# SOVRaD

## A Digest of Recent Soviet R & D Articles

## CONTENTS

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This is a collection of brief abstracts on miscellaneous topics from the current Soviet technical literature. The intent is to supply a quick look at items of possible interest, including topics not necessarily named in the DARPA interest profile, as a supplement to our reportage on specified topics.

It is intended to publish this collection on a monthly basis, (and) to continue to provide prompt coverage of numerous aspects of Soviet R&D. As an added feature, all recently acquired books will be listed as they are received. A list of source abbreviations is appended.

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# INTRODUCTION

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For further information the reader is invited to call Stuart Hibben or Lee Boylan at Informatics on (301)-770-3000.

Isotope Separation in Chemical Reactions (abstract)

The degree of isotope separation attainable in certain chemical reactions, as distinguished from selective optical excitation, is evaluated theoretically. The approach is attractive at least in the sense that the strict demands on the laser excitation technique are eliminated, since a wideband source, such as an electrical discharge, can be used for pumping.

The coefficient of separation $\beta$ is calculated for pulse-excited chemical reactions occurring under thermodynamically non-equilibrium conditions. Since $\beta$ has a strong inverse dependence on reaction temperature, which can vary widely during the process, the authors use the mean value $\beta$ in their calculations. The results are checked against those of Basov's group in nitrogen isotope separation (ZhETF P, v. 19, 1974, 336), in which an actual $\beta$ of 20 was realized against a theoretical prediction of 800. With the present model a value of $\beta = 100$ is obtained for Basov's experiment which is appreciably more accurate.

The authors conclude that increase in vibrational temperature reduces $\beta$, in cases exponentially. At low initial temperatures (100-200 K), $\beta$ can be increased by introduction of a buffer gas. [Belenov, E. M., V. A. Isakov, Ye. P. Markin, A. N. Orayevskiy, and V. I. Romanenko. Isotope separation in chemical reactions occurring under thermodynamically non-equilibrium conditions. ZhTF, no. 9, 1975, 1940-1947].

Nuclear Spin Separation of Isotopes (abstract)

FIAN researchers analyze the theoretical possibility of laser isotope separation by allowing for radiative transitions forbidden by selection rules. Such a possibility is shown to exist in the case of isotopes with different nuclear spins ($I \neq 0$) when forbidden transitions between electronic states become possible on account of the electron shell hyperfine interaction with nuclear momentum. This is the case for atoms, such as Sr, Ba, Zn, Cd, or Hg, with an $ns^2$ ground state configuration.

Theoretical evaluation shows that a selective optical excitation of the triplet $^3P_o$ state can be used to separate efficiently $Hg^{199}$ and $Hg^{201}$ isotopes with $I \neq 0$ from Hg isotopes with $I = 0$. Advantages of the spin-selective optical excitation are cited over the isotope separation methods based on isotopic frequency shift. Those cited are the less stringent demands on laser performance, and the reduced possibility of undesired cross-excitation of isotopes by resonant action. [Zel'dovich, Ya. B., and L. L. Lobel'man. Nuclear spin-selective optical excitation of isotopes. ZhETF P, v. 21, no. 6, 1975, 368-370].

Possibility for Laser-Excited Superconductivity (abstract)

A possible model for laser-generated superconductivity in a semiconductor is suggested by V. D. Blazhin of Moscow State University. From a brief theoretical treatment he shows that the effect of electron excitation by an intense optical field can result in an oscillating forbidden gap in the vicinity of single-quantum resonance, or the appearance of higher-order gaps in the case of multiphoton resonances. A numerical example is given

based on PbSe excited by a $CO_2$ laser; the conditions are indicated under which the forbidden gap becomes on the same order as for a superconductor. The best candidate for obtaining this condition would appear to be a material with a wide forbidden gap and a large volume of free carriers, so that the accelerating effect of the optical field is minimized. Also, the requisite excitation density, on the order of 1 $Mw/cm^2$, would have to be in a pulsed mode to avoid electron overheat. [Blazhin, V. D. Electron spectra of a crystal in a powerful optical field. FTT, no. 8, 1975, 2325-2329].

Gamma-Ray Laser Theory (abstract)

A new approach to developing a gamma-ray laser is proposed by researchers at the Institute for Semiconductor Physics. It is based on pumping long-lived (1 to $10^5$ sec) isomers to obtain gain at short-lived ($10^{-7}$ to $10^{-15}$ sec) nuclear transitions, by exciting resonance stimulated Raman scattering (SRS) at these transitions. In this way the conflicting requirements for realization of the earlier proposed models for a gamma-ray laser (Goldanskiy, Khokhlov) can be avoided.

A three-level diagram of nuclear energy levels is used to calculate gain due to SRS at the 0 - 2 transition from an intermediate level. Pumping time may be several orders of magnitude shorter than the lifetime of the excited level, 1. The authors estimate that the pumping power required for stimulated $\gamma$-ray emission would be about $10^2$ w for a beam cross-section of $10^{-4}$ $cm^2$. Stationary emission would require a pump interval of $10^{-8}$ sec and a gas pumping rate of $10^4$ cm/sec. Selection of a specific three-level diagram proves to be difficult for stimulated gamma-ray emission, but should be significantly easier for UV or x-ray emission. [Baklanov, Ye. V., and V. P. Chebotayev. A possibility of obtaining stimulated emission of gamma rays. ZhETF P, v. 21, no. 5, 286-289].

Study of High Performance Laser Glass (abstract)

A microscopic study of absorbing metallic or dielectric inclusions in transparent liquid and solid media are described. The purpose of the study was to develop methods and instrumentation for nondestructive testing for microinclusions in optical materials, specifically for high power laser use. A modified optical ultramicroscope with a free-running pulsed ruby laser as illuminating source was used to detect and register $10^{-4}$ to $10^{-6}$ cm size inclusions in $10^{12}/cm^3$ concentrations in optical materials having a very high breakdown energy threshold.

A variant of the ultramicroscope technique, incorporating a five stage image intensifier with electron magnetic focusing and a camera, was used for noise-free recording of images of a single scattered photoelectron. This latter modification is particularly suitable for recording of inclusions with the cited dimensions at optical power densities exceeding breakdown threshold. The authors believe that new valuable data on microstructure of optical

materials can be obtained, and strongly-absorbing inclusions can be identified and nondestructively recorded, by using the refined method described. [Leonov, R. K., G. I. Bryukhnevich, B. M. Stepanov, N. F. Tarvin, and P. A. Yampol'skiy. The use of a pulse electron-optical ultramicroscope of extreme sensitivity for study of impurities in a transparent condensed medium. Kvantovaya elektronika, no. 5, 1975, 946-954].

Oceanographic Data Processing System (abstract)

A unified (trunk) channel for remote exchange of data between individual points on board a research vessel is described. The channel, which provides for arbitrary addressing of coded messages, was developed at the Ukrainian Academy's Marine Hydrophysical Institute, as a subsystem of an automated network for gathering, transmission, and processing of oceanographic data. The object is to optimize marine research specifically experiment control, by interconnecting the computer center, laboratory and information services of a vessel. The operating principle of the channel is outlined and channel components are described.

Advantages of the developed unified channel are summarized as follows: a ready adaptation to existing media for data gathering and processing and the possibility of using it aboard any R/V by virtue of its asynchronous method of data transmission; a secure high rate of data exchange between processing center and measuring/controlling system, provided the base computer operates in a time-shared regime; real-time input and processing of data simultaneously received from several instruments and data of synchronous observations of physical processes; and the possibility of adaptive measurements, based on control action of the computer upon the measuring instrument. The maximum transmission rate of the individual console and the data trunk line is $0.5 \times 10^6$ bits/sec. The anticipated use of a modern minicomputer for channel control will eliminate the necessity of operating the base computer in a time-shared mode. [Kolesnikov, A. G., and V. M. Zaikin. A unified channel for experiment control in a system of oceanographic data-gathering and processing. Morskiye gidrofizicheskiye issledovaniya, no. 4, 1973, 84-91].

Equipment for Hydroacoustic Data Processing (abstract)

In a recent book by Myasnikov et al. on measuring techniques for underwater acoustics, the authors list a number of types of Soviet equipment used in such tests. The list is offered as typical, rather than as a complete catalog of currently used equipment.

Analyzers: AS-3 spectrum analyzer, 20-60,000 Hz; S-53 harmonic analyzer, 20-20,000 Hz; AK-2 mechanical oscillator type, 5-100 Hz; ASChKh-1 multiband analyzer, CRT display, 5-20,000 Hz; acoustic spectrometer, 50-20,000 Hz; three octave passband.

Amplifiers: UZ-12 amplifier/converter, 10-30,000 Hz; UZ-27 power amplifier, 0.02-200 kMz; U4-2 ac/dc amplifier, to 80 db, 0-20 kHz.

Pulse Generator: Type Ch 5-7, 20-80 $\mu$s pulses, frequency drift $\pm$ 0.5 x $10^{-3}$ in 10 hours.

Recorders: Pen types N 110. N 355, N 372, N 370 M, and N 36 for recording from DC to 100 kMz, speeds to 5400-mm/hr. Also East German type PSG-101 from RFT firm, 0.002-10 kHz.

Storage: Mag tape types NML-67 and NML-4-2, capacity to 2 x $10^8$ bits; type ZUMB drum.

Hydrophones: Type VNIIM, 50 Hz-20 kHz, ceramic sensor with chrome casing.

Tape Recorders: Yauza-10, 2-speed, 40-15,000 Hz; Melodiya MG-56, 50-10,000 Hz; MGZ-60A, 30-16,000 Hz; MEZ-74, dual channel, 1-500 and 50-20,000 Hz.

Phase Meters: FZ-1 acoustic type, o-160°, 20 Hz-100 kHz; type F2-4 digital, 0-180°, 20 Hz-10 MHz.

Frequency Meters: Type ChO-7, quartz stabilized, 10 Hz-16 GHz; Chl-5, 20-6 x $10^7$ Hz; Ch 3-39 counter, 10 Mz-200 MHz.

Oscilloscopes: Types Sl-1, Sl-19, Sl-6, dual channel DEO-1.

Computers: Ural-14 D, M-222, Minsk-2 with optional hookup to Minsk-22, Mir, UM-1N-KhM, Dnepr, and Dnepr-2.

Several of the above items also use foreign makes, some U.S. but mostly by Bruel and Kjaer; these include all filters, microphones, piston phones and noise meters. [Myasnikov, L. L., Ye. N. Myasnikova, and Ya. M. Shchuchinskiy. New methods of measurements in underwater acoustics and r-f techniques. Leningrad, 1974, 188-193].

The Kvant-2 Hydrophotometer (verbatim)

A description is given of a universal hydrophotometer for shipboard measurements of attenuation factor and light scattering coefficient down to depths of 300 m. The technique for measuring hydrooptical characteristics and methods for calibrating and tuning the instrument are presented. [Bondarenko, P. P., V. D. Kozlov, N. M. Samson, and V. M. Kovalev. Universal'nyy gidrofotometr Kvant-2 (Kvant-2 universal hydrophotometer). Minsk, 1975, 14 p. (RZhFiz, 8/75, #8D1420)].

Measuring Electric Field in the Ocean (abstract)

The problem is discussed of measuring the electrical field E in a moving coordinate system in the ocean, while excluding the induced emf caused by vessel motion in a geomagnetic field. A theoretically possible solution based on measurement of the magnetic field, using a ring magnetic modulator, is rejected because of the low sensitivity of presently available instruments. The author shows that the effect of an induced field can be eliminated in a measuring system based on difference in electric conductivity constants. Such a system can be realized by using a nonconductive fairing,

such as some form of infinite plane band. The electric field around the fairing is described by a Laplace equation, solution of which gives the potential difference across the center of the band which in turn can be recorded by electrodes attached to the band on both sides. Excitation of induced emf in such a measuring circuit is excluded, because of the electrode coincidence with band thickness. Thus, this system yields E, and is equivalent to a static system with test base equal to the band width. In a practical realization of the system, the fairing could be a finite circular plane. The sensitivity of the system could be increased by using an annular fairing because of increase in current density through the orifice. The cited method is also applicable to E measurement in the ionosphere. [Lopatnikov, V. I. Measuring electrical field in the ocean. Morskiye gidrofizicheskiye issledovaniya, no. 4, 1973, 125-131].

Surface Wave Effect on Hydroacoustic Signal (abstract)

A hydroacoustic communication channel in the presence of finite-amplitude surface waves is described as a linear filter with periodically varying parameters. A mathematical expression for transfer function, allowing for tapering of wave crests, is derived. Expressions for periodical changes in phase and amplitude of a monochromatic signal are obtained. The case when the wavelength of surface waves far exceeds the acoustic wavelength is considered. [Yavorskiy, I. N. Effect of finite-amplitude surface waves on transmission of hydroacoustic signals. Otbor i peredacha informatsii. Resp. mezhved. Sbornik, no. 42, 1974, 44-52. (RZhGeofiz, 6/75, #6V115)].

Underwater Robots (verbatim)

This is a brief review of the subject of underwater robots. General conditions are set forth for designing second-generation automatic devices which are equipped with elements for independent conduct and adaptation to the environment. One of the major goals is to completely eliminate continuous control of the robot device by an observer. This requires development of an observer-robot system which allows the observer to instruct the robot in generalities, and which allows the robot freedom of choice in carrying the instruction out. The main characteristics of such robots and their components are discussed. [Yastrebov, V. S. Underwater robots in oceanic research. IN: Sb. Teoriya, printsipy ustroystva i primeneniye robotov i manipulyatorov. Leningrad, 1974, 28-32. (RZhGeofiz, 6/75, #6V26)].

Metallic Hydrogen as a Superconductor (abstract)

L. F. Vereshchagin, who directs the Institute for High Pressure Physics of the Academy of Sciences, reviews the potential of metallic hydrogen as a stable superconductor, possibly at room temperature. Theory has predicted superconducting metallic hydrogen at a pressure on the order of several million atmospheres; Vereshchagin's experiments to date indicate that at least a metastable state of metallic hydrogen has been achieved under such pressure, but the question of its superconductivity is unresolved, and so far it has reverted to the normal molecular, or nonmetallic, state on removal of the applied pressure.

Upcoming experiments in Vereshchagin's lab should answer some of the questions on the stability and superconductivity of metallic hydrogen in the near future. The key to these tests is a system of nested static pressure chambers of increasing load strength, ending with an innermost working chamber of diamond construction which has supported 3 megabar. In principle this technique could be scaled up to as much as 10 megabar, according to the author.

Regardless of the outcome on room-temperature metallic hydrogren, the techniques thus being developed for its research are predicted by Vereshchagin as providing an incalculable spinoff in creation of other unusual materials. [Metallic hydrogen and superconductivity: an interview with L. F. Vereshchagin. Tekhnika i nauka, no. 8, 1975, 22-23; see also Vereshchagin, Tekhnika molodezhi, no. 3, 1975, 14-17].

Destructive Tests of Reinforced Plastic (verbatim)

A cruciform specimen shape is proposed for two-axis tensile tests of reinforced plastics, with the center portion containing the test material. On the assumption that the reinforced plastic obeys Hooks's law up to destruction, the authors analyze the stress state in specimens. Formulas are obtained for stress components, based on the theory of elasticity for anisotropic bodies. Stress maxima are calculated by computer with stress fields represented in graphical form. The nonuniform stress patterns obtained could be relieved by slotting and rounding of joints to relieve stress concentration. The strain gage data obtained agreed with calculated values. [Yengalychev, S. A. and N. A. Platonov. Optimal form of test specimens for reinforced plastics under planar stress. IN: Sb. Dinamika, prochnost' i dolgovechn. detaley mashin. No. 3, Izhevsk, 1974, 67-76. (RZhMekh, 5/75, no. 5V1655)].

Performance of Reinforced Materials (verbatim)

A method is proposed for predicting the macroscopic thermo-elastic properties of materials reinforced with discrete matrices of elliptical fibers. The temperature characteristics are obtained as a function of volume of the fiber filler, and of fiber length-to-diameter ratio. [Khoroshun, L. P. Predicting thermoelastic properties of materials reinforced with unidirectional discrete fibers. Prikladnaya mekhanika, no. 10, 1974, 23-30. (RZhMekh, 5/75, no. 5V1461)].

Reinforced Fiberglass (verbatim)

Results of flexure, shock and compression tests are described on reinforced AG-4S plexiglass specimens with various types of reinforcing matrix. Standard samples were used. The treatment does not include the case of loads applied at an angle to the reinforcing direction. [Grigor'yev, K. M., V. I. Storozhev, V. N. Suchkov, and I. V. Kozhevnikov. Effect of reinforcing configuration on strength of AG-4S fiberglass. IN: Sb. dinamika, prochnost' i dolgovechn. detaley maskin, no. 3, Izhevsk, 1974, 77-85. (RZhMekh, 5/75, no. 5V1646)].

Magnetohydrodynamic Effect in Liquid Crystals (abstract)

The behavior of a nematic liquid crystal in a rotating magnetic field is analyzed and compared to some test results of other authors. The treatment is based on a cluster theory of molecular ordering in the liquid crystal, as proposed earlier by Tsvetkov. Cluster reorientation under the applied field is examined, using a simplified two-dimensional crystal model. This model could also be used for the three-dimensional case, provided that clusters were in sufficiently long cylindrical configurations, with axis normal to the plane of the applied magnetic field.

Some discrepancy between theoretical and experimental results is attributed to the actual applied fields, in the range of 1700 to 4650 oe, which are generally considered as highly saturating, whereas the effect under study is predicated on a non-saturation condition. [Kuznetsov, A. N., and T. P. Kalaguia. Theory of magnetohydrodynamic effect in nematic liquid crystals. ZhETF, v. 68, no. 4, 1975, 1501-1505].

Laser Modulator (verbatim)

Use of ferroceramics as space modulators of coherent light is considered. Dependence of the deformation of a ferroceramic target on the degree of polarization, the current level of the primary electron beam, and the polarity of surface charge is obtained. The duration of residual deformation is also studied. Possible designs of space modulators of coherent light based on the inverse piezoelectric effect are discussed. [Butusov, M. M., A. V. Ivanov, and A. I. Kosarev. Study of spatial modulation of coherent light on the basis of an inverse piezoelectric effect. Sposoby zapisi informatsii na besserebryanykh nositelyakh. Mezhved. nauchnyy sbornik, no. 6, 1975, 31-39. (RZhFiz, 8/75, #8D1469)].

Tellurium Prism for IR Spectroscopy (verbatim)

Use of a prism made of Te single crystal results in a larger decrease in the depth of light penetration into a specimen when using the method of deviation of total reflection in the IR range. This fact is useful in the study of surface characteristics of solids by molecular spectroscopy. Optical characteristics of the prism are given, and mounting of the prism onto the Soviet-made NPVO-1 device is described. [Vettegren', V. I., K. N. Kuksenko, I. I. Farbshteyn, and A. Ye. Chmel'. Use of single-crystal tellurium in IR spectroscopy. PTE, no. 2, 1975, 198-200. (RZhFiz, 8/75, #8D1485)].

Silhouette Optical Imager (verbatim)

A swept silhouette method for registering one-dimensional signals from phase carriers with quasiresonant transmission characteristics is considered. An analogous method may be used to eliminate the effect of phase carrier nonlinearity on the spectral and correlation characteristics of the signals. [Kurashev, V. N., and Yu. V. Khoroshkov. Sweep silhouette

recording in coherent optical data processing systems with phase carriers. IN: Sposoby zapisi informatsii na besserebryanykh nositelyakh. Mezhved. nauchnyy sbornik, no. 6, 1975, 85-89. (RZhFiz, 8/75, #8D1507)].

Aberration in an IR Radiometer (verbatim)

The effect is analyzed of chromatic aberration on the view field of an IR radiometer with germanium input lens. It is shown that neglecting aberration leads to error in determination of the field of view. An expression is obtained for the field of view, allowing for chromatic aberration, in terms of the diameter and refractive index of the lens, detector size, and the range to the object. [Basetskiy, V. Ya., and Ye. S. Stogniyev. Effect of chromatic aberrations on the field of view of an IR radiometer. Leningradskiy elektrotekhnicheskiy institut. Izvestiya, no. 167, 1975, 100-105. (RZhFiz, 8/75, #8D1422)].

Optical Measurement of Phase Transition (verbatim)

The operating principles and main characteristics are given for an interference-type reversible reflector system, given the acronym FTIROS. Operation of FTIROS is based on effects of a metal-to-semiconductor transition in vanadium oxide, from a weak heating effect induced by optical flux, electric current, e-beam or direct conduction, as a result of which a pronounced change occurs in optical properties of the oxide.

Dependences of the reflection and refraction indexes of the device on wavelength in the 0.4-0.8 $\mu$ range, on temperature in the 35-65$^{o}$C range, and on energy of incident radiation in the 50-1000 erg/cm$^{2}$ range are given. The FTIROS system may be used for display and storage of optical data as well as for imaging of IR radiation. Preliminary results show that resolution exceeds 500 line/mm. Its operational characteristics have exhibted no appreciable change over a one year period. [Zakharchenya, B. P., I. K. Meshkovskiy, Ye. I. Terukov, and F. A. Chudnovskiy. Phase-transition interference reversible light reflector (FTIROS). ZhTF P, no. 1, 1975, 8-11. (RZhFiz, 8/75, #8D951)].

R-f Imaging with Standard Antenna (abstract)

The feasibility of imaging with a regular parabolic antenna in the millimeter r-f range was demonstrated. The authors used a parabolic reflector of 133 cm diameter, a focal distance of 57 cm, and $\lambda$-8 mm. Radiation from a nearby horn antenna was reflected from a square metallic target some 7 meters away and detected by the main parabolic antenna via a counter-reflector driven in a scan pattern. The detected signal was amplified and displayed as intensity modulation on a scope raster. Images of target patterns on the order of 5 to 10 cm in size were thus detectible. Improved results at greater distances were predicted. The method offers some advantages over direct optical imaging, notably in the lesser r-f susceptibility to fog, haze etc. [Gel'fer, E. I., V. B. Kravtsov, S. Ye. Finkel'shteyn, and A. V. Shisharin. Quasioptical radio imaging with standard antennas. IVUZ Radiofiz, no. 5, 1975, 731-734].

Improved E-Beam Welding (verbatim)

During melting of metals by a focused electron beam a channel filled with vapor of the target material is formed. Ionization of the vapor atoms then produces low-temperature plasma in the vicinity of the target surface. The effect of such plasma on the parameters of the electron beam is evaluated. Theoretical calculations as well as experiments show that the diameter of the welding electron beam may be considerably reduced from the effect of ion focusing. [Ledovskoy, V. P. Space-charge focusing during interaction of a powerful electron beam with metals. ZhTF P, no. 5, 1975, 224-227. (RZhFiz, 8/75, #8G102)].

Recent Publications

Aeromagnitometr AMP-7. Rukovodstvo po ekspluatatsii (AMP-7 aeromagnetometer. Operation manual). Leningrad, VITR, 1974, 69 p. (KLDV, 8/75, #13876)

Andreyeva, I. B. Fizicheskiye osnovy rasprostraneniya zvuka v okeane (Physical principles of sound propagation in the ocean). Leningrad, Gidrometeoizdat, 1975, 190 p.

Atmosfernaya optika. Sbornik statey (Atmospheric optics. Collection of articles). Moskva, Gidrometeoizdat, Mosk. otdeleniye, 1975, 118 p. (KL, 34/75, #30174)

Dinamika, prochnost' i dolgovechnost' detaley mashin. Sbornik (Dynamics, strength and durability of machine parts. Collection of articles). No. 3, Izhevsk, 1974. (RZhMekh, 5/75, no. 5V1646)

Elektronnyye kharakteristiki i elektron-fononnyye vzaimodeystviya sverkhprovodyashchikh metallov i splavov (Electron characteristics and electron-phonon interactions in superconducting metals and alloys). Fizicheskiy institut im P. N. Lebedev. Trudy, no. 82, Moskva, Nauka, 1975, 103 p. (KL, 35/75, #31132)

Gogishvili, K. Chelovek i klimat (Man and climate). Tbilisi, Znaniye, 1975, 32 p. (KL, 36/75, #32120)

Gudzenko, L. I., V. V. Yevstigneyev, and S. I. Yakovlenko. Printsip plazmennogo lazera v rentgenovskom diapazone (Principle of an x-ray plasma laser). FIAN Preprint no. 4, Moskva, 1975, 45 p. (KLDV, 8/75, #14075)

Kriogennyye metody v elektronnoy mikroskopii. Tezisy dokladov (Cryogenic methods in electron microscopy. Proceedings of symposium). Pushchino, 1974, 112 p. (KLDV, 8/75, #13919)

Lazery v tekhnologii (Lasers in technology). Moskva, Energiya, 1975, 316 p. (KL, 36/75, #32304)

Nekontaktnyye metody izmereniya okeanograficheskikh parametrov. Sbornik dokladov (Remote methods for measurement of oceanographic parameters. Collection of papers). Moskva, Gidrometeoizdat, 1975, 219 p. (KL, 36/75, #32138)

Neyrobionika. (Neurobionics). Inst. kibernetiki, AN UkrSSR. Kiyev, 1974, 123 p. (KL, 35/75, #31099)

Novyye metody issledovaniya polimerov. Sbornik statey (New methods in polymer research. Collection of articles). Kiyev, Nauk. dumka, 1975, 199 p. (KL, 34/75, #30322)

Novyye napravleniya razrabotok v SShA energeticheskikh sistem s primeneniyem vodoroda (New directions in developing hydrogen power systems in the U.S.A.). Minsk, 1975, 8 p. (KLDV, 8/75, #14112)

Oborudovaniye dlya proizvodstva khimicheskikh istochnikov toka (Equipment for manufacturing of chemical generators). Moskva, Informelektro, 1974, 33 p. (KLDV, 3/75, #14120)

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## SOURCE IDENTIFICATION

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|---|---|---|
| FTT | - | Fizika tverdogo tela |
| IVUZ Radiofiz | - | Izvestiya vysshikh uchebnykh zavedeniy. Radiofizika |
| KL | - | Knizhnaya letopis' |
| KLDV | - | Knizhnayale topis'. Dopolnitel'nyy vypusk |
| RZhFiz | - | Referativnyy zhurnal. Fizika |
| RZhGeofiz | - | Referativnyy zhurnal. Geofizika |
| RZhMekh | - | Referativnyy zhurnal. Mekhanika |
| ZhETF | - | Zhurnal eksperimental'noy i teoreticheskoy fiziki |
| ZhETF P | - | Pis'ma v ZhETF |
| ZhTF | - | Zhurnal tekhnicheskoy fiziki |
| ZhTF P | - | Pis'ma v ZhTF |