discusses nitrocarbons that might exist and related highly nitrated compounds. With the exception of TNM, the principal interest in these materials is for use in explosive and propellant formulations. TNM has also found use as a nitration reagent and as a polymerization catalyst.

Nielsen is the right person to author this book. He had co-authored an earlier book in the Organic Nitro Chemistry series and until his retirement from the Navy lab at China Lake, was one of the premier chemists in energetic materials.

For those interested in the subject, this is an invaluable source compiling data from over 1000 references, many of which are hard to find Russian publications.

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JA955348M

S0002-7863(95)05348-0

Total Reflection X-Ray Fluorescence Analysis. Chemical Analysis, Vol. 140. By Reinhold Klockenkamper (Institut für Spektrochemie und Angewandte Spektroskopie-Dortmund, Germany). John Wiley: New York. 1997. xvii + 245 pp. \$69.95. ISBN 0-471-30524-3.

Most chemists know that the basis of classical X-ray fluorescence (XRF) spectroscopy is the fact that a suitably-excited atom exhibits a characteristic X-ray spectrum. Total reflection (T) of X-rays (which occurs when the glancing angle of the incident beam is less than a critical angle) was first discovered by Compton in 1923, but was not applied to XRF until the early 1970s. Over the past 20 years, concomitant with the advances in solid-state detector sensitivity and X-ray source intensity, TXRF has been developed into an important analytical tool. The low sample detection limit (10^{-12} g), the minimal surface penetration of the incident beam (1–500 nm), and the near elimination of spectral background and matrix effects combine to make this a recommended method for both microquantitative analysis and surface analysis. However, TXRF differs fundamentally from classical XRF since the totally reflected X-ray beam (glancing angle $<0.1^\circ$) interferes with the incident primary beam to form standing waves above the sample surface and within near-surface layers. Consequently, the instrumentation requirements and data analysis methodology are unique to TXRF and are not simply extensions of classical XRF methods. Currently, in atomic spectroscopy TXRF competes with instrumental neutron activation analysis (INAA), while in surface and thin-layer studies it compares favorably with Rutherford back-scattering (RBS) and secondary ion mass spectrometry (SIMS).

This volume, written by a well-known expert in the field, is the first book solely dedicated to TXRF. It is clearly written with excellent coverage of theory, instrumentation, sample preparation, data collection and interpretation, and a wide range of applications (chemical analysis, environmental studies, medicine, industrial materials, and forensics). The book closes with a discussion of future prospects in this exciting and developing field.

Total Reflection X-Ray Fluorescence Analysis, which contains introductory background material along with detailed practical experimental hints, is an excellent survey of the current status of TXRF for both specialists and nonspecialists (including instructors of analytical chemistry). The bibliography is thoroughly representative and reasonably current; in future years it can be kept up-to-date by reference to the biennial reviews of X-ray spectroscopy which appear in *Analytical Chemistry* (e.g., **1996**, 68, 467R).

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JA975500F

S0002-7863(97)05500-5

Deciphering the Chemical Code: Bonding Across the Periodic Table. By Nicolaos D. Epiotis (University of Washington). VCH: New York. 1996. xlvii + 933 pp. \$89.95. ISBN 1-56081-946-4.

This work describes a new theoretical framework for describing chemical bonding. A prime motivation is to overcome shortcomings in “popular” theories used to explain chemical phenomena. To do so requires a blizzard of abbreviations unlike anything this reviewer has seen since the section of my college history textbook covering the New Deal. To some extent, this problem is unavoidable given the focus of the work. The author includes a pictorial glossary of new terms at the beginning of the book to help deal with this daunting “alphabet soup”, an excellent idea and one authors of related monographs would do well to consider.

The book is, at over 900 pages, not a “quick read”. In places the reading is slow going although this is expected since many concepts are unlike those employed in bonding theories familiar to chemists. In other areas the writing is in a style one could almost classify as colloquial; you get the impression the author is speaking directly to you, attempting to convince you of his arguments. There are also many intriguing chapter titles including *The Skeleton in the Closet of Inorganic Chemistry*, *How Theoretical Inorganic Chemistry Went Astray*, and *Computational Chemistry: Curse or Panacea?* to pique the curiosity.

The central thesis behind much of this book is that previous attempts at codifying electronic structure theory fail to focus on an important chemical concept, i.e., the importance of electron–electron repulsion. If one considers the simple orbital-driven arguments typically used to explain observations (e.g., the preference for one isomer over another, the stereo- and regiochemistry of a reaction, etc.) then there is much to support the hypothesis that modern electronic structure theory focuses primarily on the one-electron portion of the energy to the neglect of the two-electron portion. Given this, any work that seeks to expand this view is valuable.

Another primary goal of this work is, as the title suggests, to develop a theoretical framework that is applicable across the entire periodic table as opposed to developing specific theories for specific families of elements. Fundamental problems in the electronic structure of organic, main group, and transition metal compounds are treated. Perhaps more importantly, the emphasis is on developing qualitative (and semiquantitative) concepts that can be used not only to rationalize the results of experiments and high-level calculations but also as a tool for predicting new chemistry.

Another central thesis of this work is that despite recent advances in computational chemistry many of the fundamental theories used to rationalize numerical results are those developed many years ago by Lewis, Pauling, etc. Epiotis develops new concepts such as the interstitial and exchange bond. Will it revolutionize our ways of thinking about bonding in chemistry? The pessimistic view suggests that such an effort will fail given the chemist’s inertia toward new bonding models. On the other hand, concepts are couched in the language of valence bond theory, which, despite the fact that the overwhelming majority of computational chemistry studies reported in journals such as this employ the molecular orbital formalism, is near and dear to the hearts of chemists, experimentalists, and theorists alike. In summary, this book may be of interest to anyone with an interest in theories of chemical valence.

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JA965712X

S0002-7863(96)05712-5