

## Chemisorption of gases on metals

*Chemisorption of Gases on Metals.* By F. C. Tompkins. Pp. 370. (Academic: London, New York and San Francisco, 1978.) £16.80.

MAJOR advances in our knowledge and understanding of the chemisorption of gases on metals have occurred during the past decade. The elemental composition, crystallography, and the electronic and vibrational properties of surface layers on defined single crystal faces are now measurable, and a wealth of detailed information is available in the research literature. But for the advanced undergraduate or beginning postgraduate student there has been a serious lack of comprehensive introductory texts in which the theoretical bases and experimental methods of the newer physical techniques are clearly explained and in which the contributions of these techniques are placed in perspective with the traditional methods of surface study.

Professor Tompkins' book is intended to fill this gap. Its plan is excellent. The early chapters deal with the terminology of adsorption, methods of preparing clean surfaces, the kinetics of adsorption and desorption, isotherms and heats of adsorption, and the thermodynamics and statistical thermodynamics of adsorption. These chapters provide a natural link with earlier texts. They are followed by outlines of the electronic theory of metals and metal surfaces. The remaining half of the book is composed of short chapters dealing with work functions, magnetic susceptibility, electrical conductivity, low energy electron diffraction, infrared spectroscopy, field emission and field ion microscopy, Auger electron spectroscopy, photoelectron spectroscopy, ion neutralisation spectroscopy, electron energy loss and appearance potential spectroscopies, and a short review of some experimental results for adsorbates on tungsten.

The book conveys quite well the interplay of theory and experiment in modern surface science, and gives due emphasis to the methods which have proven most fruitful. However, it is neither as comprehensive nor as up to date as one might have expected. Ion-scattering and secondary ion mass spectrometry are completely omitted, as is ellipsometry, and the only reference to high resolution electron energy loss spectroscopy is the early paper of Propst and Piper (1967). Although published towards the end of 1978, the book contains very few ref-

erences dated after 1975. Except for the treatment of ultraviolet photoelectron spectroscopy, it is not appreciably more up to date than Wedler's *Chemisorption: An Experimental Approach* (Butterworths, 1976) and it is less comprehensive in its coverage of experimental methods. More emphasis is placed by Tompkins on the theoretical background, particularly the electronic properties of metals and surfaces. However, the level of the theory is sometimes too ambitious for its proper development in an intro-

ductory book of this scope and the student will often be baffled unless he pursues the references.

Despite these shortcomings the book is a welcome addition to the literature on chemisorption. The student will find it a useful guide to an increasingly interdisciplinary field of physics and chemistry.

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## Account of the bumblebee

*The Life of the Bumblebee.* By D. V. Alford. Pp. 80. (Davis-Poynter: London, 1978.) £3.95.

THIS is a popularised and much abbreviated version of D. V. Alford's *Bumblebees* which was published by Davis-Poynter in 1975. To help the general reader Alford begins by reviewing the features of insects in general, and bumblebees in particular. He then follows the usual and successful formula of tracing the biology of the colony from its initiation in spring, its growth to maturity, and the production of males and queens. He goes on to discuss further topics (including temperature regulation, foraging, orientation, mating and hibernation) and refers to most of the more important recent findings as well as the better

known and established aspects of bumblebee biology.

The final chapter entitled "Bumblebees and Man" is most valuable in drawing the reader's attention to the importance of bumblebees as pollinators of our crops, and the need whenever possible to protect them from the hazards of insecticides, to replace sources of forage destroyed by herbicides and intensive cultivation, and to provide sites suitable for nesting and hibernation. Appendices describe the 25 British species of bumblebees. There are eight pages of good black and white photographs.

In general Alford is to be congratulated in avoiding placing undue emphasis on his own particular interests and in presenting a well balanced accurate and readable account of the bumblebee.

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## Biological identification methods

*Biological Identification: The Principles and Practice of Identification Methods in Biology.* By R. J. Pankhurst. Pp. 104. (Edward Arnold: London, 1978.) Paperback £3.20.

SYSTEMATICS as an approach to the teaching of the biologies was becoming unpopular in the 1960s. Memory-taxing, as then taught, it carried a flavour of the elite natural history museums and culture collections: the spirit of Robbins was moving university teachers towards molecular biology and genetics which could, in some fashion, be assimilated by the many.

Meanwhile, computers were making possible numerical, multivariate and probabilistic treatments of biological classification and identification. It has taken over a decade for this to penetrate university teaching and by now there is a shortage of young systematists with an interest in the identification craft.

R. J. Pankhurst's compact book on biological identification methods begins with a splendidly lucid section on the use and construction of keys, taking British species of the genus *Epilobium* as a running example. If the rest were as easy to understand, one could begin to see a very satisfying second-year biology degree module in general systematics drawing on the second edition of C. Jeffrey's *Biological Nomenclature* (Edward Arnold: London, 1977) for nomenclature, P. H. A. Sneath and R. R. Sokal's *Numerical Taxonomy* (Freeman: Reading, 1973) for classification, and Pankhurst for identification. Lecturers should buy their copy well ahead of the students and settle down to some supplementary reading (the short bibliography is well chosen): the section on probabilistic methods drawing on Bayes' theorem, for a start, will need cracking by a worked-out example, that given (Fig. 16) being just a section of a computer print-out, understandable only by the initiated.

Monothetic and polythetic methods, explained on page 3, would have been an academically sound way of arranging the core of the work. Instead, the