A88-36157 Simulation of the effect of the orientation of column-crystals on their size distribution as measured by a photoelectric particle-size meter (Modelirovanie vliianiia orientatsii kristallov-stolbikov na spektr ikh razmerov, izmeriaemyi fotoelektricheskim priborom IRCh). E. T. IVANOVA and A. L. KOSAREV, *The physics of clouds, fogs and active modifications* (A88-36151 14-47). Moscow, Gidrometeoizdat, 1987, pp. 98-107. 8 Refs.

The interpretation of data on cirrus clouds obtained with an airborne photoelectric particle-size meter is examined. Numerical simulation results are presented on the size distribution of column crystals in such clouds.

A88-33837 Thin-film multipass AlGaAs photocells with bilateral photosensitivity (Tonkoplenochnye mnogoprokhodnye AlGaAs-fotoelementy s dvustoronnei fotochustvitel'nost'iu). ZH. I. ALFEROV, V. M. ANDREEV, K. I. VAKAREL'SKA, IU. M. ZADIRANOV, V. R. LARIONOV et al., *Pis'ma v Zhurnal Tekhnicheskoi Fiziki* (ISSN 0320-0116), Vol. 14, Feb. 12, 1988, pp. 193-197. 8 Refs.

The paper presents experimental reasults on thin-film solar cells based on n-Al (0.8) Ga (0.2) As-p-GaAs-p-GaAs-p-Al (0.8) Ga (0.2) As. Owing to the creation of a rear potential barrier and the use of multipass effects, it was possible to achieve high bilateral photosensitivity with a minimum thickness of the active region (GaAs) of about 0.6 micron for a total structure thickness of about 1.5 microns.

A88-28325 'Violet' pAlGaAs-pGaAs-nGaAs photocells with hyperthin (30-300 A) wideband layers ('Fioletovye' pAlGaAs-pGaAs-nGaAs-fotoelementy so sverkhtonkimi /30-300 A/ shirokozonnymi sloiami). ZH. I. ALFERNOV, V. M. ANDREEV, A. A. VODNEV, V. R. LARIONOV, A. V. NIKITIN et al., *Pis'ma v Zhurnal Tekhnicheskoi Fiziki* (ISSN 0320-0116), Vol. 14, Jan. 12, 1988, pp. 76-79. 6 Refs.

Experimental results are presented on photocells with hyperthin (30-300 A) wideband layers of Al(x)Ga(1-x)As (x = 0.7-0.9) solid solutions. It is shown that the photoresponse in the violet region can be increased by reducing the thickness of the wideband 'window' of this solid solution to values less than 100 A, while preserving a high photoresponse in the remaining part of the spectrum at 0.45-0.9 micron.

A88-21891 Synthesis of topologies of multicomponent code photoresistors using Group II B—VI A materials (Sintez topologii mnogoelementnykhkodovykh A2 B6 fotorezistorov). V. B. BOGDANOVICH, A. L. PALAMARCHUK, and S. V. SVECHNIKOV, *Optoelektronika i Poluprovodnikovaia Tekhnika* (ISSN 0233-7577), No. 12, 1987, pp. 1-6. 5 Refs.

Structural principles for the topology design of multicomponent photoresistors using Group II B—VI A materials, e.g, CdS(x)Se(1-x), have been developed. The basic relationships and limiting values of the geometric dimensions of the components are determined. Basic variants of simple code and combined topologies are examined, and the domains of their effective application are defined.

A87-49733 Low-temperature optical bistability of photocurrent in gallium arsenide (Nizkotemperaturnaia opticheskaia bistabil'nost' fototoka v arsenide galliia). O. A. RIABUSHKIN and V. I. SERGEEV, *Pis'ma v Zhurnal Tekhnicheskoi Fiziki* (ISSN 0320-0016), Vol. 13, June 12, 1987, pp. 653-656. 7 Refs.

A photocurrent hysteresis dependenton light intensity, with the photon energy (h/2pi)(omega) less than Eg, has been observed in a GaAs film at helium temperature. The width of the hysteresis is controlled by an electrical voltage applied to the film. The experimental results are explained in terms of a low-temperature impurity-induced breakdown. Details of the experimental procedure and results are reported.

A88-28250 Optimization of the parameters of a solar photoelectric system exposed to cosmic rays (Optimizatsiia parametrov solnechnoi fotoelektricheskoi ustanovki, podverzhennoi vozdeistviiu kosmicheskoi radiatsii). O. F. ZAITSEV, *Geliotekhnika* (ISSN 0130-0997), No. 6, 1987, pp. 23-28. 7 Refs.

A model and an algorithm are developed for the optimization of the performance characteristics of concentration-type solar photoelectric systems consisting of planar solar arrays, concentrator reflecting films, and supporting structures. The model and the algorithm make it possible to accurately predict the parameters of concentration-type photoelectric systems at the design stage. It is shown that, under conditions of considerable radiation-induced damage, the performance of such systems can be improved by using low-potential concentration systems and discrete reservation of output power.

A88-26707 The application of double-orthogonal functions in the theory behind the photoelectric method of star observations (Primenenie funktsii s dvoinoi ortogonal'nost'iu v teorii fotoelektricheskogo metoda nabliudenii zvezd). V. N. BARANOV, *Geodeziia i Aerofotos'emka* (ISSN 0536-101X), No. 4, 1987, pp. 37-48. 6 Refs.

The determination of the systematic errors of photoelectric star observations necessitates the structural analysis of the optical images of the observed stars. In connection with this error determination, the present paper proposes the use of eigenfunctions of the Fourier-Bessel transform for the analysis of linear instruments and the definition of the simplest relationships between the signal and its transform. Formulas are obtained expressing the eigenfunctions by Zernike polynomials, and the expansion of the aberration function in a generalized Fourier series is described. The determination of star-image diameters in the presence of objective chromatism is considered as an example.

A88-18096 Characteristics of the integral-adaptive self-scanning mode in multielement photodetectors (K svoistvam integral'noadaptivnogo rezhima samoskanirovaniia v mnogoelementnykh fotopriemnikakh). B. G. PODLASKIN, *Zhurnal Tekhnicheskoi Fiziki* (ISSN 0044-4642), Vol. 57, Aug. 1987, pp. 1610-1616. 7 Refs.

The possibility of achieving self-scanning in multielement photodetectors adaptive to input illumination distributions and changes is examined. The self-scanning mode is based on the continuous comparison of the integral photocurrent values from different areas of the photodetector and accumulation of a difference signal. As a result, an aperture with adaptive parameters is formed, and a constant S/N ratio is maintained for the full scanning range. The self-scanning mode could be used in the vision circuits of automatic control and industrial robot systems.

A87-41798 Spectral characteristics of the photoemission of thin silver films treated by cesium and oxygen (Ob osobennostiakh spektral'noi kharakteristiki fotoemissii iz tonkikh plenok serebra, obrabotannykh tseziem i kislorodom). A. P. BALASHOVA and A. E. SHABEL'NIKOVA, *Radiotekhnika i Elektronika* (ISSN 0033-8494), Vol. 32, April 1987, pp. 895-898. 6 Refs.

A constant describing optical absorption inthe system Ag-Cs-O on glass and indium phosphide substrates in thespectral range 0.75-0.9 micron is determined on the basis of photoemission measurements as a function of the silver film thickness. It is found that the absorption vs thickness curve has a maximum corresponding to a film thickness of about 100 A in the case of a glass substrate and 40-70 A in the case of an indium phosphide substrate. It is also found that the maximum absorption of a silver film on an indium phosphide substrate is significantly lower than that of a silver film on a glass substrate.

Japanese Aerospace Literature This month: *Photoelectric Technologies*

A90-43393 Optoelectronic synaptic connection circuit with variable analogue weights. H. YONEZU, T. HIMENO, K. KANAMORI, K. PAK, and Y. TAKANO, *Electronics Letters* (ISSN 0013-5194), Vol. 26, June 21, 1990, pp. 910-912. Research supported by MOESC. 5 Refs.

A basic optoelectronic circuit of an artificial synaptic connection was fabricated in which analogue weights were varied electrically. Circuit simplicity and low current level operation, necessary for a large scale OEIC, were realized.

A87-38063 Photoluminescence and absorption of a zirconium fluorideglass and ZrF4. YASUTAKE OHISHI, SHIGEKI SAKAGUCHI, and SHIRO TAKAHASHI, *American Ceramic Society, Communications* (ISSN 0002-7820), Vol. 70, April 1987, pp. C-81 to C-83.

The glass containing reduced zirconium exhibits a photoemissioon band at 480 nm and an excitation band from 230 to 370 nm. Reduced zirconium tetrafluoride has broad absorption at 400 nm. Reduction of zirconium tetrafluoride occurs through fluorine or oxygen impurity elimination. When fluorine ion deficiency occurs, emission and excitation bands appear at 440 and 350 nm, respectively. When oxygen deficiency occurs, emission and excitation bands appear at 480 and 300 nm, respectively.

A89-43912 Photoemission study of single crystal Bi2Sr2CaCu2O8. TAKASHI TAKAHASHI, HIROYOSHI MATSUYAMA, HIROSHI KATAYAMA-YOSHIDA, YUTAKA OKABE, SHOICHI HOSOYA et al., *Advances in superconductivity; Proceedings of the First International Symposium on Superconductivity* (ISS '88), Nagoya, Japan, Aug. 28-31, 1988 (A89-43901 19-76). Tokyo and New York, SpringerVerlag, 1989, pp. 175-180. Research supported by the Nippon Sheet Glass Foundation for Materials Science. 8 Refs.

Photoemission measurements with synchrotron radiation have been performed on single crystal Bi2Sr2CaCu2O8. Two energy bands with dispersion of 0.2-0.5 eV were observed in the vicinity of the Fermi level and one of them crosses the Fermi level midway between the center and boundary of the Brillouin zone, giving a clear evidence for existence of a Fermi surface. The Fermi-edge peak exhibits a pronounced enhancement at photon energy of the O 2s core threshold, meaning a dominant O 2p nature of the Fermi-edge states. These results indicate existence of the Fermi-liquid states with dominant O 2p nature in the high-Tc superconductor. The superconductivity could be driven by formation of Cooper-pairs of the O 2p holes in the Fermi-liquid states, probably through the spin or charge fluctuation.

A90-51608 Optical and electrical characterization of BSO crystals. TAKAYUKI SAWADA, TETSUYA HIRAO, HIROYUKI OHARA, and KIKUO UJIHARA, *Japanese Journal of Applied Physics, Part 1* (ISSN 0021-4922), Vol. 29, Jan. 1990, pp. 108-115. 19 Refs.

Optical and electrical properties of undoped Bi12SiO20 crystals were simultaneously measured and compared. Material parameters determined from optical measurements such as steady-state diffraction efficiency versus light-induced grating spacing and recording time versus light-induced grating spacing characteristics agree well with those determined from electrical measurements, including steady-state photocurrent under a uniform illumination and interference fringe illumination, and transient photocurrent after application of a short light pulse, when a simple band transport model is used for the analyses. The result indicates that the simple electrical measurements are useful for rapid assessment of the crystal as well as for predicting the photoreference properties.

A90-28430 324 x 487 Schottky-barrier infrared imager. KAZUO KONUMA, NOBUKAZU TERANISHI, SHIGERU TOHYAMA, KOUICHI MASUBUCHI, SHIGEKI YAMAGATA et al., *IEEE Transactions on Electron Devices* (ISSN 0018-9383), Vol. 37, pt. 1, March 1990, pp. 629-635. 7 Refs.

A standard TV-compatible PtSi Schottky-barrier infrared imager is described. The imager is a 324 x 487 element area array and has an electronic shutter function. Although the pixel is 42 x 21 microns, a large fill factor of 42 percent is obtained, using a 1.5-micron minimum design rule and a two-level polysilicon layer and two-level aluminum layer structure. Using face-down bonding technology, it was possible to reduce the package size to 60 percent of the conventional ceramic package size. Due to optimization of the Schottky-barrier diode process and the diode structure, the noise equivalent temperature difference is as small as 0.1 K at f/1.

A90-13801 5:1 ON-OFF contrast InGaAs/InP multiple quantum well Fabry-Perot etalon modulator. A. TOMITA, Y. KOHGA, A. SUZUKI, T. TERAKADO, and A. AJISAWA, *Applied Physics Letters* (ISSN 0003-6951), Vol. 55, Oct. 30, 1989, pp. 1817-1819. 10 Refs.

The first demonstration of an InGaAs/InP multiple quantum well Fabry-Perot etalon modulator. The obtained ON-OFF contrast is 5:1 at -16 V applied voltage for 1540 nm wavelength light. The absorption coefficient of the multiple quantum well around 1540 nm increases from 1000 to 6300 per cm as the applied voltage increases from 0 to -16 V, and the relative refractive index change is up to -0.9 percent.

A89-54920 Output energy enhancement of discharge-pumped XeF(B X) lasers with the two-component halogen donor mixtures. HIROSHI KUMAGAI and MINORU OBARA, *IEEE Journal of Quantum Electronics* (ISSN 0018-9197), Vol. 25, Aug. 1989, pp. 1874-1878. Research supported by TEPCO Research Foundation. 18 Refs.

The effect of using a two-component halogen donor mixture was studied in a discharge-pumped XeF (B - X) laser using low-pressure (less than or equal to 2 atm) He- and Ne-diluted mixtures containing both F2 and NF3 donors. The laser output energy obtained with the 2-atm He-diluted mixture was higher by a factor of 2 than that obtained with the conventional He/Xe/NF3 mixture. With an atmospheric-pressure Ne-diluted mixture containing two halogen donors, a laser energy enhancement of more than 70 percent over that of the Ne/Xe/NF3 mixture was obtained. This effect can be attributed to the increase of the laser extraction efficiency due to the enhancement of the net gain as manifested by the small-signal gain coefficient, small-signal absorption coefficient, and gain saturation intensity estimated from a Rigrod's analysis.

A89-53383 Scanning internal-photoemission microscopy—New mapping technique to characterize electrical inhomogeneity of metal-semiconductor interface. TSUGUNORI OKUMURA and KENJI SHIOJIMA, *Japanese Journal of Applied Physics, Part 2* (ISSN 0021-4922), Vol. 28, July 1989, pp. L1108-L1111. 12 Refs.

A new mapping technique, termed scanning internal-photoemission microscopy, has been presented to characterize the electrical inhomogeneity of metal-semiconductor interfaces. To obtain images of a Schottky barrier height, two laser beams in a 1micron band for which Si and GaAs substrates are transparent, and thus the proposed technique has been capable of probing the metal-semiconductor interfaces directly. The capability of this microscopy has been demonstrated by visualizing the parallel contact with two different metals, the existence of mechanical damage, and an ultrathin layer buried beneath a thick metal.

A89-32968 Effects of low-level boron doping on the photocurrent of amorphous silicon Schottky photodiodes. H. KAKINUMA, Y. KASUYA, M. SAKAMOTO, and S. SHIBATA, *Journal of Applied Physics* (ISSN 0021-8979), Vol. 65, March 15, 1989, pp. 2307-2312. 25 Refs.

The effects of low-level boron doping on the photocurrent-electric field (Jph-F) characteristics of amorphous silicon Schottky photodiodes were investigated by measuring the Jph-F characteristics of a lightly B-doped photodiode with a configuration of Cr/a-Si:H/tin-doped indium oxide (ITO). The Jph-F curves, which were found to be strongly dependent on the B-doping ratio, were analyzed on the basis of Crandall's (1984) theory, and the Bdoping dependencies of the mobility-lifetime (mu-tau) product for electrons and holes were deduced. The effects of low-level B-doping on the mu-tau products and space charges of the photodiodes were discussed in terms of the charge state of the dangling bond state.

A89-46311 Preparation of porphyrin thin films using the micelle disruption method and their photoresponses. KAZUHIKO TAKEDA, YUTAKA HARIMA, KAZUO YAMASHITA, and SEIICHIRO YOKOYAMA, *Japanese Journal of Applied Physics, Part 2* (ISSN 0021-4922), Vol. 28, Jan. 1989, pp. L 141-L 143. 10 Refs.

The electrolytic micelle disruption method was used to prepare thin films of eight different porphyrins on indium-tin oxide electrodes. The porphyrins studied are 5, 10, 15, 20-tetraphenylporphyrin and its metal complexes, all of which are typical p-type semiconductors. As a example of an n-type semiconductor, 5, 10, 15, 20-tetra(4-pyridyl) porphyrin is used.

A89-39126 Synchrotron radiation photoelectron spectroscopy of high-Tc superconductor Bi-Sr-Ca-Cu-O single crystals. FUMIHIKO MAEDA, TOMOAKI KAWAMURA, MASAHARU OSHIMA, YOSHIKAZU HIDAKA, and AKIHIKO YAMAJI, *Japanese Journal of Applied Physics, Part 2* (ISSN 0021-4922), Vol. 28, March 1989, pp. L361-L363. 20 Refs.

Photoelectron measurements made on the high-Tc superconductor single crystals of Bi2(Sr,Ca)3Cu2O(x) using synchrotron radiation of 35-120 eV revealed a valence band satellite due to the two-hole bound state, which indicated considerable large intra-atomic Coulomb energy between Cu-3d electrons. The density of states on the Fermi level was clearly observed. This feature is quite different from those of the La-Sr-Cu-O and Y-Ba-Cu-O systems.

A89-37136 Low resistance ohmic contacts to high-Tc superconducting thin films. YASUO TAZOH, KIMIHISA AIHARA, KAZUNORI MIYABARA, KOHJI HOHKAWA, and MASAHARU OSHIMA, *IEEE Transactions on Magnetics* (ISSN 0018-9464), Vol. 25, March 1989, pp. 2049-2052. 8 Refs.

Metal contacts to high-Tc superconducting thin films have been studied. By analyzing the I-V characteristics at contact junctions and by synchrotron radiation photoemission spectroscopy, the effect of contact metal and surface treatment before depositing contact metal on the metal-superconductor interface characteristics has been investigated. Lowresistance ohmic contacts are realized by the following sequence of processes: (1) oxygen ion sputter etching; (2) high-pressure oxygen plasma treatment, and (3) in situ deposition of Au with no interfacial reaction with the superconductor. A low-contact resistivity equal to 5.5 x 10 to the -7 th ohm sq cm at 77 K is realized experimentally.

A89-23504 Implications of bandstructure calculations for high-Tc related oxides. KEY TAECK PARK, KIYOYUKI TERAKURA, TAMIO OGUCHI, AKIRA YANASE, and MINORU IKEDA, *Physical Society of Japan Journal* (ISSN 0031-9015), Vol. 57, Oct. 1988, pp. 3445-3456. 55 Refs.

Band calculations have been performed for the high-Tc related oxides, La2CuO4, YBa2Cu3O(y) (y = 6 or 7), La2CaCu2O6, CuO, and NiO with the full-potential linear augmented plane-wave method, in order to derive information about the characteristic aspects of these materials. Particular attention is given to the energy separation between the oxygen p and the copper d levels, the assignment of a p orbital for the extra hole accommodation, the significance of the p-p hopping, the occupancy of the two-dimensional Cu-O bands, and the Cu valency.

A89-22914 Very high speed GaInAs metal-semiconductor-metal photodiode incorporating an AlInAs/GaInAs graded superlattice. O. WADA, H. NOBUHARA, H. HAMAGUCHI, T. MIKAWA, A. TACKEUCHI et al., *Applied Physics Letters* (ISSN 0003-6951), Vol. 54, Jan. 2, 1989, pp. 16, 17. 16 Refs.

A lateral structure metal-semiconductor-metal photodiode has been fabricated on GaInAs, in which an AlInAs/GaInAs graded superlattice has been incorporated. This photodiode has exhibited a dark current lower than 100 nA, an internal quantum efficiency of greater than 80 percent at a wavelength of 1.3 micron, and a capacitance of 40 fF, all at the bias voltage of 10 V. The response speed of this photodiode has been characterized by electro-optic sampling to exhibit a full width at half maximum of 14.7 ps.

A88-25751 Novel quantum-well optical bistability device with excellent on/off ratio and high speed capability. H. SAKAKI, H. KURATA, and M. YAMANISHI, *Electronics Letters* (ISSN 0013-5194), Vol. 24, Jan. 7, 1988, pp. 1, 2.

A novel optical bistability device is proposed and analyzed in which the Stark effect of a multiple quantum well is used in combination with a negative resistance device. The device is found to posses an excellent on/off ratio (19:1) and high speed capability (tau less than 10 ps), while the required optical power P is as small as 1 mW or less with a bias voltage of 5 V, giving a P-tau product of 1 to 10 fJ.

A89-14376 Thermal variation of imaginary part of permeability in previously photoexcited YIG single crystal. KEIZO HISATAKE, IKUYA MATSUBARA, KEIICHIRO MAEDA, TUTOMU FUJIHARA, and NOBORU ICHINOSE, *Japanese Journal of Applied Physics, Part 2* (ISSN 0021-4922), Vol. 27, Aug. 1988, pp. L1527-L1529. 7 Refs.

A photoinduced increase in the imaginary part of permeability (mu-double prime) has been observed at 77 K in an undoped YIG single crystal and the temperature dependence has been measured. As a result, double peaks of mu-double prime have been observed and the dependence of the peak height on the intensity of illumination is found to vary over a temperature range between 77 and 300 K. The behaviors of these peaks are qualitatively explained by a two levels-two minima model proposed in this paper.

A89-23846 Surfaces and interfaces of high-Tc superconductors for contact and junction formation studied with synchrotron radiation photoemission spectroscopy. MASAHARU OSHIMA, YASUKO YAMADA, TOMOAKI KAWAMURA, SATOSHI MAEYAMA, KOUJI HOHKAWA et al., *Japanese Journal of Applied Physics, Part 2* (ISSN 0021–4922), Vol. 27, Nov. 1988, pp. L2233–L2236. 8 Refs.

Interface characteristics between contact metals or junction materials and oxide superconductors were analyzed by synchrotron radiation photoemission spectroscopy. A new surface processing technique consisting of O(+) ion sputtering and in-situ Au deposition processes on YBa2Cu3O(y) was developed to realize very low contact resistance based on these SRPES experiments. Furthermore, a strong interface reaction in the Si/YBa2Cu3O(y) system for junction formation was observed, suggesting that amorphous Si is not a good candidate for the junction material.

A89-12189 Evidence from angle-resolved resonant photoemission for oxygen–2p nature of the Fermi-liquid states in Bi2CaSr2Cu2O8. T. TAKAHASHI, H. MATSUYAMA, H. KATAYAMAYOSHIDA, Y. OKABE, S. HOSOYA et al., *Nature* (ISSN 0028–0836), Vol. 334, Aug. 25, 1988, pp. 691, 692. MOESC supported research. 9 Refs.

Experimental results using the technique of angle-resolved resonant photoemission are presented which provide a clear picture of the electronic structure of the high-Tc superconductor Bi2CaSr2Cu2O8. The structure consists of two major features: a Fermi-liquid state with predominantly O 2p character and strongly localized states away from the Fermi level with both Cu 3d and O 2p character. Superconductivity could be driven by Cooper-pairing of the O 2p holes in the Fermi-liquid state.

A88-39369 Oxygen-doped Si epitaxial film (OXSEF). MICHIHARU TABE, MITSUTOSHI TAKAHASHI, and YUTAKA SAKAKIBARA, *Japanese Journal of Applied Physics, Part 1* (ISSN 0021–4922), Vol. 26, Nov. 1987, pp. 1830–1837. 23 Refs.

The paper proposes a new wide-gap material, an oxygen-doped Si epitaxial film (OXSEF), for applications to Si heterobipolar transistors (HBTs). OXSEF containing several tens of at. pct of oxygen can be grown on a Si substrate by depositing Si in about 10 to the –6th Torr O2. OXSEF is literally almost a single crystal with an identical crystalline structure to Si, although it includes 111-plane twins as defects caused by oxygen. Temperature and O2 pressure dependences of oxygen concentration in OXSEF are dominated by oxygen adsorption on the Si surface. Oxygen atoms in OXSEF segregate to some extent to form incomplete oxides like SiO(1.5), but complete phase separation as a mixture of Si and SiO2 regions does not occur, probably because of nonequilibrium conditions in MBE growth. Valence band discontinuity at the Si/OXSEF interface is deduced to be 0.26 eV based on photoelectrical measurements.

A88-39366 Photocurrent spectra of phthalocyanine films in relation to excited state properties. NOBUTSUGU MINAMI and MICHIHIKO ASAI, *Japanese Journal of Applied Physics, Part 1* (ISSN 0021–4922), Vol. 26, Oct. 1987, pp. 1754–1758. 14 Refs.

Photocurrent spectra of thin-film sandwich cells of vacuum-deposited phthalocyanines (Pc's) have been investigated and compared with their optical absorption spectra. A close resemblance was found between the two spectra for H2Pc and ZnPc, but peaks in the photocurrent spectra of CuPc and NiPc have been found to be considerably shifted compared with those in the absorption spectra. These photocurrent peaks in CuPc and NiPc correspond well to structures in the recently reported electroabsorption spectra of phthalocyanines. Direct chargetransfer excitation is suggested to play a role in the photocarrier generation in phthalocyanine films. The absorption spectrum of VOPc is considerably dependent on the deposition conditions of thin films, unlike other planar phthalocyanines.

A88-18581 Temperature dependence of light-induced degradation in a-Si solar cells. TAKESHI YANAGISAWA, *Solar Cells* (ISSN 0379–6787), Vol. 22, Oct. 1987, pp. 125–132. 21 Refs.

Stability tests were conducted on amorphous silicon solar cells with a glass/indium-tin-oxide/(p-i-n)a-Si:H/metal structure and on hydrogenated amorphous silicon (a-Si:H) film under various combinations of light and ambient temperature. The degradation of characteristics was dependent on temperature and was governed by the extent of the temperature rise. Results of the tests showed that light-induced degradation and recovery from temperature-induced degradation progress together as time passes. It had been expected that no light-induced degradation would occur if cells were kept at 130–140 C for long periods of time, and, in order to investigate these phenomena, the changes in diode characteristics and the photocurrent excited by low energy light in solar cells were measured.

A87-32243 Energy-band discontinuities in a heterojunction of amorphous hydrogenated Si and crystalline Si measured by internal photoemission. HIDENORI MIMURA and YOSHINORI HATANAKA, *Applied Physics Letters* (ISSN 0003–6951), Vol. 50, Feb. 9, 1987, pp. 326–328. Research supported by the Hoso Bunka Foundation and Nippon Sheet Glass Co. 10 Refs.

Energy-band discontinuities were measured for hydrogenated amorphous Si and crystalline Si heterojunctions by internal photoemission. The measurement was performed both for the conduction-band side and for the valence-band side, and the conduction-band discontinuity and the valence-band discontinuity were estimated to be 0.09 and 0.71 eV, respectively. This result indicates that the band discontinuity mainly exists at the valence-band side.

A88-34378 Study of electron transport and light-induced effects in a-SiH films. M. YAMAGUCHI, H. YAMAGISHI, M. KONDO, A. HIROE, Y. HOSOKAWA et al., *Proceedings of the 19th IEEE Photovoltaic Specialists Conference,* New Orleans, LA, May 4–8, 1987, (A88-34226 13–44). New York, Institute of Electrical and Electronics Engineers, Inc., 1987, pp. 845–850. 12 Refs.

Electron lifetimes and mobility-lifetime products before and after exposure to white, blue or red light have been estimated on the basis of steady-state photocurrent measurements using, delayed-field (DF) and time-of-flight (TOF) techniques. The sample had the structure glass /transparent-conductive-oxide/a-SiC(300 A)/a-SiH(10 microns)/ a-SiC(300 A)/ metal. From transient photocurrent measurements (DF and TOF), it was found that a change occurs in mobility-lifetimeproducts and lifetimes of the electrons. The trapping lifetime of the electrons was reduced by light soaking. This short lifetime is attributed to an increase of deep trapping centers or recombination centers with large cross sections.

A88-27797 Anodic oxidation for enhancement of fabrication yield and efficiency of amorphous silicon solar cells. SATOSHI ARIMOTO, HIDEKI HASEGAWA, HIDEKAZU YAMAMOTO, and HIDEO OHNO, *Electrochemical Society Journal* (ISSN 0013–4651), Vol. 135, Feb. 1988, pp. 431–436. 17 Refs.

Anodic oxidation is applied to the fabrication of hydrogenated amorphous silicon (a-Si:H) solar cells. Anodic oxidation is found to be very effective for (1) realization of metal-insulator-semiconductor (MIS) solar cells with a high opencircuit voltageand (2) for passivation of shunt leakage current paths which deteriorate the photoelectric performance in the MIS and p-i-n solar cell structures. The passivation effect leads to simultaneous enhancement of the fabrication yield and the photoelectric conversion efficiency. A detailed study indicates that the passivation mechanism is due to selective oxidation of the material defects responsible for leakage current.

A88-15731 Highspeed light valve using an amorphous silicon photosensor and ferroelectric liquid crystals. N. SHIN-ICHI TAKAHASHI, HIDEKI ASADA, MASAKI MIYAHARA, SHOICHI KURITA, and HIROYUKI KURIYAMA, *Applied Physics Letters* (ISSN 0003–6951), Vol. 51, Oct. 19, 1987, pp. 1233–1235. 12 Refs.

A novel high-speed response light valve composed of a hydrogenated amorphous silicon (a-Si:H) photosensor and a chiral smectic C phase liquid crystal is presented for the first time. This device is optically addressed. The switching between on and off states is caused by reversing the polarity of the applied voltage across the liquid crystal due to the photocurrent from the a-Si photosensor. The response time measured is about 400 microsec. The switching speed of this device is one to two orders of magnitude faster than that of the nematic liquid-crystal light valve. This device can be applied to optical bistable devices without optical feedback, using an electro-optic memory effect of the ferroelectric liquid crystal.

A88-15419 Effect of metal/P-doped a-Si:H junctions on the photovoltage of a-Si:H solar cells. YUICHI SAKAI, MICHIO MATSUMURA, YOSHIHIRO NAKATO, and HIROSHI TSUBOMURA, *Journal of Applied Physics* (ISSN 0021–8979), Vol. 62, Oct. 15, 1987, pp. 3424–3426. 8 Refs.

The open-circuit photovoltages (Voc) of a-Si:H solar cells having a glass/TCO/p-i-n a-Si:H/metal structure were examined as a function of the thickness of the n layer. The Voc stayed constant at about 0.8 V, irrespective of the kind of metals, as far as the thickness of the n layer was larger than 15 nm, but dropped when the n layer got thinner. This effect was the stronger, the smaller the work function of the metal. The decrease of Voc is attributed to complete depletion of the n layer, leading to the reduction of the potential gradient in the i layer. The effects of the metal/P-doped a-Si:H junction were further investigated using cells having a glass/TCO/n-i-n/metal structure and different doping concentrations for the latter n layer. The results obtained supported the above-mentioned conclusion.

A87-50330 New configuration-coordinate model for the ground, excited, and metastable states of EI2 in GaAs. YASUNORI MOCHIZUKI and TOSHIAKI IKOMA, *Physical Review Letters* (ISSN 0031–9007), Vol. 59, Aug. 3, 1987, pp. 590–593. 19 Refs.

A new configuration-coordinate model for EL2, where the excited state has asymmetrical dual minima, is proposed to explain the oscillatory spectrum of transition rate obtained by a novel spectral photocapacitance transient analysis measurement. The model claims that an electron in the excited state of EI2 has a probability of relaxing both to the conduction band and to the metastable state. It can explain a Gaussian shape of the photoquenching spectrum which cannot be interpreted with the conventional scheme. The proposed model suggests that EL2 in GaAs originates from a complex defect of arsenic antisite with arsenic interstitial atoms(s).

A87-40973 Photoemission studies of electronic structures of BaPb(1-x)Bi(x)O3. HIROKAZU SAKAMOTO, HIROFUMI NAMATAME, TAMIKO MORI, KOICHI KITAZAWA, SHOJI TANAKA et al., *Physical Society of Japan Journal* (ISSN 0031–9015), Vol. 56, Jan. 1987, pp. 365–369. 12 Refs.

Photoemission spectra for BaPb(1-x)Bi(x)O3 with x = 0, 0.25, and 0.6, measured using synchrotron radiation, are analyzed. The electronic structures of BaPbO3 are examined. The relations between the binding energy and photoemission intensity, photoionization and h(nu), and the photoemission intensity and x are studied. Constant initial state spectra for several photoemission structures in BaPbO3 are investigated.