most recent achievements and the pressing problems of physical science. The presentation is distinguished by a high informational content and scientific rigor. It is intended for readers have some education in physics (including physics students).

Ultrafast phenomena

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Ultrafast Phenomena, Eds. G. R. Fleming and A. E. Siegman, Springer-Verlag, Berlin; Heidelberg; New York; London; Paris; Tokyo, 1986 pp. 551 (Springer Series in Chemical Physics V. 46)

This entire voluminous book is devoted to the application of short and ultrashort intense light pulses to the study of ultrafast phenomena and to the discovery of new nonlinear optical phenomena and their applications.

The first investigations of this kind appeared at the very end of the 1960s and during the last 15 years have led to amazing successes. Investigations of ultrafast processes in molecular, ionic and electronic systems in gases, liquids and solids came in a rushing stream. Special conferences devoted to these problems became necessary.

The book under review represents volume 46 of the "Springer Series in Chemical Physics" containing materials of the conference of the American Optical Society which took place on 16–19 June, 1986 in the USA and was devoted to the application of ultrashort light pulses to the study of different ultrafast processes. The book is entitled "Ultrafast Phenomena." The book containing the materials of the IV conference (1984) has the same title while the preceding three books were entitled "Picosecond Phenomena." The first book appeared in 1978. So far the conference devoted to this subject occur every two years, and in the year of each conference a book appears containing the conference materials. It should be noted that materials related to or coinciding with this subject can be found also in other series published by Springer, for example "Springer Proceedings in Physics" (V.4), "Time Resolved Vibrational Spectroscopy," etc.

The book under review contains 145 articles divided into nine parts. Primarily the research has been carried out by American physicists, Japan and France are represented by 10 papers each, FRG by 9 papers, England by 7 papers, USSR and PRC by 2 papers each. Several investigations have been carried out by western countries jointly.

The materials of the volume are very diverse, and therefore even a brief review of the contents will go beyond the volume of a usual journal review. Therefore we present the titles of the parts of the book from which one can partially draw conclusions concerning its breadth of subject, and we shall speak about the content only very briefly.

Part I. Mode Locking and Ultrashort Pulse Generation

Part II. Ultrafast Optical Generation and Measurement Techniques

Part III. Electrooptic Sampling Techniques

Part IV. Nonlinear Optics and Continuum Generation

Part V. Applications to Semiconductors, Quantum Wells, and solid State Physics

Part VI. Chemical Reaction Dynamics

Part VII. Dynamics of Biological Processes

Part VIII. Energy Transfer and Relaxation

Part IX. Coherent Spectroscopic Techniques

The book devotes considerable attention to the techniques of generating picosecond, subpicosecond and particularly femtosecond light pulses. As a rule, we are dealing with the now conventional generation of light pulses of 100 to 20 femtosecond duration, but in some cases there are now generated and utilized pulses of duration less than 10 fs. Different methods of pulse "compression" and amplification are described, in particular in multiple traversal of the pulse through a jet of dye in a resonator. The possibility of utilizing Raman scattering of light for amplification and production of soliton or quasisoliton lasers utilizing as resonators ring optical fibers is demonstrated. In these cases pulses of ~60–20 fs duration are generated. Methods are developed for analyzing luminescence of subpicosecond duration.

Electrical circuits based on ordinary electronics turn out to be unsuitable for the technique of picking out subpicosecond and femtosecond pulses, and a new step must be taken, in particular utilizing cryogenic techniques. This in particular is described in several papers of Part III. Devices are described there which enable one to obtain a very steep front of growth of an electrical pulse—several tens of picoseconds, and even such a scheme which produces a time for front growth of 5 ps.

Picosecond, subpicosecond and femtosecond pulses propagating in media have made it possible to observe new phenomena in the case of three-wave and four-wave interaction and generation of a very broad continuous spectrum in the case of passage of short pulses through gases, and to study the problems of absorption spectroscopy.

Various nonlinear optical phenomena and special features of the interaction of ultrashort light pulses with semiconductors are described in Part V of the book. The thermodynamics and kinetics of melting and crystallization under

the action of ultrashort pulses have been studied, when the temperature gradients attain values of 10^{10} K/m, while the duration of the process is $\sim 10^{-9}$ s.

Devices have been constructed which enable one to study nonthermal distribution of optical excitation by utilizing light pulses of 60 fs duration and with a "compressed" pulse—down to 10 fs. This enables one to study the dynamics of thermalization using absorption spectra. Phenomena of superheating of semiconductors and the dynamics of nonequilibrium carriers, the relaxation of excitons in the picosecond time range, photorefraction in gallium arsenide, photoluminescence developing in time, formation of nonequilibrium structures of a lattice type and many nonlinear optical and other physical phenomena in solids have been studied, which without the technique of ultrashort light pulses could not have been observed and studied.

Ultrashort light pulses have given us the possibility of studying the most subtle and ultrafast processes in chemical reactions. In this book considerable space is devoted to such questions. Potential barriers are observed in the course of changes of molecular structure in solutions—the dynamics of photoisomerization, the dynamics of solvation processes, femtosecond investigations of the localization of an electron and solvation in pure water, processes of recombination, processes of induction of light, intramolecular transfer of an electron, rapid photochemical processes in aromatic nitrocompounds in solutions and many other problems of chemical dynamics.

The application of the technique of femtosecond and picosecond pulses to the study of the dynamics of processes in biological molecules has turned out to be fruitful. Processes of electron transfer have been studied. Femtosecond spectroscopy of the development of bacterial photosynthesis, of the transfer of excitation energy and division of charge in reaction centers of photosynthesizing bacteria, and the spectroscopy of time resolution of absorption in green plants in the picosecond range have been created. Other problems have been studied as well.

The use of ultrashort light pulses for the study of energy transfer and relaxation phenomena, transfer of energy and electrons in adsorbed dye molecules in single crystals and other materials, picosecond fluorescence and absorption on Langmuir films, the spectroscopy of ultrashort infrared pulses of nonlinear absorption in liquids, femtosecond relaxation dynamics of large molecules, optical destruction of molecular crystals and for many other investigations has proved very effective.

In the last part of the book articles are placed which are devoted to the study of relaxation and other properties of different media, in particular by means of creating in the medium non-steady-state phase lattices and analyzing their decay in time, to the use of nonlinear response in the four-wave shift for the determination of the line shape of Raman scattering of light and for a study of third order nonlinearities in thin films, to the use of picosecond spectroscopy for studying phase reversal in Raman scattering, time resolution in the picosecond range of CARS-spectroscopy, direct measurement of the dependence of the energy of polaritons on the wave vector, the stimulated, Rayleigh, Mandel shtam-Brillouin and Raman scattering of light and certain other articles.

The articles contained in this and similar books, as a rule, are distinguished by brevity, but all the important information on the formulation of the problem, the methods of its solution and the results are contained in them. A great merit of these books is their rapid appearance in publication. If we have in mind materials of a conference, as in our case, then the book appears in the same six month period in which the conference took place. Thus the reader can at once become acquainted with the state of a particular field as of today. For this one can easily forgive the occasionally occurring carelessness in formulation, which does not affect the content of the book. One would wish that this experience would be taken into account also in our country.

Physics of surfaces

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Lectures on Surface Science: Proceedings of the Fourth Latin-American Symposium. Caracas, Venezuela, July 14–18, 1986. Eds. G. R. Castro and M. Cardona, Springer-Verlag, Berlin; Heidelberg; New York; London; Paris; Tokyo, 1987, pp. 329.

The book contains the proceedings of the IV Latin-American Symposium on Surface Physics which took place at the Central University of Venezuela in Caracas between 14 and 18 July 1986. Forty-nine papers were presented; 9 of them are of a general review nature, while the rest are devoted to more particular problems. The papers were presented at the symposium primarily by Latin American authors.

Physics of surfaces is a field of infinite variety in its subject matter. The study of free surfaces, interfaces and structures associated with them, the tremendous variety of materials being studied, modern experimental methods—all