are bulk metals and alloys, alumina-supported catalysts of high and low loadings, and silica- and carbon-supported catalysts. The quality of the experimental work is quite good. Chapter 5 deals primarily with the reforming of heptane over the various alumina-supported catalysts and attempts to correlate this data with information from the preceding chapters. A final short chapter, Chapter 6, compares the results to published data on these systems. For the most part the information obtained by TPD corroborates and somewhat extends the current status of these systems.

This text is well written and easy to read except for a small number of inconveniences, such as placing Table 7 of Chapter 4 between Tables 1 and 2. An unfortunate feature of the systems studied is that the TPD chromatograms of hydrogen are very similar for all compositions of the unsupported metals. Also, the desorption peaks for the supported metals are rather broad and overlapping. Nonetheless, Rasser gives a detailed analysis of the experiments and is able to extract some useful information. The experimental data pertaining to catalytic activity is less detailed. It would have been especially helpful if the selectivity of the various catalysts were compared at the same percentage conversion. The main limitation of the text is its narrow scope; it also lacks an index. However, the book should be useful to scientists interested in TPD studies of practical catalysts or the chemistry of Pt–Ir catalysts.

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The Chemical Physics of Surfaces. S. ROY MORRISON. Plenum Press, New York and London, 1977. 415 pp., $39.50.

The word "The" in the title of the book makes the publication sound more ambitious than the author can keep up with and more ambitious than he obviously had planned. In the preface he writes: "The objective of this work has therefore been to describe the results and current models of surface science spanning a broad gray area between surface physics and surface chemistry with some overlap into each of these disciplines." The main chapter headings may give the prospective buyer an idea of the contents:

1. Introduction, 1.1 Surface States and Surface Sites;
2. Space Charge Effects, 2.1 General, 2.2 Space Charge Effects with Reactive Surface Species, 2.3 Electron Hole Transfer between the Solid and its Surface;
3. Experimental Methods, 3.1 Surface Measurements Based on Electrical and Optical Techniques, 3.2 Surface Spectroscopies, 3.3 Chemical Measurements;
4. Adsorbate-Free Surface, 4.1 Introduction, 4.2 Theoretical Models, 4.3 Measurements on Adsorbate-Free Ionic Solids, 4.4 Measurements on Adsorbate-Free Covalent or Metallic Solids;
5. Bonding of Foreign Species of the Solid Surface, 5.1 Reconstruction and Relocation in Bonding, 5.2 The Semiclassical Model of Bonding: The Surface Molecule, 5.3 Quantum Models of the Adsorbate/Solid Bond, 5.4 Measurement of Adsorbate Surface States on Covalent or Metallic Solids, 5.5 The Chemistry of Surface States, 5.6 The Formation of Surface State Bonds;
6. Nonvolatile Foreign Additives on the Solid Surface, 6.1 General, 6.2 Dispersion of Additives, 6.3 The Cluster, the Transition between a Molecule and a Solid, 6.4 The Control of Surface Properties with Additives, 6.5 The Real Surface;
7. Adsorption, 7.1 Adsorption Isoterms and Isobars, 7.2 Ionosorption on Semiconductors, 7.3 Adsorption with Local Bonding;
8. The Solid/Liquid Interface, 8.1 Introduction, 8.2 Theory, 8.3 Observation with Semiconductor Electrodes, 8.4 Comparison of Solid/Liquid with the Solid/Gas Interface;
9. Photoeffects at Semiconductor Surfaces, 9.1 General, 9.2 Single Hole/Electron Recombination, 9.3 Photoadsorption and Photodesorption, 9.4 Photocatalysis, 9.5 Direct Excitation of Surface States by Photons;
10. Surface Sites in Heterogeneous Catalysis, 10.1 General Concepts, 10.2 Surface Sites Associated with Steps and Other Geometrical Factors, 10.3 The Role of Acid and Base Sites in Catalytic Reactions, 10.6 Covalent Bonding to Coordinatively Unsaturated Metal and Cationic Sites, 10.6 Examples of Oxidation Catalysis.

The author focuses his attention on surface bonding orbitals, sites, and states and discusses, often very briefly, a considerable number of techniques for surface analysis. The treatment is limited to solid/gas and solid/liquid interfaces. Even with these given limits, the writing of such a book is a bold enterprise. Most subdisciplines are still expanding at a considerable rate, the accumulated material is enormous, and the various analytical techniques are reaching a respectable number. Therefore, it is no wonder that most surface science books, which were published during recent years,

were written by larger groups of authors. However, even in the better samples of the latter category gaps appear and abrupt breaks are unavoidable. A coherent presentation of the matter can only be attempted by the single author. It is this coherence and the clarity of the presentation which makes Morrison's book so readable and valuable to the novice or to the specialist who wants quick, not in depth, information on the "gray area." Again, a complete review of the area should not be expected.

The second edition, which may follow soon because of the fast development in the area, must take care of some unavoidable flaws. (One example: The reviewer cannot agree that in the FIM a *crystal face* provides one spot, which can be analyzed by the atom probe. It is the surface atom or a surface complex!) A collection of books and review articles, which might be useful for more in-depth studies, should be separated from the numerous references provided for each chapter. This would increase the value of the present book.

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