# Journal of APPLIED PHYSICS

	Applied Physics Review	
Quar	titative Emission Spectr	N: aseaay
Бус	J. Kölzer, C. Boit, A. Dalln	nainn.
	eboy, J. Otto, and D. Wei	
Volume 71	1 June 1992	Number, 11
		Wallbel 11

a publication of the American Institute of Physics





### APPLIED PHYSICS

Steven J. Rothman, Editor

Lester Guttman, Consulting Editor

Robert C. Birtcher, Gian P. Felcher, Robert E. Holland, and John N. Mundy, Associate Editors

Catherine M. Dial, Assistant to the Editor

Editorial Board

Term ending 31 December 1992

Term ending 31 December 1993

Term ending 31 December 1994

David K. Biegelsen Robert L. Byer Frans Spaepen L. Eric Cross
D. K. Finnemore
J. Murray Gibson
Frans W. Saris

William R. Frensley Julia M. Phillips Paul M. Solomon

AIP EDITORIAL STAFF: Deborah McHone, Editorial Supervisor; Julia Macklin, Chief Production Editor; Cindy Klingensmith and Marilyn Schrage, Senior Production Editors; Elizabeth Belmont, Journal Coordinator

The Journal of Applied Physics is published semimonthly by the American Institute of Physics (AIP) with the cooperation of The American Physical Society. It is devoted to general physics and its applications to other sciences, to engineering, and to industry. (Prior to 1937, the Journal carried the name Physics.) The Editor welcomes manuscripts describing significant new experimental or theoretical results in applied physics or manuscripts concerning important new applications of physics to other branches of science and engineering.

### Information for Contributor

Submit manuscripts to the Journal of Applied Physics, Argonne National Laboratory, 9700 South Cass Avenue, Building 203, Room R-127, P.O. Box 8296, Argonne, IL 60439-8296. Submission is a representation that the manuscript has not been published previously nor currently submitted for publication elsewhere. It is the responsibility of the corresponding author to confirm that each co-author approves of the paper as submitted. The manuscript should be accompanied by a statement transferring copyright from the authors (or their employers—whoever holds the copyright) to AIP; a suitable form for copyright transfer is occasionally printed in the back of this journal and is available from the Editor's office or AIP. This written transfer of copyright, which previously was assumed to be implicit in the act of submitting a manuscript, is necessary under the 1978 U.S. copyright law in order for AIP to continue disseminating physics research results as widely as possible. Further information may be obtained from AIP.

**Publication Charge:** To support the cost of wide dissemination of research results through publication of journal pages and production of a data base of articles, the author's institution is requested to pay a *page charge* of \$55 per page (with a one-page minimum) and an *article charge* of \$20 per article. For **Errata** the minimum page charge is \$10, with no article charge.

Two categories of manuscripts are acceptable, **full-length articles** and **Communications**. The latter are short contributions not generally exceeding in length nine double-spaced typewritten pages or approximately 2500 words of text reduced, however, by allowances for equations, tables, and figures. Abstracts are required for manuscripts of both types. Being short, Communications are often published more quickly than full-length articles. Instructions for preparation of

manuscripts will be found in the January issue of this journal and occasionally in later issues. In brief and incomplete summary: Two copies of the manuscript, including clear copies of the figures, are required, double-spaced throughout on one side of  $21.6 \times 28$  cm ( $8\frac{1}{2} \times 11$  in.) paper. The abstract, references, figure captions, and tables are similarly to be double-spaced each on its separate sheets. The figures should be original line drawings or high-contrast glossy prints not larger than  $21.6 \times 28$  cm and should be included with the submission. References should conform to the style used in AIP journals including this one. Unusual mathematical symbols should be clarified with marginal notes. See AIP Style Manual for further details.

AIP's Physics Auxiliary Publication Service (PAPS) is a low-cost depository for material which is part of and supplementary to a published paper, but is too long to be included in the journal; inquire of the Editor.

Proofs and all correspondence concerning papers in the process of publication should be addressed to: Editorial Supervisor, *The Journal of Applied Physics*, American Institute of Physics, 500 Sunnyside Blvd., Woodbury, NY 11797. In all correspondence reference should be made to title, author, journal, and scheduled date of issue. A limited number of alterations in proof are unavoidable, but the cost of making extensive alterations after the article has been set in type will be charged to the author.

Copyright 1992, American Institute of Physics. Individual teachers, students, researchers, and libraries acting for them are permitted to make copies of articles in this journal for their own use in research or teaching, including multiple copies for classroom or library reserve use, provided such copies are not sold. Copying for sale is subject to payment of copying fees. (See "Copying Fees" paragraph elsewhere in this journal.) Permission is granted to quote from this journal with the customary acknowledgment of the source. To reprint a figure, table, or other excerpt requires in addition the consent of one of the original authors and notification to AIP. Reproduction for advertising or promotional purposes, or republication in any form, is permitted only under license from AIP, which will normally require that the permission of one of the authors also be obtained. Direct inquiries to Office of Rights and Permissions, American Institute of Physics, 335 East 45th Street, Now Vark NV 10017



### APPLIED PHYSICS REVIEWS

R23 Quantitative emission microscopy

### GENERAL PHYSICS: Nuclear, Atomic, and Molecular (PACS 01-36)

5303 Representation of tails of periodic and infinite-range signals: Towards a treatment for truncation

J. Kölzer, C. Boit, A. Dallmann, G. Deboy, J. Otto, D. Weinmann

A. C. Vermeulen, R. Delhez, Th. H. de Keijser, E. J. Mittemeijer

### CLASSICAL PHENOMENOLOGY: Electricity, Magnetism, Optics, Acoustics, Heat, Mechanics (PACS 41-52)

5310	instabilities in ann	ealed proton	exchange	waveguides	in lithium	tantalate
------	----------------------	--------------	----------	------------	------------	-----------

5318 Propagation of several waves in a nonlinear medium displaying an optical activity: Application to four-wave mixing in Bi<sub>12</sub>(Ge;Si)O<sub>20</sub> crystals

AlGaAs diode laser blue shift resulting from fast neutron irradiation 5323

Effect of optical activity on higher-order self-diffraction in absorptive photorefractive medium: Transmission geometry for two-wave mixing

Magnetic field enhanced performance of a copper hollow anode cathode 5338

Longitudinal mode stability difference in Se- and Si-doped AlGaAs lasers 5344

5347 Gain measurements of high-pressure ultraviolet-preionized self-sustained discharge pumped atomic xenon laser

5353 Anisotropic thermal conductivity in chemical vapor deposition diamond JORARY OF Paul J. Matthews, Alan R. Mickelson

M. Sylla, P. X. Nguyen, D. Rouede, G. Rivoire

J. C. Camparo, S. B. Delcamp, R. P. Frueholz

Amitava Roy, Kehar Singh

Z. Zhang, N. D. Perry, R. C. Tobin

H. Sugiura, A. Noma, M. Yuri, M. Hirose, M. Kume, I. Ohta, M. Kazumura

Katsuhiko Komatsu, Fumihiko Kannari, Minoru Obara

Graebner, S. Jin, G. W. Kammott, B. Bacon, L. Seibles, W. Banholzer

(Continued)

please use it Request from subscribers for missing journal issues will be honored without charge only if received within six months of the issue's actual date of publication; otherwise, the issue may be purchased at the single-copy price. (AIP Headquarters are located at 335 East 45th St., New York, NY 10017; Subscription Fulfillment offices are located at 500 Sunnyside Blvd., Woodbury, NY 11797.)

Reprints of individual articles in this journal may be ordered singly at \$10.00 per article copy (postage included) for articles up to 20 pages. Beyond 20 pages there is a surcharge of \$0.20 per page. Air mail delivery is available. Orders are filled within one week of receipt or of the date of publication, whichever is later. Send orders to the AIP Member and Subscriber Services Division, 500 Sunnyside Bivd., Woodbury, NY 11797.

Copying Fees: The code that appears on the first page of articles in this journal gives the fee for each copy of the article made beyond the free copying permitted by AIP. (See statement under "Copyright" elsewhere in this journal.) If no code appears, no fee applies. The fee for pre-1978 articles is \$0.25 per copy. With the exception of copying for advertising and promotional purposes, the express permission of AIP is not required provided the fee is paid through the Copyright Clearance Center, Inc. (CCC), 21 Congress St., Salem, MA 01970. Contact the CCC for information on how to report copying and remit payment.

Microfilm Subscriptions of complete volumes of the Journal of Applied Physics are available on 16 mm and 35 mm. The Journal of Applied Physics also appears on a monthly basis in Current Physics Microform (CPM) Section 1 along with 32 other journals published by the American Institute of Physics and its member societies. A Microfilm Catalog is available on request. The Journal of Applied Physics is indexed quarterly in Current Physics Index, a subject and author index (with abstracts) to all journals published by AIP and its member sociation

### Subscription Prices\* (1992)

		Can., Mex., Central & S. Amer. & Caribbean	Foreign Surface mail	Air Freight	Optional Air Freight
	U.S.A. & Poss.			Europe, Asia, Africa & Oceania	
Members <sup>†</sup>	\$160.00	\$240.00	\$240.00		\$350.00
Reg. rate	\$1240.00	\$1320.00		\$1430.00 <sup>‡</sup>	_

<sup>\*</sup>The Journal is available on microfiche at \$160 per year to members and \$1240 per year at the regular rate.

Back-Number Prices. Single copies from Vol. 24 (1953) through Vol. 55 (1984): \$55.00; Vol. 56 (1984) and thereafter; \$55.00. Special Supplements; \$55.00. Volumes 1-23 (1931-1952) are available only on microfilm.

The Journal of Applied Physics (ISSN: 0021-8979) is published semimonthly by the American Institute of Physics, 500 Sunnyside Blvd., Woodbury, NY 11797. Second-class postage paid at Woodbury, NY, and additional mailing offices. POSTMASTER: Send address changes to Journal of Applied Physics, 500 Sunnyside Blvd., Woodbury, NY 11797.

Subscription, renewals, address changes, and single-copy orders should be addressed to AIP Member and Subscriber Services Division, 500 Sunnyside Blvd., Woodbury, NY 11797. Allow at least six weeks advance notice. For address changes please send both old and new addresses and, if possible, include a mailing label from the wrapper of a recent issue. For your convenience a change Of address form is included in every issue of Physics Today.



<sup>&</sup>lt;sup>†</sup>AIP Member and affiliated Societies.

<sup>&</sup>lt;sup>‡</sup>Regular rate subscriptions to Europe, Asia, Africa, and Oceania include air freight service.

voi. / i, No. 11, 1 June 1992

### APPLIED PHYSICS REVIEWS

R23 Quantitative emission microscopy

GENERAL PHYSICS: Nuclear, Atomic, and Molecular (PACS 01-36)

5303 Representation of tails of periodic and infinite-range signals: Towards a treatment for truncation

J. Kölzer, C. Boit, A. Dallmann, G. Deboy, J. Otto, D. Weinmann

A. C. Vermeulen, R. Delhez, Th. H. de Keijser, E. J. Mittemeijer

CLASSICAL PHENOMENOLOGY: Electricity, Magnetism, Optics, Acoustics, Heat, Mechanics (PACS 41-52)

5310 Instabilities in annealed proton exchange waveguides in lithium tantalate

Propagation of several waves in a nonlinear medium displaying an optical activity: Application to four-wave mixing in  $\rm Bi_{12}(Ge;Si)O_{20}$  crystals

5323 AlGaAs diode laser blue shift resulting from fast neutron irradiation

Effect of optical activity on higher-order self-diffraction in absorptive photorefractive medium: Transmission geometry for two-wave mixing

5338 Magnetic field enhanced performance of a copper hollow anode cathode laser

5344 Longitudinal mode stability difference in Se- and Si-doped AlGaAs lasers

5347 Gain measurements of high-pressure ultraviolet-preionized self-sustained discharge pumped atomic xenon laser

5353 Anisotropic thermal conductivity in chemical vapor deposition diamond

Paul J. Matthews, Alan R. Mickelson

M. Sylla, P. X. Nguyen, D. Rouede, G. Rivoire

J. C. Camparo, S. B. Delcamp, R. P. Frueholz

Amitava Roy, Kehar Singh

Z. Zhang, N. D. Perry, R. C. Tobin

H. Sugiura, A. Noma, M. Yuri, M. Hirose, M. Kume, I. Ohta, M. Kazumura

Katsuhiko Komatsu, Fumihiko Kannari, Minoru Obara

J. E. Graebner, S. Jin, G. W. Kammott, B. Bacon, L. Seibles, W. Banholzer

(Continued)

Subscription Prices\* (1992)

U.S.A. & Poss.		Can., Mex., Central & S. Amer. & Caribbean	Foreign Surface mail	Air Freight  Europe Africa &	
Members <sup>†</sup>	\$160.00	\$240.00	\$240.00		\$350.00
Reg. rate	\$1240.00	\$1320.00	6.12	\$1430.00 <sup>‡</sup>	

\*The Journal is available on microfiche at \$160 per year to members and \$1240 per year at the regular rate.

<sup>†</sup>AIP Member and affiliated Societies.

Regular rate subscriptions to Europe, Asia, Africa, and Oceania include air freight service.

**Back-Number Prices.** Single copies from Vol. 24 (1953) through Vol. 55 (1984): \$55.00; Vol. 56 (1984) and thereafter; \$55.00. Special Supplements; \$55.00. Volumes 1-23 (1931–1952) are available only on microfilm.

The Journal of Applied Physics (ISSN: 0021-8979) is published semimonthly by the American Institute of Physics, 500 Sunnyside Blvd., Woodbury, NY 11797. Second-class postage paid at Woodbury, NY, and additional mailing offices. POSTMASTER: Send address changes to Journal of Applied Physics, 500 Sunnyside Blvd., Woodbury, NY 11797.

Subscription, renewals, address changes, and single-copy orders should be addressed to AIP Member and Subscriber Services Division, 500 Sunnyside Blvd., Woodbury, NY 11797. Allow at least six weeks advance notice. For address changes please send both old and new addresses and, if possible, include a mailing label from the wrapper of a recent issue. For your convenience a change of address form is included in suppression.

please use it. Request from subscribers for missing journal issues will be honored without charge only if received within six months of the issue's actual date of publication; otherwise, the issue may be purchased at the single-copy price. (AIP Headquarters are located at 335 East 45th St., New York, NY 10017; Subscription Fulfillment offices are located at 500 Sunnyside Blvd., Woodbury, NY 11797.)

Reprints of individual articles in this journal may be ordered singly at \$10.00 per article copy (postage included) for articles up to 20 pages. Beyond 20 pages there is a surcharge of \$0.20 per page. Air mail delivery is available. Orders are filled within one week of receipt or of the date of publication, whichever is later. Send orders to the AIP Member and Subscriber Services Division, 500 Sunnyside Blvd., Woodbury, NY 11797.

Copying Fees: The code that appears on the first page of articles in this journal gives the fee for each copy of the article made beyond the free copying permitted by AIP. (See statement under "Copyright" elsewhere in this journal.) If no code appears, no fee applies. The fee for pre-1978 articles is \$0.25 per copy. With the exception of copying for advertising and promotional purposes, the express permission of AIP is not required provided the fee is paid through the Copyright Clearance Center, Inc. (CCC), 21 Congress St., Salem, MA 01970. Contact the CCC for information on how to report copying and remit payment.

Microfilm Subscriptions of complete volumes of the Journal of Applied Physics are available on 16 mm and 35 mm. The Journal of Applied Physics also appears on a monthly basis in Current Physics Microform (CPM) Section 1 along with 32 other journals published by the American Institute of Physics and its member societies. A Microfilm Catalog is available on request. The Journal of Applied Physics is indexed quarterly in Current Physics Index, a subject and author index (with abstracts) to all journals published by AIP and its



	5363	Longitudinal electron direction described	Prieips, L. E. Killie
	5372	Mass spectroscopic study of CH <sub>3</sub> radicals produced in a hollow cathode	M. M. Sanz, L. Abad, V. J. Herrero, I. Tanarro
	5376	discharge cell  Frequency up-conversion of a high-power microwave pulse propagating in	S. P. Kuo, A. Ren
	5381	a self-generated plasma Resonator amplification of microwave emission from a relativistic	Gregory Benford, A. Ben-Amar Baranga
		beam-plasma system	-68)
	COND	ENSED MATTER: Structure, Mechanical, and Thermal Properties (PACS 61	R. G. Vardiman
	5386	The formation and annealing of dislocation damage from high-cose	<b>V.I. C.</b> I.
	5391	Calorimetric measurements of the thermal relaxation in nanocrystalline	A. Tschöpe, R. Birringer, H. Gleiter
	5395	Bonding properties of glow-discharge polycrystalline and amorphous Si-C films studied by x-ray diffraction and x-ray photoelectron spectroscopy	T. Takeshita, Y. Kurata, S. Hasegawa
-	5401	Scanning tunneling microscope-promoted growth of nanometer-scale, uniform gold stripes on reconstructed Au(111) surfaces	Zhouhang Wang, Martin Moskovits
	5410	Molecular-dynamics simulations of bulk and surface damage production in low-energy Cu→Cu bombardment	Frank Karetta, Herbert M. Urbassek
	5419	Thermally stimulated current of Si-ion-implanted GaAs	Y. H. Lee, T. W. Kang, T. W. Kim
	5423	Recrystallization behavior of silicon implanted with iron	J. P. de Souza, L. Amaral, P. F. P. Fichtner
	5427	Structure and crystallization of low-pressure chemical vapor deposited silicon films using $Si_2H_6$ gas	C. H. Hong, C. Y. Park, HJ. Kim
	5433	Tantalum as a diffusion barrier between copper and silicon: Failure mechanism and effect of nitrogen additions	Karen Holloway, Peter M. Fryer, Cyril Cabral, Jr., J. M. E. Harper, P. J. Bailey, K. H. Kelleher
	5445	A real time study of the growth of microcrystalline silicon on transparent conducting oxide substrates	M. Fang, B. Drevillon
	5450	Study of the initial formation of silicon carbide by reaction of tetraethyl silane with silicon	V. M. Bermudez
	5460	Effects of amorphous titanium silicide on subsequently formed crystalline compound prepared by two-step thermal process	H. G. Nam, I. Chung, R. W. Bene
	CON	DENSED MATTER: Electrical and Magnetic Properties (PACS 71—76)	
		Investigation of the photorefractive effect in Bi <sub>2</sub> TeO <sub>5</sub>	I. Foldvari, Huimin Liu, Richard C. Powell, A. Peter
	5474	Phosphorus diffusion into silicon from a spin-on source using rapid thermal processing	B. Hartiti, A. Slaoui, J. C. Muller, R. Stuck, P. Siffert
	5479	Investigations of the electrical properties of electrodeposited CulnSe <sub>2</sub> thin films	C. Guillén, J. Herrero
	5484	Saturation of the surface field with external bias for metalorganic chemical vapor deposition epilayer GaAs/GaAs as determined by electroreflection spectroscopy	Henry Poras, George J. Goldsmith, Noren Pan
	5489	Progress towards spin-polarized scanning tunneling microscopy	I. V. Shvets, R. Wiesendanger, D. Bürgler, G. Tarrach, HJ. Güntherodt, J. M. D. Coey
	5500	Hysteresis of the work function of Co(0001) surface resulting from an allotropic transformation	S. Saito, K. Takeda, T. Soumura, M. Ohki, T. Tani, T. Maeda
	550	4 A simplified and improved model of ideal and almost ideal silicon p-n junctions: The role of oxygen	Bruno Pellegrini
	551	7 Miniband Bloch conduction in semiconductor superlattices	X. L. Lei, I. C. da Cunha Lima

J. L. Pack, R. E. Voshall, A. V.

Phelps, L. E. Kline

time-varying strength of a line heat source

5363 Longitudinal electron diffusion coefficients in gases: Noble gases

(Continued)



## DOCKET

### Explore Litigation Insights



Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

### **Real-Time Litigation Alerts**



Keep your litigation team up-to-date with **real-time** alerts and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

### **Advanced Docket Research**



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

### **Analytics At Your Fingertips**



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

### API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

#### **LAW FIRMS**

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

#### **FINANCIAL INSTITUTIONS**

Litigation and bankruptcy checks for companies and debtors.

### **E-DISCOVERY AND LEGAL VENDORS**

Sync your system to PACER to automate legal marketing.

