Narrow Gap Semiconductors Proceedings Of The Nato Workshop 25 27 June 1991 Oslo Norway

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Diagnostic Techniques for
Semiconductor Materials Processing
1993
Quantum Semiconductor Structures
Claude Weisbuch 2014-06-28
In its original form, this widely acclaimed primer on the fundamentals of quantized semiconductor structures was published as an introductory chapter in Raymond Dingle's edited volume (24) of Semiconductors and Semimetals. Having already been praised by reviewers for its excellent coverage, this material is now available in an updated and expanded "student edition." This work promises to become a standard reference in the field. It covers the basics of electronic states as well as the fundamentals of optical interactions and quantum transport in two-dimensional quantized systems. This revised student edition also includes entirely new sections discussing applications and one-dimensional and zero-dimensional systems. Available for the first time in a new, expanded version.

Long Wavelength Infrared Detectors
Manijeh Razeghi 2020-03-09
This timely work presents a comprehensive overview of the development of new generations of infrared detectors based on artificially synthesized quantum structures. The growth of quantum wells and superlattices is well documented in this volume, as are the principal new superlattice technologies for long wavelength
infrared detection. Featuring insightful contributions from researchers working at the "cutting edge" of this exciting field, this volume is sure to become an essential reference for advanced graduate students and researchers alike. *Device Physics of Narrow Gap Semiconductors* Junhao Chu 2009-10-13

Narrow gap semiconductors obey the general rules of semiconductor science, but often exhibit extreme features of these rules because of the same properties that produce their narrow gaps. Consequently these materials provide sensitive tests of theory, and the opportunity for the design of innovative devices. Narrow gap semiconductors are the most important materials for the preparation of advanced modern infrared systems. *Device Physics of Narrow Gap Semiconductors*, a forthcoming second book, offers descriptions of the materials science and device physics of these unique materials. Topics covered include impurities and defects, recombination mechanisms, surface and interface properties, and the properties of low dimensional systems for infrared applications. This book will help readers to understand not only semiconductor physics and materials science, but also how they relate to advanced opto-electronic devices. The final chapter describes the device physics of photoconductive detectors, photovoltaic infrared detectors, super lattices and quantum wells, infrared lasers, and single photon infrared detectors. *Spectroscopy of Semiconductor Microstructures* Gerhard Fasol
Intersubband transitions in quantum wells have attracted tremendous attention in recent years, mainly due to the promise of applications in the mid and far-infrared regions (2-20 μm). Many of the papers presented in Quantum Well Intersubband Transition Physics and Devices are on the basic linear intersubband transition processes, detector physics and detector application, reflecting the current state of understanding and detector applications, where highly uniform, large focal plane arrays have been demonstrated. Other areas are still in their early stages, including infrared modulation, harmonic generation and emission. Properties of Impurity States in Superlattice Semiconductors C.Y. Fong

A NATO workshop on "The Properties of Impurity States in Semiconductor Superlattices" was held at the University of Essex, Colchester, United Kingdom, from September 7 to 11, 1987. Doped semiconductor superlattices not only provide a unique opportunity for studying low dimensional electronic behavior, they can also be custom-designed to exhibit many other fascinating electronic properties. The possibility of using these materials for new and novel devices has further induced many astonishing advances, especially in recent years. The purpose of this workshop was to review both advances in the state of the art and recent results in various
areas of semiconductor superlattice research, including: (i) growth and characterization techniques, (ii) deep and shallow impurity states, (iii) quantum well states, and (iv) two-dimensional conduction and other novel electronic properties. This volume consists of all the papers presented at the workshop. Chapters 1-6 are concerned with growth and characterization techniques for superlattice semiconductors. The question of a-layer is also discussed in this section. Chapters 7-15 contain a discussion of various aspects of the impurity states. Chapters 16-22 are devoted to quantum well states. Finally, two-dimensional conduction and other electronic properties are described in chapters 23-26.

Narrow Gap II-VI Semiconductors

Stian Loevold 1991

Resonant Tunneling in Semiconductors

L.L. Chang 2012-12-06 This book contains the proceedings of the NATO Advanced Research Workshop on "Resonant Tunneling in Semiconductors: Physics and Applications", held at Escorial, Spain, on May 14-18, 1990. The tremendous growth in the past two decades in the field of resonant tunneling in semiconductor heterostructures has followed, if not outpaced, the expansion witnessed in quantum structures in general. Resonant tunneling shares also the multi-disciplinary nature of that broad area, with an emphasis on the underlying physics but with a coverage of material systems on the one end and device applications on the other. Indeed, that resonant
tunneling provides great flexibility in terms of materials and configurations and that it is inherently a fast process with obvious device implications by the presence of a negative differential resistance have contributed to the unrelenting interest in this field. These proceedings consist of 49 refereed articles; they correspond to both invited and contributed talks at the workshop. Because of the intertwining nature of the subject matter, it has been difficult to subdivide them in well-defined sections. Instead, they are arranged in several broad categories, meant to serve only as guidelines of emphasis on different topics and aspects. The book starts with an introduction to resonant tunneling by providing a perspective of the field in the first article. This is followed by discussions of different material systems with various band-structure effects.

Point and Extended Defects in Semiconductors Giorgio Benedek
2013-06-29 The systematic study of defects in semiconductors began in the early fifties. From that time on many questions about the defect structure and properties have been answered, but many others are still a matter of investigation and discussion. Moreover, during these years new problems arose in connection with the identification and characterization of defects, their role in determining transport and optical properties of semiconductor materials and devices, as well as from the technology of the ever-increasing scale of...
integration. This book presents to the reader a view into both basic concepts of defect physics and recent developments of high resolution experimental techniques. The book does not aim at an exhaustive presentation of modern defect physics; rather it gathers a number of topics which represent the present-time research in this field. The volume collects the contributions to the Advanced Research Workshop "Point, Extended and Surface Defects in Semiconductors" held at the Ettore Majorana Centre at Erice (Italy) from 2 to 7 November 1988, in the framework of the International School of Materials Science and Technology. The workshop has brought together scientists from thirteen countries. Most participants are currently working on defect problems in either silicon submicron technology or in quantum wells and superlattices, where point defects, dislocations, interfaces and surfaces are closely packed together.

New Technical Books

New York Public Library 1992

Physics of Narrow Gap Semiconductors
Erich Gornik 1982

Science and Engineering of One- and Zero-Dimensional Semiconductors
Steven P. Beaumont 2012-12-06

This volume comprises the proceedings of the NATO Advanced Research Workshop on the Science and Engineering of 1- and 0-dimensional semiconductors held at the University of Cadiz from 29th March to 1st April 1989, under the auspices of the NATO International Scientific Exchange Program. There is a wealth of scientific activity on the properties of two-dimensional
semiconductors arising largely from the ease with which such structures can now be grown by precision epitaxy techniques or created by inversion at the silicon-silicon dioxide interface. Only recently, however, has there burgeoned an interest in the properties of structures in which carriers are further confined with only one or, in the extreme, zero degrees of freedom. This workshop was one of the first meetings to concentrate almost exclusively on this subject: that the attendance of some forty researchers only represented the community of researchers in the field testifies to its rapid expansion, which has arisen from the increasing availability of technologies for fabricating structures with small enough (sub - 0.1/tm) dimensions. Part I of this volume is a short section on important topics in nanofabrication. It should not be assumed from the brevity of this section that there is little new to be said on this issue: rather that to have done justice to it would have diverted attention from the main purpose of the meeting which was to highlight experimental and theoretical research on the structures themselves.

The MRS Symposium Proceeding series is an internationally recognised reference suitable for researchers and practitioners.

Narrow Gap Semiconductors 1995 J.L Reno 2020-11-26 Narrow Gap Semiconductors 1995 contains the invited and contributed papers
presented at the Seventh International Conference on Narrow Gap Semiconductors, held in January 1995. The invited review papers provide an overview and the contributed papers provide in-depth coverage of research results across the whole field.

**Crystalline Semiconducting Materials and Devices** Paul N. Butcher

2013-11-11 This book is concerned primarily with the fundamental theory underlying the physical and chemical properties of crystalline semiconductors. After basic introductory material on chemical bonding, electronic band structure, phonons, and electronic transport, some emphasis is placed on surface and interfacial properties, as well as effects of doping with a variety of impurities. Against this background, the use of such materials in device physics is examined and aspects of materials preparation are discussed briefly. The level of presentation is suitable for postgraduate students and research workers in solid-state physics and chemistry, materials science, and electrical and electronic engineering. Finally, it may be of interest to note that this book originated in a College organized at the International Centre for Theoretical Physics, Trieste, in Spring 1984. P. N. Butcher N. H. March M. P. Tosi vii

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1. Two Different Strategies for Band-Structure Calculations

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Narrow Gap Semiconductors - Proceedings Of The Eighth International Conference

Sue-chu Shen

High Field Cyclotron Resonance in GaSb and Effective Mass at the Γ and L-Points (H Arimoto et al)
Quantum Dots: Growth and Characterization of InAs Quantum Dots (N N Ledentsov)
Self-Assembled InAs Quantum Boxes: Growth, Intrinsic Properties, Potential Applications (Abstract) (J M Gérard) and other papers

Readership: Researchers in the field of semiconductors.

Narrow Gap Semiconductors NATO. 1991

Electronic States and Optical Transitions in Semiconductor Heterostructures
Fedor T. Vasko
2012-12-06

The theoretical basis and the relevant experimental knowledge underlying our present understanding of the electrical and optical properties of semiconductor heterostructures. Although such structures have been known since the 1940s, it was only in the 1980s that they moved to the forefront of research. The resulting structures have remarkable properties not shared by bulk materials. The text begins with a description of the electronic properties of various types of heterostructures, including discussions of complex band-structure effects, localised states, tunnelling phenomena, and excitonic states. The focus of the remainder of the book is on optical properties, including intraband absorption, luminescence and recombination, Raman scattering, subband optical transitions, nonlinear effects, and ultrafast optical phenomena. The concluding chapter presents an overview of some of the applications that make use of the physics discussed. Appendices provide background information on
band structure theory, kinetic theory, electromagnetic modes, and Coulomb effects.

Oxides / Oxide E. Nakamura 1989-12-12

Volume III/28 is a supplement to volume III/16a+b Ferroelectrics and Related Substances. It also consists of two parts a and b. The present subvolume III/28a contains data on ferroelectric oxides, supplementing III/16a which appeared in 1981. Subvolume III/28b, due in 1990, will cover non-oxides, supplementing III/16b (published in 1982). Reliable data on both pure compounds and solid solutions, published mostly between 1978 and 1986 and some data from the literature up to early 1988 are critically evaluated and included. The dielectric and ferroelectric behaviour, as well as all other properties relevant to the characterization of these substances are presented in tables and figures. About 22,000 references have been surveyed with the aid of a computer. All values are given in SI units. Rapid localization of the required data is facilitated by an alphabetical index of substances and a two-dimensional survey of substances and properties dealt with in both subvolumes III/28a and III/16a.

Optical Properties of Narrow-Gap Low-Dimensional Structures Clivia M Sotomayor Torres 1987-06-30

Condensed Systems of Low Dimensionality J.L. Beeby 2012-12-06

The NATO Special Programme Panel on Condensed Systems of Low Dimensionality began its work in 1985 at a time of considerable activity in the field. The Panel has since funded
many Advanced Research Workshops, Advanced Study Institutes, Cooperative Research Grants and Research Visits across the breadth of its remit, which stretches from self-organizing organic molecules to semiconductor structures having two, one and zero dimensions. The funded activities, especially the workshops, have allowed researchers from within NATO countries to exchange ideas and work together at a period of development of the field when such interactions are most valuable. Such timely support has undoubtedly assisted the development of national programs, particularly in the countries of the alliance wishing to strengthen their science base. A closing Workshop to mark the end of the Panel's activities was organized in Marmaris, Turkey from April 23-27, 1990, with the same title as the Panel: Condensed systems of Low Dimensionality. This volume contains papers presented at that meeting, which sought to bring together chemists, physicists and engineers from across the spectrum of the Panel's activities to discuss topics of current interest in their special fields and to exchange ideas about the effects of low dimensionality. As the following pages show, this is a topic of extraordinary interest and challenge which produces entirely new scientific phenomena, and at the same time offers the possibility of novel technological applications.

Semiconductors and Semimetals
1988-02-01 Semiconductors and Semimetals
Narrow Gap Semiconductors
Junichiro Kono 2006-05-25 Bringing together

Narrow Gap Semiconductors
Junichiro Kono 2006-05-25 Bringing together
researchers from twenty-five countries, Narrow Gap Semiconductors: Proceedings of the 12th International Conference on Narrow Gap Semiconductors discusses the recent advances and discoveries in the science and technology of narrow gap semiconductors (NGS). In particular, it explores the latest findings in the fundamental physics of narrow-gap semiconductor structures (Part III). Sessions on, for example, the growth methods and characterization of III-V, II-VI, and IV-VI materials, discussed in Part II, were an integral part of the workshop. Considering the small masses of the carriers in narrow-gap low dimensional structures (LOS), in Part I the enhanced band mixing and magnetic field effects are explored in the context of the envelope function approximation. Optical nonlinearities and energy relaxation phenomena applied to the well-known systems of HgCdTe and GaAs/GaAlAs, respectively, are reviewed with comments on their extension to narrow gap LOS. The relevance of optical observations in quantum transport studies is illustrated in Part IV. A
review of devices based on epitaxial narrow-gap materials defines a frame of reference for future ones based on two-dimensional narrow-gap semiconductors; in addition, an analysis of the physics of quantum well lasers provides a guide to relevant parameters for narrow-gap laser devices for the infrared (Part V). The roles and potentials of special techniques are explored in Part VI, with emphasis on hydrostatic pressure techniques, since this has a pronounced effect in small-mass, narrow-gap, non-parabolic structures.

Light Scattering in Semiconductor Structures and Superlattices
D.J. Lockwood 2013-12-20

Just over 25 years ago the first laser-excited Raman spectrum of any crystal was obtained. In November 1964, Hobden and Russell reported the Raman spectrum of GaP and later, in June 1965, Russell published the Si spectrum. Then, in July 1965, the forerunner of a series of meetings on light scattering in solids was held in Paris. Laser Raman spectroscopy of semiconductors was at the forefront in new developments at this meeting. Similar meetings were held in 1968 (New York), 1971 (Paris) and 1975 (Campinas). Since then, and apart from the multidisciplinary biennial International Conference on Raman Spectroscopy there has been no special forum for experts in light scattering spectroscopy of semiconductors to meet and discuss latest developments. Meanwhile, technological advances in semiconductor growth have given rise to a veritable renaissance in the field of semiconductor physics. Light
scattering spectroscopy has played a crucial role in the advancement of this field, providing valuable information about the electronic, vibrational and structural properties both of the host materials, and of heterogeneous composite structures. On entering a new decade, one in which technological advances in lithography promise to open even broader horizons for semiconductor physics, it seemed to us to be an ideal time to reflect on the achievements of the past decade, to be brought up to date on the current state-of-the-art, and to catch some glimpses of where the field might be headed in the 1990s.

**Optical Properties of Narrow-Gap Low-Dimensional Structures** Clivia M. Sotomayor Torres 2012-12-06 This volume contains the Proceedings of the NATO Advanced Research Workshop on "Optical Properties of Narrow-Gap Low-Dimensional Structures", held from July 29th to August 1st, 1986, in St. Andrews, Scotland, under the auspices of the NATO International Scientific Exchange Program. The workshop was not limited to optical properties of narrow-gap semiconductor structures (Part III). Sessions on, for example, the growth methods and characterization of III-V, II-VI, and IV-VI materials, discussed in Part II, were an integral part of the workshop. Considering the small masses of the carriers in narrow-gap low dimensional structures (LOS), in Part I the enhanced band mixing and magnetic field effects are explored in the context of the envelope function approximation. Optical
nonlinearities and energy relaxation phenomena applied to the well-known systems of HgCdTe and GaAs/GaAlAs, respectively, are reviewed with comments on their extension to narrow gap LOS. The relevance of optical observations in quantum transport studies is illustrated in Part IV. A review of devices based on epitaxial narrow-gap materials defines a frame of reference for future ones based on two-dimensional narrow-gap semiconductors; in addition, an analysis of the physics of quantum well lasers provides a guide to relevant parameters for narrow-gap laser devices for the infrared (Part V). The roles and potentials of special techniques are explored in Part VI, with emphasis on hydrostatic pressure techniques, since this has a pronounced effect in small-mass, narrow-gap, non-parabolic structures. Polarons and Excitons in Polar Semiconductors and Ionic Crystals J.T. Devreese 2013-06-29 The 1982 Antwerp Advanced Study Institute on "Physics of Polarons and Excitons in Polar Semiconductors and Ionic Crystals" took place from July 26 till August 5 at the Conference Center Priorij Corsen donk, a restored monastery, close to the city of Antwerp. It was the seventh Institute in our series which started in 1971. This Advanced Study Institute, which was held fifty years after Landau introduced the polaron concept, can be considered as the third major international symposium devoted to the physics of polarons. The first such symposium took place in St. Andrews in 1962 under the title "Polarons and Excitons" [I].
The early theoretical developments related to polarons were reviewed in depth at this meeting; the derivation of the polaron Hamiltonian by Frohlich, the Frohlich weak coupling theory (and the equivalent weak coupling canonical transformations), the Landau-Pekar and Bogolubov strong coupling theory and the Feynman polaron model formulated with his path integrals. The main emphasis was on the polaron self-energy, effective mass and mobility. From the experimental side the first evidence for polaron effects was provided by the pioneering cyclotron and mobility measurements of the silver halides by F. E. Brown and his group. Also the significance of polaron effects for the understanding of excitons in ionic crystals was a central topic in St. Andrews. The second Advanced Study Institute concerning polaron physics was organized at the University of Antwerp (R. U. C. A. Growth and Optical Properties of Wide-Gap II–VI Low-Dimensional Semiconductors T.C. McGill 2012-12-06 This volume contains the Proceedings of the NATO Advanced Research Workshop on "Growth and Optical Properties of Wide Gap II–VI Low Dimensional Semiconductors", held from 2 - 6 August 1988 in Regensburg, Federal Republic of Germany, under the auspices of the NATO International Scientific Exchange Programme. Semiconducting compounds formed by combining an element from column II of the periodic table with an element from column VI (so called II–VI Semiconductors) have long promised many optoelectronic devices operating in the visible region of
the spectrum. However, these materials have encountered numerous problems including: large number of defects and difficulties in obtaining p- and n-type doping. Advances in new methods of material preparation may hold the key to unlocking the unfulfilled promises. During the workshop a full session was taken up covering the prospects for wide-gap II-VI Semiconductor devices, particularly light emitting ones. The growth of bulk materials was reviewed with the view of considering II-VI substrates for the novel epitaxial techniques such as MOCVD, MBE, ALE, MOMBE and ALE-MBE. The controlled introduction of impurities during non-equilibrium growth to provide control of the doping type and conductivity was emphasized.

**Non-oxides / Nicht-Oxide** M. Adachi

1990-12-19 Volume III/28 is a supplement to volume III/16a+b Ferroelectrics and Related Substances. It also consists of two parts a and b. Subvolume III/28a which came out in December 1989, contains data on ferroelectric oxides, supplementing III/16a which appeared in 1981. The present subvolume III/28b covers non-oxides, supplementing III/16b (published in 1982). Reliable data on both pure compounds and solid solutions, published mostly between 1978 and 1986 and some data from the literature up to early 1988 are critically evaluated and included. The dielectric and ferroelectric behaviour, as well as all other properties relevant to the characterization of these substances are presented in tables and figures.
About 22,000 references have been surveyed with the aid of a computer. All values are given in SI units. Rapid localization of the required data is facilitated by an alphabetical index of substances and a two-dimensional survey of substances and properties dealt with in both subvolumes III/28b and III/16b.

**Surveillance of Environmental Pollution and Resources by Electromagnetic Waves** T. Lund

2012-12-06 These proceedings contain lectures, research papers and working group reports from the NATO Advanced Study Institute on "Surveillance of environmental pollution and resources by electromagnetic waves", held at Spatind, Norway, April 9-19, 1978. Remote sensing of the environment has developed into a very complex multidisciplinary field. It encompasses a huge range of different instrumental techniques and analytical methods, designed to provide information about a vast number of environmental parameters. Nevertheless, the approach to solve specific problems and the ways of handling the collected information are to a large extent the same or similar. This commonality is the basis for the Advanced Study Institute. To provide the best possible background, both tutorial and for a fruitful exchange of research ideas and results, a number of outstanding scientists were invited to review some major fields. The material presented in these proceedings is certainly not complete in the sense that it covers all aspects of the subject. The selection
is deliberately due to the program committee and the editor. The program committee would like to express their gratitude to Dr. Ti10 Kester, head of the NATO Advanced Study Institute Program, NATO Scientific Affairs Division, for his support and encouragement during the organization of the Institute. Oslo, June 1978.

**The Physics and Chemistry of Low Dimensional Solids**
Luis Alcácer

2012-12-06 Proceedings of the NATO Advanced Study Institute, Tomar, Portugal, August 26-September 7, 1979

**Semiconductor Superlattices and Interfaces**
A. Stella

2013-10-22 This book is concerned with the dynamic field of semiconductor microstructures and interfaces. Several topics in the fundamental properties of interfaces, superlattices and quantum wells are included, as are papers on growth techniques and applications. The papers deal with the interaction of theory, experiments and applications within the field, and the outstanding contributions are from both the academic and industrial worlds.

**Narrow Gap Semiconductors, Proceedings of the NATO Workshop, 25-27 June 1991, Oslo, Norway**
North Atlantic Treaty Organization 1992

Invited papers from this prestigious NATO workshop discuss the topics of growth techniques for narrow band gap semiconductors (MBE, CBE and MOVPE), the materials themselves and their properties. Applications of these materials in devices including infrared photodetectors, infrared diode arrangements and photovoltaic lead-salt detectors are studied.

**Infrared Detectors and Emitters:**
Materials and Devices  
Peter Capper  
2013-11-27  
An up-to-date view of the various detector/emitter materials systems currently in use or being actively researched. The book is aimed at newcomers and those already working in the IR industry. It provides both an introductory text and a valuable overview of the entire field.

Proceedings of the First International Symposium on Long Wavelength Infrared Detectors and Arrays: Physics and Applications  
Electrochemical Society. Electronics Division 1995

Band Structure Engineering in Semiconductor Microstructures  
R.A. Abram 2012-12-06  
This volume contains the proceedings of the NATO Advanced Research Workshop on Band Structure Engineering in Semiconductor Microstructures held at Il Ciocco, Castelvecchio Pascali in Tuscany between 10th and 15th April 1988. Research on semiconductor microstructures has expanded rapidly in recent years as a result of developments in the semiconductor growth and device fabrication technologies. The emergence of new semiconductor structures has facilitated a number of approaches to producing systems with certain features in their electronic structure which can lead to useful or interesting properties. The interest in band structure engineering has stimulated a variety of physical investigations and novel device concepts and the field now exhibits a fascinating interplay between pure physics and device technology. Devices based on microstructures are
useful vehicles for fundamental studies but also new device ideas require a thorough understanding of the basic physics. Around forty researchers gathered at Il Ciocco in the Spring of 1988 to discuss band structure engineering in semiconductor microstructures.


Richard Anthony Stradling 1993 The papers presented here first appeared in Semiconductor Science and Technology (1993, Volume 8, Number 1S), a journal from Institute of Physics Publishing

Metallization and Metal-Semiconductor Interfaces Inder P. Batra 2012-12-06

This book represents the work presented at a NATO Advanced Research Workshop on "Metallization and Metal-Semiconductor Interfaces", held at the Technical University of Munich, Garching, W. Germany from 22-26 August 1988. The major focus of the workshop was to evaluate critically the progress made in the area of metal-semiconductor interfaces. The underlying theme was the mechanism of Schottky barrier formation and a serious assessment of the various models. A significant fraction of the workshop time was also spent in discussing the interaction of alkali metals with semiconductors. Alkali metals on semiconductors form ordered overlayers and the resulting system often exhibits one-dimensional metallic properties. The nature of their interaction has introduced new and exciting complexities and this was pursued at length during the
lively discussions at the workshop. A half a day was devoted to Scanning Tunneling Microscopy, the emphasis being on its utility in providing structural and electronic character of low-coverage regime. The book should provide readers with the most current status of the research activity in the general area of metal-semiconductor interfaces at an international level. It should also serve as an excellent introduction to the field, since sufficient review type of material has also been included. The workshop organizers, Dr. I. P. Batra (Director), mM Almaden Research Center, San Jose, Prof. S. Ciraci, Bilkent University, Ankara, Prof. C. Y. Pong, University of California, Davis, Prof. Dr. F. Koch (Local Chairman), Technical University Munich, Garching, Dr. H.