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BOOK REVIEW

Chemistry in Two Dimensions: Surfaces. By GABOR A. SOMORJAI, Cornell University Press, Ithaca/London, 1981. 575 pp. $50.49.

When I learned that Gabor Somorjai was working on a book again, I sincerely hoped that it would be the updated, improved second edition of "Principles of Surface Chemistry." However, instead of a facelift the introductory textbook obtained a big brother.

The present book is based upon the Baker Non-Resident Lectures which the author presented at Cornell during the fall of 1977. Somorjai used these lectures—as he put it in the preface—to present his view of modern surface chemistry, emphasizing those areas in which much of his research is concentrated. This concept, of course, shows also in the book, and the author does not intend to hide it: "This book also reflects 15 years of my research at the University of California at Berkeley and elsewhere." The breadth of Somorjai's interests and expertise means, however, that the coverage is not confined to a few special topics. While the book reflects the author's research, it is not entirely restricted to it. It is not a complete review of the state-of-the-art (an impossible task anyway, considering today's size of the area, its rapid development, and the limited number of book pages available), but it covers current major techniques, experimental results, and concepts of the area of gas/solid interfaces. Some of the fundamental surface properties are considered to be outside the scope of the book and the reader is referred to "Introduction to Surface Chemistry."

Since nothing demonstrates the outline of the book better than the table of contents, in the following the main chapter headings are shown to guide the prospective buyer:

1. Surfaces—Favorite Media of Evolution
2. Tools of the Surface Scientist's Trade
3. Composition of Surfaces: Thermodynamic Guidelines and Experimental Results
4. Structure of Clean Surfaces
5. Structure of Adsorbed Monolayers on Solid Surfaces
6. The Surface Chemical Bond
7. Energy Transfer in Gas–Surface Interactions
8. Catalyzed Surface Reactions: Principles
9. Hydrocarbon Conversion on Platinum
10. Catalytic Hydrogenation of Carbon Monoxide
11. Photochemical Surface Reactions

Somorjai summarizes the contents of these chapters as follows:

> In Chapter 1 we review the reasons why surfaces are unique chemical systems so that CHEMISTRY IN TWO DIMENSIONS is of special significance. This chapter presents a brief summary of the unique physical–chemical surface properties based on what we know about the dynamics of surface atoms, the thermodynamics of surfaces, and the electrical properties of surfaces.
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> In Chapter 2 the various experimental techniques used most frequently in surface studies are discussed. We then begin our review of the composition and atomic structures of clean solid surfaces (Chapters 3 and 4). Following this, the structure and chemical bonding of adsorbed monolayers of atoms and molecules are discussed (Chapters 5 and 6). After treating these static properties of surfaces, we review the dynamics of gas–surface interactions, including the kinetics of elementary surface reactions (Chapter 7). Then we turn to heterogeneous catalysis (Chapter 8) and to the application of modern surface science to three problems of heterogeneous catalysis: hydrocarbon conversion over platinum (Chapter 9), the hydrogenation of carbon monoxide (Chapter 10), and photochemical, thermodynamically uphill surface reactions (Chapter 11).

The value of the book is enhanced by its extensive reference sections (the bulk of the references cover publications up to 1979, only a few of them reach into the 1980s) and a sufficiently large subject index. Those working in the field will find the extensive tables of collected data on surface properties especially useful. They cover areas like: surface bond-length relaxation; adsorption properties of metal monolayers on metal substrates; surface structures on substrates with twofold, threefold, and fourfold rotational symmetry; surface structures on stepped substrates; surface structures formed by adsorption of organic compounds; the structure of clean surfaces and adsorbed atoms obtained by surface crystallography; heats of adsorption

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of O_2, H_2, CO, CO_2, and N_2; kinetic parameters for some catalytic reactions over metal catalysts (hydrogenolysis, ring opening, hydrodealkylation, cracking, dehydrogenation, isomerization, dehydrocyclization, and hydro- and dehydroisomerization).

The book should be useful for the advanced student as well as the expert. It should be appropriate for a specialized graduate course and it should provide the experienced professional with the opportunity to brush up on more recent developments. The latter will definitely enjoy, as pointed out earlier, the extensive tables of collected surface data.

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