Book Reviews*

Molar Mass Measurements in Polymer Science. By N. C. BILLINGHAM (University of Sussex). Wiley/Halsted Press, New York. 1977. 254 pp. $32.50.

An account of the techniques available for measurement of molecular weight averages for high polymers: vapor pressure, membrane osmometry, light scattering, ultracentrifugation, viscosity, gel permeation chromatography, and end-group assay. An appendix lists suppliers of equipment and accessories.

Point Defects in Crystals. By R. K. WATTS (Texas Instruments, Inc.). Wiley/Interscience, New York. 1977. xi + 312 pp. $21.95.

An introduction to the spectroscopic properties of point defects in crystals. The first part of the book presents theories of electronic and vibrational properties of defects. The second part surveys defects in group IV crystals (silicon, germanium, and diamond), in III-V and II-VI compounds, and in alkali halides.

Fluorine-Containing Free Radicals (ACS Symposium Series, No. 66). Edited by J. W. ROOT (University of California, Davis). American Chemical Society, Washington, D.C. 1978. viii + 423 pp. $28.00.

Fourteen papers presented at a symposium sponsored by the ACS Division of Physical Chemistry in Philadelphia, April 7-11, 1975. Coverage includes classical kinetics and molecular beam studies of atomic fluorine and fluorine-containing radicals, ESR studies, and theoretical dynamics. Recent developments of fluorine-atom chemical lasers are not discussed.

State-to-State Chemistry (ACS Symposium Series, No. 56). Edited by P. R. BROOKS and E. F. HAYES (Rice University). American Chemical Society, Washington, D.C. 1977. xii + 259 pp. $23.50.

A collection of 32 papers presented at a symposium sponsored by the ACS Division of Physical Chemistry in New Orleans, March 21-23, 1977. Most of the major contributors to this rapidly developing area were in attendance. To quote from the introductory paper by R. B. Bernstein: "Recent experimental and theoretical advances have led to the development of a new field known as 'state-to-state' chemistry. It is now becoming possible to measure directly . . . the relative probabilities of formation of nascent reaction products in specified internal states from reagents in selected states. In addition to a number of important practical applications (. . . new laser-induced reactions and improved chemical lasers) there are many fundamental implications for the field of gas phase chemical kinetics." The succeeding contributions are divided into sections titled: reactive collisions, beam studies; reactive collisions, bulk studies; energy transfer collisions; theory. Specific topics include ion–molecule reactions, laser techniques and laser-induced processes, Fourier transform Doppler spectroscopy, infrared chemiluminescence, mode-to-mode flow of vibrational energy, and reactions in interstellar clouds.

Resonance Raman Spectroscopy as an Analytical Tool. Edited by A. J. MELVEGER (Ethicon, Inc.). The Franklin Institute Press, Philadelphia. 1978. viii + 84 pp. $10.50 (paperback).

This short volume is the proceedings of a symposium held at the Eastern Analytical Symposium, December 1977. The four invited papers stress experimental aspects of resonance Raman spectroscopy, with a strong biochemical emphasis. The topics covered include the problems of sample heating and luminescence and measurement of spectra in photochemically active systems. CARS is discussed in two of the four papers, reflecting the currently high interest in this approach to luminescence rejection.

Molecular Structure by Diffraction Methods. Volume 2. Senior Reporters: G. A. SIM (University of Glasgow) and L. E. SUTTON (University of Oxford). The Chemical Society, London. 1974. 513 pp. £17.50.

Part of an annual series of Specialist Periodical Reports, this volume purports to give comprehensive coverage to papers published on molecular structure determinations in the areas of electron diffraction of vapors and neutron and X-ray diffraction of crystalline solids for the period April 1972 through early or mid-1973. Reflecting the greater number of papers published in that area, the X-ray reports constitute fully seven-eighths of Volume 2. This volume retains the same format and organization of subjects, but has a slightly different set of reporters than Volume 1. Under each experimental method the relevant molecules are divided into common categories, often by group in the periodic table. Each molecule receives brief mention in the text. Values of selected structure parameters are incorporated into the text as well, or very occasionally are placed in tables. Only about half of the authors included error estimates for these parameters. For the most part the reporting is simply a noncritical transfer of data from the source articles, with very little interpretive discussion. The only index is an author index, and the lack of a formula or subject index is felt to be a serious deficiency. Often, especially in the case of organic molecules and organometallic complexes, it is quite difficult to locate within the text reference(s) to a specific compound without reading through an entire chapter or subsection.

Since the text is virtually free of technical references to esoteric aspects of data analysis, one can presume that a fairly broad, nonexpert audience is aimed at. But the intended use of this work by that audience is rather obscure to this reviewer. Too little information about each molecule, beyond the reference to source articles, is included for the book to stand on its own as reference material. If a strictly bibliographic function was intended, a different format would have been far more effective. Unfortunately, few of the advantages which can be conferred by a discursive form of presentation have been realized in this volume. Presumably they were sacrificed in the interest of brevity. In this reviewer's opinion, the chief use of the book is as a rather cumbersome starting point for literature searches, and as such belongs in libraries, but would not be particularly valuable in personal collections. It should be noted that useful review articles on the theory and practice of electron diffraction were included in Volume 1. It is possible that future volumes of this series will be enhanced by the inclusion of more articles of this nature on subjects of topical interest to physical chemists, particularly diffractionists.

E. J. Jacob, *University of Toledo*

Mass Spectrometry of Metal Compounds. Edited by J. CHARALAMBOUS (The Polytechnic of North London). Butterworths, London. 1975. 289 pp. $14.00.

"Mass Spectrometry of Metal Compounds" is comprised of ten chapters, each devoted to a particular aspect of the mass spectrometric behavior of metal compounds in general or to the mass spectrometric characteristics of particular types of metal compounds. Included are carbonyls and related complexes, metal chelates, transition metal, and main group organometallics.

The relationship between the fragmentation patterns of metal compounds and their structure, bonding, stability, and nature of the metal is emphasized throughout the monograph. Included also are discussions of the instrumentation commonly used to study metal compounds, the energetics of molecular ionization and dissociation, and brief accounts of spectral presentation, types of ions, and isotope patterns encountered.

"Mass Spectrometry of Metal Compounds" will be valuable to those engaged in mass spectrometry. The accounts of the general principles and instrumentation should prove to be invaluable to those organometallic and inorganic chemists with no previous experience in the techniques of mass spectrometry.

Margaret L. Johnson, *University of Michigan*

Lecture Notes in Chemistry. Edited by G. BERTHIER ET AL. **Volume 3. The Consistent Force Field: A Documentation.** By S. R. NIKETIĆ (University of Belgrade) and K. RASMUSSEN (Technical University of Denmark). Springer-Verlag, Berlin. 1977. ix + 212 pp. $13.30 (paper).

This self-contained book in English is one of a series (now numbering seven or more volumes) which aims to report new developments in chemical research and teaching—quickly, informally, and at a high

* Unsigned book reviews are by the Book Review Editor.

level. This volume deals mainly with computational methods of minimizing the vibrational potential energy of polyatomic molecules. The consistent force field (CFF) is an empirical melding of standard potential functions (Coulomb's law, harmonic oscillator, Morse function, Lennard-Jones potential, and the like) so as to describe molecules containing 50 or more atoms in all their mutual interactions. The CFF was developed since 1967 mainly by S. Lifson (Weizmann Institute) and his associates. This book brings together in a clear and orderly way material formerly available in widely scattered references and dissertations. Without giving details, this book describes in general terms the kinds of computer programs that are in use by the authors and available from them if requested. (Cost of the programs is not mentioned.)

Upon combining well-known potentials into a gigantic multidimensional potential, the CFF is able to derive a numerical value of energy as a function of atomic position. This function is then converted to a Taylor's series involving up to second derivatives. Computer programs that use the method of steepest descent, the modified Newton method, and/or the Davidon-Fletcher-Powell method (DFP) then minimize energy with respect to atomic Cartesian coordinates. The aim may be to determine the molecular conformation, to calculate vibrational frequencies, or to calculate some other property (e.g., dipole moment).

The CFF was originally aimed at protein configurations. This book provides many examples of time and core requirements of programs, how graph theory is used to represent molecular structure, and results of use on several kinds of molecule (hydrocarbons, transition metal complexes, solids, amides, etc.). The book is full of literature references, mostly from 1965 to 1976.

In a very general way, this book and the CFF deal with the problem of unconstrained minimization of a multivariable function. Although the computer programs described here are aimed at vibrational energy of large molecules, it seems reasonable to expect that this kind of method could guide other studies, say, economics. One would expect eventually that better potentials than the Morse function will be incorporated with the CFF programs.

At first sight, this volume seems to be merely a well-written general reference manual for persons who use or may want to use the authors' present CFF programs. It is, however, much more. It is an excellent way for a newcomer to plunge into the middle of things with assurance. It is a book with a mission: how to make predictions for systems too large or too complicated to be studied experimentally or theoretically at this time. It is a book whose authors are willing and eager to share their wisdom and to give helpful advice. For example, on pp 158–161, they remark that minimization by numerical methods appears to work best if one uses the method of steepest descents to get into the general region of the minimum. Then one is advised to switch to the DFP method until finally, quite near the minimum, the Newton method can be used efficiently. The authors comment also (p 159) that for small problems ($\leq$50 dimensions) the DFP method may be more efficient than the other two. There are also sage comments on calculations that have not yet been done and remarks on how to avoid false minima (p 161).

William F. Sheehan, *University of Santa Clara*

Principles of Physical Chemistry. By ROBERT M. ROSENBERG (Lawrence University). Oxford University Press, New York. 1977. xix + 745 pp. $18.00.

This laconic text aims to lead students safely through the math of physical chemistry. The level of difficulty seems somewhat uneven, on the average a bit lower than typical. The length is a bit less than two-thirds of typical. It uses SI units and the IUPAC electrode convention. Generously and well illustrated, it incorporates primary data with exact literature references.

The order of subjects is: gases, quantum theory, molecular structure, statistical mechanics, classical thermodynamics, kinetics, solids, liquids, thermodynamics of solutions, electrochemistry, adsorption, colloids. This order may cause problems if laboratory work is part of the same course; hence, the preface suggests alternate sequences. The early chapters and those on kinetics and adsorption are nicely done.

Chemical thermodynamics constitutes only about one-third of this brief text. Succinctness is achieved in part by use of 281 "exercises" that often ask the student to derive or verify a certain equation or result immediately after it is presented. Numerical examples worked out in detail are rare. The 19 chapters end with 115 problems; half are quite challenging relative to the text's general level. While the textbook contains no answers to "exercises" or problems, there is a Solutions Manual for all 396. (It costs $4.00 and is well done indeed.) As this reviewer believes in having students work lots of numerical problems, he feels this brief text, alone, often stops short and seems superficial.

There seem to be some pedagogical problems, although the acid test for these is how students react. With homework-type problems so few, why should Problem 2-9 not support theory? Chapter 8 on statistical mechanics assumes a knowledge of entropy and K_{eq}, but classical thermodynamics begins in Chapter 9. Why give only 17 electrode potentials in Table 17-4 when descriptive matter is already minimized? It is only vaguely implied that Table 9-1 applies only at constant T, and, to get equation (9-26), the fact that the energy of a perfect gas depends only on T is used without thermodynamic proof The symbol W for work done on the system is not defined until the end of p 302, but it is used in a most important way on p 301. Also, in general, when work is said to be done, the text does not indicate by what or on what. Most troubling of all to this reviewer, however, are the cases akin to those of math books where one may find "it is obvious that" at awkward places. The proofs of these equations seem to be of this kind: (4-39), (4-65), (4-72), (6-31), (11-9) to (11-12), and (13-30). Many "exercises" could also be included, and there are some mighty jumps just before Exercise 15-1 and at the end of pp 97 and 553.

In the realm of possible scientific error, one would hope for a better definition of adiabatic than that on page 300. The remark on p 148 that a correlation diagram for nuclei of equal charge can be used for diatomics of unequal charge is not correct; the correlations to 2s and 2p of the united atom differ. The classic works of Gaydon and Herzberg list $^1\Sigma^-$ and $^3\Sigma^+$, contrary to p 148. Neither CaF_2 nor CsCl is based on a body-centered lattice, as suggested on p 452. Other errors exist.

It is, of course, practically impossible to write an advanced textbook so as to avoid all error or please everyone, even the author. A brief text like this cannot generally make up for omissions by offering an excess that can be selectively ignored. In fact, there seems to be much less than a usual effort on three-component phase diagrams, equipartition of energy, important types of ionic crystal, the Gibbs isotherm (despite chapters on adsorption and colloids), numerical calculations with tables of free-energy functions (although the free-energy function is well described by statistical mechanics), the variation method in quantum mechanics, crystalline imperfections, or finding dipole moments from molar polarization. This reviewer believes thermodynamics is best taught by lots of problems involving cycles and invented intermediate states; these are rare here.

Opportunities for clarity and elegance seem to have been missed. Table 13-2 would perhaps be improved by use of roots rather than cosines in dealing with radius ratios. Surely the superb Landolt-Börnstein tables should be included in the list of thermodynamic sources (pp 384–5). The traditional proof of the phase rule (p 521) could perhaps be improved by emphasizing the partition of just $C + 2$ *independent* variables into two classes: intensive and extensive. Perhaps the excellent remarks on ΔG in the middle of p 357 could be driven home by noting that one generally has the compromise $\Delta H - T\Delta S$.

If one surveys the available physical chemistry texts, one sees many defects and few really good ones. Perhaps this text is as good as any. To be effective, it seems to need a supplementary problem text and a professor who is willing to add a bit of himself. A striving professor and a book of reasonable size may be the very best for some.

William F. Sheehan, *University of Santa Clara*

Annual Review of Energy. Volume 2. Edited by J. M. HOLLANDER, M. K. SIMMONS, and D. O. WOOD. Annual Reviews, Inc., Palo Alto, Calif. 1977. ii + 522 pp. $17.00.

Volume 2 of this series covers energy supply and demand from a world-wide point of view. It does not attempt to update Volume 1, which covered technology in general and U.S. aspects of energy. (Volume 1 was reviewed in *J. Am. Chem. Soc.*, **98**, 6978 (1976).) An overview of worldwide demand trends and resources is provided, followed by a survey of global political and economic issues. This includes a brief survey of and commentary on world and national energy models. Other sections of the book cover the relationship of energy

to food in both underdeveloped and industrialized societies, the impact of energy use on climate, and the problem of nuclear safeguards. The discussion of conservation not only compares the U.S. situation with that abroad but also looks at possible changing values and the role of stewardship as part of a conservation ethic.

The last section, almost half the book, covers particular areas of the world, some of them importers and others exporters of fuel. There are separate chapters on the European Economic Community, Sweden, Japan, India, Central America, and the organization of Arab Oil Exporting Countries. Of particular interest are detailed chapters analyzing the situation in the U.S.S.R. and the Peoples Republic of China, which, along with the U.S., constitute the Big Three in total energy resources.

The book has an index to all authors cited as well as a detailed subject index. It also has a cumulative index to chapter titles and authors. To aid the reader confused by terawatts, gigajoules, quads, and barrel-per-day oil equivalents, there are energy and power conversion tables.

The authors have given clear presentations that make explicit any assumptions that may be controversial and point out the lack of data where it is important. There are abundant references and data tables. This volume complements Volume 1 well.

William J. Sheppard, *Battelle Memorial Institute*

Practical Electron Microscopy on Materials Science. By J. W. EDINGTON (University of Delaware). Van Nostrand-Reinhold, New York. 1976. xii + 344 pp. $34.50.

This excellent book on the practice of transmission electron microscopy is divided into four major sections, dealing with the operation and calibration of the electron microscope; electron diffraction techniques; interpretation of electron micrographs; and typical investigations. Each section contains concise descriptions of the techniques covered and detailed directions for carrying them out. The descriptions of operating procedures are mostly based on the Philips EM300 electron microscope; however, they can easily be interpreted in terms of other comparable instruments. There are numerous, excellent diagrams and micrographs illustrating the principles and results of the various techniques discussed plus many excellent tabulations of data throughout the text and in the appendices.

This book can be highly recommended as a reference for any laboratory doing conventional transmission electron microscopy on thin metal or ceramic specimens. It should be particularly valuable for persons just beginning such work, or perhaps for laboratory courses in advanced methods of transmission electron microscopy on crystalline materials.

W. C. Bigelow, *University of Michigan*

The Alkaloids. Chemistry and Physiology. Volume XVI. Edited by R. H. F. MANSKE (University of Waterloo). Academic Press, Inc., New York. 1977. xviii + 569 pp. $59.00.

This is the most recent volume in the classic series of books on alkaloid chemistry, originally edited by Manske and Holmes. The challenge of presenting a basic foundation in alkaloid chemistry, as was done in the first few volumes of the series, and then keeping it up to date over the years is a tremendous one. This volume is up to the expected high standard.

The first chapter, entitled "Plant Systematics", is a deviation from the normal format of the series and would appear to be quite unique. In it, D. S. Seigler discusses the use of chemical constituents to solve problems in plant taxonomy and, conversely, the use of the taxonomic characterization of a given plant to ascertain possible structure types of its constituents. A few years ago, it was felt that this use of chemical constituents along with the more classical morphology would bring about a revolution in plant taxonomy. Although some of this has come to pass, there have been a number of problems. In the chapter, the general goals of the methodology are introduced and explained, the various difficulties involved are detailed and discussed, and some of the successes are described. The biosynthesis of the major groups of alkaloids is then briefly summarized. In the final portion of the chapter, the author presents a discussion of the occurrence of various alkaloids in plant families, *from the standpoint of the plant families.* The whole chapter involves a complex and difficult presentation but is quite well done and should be most useful to plant taxonomists and alkaloid chemists alike.

Chapters 5 and 6 are complementary and are devoted to the "Bisbenzylisoquinoline Alkaloids". In Chapter 5, the occurrence, structure elucidation, and pharmacology of these compounds is brought up to date. A tabulation of the molecular weights of the known alkaloids of the group is presented, which should be quite useful for the mass spectrometric study of newly isolated compounds. In Chapter 6, the extensive synthetic work on the alkaloids is described, probably for the first time in this form. The bisbenzylisoquinoline alkaloids have fairly simple structures (with only two chiral carbons), but their synthesis has been quite difficult, and no facile methods are known as yet.

In Chapter 4, the chemistry of the relatively recently discovered "Celestraceae Alkaloids" is described for the first time in the series. In other chapters, the chemistries of the "Tropane Alkaloids", the "*Nuphar* Alkaloids", the "Hasubanan Alkaloids", and the "Monoterpene Alkaloids" are brought up to date. The last chapter, by Professor Manske, is devoted to "Alkaloids Unclassified and of Unknown Structure".

The book is well organized and readable and should be added to the older volumes of the series on the shelves of all good libraries and serious alkaloid chemists.

James M. Bobbitt, *University of Connecticut*

Encyclopedia of the Alkaloids. Volume 3. By JOHN S. GLASBY (ICI Organic Division Ltd.). Plenum Publishing Corp., New York. 1977. 519 pp. $49.50.

Volumes 1 and 2 of this series (published in 1975) contained an alphabetical listing of the then known alkaloids. For each compound, an empirical formula and a structural formula, if known, were given along with a melting point and, in some cases, additional physical or spectral properties. The plant source and the general basis for structural assignment were presented in a short paragraph, followed by a few leading references.

In Volume 3 the author has corrected the errors in the first two volumes and brought his series up to date. He has also responded to the two major criticisms directed to the first two volumes [*J. Am. Chem. Soc.*, **98**, 1062 (1976)] by including a formula index for all three volumes and by stating that his literature coverage is through October, 1976.

One of the more important aspects of this series is the coverage given to the alkaloid chemistry carried out in the Soviet Union. The author acknowledges the help of Professor S. Yu. Yunusov of the University of Tashkent in Uzbekistan in the correction of the first two volumes and the preparation of the third. Thus, one assumes that Volume 3 contains a clear and complete picture of the tremendous amount of alkaloid chemistry which has been done in the Soviet Union in the last several years.

The three volumes, coupled with the formula index, will provide a facile access to a very large amount of alkaloid chemistry. In addition, this reviewer found Volume 3 a most fascinating book to look through. The tremendous variation in structure and the complexities which exist in alkaloids both stagger and tickle the imagination. There is only one small criticism of the series. It would have helped to have a brief statement at the beginning of one or all of the volumes in which the guidelines governing the selection of data to be given were discussed. With such brief comments on each compound, one wonders about the criteria used in this selection.

The set of books should be available in any laboratory or institute in which alkaloid chemistry is studied.

James M. Bobbitt, *University of Connecticut*

Optics and Lasers. By M. YOUNG (National Bureau of Standards). Springer-Verlag, Berlin. 1977. xii + 207 pp. $22.90.

The introduction of lasers has caused an entire revision in the attitude of physical scientists toward optics. Previously optics was considered a rather arcane science which, except for a few simple lens equations, was of little use to the practicing scientist. A large fraction of traditional optics texts contained many interesting but useless subjects such as the precise determination of the speed of light, or extensive analyses of optical aberrations. The advent of day-to-day use of lasers by scientists in many fields has awakened an interest in understanding many optical principles which were previously not emphasized or buried amid other complications in older texts. Hence there was a need for a modern text in optics likely to be of use to workers in laser-related fields. In addition a good introduction to the optics of lasers themselves and related areas such as interferometry and holography would be of value.

This book is an attempt to fill this need. It opens with introductory

treatments of ray optics, optical instruments, light sources and detectors, and wave optics. In each section there is emphasis on principles with considerable attention paid to applications. There is an attempt to keep the material free of mathematical detail, which makes the book easily readable, but provides relatively few practical and usable formulas.

The next portion of the book deals with interferometry, holography, and lasers. This provides a valuable introduction for readers relatively unfamiliar with these topics, but once again this is not of much use to those already working in one of these areas. Each topic is treated in too sketchy a manner. In addition there is relatively little integration of this material with previously covered topics.

The last chapter is on electromagnetic and polarization effects which seems somewhat out of order. There are some very valuable topics covered such as nonlinear optics, electrooptics, and birefringence; in some ways this is the strongest chapter. It should logically be presented earlier in the book to allow use of some of these topics such as reflection or Brewster's angle before covering holography or lasers.

Although the idea of this book is very good, it would not provide a good modern working reference for the practicing scientist. Its main value would be as a text for an introductory modern optics couse. The material is of about the right level of difficulty and depth for a one-semester course, but a more serious student who intended to work in the field would need a supplement from other texts and monographs presently available.

John R. Lombardi, *City College, CUNY*

Progress in Surface and Membrane Science. Volume 10. Edited by D. A. CADENHEAD (State University of New York at Buffalo) and J. F. DANIELLI (Worcester Polytechnic Institute). Academic Press, New York. 1976. xi + 407 pp. $17.50.

As in the previous volumes of this series, the chapters vary greatly in scope and length. In the first article on "Selective Changes of Cellular Particles Influencing Sedimentation Properties" (25 pp) R. Wattiaux describes the centrifugation techniques used in the study of subcellular structure. The sedimentation can be used for purification purposes, but caution must be exercised, particularly if one works with organelles.

In an extensive chapter Filinovsky and Pleskov discuss the use of the "Rotating Disk and Ring Disk Electrodes in Investigations of Surface Phenomena at the Metal-Electrolyte Interface" (90 pp). While the theory of these techniques is given, the actual experimental devices are not described. Several examples illustrate the use of rotating disk electrodes in the study of electrochemical kinetics and adsorption, with special emphasis on corrosion.

The chapter on "Membrane Potential of Phospholipid Bilayer and Biological Membranes" by S. Ohki (136 pp) attempts to clarify several transmembrane potential theories including the diffusion potential, Donnan equilibrium, fixed charge, membrane electrode, and surface potential theory. Various experimental data on lipid bilayer and biological membranes are discussed in terms of the above models.

The classical problem of interfacial science dealing with the "Adsorption of Surfactant Monolayer at Gas/Liquid and Liquid/Liquid Interfaces" (108 pp) is expertly dealt with by E. H. Lucassen-Reynders. Various equations of state for monolayers and the surface behavior of pure and mixed monolayers are discussed. The surface solution theory is analyzed in detail and its limitations are given. It is interesting to note that one of the unsolved problems is still the lack of a proper definition of what constitutes a surface!

The final chapter on "Enzymes Immobilized on Glass" by D. J. Lartigue and S. Yaverbaum (42 pp) is probably the least successful in this volume. It is rather sketchy and in part quite elementary for a volume of this series. While the title implies glass as the only substrate, other supports are discussed in the text.

The volume is printed by "rapid manuscript reproduction". Although such printing procedure speeds up the publication and keeps the costs down, it is far from being satisfactory to anyone who enjoys fine graphics. The failure to give an Author Index is deplorable in a scientific work. Finally, there are numerous typing errors in the text, although not of a sufficiently serious nature to make the reading intolerable.

Egon Matijević, *Institute of Colloid and Surface Science Clarkson College of Technology*

Progress in Surface and Membrane Science. Volume 11. Edited by D. A. CADENHEAD (State University of New York at Buffalo) and J. F. DANIELLI (Worchester Polytechnic Institute). Academic Press, New York. 1976. xi + 345 pp. $21.50.

In the first chapter of this volume on the "Quantum Theory of Surface Phenomena" (70 pp) J. Koutecky treats the interactions between crystal surfaces and chemisorbed atoms or molecules. Specifically, use of the Green operator method in the quantum theory of surfaces is examined. This enables the author to apply the LCAO model to describe the chemisorption bond taking into account the specific characters of the adsorbent and adsorbate.

The mechanism of metal deposition on electrodes is discussed in the article on "Some Fundamental Aspects of Electrocrystallization" (46 pp) by E. B. Budevski. The author stresses the exceptional importance of the surfaces topography of the metal electrode on the nature of the electrodeposited crystals. The two-dimensional nucleation and growth processes on perfect crystal faces are discussed in detail. Furthermore, depositions on faces intersected by screw-dislocations resulting in different morphologies are illustrated. Apparently, all data were obtained with silver, although the author fails to indicate so in various diagrams and photographs.

"Exoelectric Emission" (64 pp) by J. A. Ramsey deals with a series of electron emission (EE) phenomena which occur when materials undergo some external treatment. These effects should not be confused with the well-understood photoelectric or thermoionic emissions. The external treatments preceding EE can vary greatly and include mechanical deformation, evaporation of films, exposure to ionizing radiations, etc. In some cases irradiation with light or heating is needed, following the external treatment, in order to produce EE. It is suggested that the phenomena are due to oxide films on the metal surfaces. The entire field seems rather fuzzy with little documented evidence for the cause of the effects.

Titania is still the most commonly used white pigment, which explains why this material (in its various crystalline forms) is a subject of continuous intensive studies. In the chapter on "The Surface of Titanium Dioxide" (46 pp) G. D. Parfitt reviews the chemistry of anatase and rutile surfaces with special emphasis on the hydroxylation.

Scientists have always tried to develop and improve techniques which would make the materials they investigate "visible". When dealing with colloid systems, surfaces, and membranes, no tool has been more useful than electron microscopy. In the article on the "Prospects for Atomic Resolution Electron Microscopy in Membranology" (114 pp) W. Baumeister and M. Hahn discuss in great detail techniques which would make the high-resolution electron microscopy even more applicable to the study of membranes. For this purpose the model membranes consisting of monolayers are most useful. Techniques for preparation, transfer, support, and labeling of such systems are described in detail. The authors are convinced that the work on the model systems is rather representative of "real" membranes, and they are optimistic about the prospects for the application of atomic resolution electron microscopy in molecular biology.

As the previous book in the series, this volume is prepared by "rapid manuscript reproduction".

Egon Matijević, *Institute of Colloid and Surface Science Clarkson College of Technology*