcOH (CO_2 stream), cooled, neutralised (p_H 6·0) with $CaCO_3$, and pptd. with $Pb(OAc)_2$. After filtration the extract is acidified with AcOH to p_H 3·0 and titrated with 2 : 6-dichlorophenol-indophenol to a slight pink (CO_2 stream). Good agreement with biological assays is obtained. J. W. B.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

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3RD AND 4TH ORDERS

10

A chemical method for determination of vitamin B_1. V. A. Devistain.—*Compt. rend. acad. sci. U. R. S. S.* [N. S.], 4, 67-71(1936).—In a small test tube are mixed 1 cc. of Kinnersley and Peters reagent (100 ml. *N* NaOH, 6.76 g. $NaHCO_3$ and 100 ml. H_2O) (*C. A.* 28, 8844[4]), 2 cc. of diazotized sulfanilic acid (0.5%), 3 drops 40% CH_2O and 1 cc. of the ext. to be tested. The contents are quickly shaken and allowed to stand 10 min. in a water bath at 90-95°. The reading is then taken in a colorimeter. Details are given for prepg. the soln. to be tested.

E. D. Walter

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

PROCESSES AND PROPERTIES INDEX

Ca

110

The determination of ascorbic acid (vitamin C) in blood and urine. V. A. Devyatnin and V. M. Iosikova. *Compt. rend. acad. sci. U.R.S.S.* 15, 85–8 (1947) (in English). The method is based on the observation that the oxidation of ascorbic acid (I) by $Hg(OAc)_2$ is inhibited by Ca salts. To 4 cc. blood or urine are added 8 cc. 0.5% $Ca(OAc)_2$ and (with stirring) 4 cc. 25% $Hg(OAc)_2$. After stirring until the mixt. is homogeneous, the mixt. is centrifuged or filtered. Blood samples require centrifuging; urine samples can be clarified by filtration. I that may have been oxidized by $Hg(OAc)_2$ is then reduced by passing H_2S through the clear soln. for 3–5 min.; H_2S is then removed by CO_2 and the soln. titrated with 0.0005 *N* 2,6-dichlorophenolindophenol to a stable pink color. A blank detn. must be carried out on the reagents used. One mg. I reduced 11.4 cc. 0.001 *N* 2,6-dichlorophenolindophenol soln. Twenty-three substances that might occur in body fluids were carried through this detn., and found to use none of the reagent. The blood of normal human blood contains 0.50–0.80 mg. % I. Daily administration of 300 mg. I resulted in gradually increased elimination of I in the urine. Hypervitaminosis C does not occur in the human organism, but hypovitaminosis C may occur, especially in the winter-spring period, if fresh fruits and vegetables are not eaten in sufficient quantity. W. Gordon Rose

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

PROCESSES AND PROPERTIES INDEX

C 2 B

Purification of ascorbic acid. V. A. Devyatnin and V. M. Iosikova. *Farmatsiya* 1939, No. 2-3, 22-3; *Khim. Referat. Zhur.* 1939, No. 8, 49.—Dissolve crude ascorbic acid with heating in 96% alc. in a current of CO_2, add to the warm filtrate a hot satd. alc. soln. of Pb acetate, evap. the filtrate *in vacuo*, crystallize on ice, filter, wash with water and dry in a vacuum desiccator over H_2SO_4, NaOH and paraffin. A 70% yield is obtained. Recrystn. gives a product contg. 99.8-100% of ascorbic acid, m. 190°. W. R. Henn

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

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CA 17

New vitamin preparations and synthetic derivatives of ascorbic acid. V. A. Devyatnin. *Trudy Vsesoyuz. Konferentsii Vitaminam* (Moscow, June 19-23, 1939); 1940, 147-50; *Khim. Referat. Zhur.* 4, No. 9, 71(1941).—Ascorbic acid tetraacetate, prepd. by acetylation in vacuo, is an oily substance (mol. wt. 344) that has a favorable effect on the healing of wounds. 2-Ethoxy-6,9-diaminoacridine ascorbate (a good antiseptic) and quinine ascorbate (in which ascorbic acid is in the reduced form) were synthesized. $(C_6H_7O_6)FeOH$ was effective in the treatment of anemia, avitaminosis and some kinds of pellagra. $Ca(C_6H_7O_6)_2$ was effective in bronchial asthma and rheumatism. $Ba(C_6H_7O_6).H_2O$ and Cu ascorbate (contg. ascorbic acid 65 and Cu 44%) also were synthesized. The synthesis of ascorbic acid phosphate is of a special theoretical significance, owing to the fact that it has been considered previously that ascorbic acid does not react with metalloids. A highly nutrient "polyvitamin" prepn. with the vitamin complex A + C + D contg. proteins, fats, carbohydrates and min. salts (concentrate of defibrinated blood) was also prepd. W. R. Henn

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

1ST AND 2ND ORDERS

3RD AND 4TH ORDERS

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CA

17

Ascorbic acid derivatives. II. Alkaline earth ascorbates. V. A. Devyatnin. *Farmatsiya* 1940, No. 11, 23-6; cf. C. A. [illegible].—Ammonium ascorbate, a new salt, was prepd. from strong aq. ascorbic acid and $(NH_4)_2CO_3$ solns. Its ascorbate has some clinical interest because of its low toxicity, and chem. interest as a reagent for prepg. complex ascorbates. Ca ascorbate has some clinical interest in rheumatism and asthma. It is somewhat sensitive to sterilization conditions but can be sterilized without loss.

Julian F. Smith

COMMON ELEMENTS

OPEN

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1ST AND 2ND LETTER

1ST AND 2ND GROUPS

PROCESSES AND PROPERTIES INDEX

Ch

A vacuum apparatus for synthesis of easily oxidizable substances. V. A. Davyatain. *Lab. Prakt.* (U. S. S. R.) 15, No. 7-8, 23-4(1940).—A glass app. is described and illustrated in which vitamin C derivs. and other easily oxidizable substances can be prepd. The whole process beginning with the mixing of the reagents, filtration, evapn. of the filtrate and drying of the product can be performed in a const. atm. of an inert gas or in vacuo. The
4 overall height of the app. is 70 cm. and the diam. of its various tubes 2 mm. and that of the stopcocks 5 mm.

W. R. Henn

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

1ST AND 2ND ORDERS

PROCESSES AND PROPERTIES INDEX

Ca

10

Ascorbic acid derivatives. I. Ferrous ascorbate. V. A. Devyatnin and V. M. Ioslkova. *Voprosy Pitaniya* 9, No. 1-2, 50-8(1940); cf. *C. A.* 35, 5280[9].—Ascorbic acid reacts with $FeCO_3$ to form $C_6H_6O_6Fe$, a salt which is stable when dry but is quickly hydrolyzed in H_2O. It is a typical complex ascorbate. From the Ac no., Br no. and mol. wt. it appears that the ascorbic acid in this complex salt has 1 double bond. Julian F. Smith

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

PROCESSES AND PROPERTIES INDEX

CA 17

Utilizing primrose leaves. V. A. Devyatnin, B. P. Skorobogatova and V. V. Zvorykina. *Farmatsiya* 6, No. 1, 17-20(1943).—Primose (*Primula officinalis*) leaves contain about 6% ascorbic acid (calcd. on dry wt.) and retain up to $^{2}/_{3}$ of it even after drying at 120°. The fresh or dried leaves offer high antiscorbutic potency. The prepn. of primrose-leaf infusion is simple and can be carried on under field conditions, e. g., for troops or in front line hospital units. The macerated leaves are covered quickly with 4 times their wt. of hot water (90-95°) acidified with HCl (sp. g. 1.19, 3 g./l.). The acid stabilizes the infusion against loss of vitamin potency; cranberry juice or kvass may be used if HCl is not available. The infusion contains up to 200 mg.-% ascorbic acid (depending on the initial content), or up to 100 human doses of vitamin C per l. Concentrates prepd. by vacuum evapn. keep a month or more (under room conditions) without losing more than 24% of their initial high vitamin C potency. Julian F. Smith

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

1ST AND 2ND ORDERS

3RD AND 4TH ORDERS

PROCESSES AND PROPERTIES INDEX

Devyatin, V. A.

CA

17

Vitamin value of the fruit of Hippophae rhamnoides. V. A. Devyatin and M. P. Zakharova. *Pishchevaya Prom.* 1944, No. 5/6, 11-14.—The fruits of *Hippophae rhamnoides* are rich in vitamin C (800 mg. %) and carotene and contain no "ascorbinase." Practically no vitamin C activity is lost in making concentrates. By pressing the seeds an aq. ext. rich in vitamin C and an oil rich in carotene can be obtained. S. Gottlieb

ASB-SLA METALLURGICAL LITERATURE CLASSIFICATION

1ST AND 2ND ORDERS

PROCESSES AND PROPERTIES INDEX

BC

C-2

1821. Determination of 2-methyl-1:4-naphthoquinone in commercial preparations. M. P. Zakharova and V. A. Devjatnin (Biokhimiya, [illegible]).—≈110 mg. of the material are weighed into an Erlenmeyer flask with a ground-glass neck and dissolved in a small quantity of 95% ethyl alcohol (I). A mixture (III) of 20 ml. of conc. HCl ([illegible]) and 20 ml. of 10% (II) is prepared, and cooled in ice; 20 ml. of 10% aq. KI are then added to the well-cooled mixture (III) and the whole is immediately added to solution (I). The liberated I is at once titrated with 0·1N-$Na_2S_2O_3$, of which 1 ml. ≡ 8·6 mg. of 2-methyl-1:4-naphthoquinone, the average accuracy of the method being given as ±0·18%. The method is based on that described by Valeur (A., 1900, ii, 57) for the determination of quinones.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

1ST AND 2ND ORDERS

PROCESSES AND PROPERTIES INDEX

12

CA

The utilization of wheat embryos. V. A. Devyatnin. Pishchevaya Prom. 1944, No. 9, 8-12.—Wheat embryos have many potential uses as vitamin and food products. Some of the suggested products from the water-sol. fraction are: pyridoxine concentrate, B-complex vitamin concentrate (pyridoxine, thiamine, and nicotinic acid), and thiamine concentrate. From the fat-sol. fraction, the following products are suggested: food fat (raw and refined), hard fat (hydrogenated), vitamin E concentrate, and sitosterol concentrate. Various products for specific use in the flour and confectionery industries are also mentioned. N. Gottlieb

ASB-SLA METALLURGICAL LITERATURE CLASSIFICATION

CA

11D

Distribution of ascorbic acid in plant leaves. V. A. Devyatnin. *Vitamin Research News* (U.S.S.R.) 1946, No. 1, 35-8.—Plants not contg. chlorophyll do not form ascorbic acid. Plants growing in sunlight have more ascorbic acid than those grown in the shade. Plants grown under conditions of abundant aeration have more ascorbic acid than those grown in O deficiency. Plants which accumulate large amts. of essential oils, alkaloids, polyterpenes, and products of incomplete oxidation have less ascorbic acid than plants poor in these substances. Low temp. appears to favor formation of ascorbic acid. Geographic factors which control the amt. of sunlight and similar factors influence the amt. of ascorbic acid in plants. Enrichment of soil with N, P, and K increases ascorbic acid levels in plants. Shorter period of vegetation (geographic) gives higher ascorbic acid levels because of more energetic metabolism. Max. ascorbic acid is reached at the period of flowering and fruit production. Human interference by production of noxious gases of industry tends to lower the ascorbic acid levels. Ascorbic acid is lowest in simplest plants (bacteria, fungi) and highest in the most complex plants; however, some extremely specialized plants may have very low ascorbic acid levels. G. M. Kosolapoff

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

04

7

Colorimetric determination of nicotinic acid. V. A. Nevyatnin and V. M. Ivdkova. U.S.S.R. 69,191, Aug. 31, 1947. The analyzed liquid is made alk. and there is added a soln. satd. with Br comprising KCNS, KBr, and HCl. Then an alc. soln. of aniline is added and the amt. of nicotinic acid estimated from the intensity of the resulting color. M. Hosch

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

DEVYATNIN, V. A.

C. A.

Precursors in the synthesis of ascorbic acid in plants. V. A. Devyatnin (Vitamin Inst., Moscow). *Biokhimiya* 15, 325-6(1950).—Leaves of various plants, especially of 10-12 day old sprouting oats, were infiltrated with solns. of carbohydrates, acids, alcohols, mineral substances, and amino acids. The increase in ascorbic acid was then detd. Biosynthesis of ascorbic acid occurred best with carbohydrates, alcohols, and acids of at least 6 carbon atoms, with the 5th and 6th C atoms similar in configuration to those of ascorbic acid (inositol, sorbitol, 2-keto-L-gulonic acid, glucose, levulose, sorbose, and saccharose). The following did not yield ascorbic acid: arabinose, galactose, lactose, maltose, mannose, raffinose, glycerin, tartaric acid, succinic acid, lysine, and valine. H. Priestley