REVIEWS

Progress in Surface Science, Volumes 6 and 7. Edited by Sydney G. Davison. (Pergamon Press Limited, Headington Hill Hall, Oxford OX3 0BW, England), 1977. Pp. vi + 244 + 190. Price : U.S. $ 77.00, £ 39.00.

Recent years have witnessed a phenomenal interest surface and interfacial phenomena. This applies both to observations and understanding of surfaces; and has been the cause of spurt in the activity in several areas like thin film technology, surface and solid state chemistry, etc. Concomitant to the notion of the interfaces are the concepts of adsorption (physical and chemical), charge transfer, photoemission kinetics and catalysis. In particular one wishes to know more of adsorption under illumination conditions (photo adsorption) or under specific interfacial situations (say, organic crystal-electrolyte). While the development of the theories of electron transfer and photoemission from metal surfaces had to rely heavily on the progress in the physics of the condensed matter and surfaces, the direct observation of surfaces and its changes had to wait, for techniques like low energy electron diffraction (LEED) or photoelectron spectroscopy.

The book under review comprises of two volumes (Vols. 6 and 7) of *Progress in Surface Science*— carries the reports on some topics in these vital areas. Dogonadze and Kuznetsov, hailing from the reputed electrochemical school in Moscow, have presented a very competent account of their researches and the present state of theories of electron transfer at solid (essentially metal)-polar liquid interfaces (pp. 1–42, V. 6). A similar, though not exhaustive, report on the thoereis of photoemission from metal surfaces is provided by Glasser and Bagchi (pp. 113–148, V. 7) who have reviewed the various quantum mechanical theories of emission from an adsorbate free and adsorbate-covered surfaces.

Three other reports deal with adsorption under various cohtexts. The one on the photoadsorption effect in semiconductors by Th. Wolkenstein (pp. 213–240, V. 6) considers the models for both 'ideal' and 'real' surfaces. A shorter version on organic crystal-electrolyte interface is by Lohmann and Mehl (pp. 185–212, V. 6) and treats not only adsorption but also charge transfer reactions under various conditions in detail. The contribution by Takaishi (pp. 43–62, V. 6) is rather restricted in scope and style, in comparison with others, and considers the localised *vis-a-vis* mobile adsorption Vol. 6 also includes a comprehensive bibliography of electronic phenomena in chemisorption and catalysis on semiconductors by Peshev *et al.* (pp. 63–184, V. 6). The very fact that this classified list of references is included along with other research reports is a sufficient proof for the importance and need of the topic covered This pertains to the period 1946–72 only and lists 2,737 titles.

The other group of papers deals with LEED, sputtering (ion bombardment and glow discharge) and photoelectron spectra of adsorbed species on tungsten. The first one by Tong (pp. 1–48, V. 7) concerns with the theory of LEED. Ion bombardment induced surface topology changes are reviewed by Navinšek (pp. 49–70, V. 7). A detailed account of the rapid development in glow discharge sputtering (pp. 71–112, V. 7) is given by Westwood. Finally Plummer *et al.* present a report (pp. 149–182, V. 7) on the photoelectron spectra of H_2, I_2, O_2, N_2 and CO adsorption on W (100); H_2, CO, on W (110) giving details of both measurements and models for adsorption.

The author and subject indices are provided separately for both volumes and the usual high standard of production of this series is maintained.

As an authoritative report on the recent results, this combined volume will be welcomed by the research community of this multi-disciplinary area of interfacial science.

S. K. RANGARAJAN.

Probability and Random Processes. By S. K. Srinivasan and K. M. Mehta. (Tata McGraw-Hill Publishing Co. Ltd., 12/4, Asaf Ali Road, 3rd Floor, New Delhi 110 002), 1978. Pp. 336. Price : Rs. 18-00 (Low Cost University Editions).

This book has in all nine chapters; only the last chapter covers Random (*i.e.*, Stochastic) Processes using only 73 pages, though the title gives the feeling that this topic may receive about half the total number of pages. Every chapter has sufficient number of problems for practice and the book has a small bibliography and subject index at the end.

The book is essentially meant to be a text-book for the university students who have studied calculus reasonably well and are taking to the study of probability for the first time. Every teacher presents a subject in his own individualistic manner. These authors wanted their manner of exposition to be caught in a book form. Buty they got disillusioned and

realized that "this book is going to be no different from any of those that have been published earlier". Technical limitations could not permit them to incorporate in the book "appropriate projection of those elements that go to constutute a blackboard lecture". The authors have frankly stated that they "could not put down in written form all those ideas and methods of presentation that appeared exciting, and sometimes original too, on the blackboard". All this means that there is still a place for a really good teacher in our universities.

Should we say that this disappointment has made the authors not to pay careful attention to some other aspects? (1) Problems 9 and 12 at the end of Chapter 1 are identical. Solved Exp. 2.2 (p. 31) and Problem 9 (p. 40) are the same. Problems 8 and 11 at the end of Chapter 2 are almost identical. (2) Definition 1.15 (p. 13) is incorrect. A, B, C, ... have to be subsets of some set; they cannot be arbitrary elements. (3) It is misleading to draw the conclusions about commutativity, etc, of operations on the basis of single example as is done in Exp. 1.3, 1.4, 1.5 on p. 5 and in Exp. 1.13 on p. 7. Nobody can believe that the authors do not know these things. One can only conclude that they have not taken precautions in making such statements. Can we blame the students then if they adopt such arguments? (4) Though the situations are similar, in Exp. 1.17 (p. 22) it is stated (without giving reasons) that all the possible ways are equally likely, in Exp. 1.18 readers are asked to suppose that they are equally likely, and in Exp. 1.19 no mention is made about the cases being equally likely though it is used. (5) In mathematics we use Venn diagrams to verify properties of set operations but these verifications are not accepted as proofs. Authors, however, have called such diagrammatic verification as proof in the beginning of page 12. Such inexactness has crept in, even though the authors have given the real proof of similar property on page 6. (6) It is not proper to make a statement "The subsets of the sample space are events" [beginning of (2.1)]. It is better to say that the events are subsets of a sample space since it is known that every subset of a sample space may not be an event. (7) The term 'probability field' as such is not defined anywhere but is used in para 2 on p. 47. (8) How to deal with the answer-1 in the solution (Exp. 3.13, p. 76) is not mentioned. There are some more pitfalls of this type and they will hinder proper understanding and also precise thinking on the part of readers. There are also many misprints in the book. Some of them could have been easily avoided at the proof correction stage.

The book is otherwise well planned in the choice of the order of the topics discussed. $P(\phi) = 0$ need not have been included in the axioms (p. 27). Mention of the fact "$P(A) = 0$ does not imply that the event A is impossible" should have occurred somewhere. Answers at least to selected problems must have been included. If a student makes amends for the points of the type mentioned above, he can use the book profitably; in fact he can possess it as its price is very much within his reach and all the topics in probability, needed by him in his early curriculum are treated nicely in this book.

V. G. TIKEKAR.

Annual Review of Physical Chemistry, Volume 28. Editor: B. S. Rabinovitch; Associate Editors: J. M. Schurr and H. L. Strauss. (Annual Reviews, Inc, 4139 El Camino Way, Palo Alto, California, 94306, U.S.A.), 1977. Pp. ix + 570. Price: $ 17.00 in U.S.A., $ 17.50 elsewhere.

This volume starts with a pleasing article by Henry Eyring recollecting his life as a man and as a scientist; it is most interesting to read the reminiscences of this doyen of physical chemistry. A few of the articles in this volume come under the broad area of dynamics. These include, initiation of gaseous detonation by Lee, Photodissociation of polyatomic molecules by Gelbart and hydrodynamics in biophysical chemistry by Bloomfied. Articles on related topics are the ones by Libby on electron tunnelling and Berson on thermal rearrangements; vibrational state analysis of electronic to vibrational energy transfer processes has been discussed by Lemont and Flynn. A number of articles in the volume pertain to the broad area of liquids. These include statistical mechanics of molecular motion in dense liquids by Hynes, computer simulation and theory of liquids of linear molecules by Streett and Gubbins, decorated lattice-gas modes of critical phenomena in fluids and fluid mixtures by Wheeler and theology and kinetic theory of polymer liquids by Bird. Laser induced fluorescence and laser separation of isotopes have been discussed by Kinsey and Letokhov respectively; the latter is particularly relevant to isotope chemists. Theoretical aspects of negative molecular ions have been discussed by Simons. Kebarle has reviewed ion thermochemistry and gas phase ion solvation; this article is most valuable to all those interested in electrolytes and ion solvation. In terms of studies based on new techniques, there are articles on surface scattering by Cyer and Somorjai, NMR studies of thermotiopic liquid crystals by Wade, resonance effects in molecular vibrational scattering by Spiro and Stein and study of valence bands of solids by photoelectron spectroscopy by Green. The article on surface scattering is indeed useful to all those interested in modern surface science.

This volume maintains the traditional high standards of *Annual Reviews of Physical Chemistry* and all the contributions have been written well. One

cannot but get the feeling that the direction of physical chemistry is fast changing when one observes modern trends in research. However, this volume seems to make physical chemistry appear much more oriented in certain directions that it really is at present. I hope that future volumes will include regular articles covering various other aspects of physical chemistry like solid state chemistry, molecular spectroscopy, glassy state, etc.

C. N. R. RAO.

International Series in Analytical Chemistry, Vol. 61—Principles of Field Ionization and Field Desorption Mass Spectrometry. By H. D. Beckey. (Pergamon Press Limited, Headington Hill Hall, Oxford OX3 0BW, England), 1977. Pp. xv + 335. Price : $ 35·00, £ 19·50.

Field Ionization (FI) and Field Desorption (FD) mass spectrometry is a new branch of mass spectrometry which evolved from the FI microscopy developed by Erwin Müller in the early fiftees. This field has recently developed very rapidly with numerous applications in the area of physico-chemical investigations and quantitative or structural chemical analyses.

This book is a successor to an earlier volume on the same subject written by the same author in 1969, and covers the numerous advances in FI and FD mass spectrometry in the last few years. The subject-matter is divided into five main sub-areas which have seen notable developments. They are : theory of field ionization and field desorption, experimental techniques, kinetics and mechanism of decomposition of field ions in the gas phase, qualitative and quantitative analysis with FI and FD mass spectrometry.

Starting with the presently available theories of FI and FD, the book deals with the techniques of FI and FD with particular emphasis on the design and performance of ion sources. The advantages and disadvantages of tips, blades and thin wires as sources of ions are discussed in detail, which should be very useful to the newcomer in this area. The third chapter deals with the theory of ionic decomposition under high field conditions with special reference to energetics and appearance potentials of fragment ions.

The fourth chapter covers the kinetics and mechanism of decomposition of organic ions in the gas phase within the time range of 10^{-11} to 10^{-5} sec. A number of examples are given on the application of the theory to specific unimolecular decompositions. The final chapter deals with a wide and interesting range of qualitative and quantitative analyses with FI and FD mass spectrometers.

This book written by one of the leading workers in the field represents a single important source of information on the theory and practice of FI and FD mass spectrometry. It is a very useful guide to the newcomer and an important reference for the active worker who wishes to learn all the new developments in the field.

K. GOPALAN.

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