

The strong solvent dependence of the photoreactions of pyrazolenines is indicated in Table I. It is apparent that solvents of low dielectric constant direct the partition of the photoexcited state in favor of cyclopropene formation. Experiments are in progress to determine whether the different pathways involve excited states of different multiplicities.

Finally it should be pointed out that the conversion of pyrazolenines to cyclopropenes might well be a two-quantum process, in which the first step is the formation of diazoalkene III. Supporting this hypothesis is due to the instability of the desired compound, receives strong support from our observations on IIb.

the observation of an induction period in nitrogen evolution and the buildup of a steady-state concentration of III as evidenced by the development of a strong red color of the photolysis solutions. The light-induced conversion of III to II finds its analogy in previously reported examples of cyclopropene formation from diazoalkenes.⁷

- (7) G. L. Closs, L. E. Closs, and W. A. Böll, *ibid.*, **85**, 3796 (1963).
 (8) A. P. Sloan Foundation Fellow.

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BOOK REVIEWS

Inorganic Thermogravimetric Analysis, Second and Revised Edition. By CLÉMENT DUVAL, Directeur de Recherche au C.N.R.S., Directeur du Laboratoire de Recherches Micro-analytiques (E.N.S.C., Paris), President du Groupe de Chimie analytique. Translated from the French manuscript by RALPHE E. OESPER, Ph.D., Professor Emeritus of Analytical Chemistry, University of Cincinnati. American Elsevier Publishing Company, Inc., 52 Vanderbilt Avenue, New York 17, N. Y. 1963. 16 × 23 cm. xv + 722 pp. Price, \$22.00.

The second and revised edition of this book covers a wider range of topics than its title implies, but as the author states in the preface the word *analytical* has been retained because up to now analytical chemistry has profited most from the recent progress in thermogravimetry. In addition to applications in analytical chemistry, the book deals with "kinetic studies, investigations of catalysis, reactions in the solid state, and studies of the behavior of standard materials for titrant solutions, and also of various substances which are not employed in analysis."

The book is divided into two parts: Part I (The Thermobalances), 162 pp., and Part II (The Thermolysis Curves), 521 pp. There are five chapters in Part I; they deal with the topics: a brief historical review, deflection type thermobalances, null type thermobalances, applications of the thermobalances, and precautions to be taken in the use of the thermobalance. Since the first edition was issued (1953), three world-renowned scientists have died: Honda (in 1954), and Guichard and Chevenard (in 1960). Appropriately, a photograph and short biographical sketch of each of these pioneers in thermogravimetry are included in the first chapter. As an appendix to Part I, the author gives an extensive table (15 pages) bringing together the methods which he suggests for automatic inorganic analysis (plutonium and americium excepted).

Chapters 6 to 84 are covered in Part II, a chapter being devoted to compounds or ions of each of the following 78 elements listed in the order of their atomic number: lithium, beryllium, boron, carbon, nitrogen, fluorine, sodium, magnesium, aluminum, silicon, phosphorus, sulfur, chlorine, potassium, calcium, scandium, titanium, vanadium, chromium, manganese, iron, cobalt, nickel, copper, zinc, gallium, germanium, arsenic, selenium, bromine, rubidium, strontium, yttrium, zirconium, niobium, molybdenum, ruthenium, rhodium, palladium, silver, cadmium, indium, tin, antimony, tellurium, iodine, cesium, barium, lanthanum, cerium, praseodymium, neodymium, samarium, europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium, lutetium, hafnium, tantalum, tungsten, rhenium, osmium, iridium, platinum, gold, mercury, thallium, lead, bismuth, thorium, uranium, plutonium, and americium. The closing chapter is devoted to studies in organic chemistry and briefly discusses the results obtained with a number of purely organic compounds closely linked with inorganic analysis.

An idea of the rapid growth of thermogravimetry is gained by the fact that by January 1, 1961, there were 52 models of thermobalances, 10 of these being available from dealers throughout the world. The extensive and thorough coverage of the literature is indicated by the author's statement that he had read 2200 papers in periodicals from all quarters of the globe or, in more precise terms, had regularly consulted the leading analytical journals and abstracts through 1960, which he has listed in the preface.

The book concludes with author and subject indexes. Printing, paper, and cloth binding are of good quality.

It has been a special pleasure to review this book because of my close association with Professor Duval for some twelve years as a member of the IUPAC Commission on New Analytical Reagents. He is to be congratulated and thanked for this useful and up-to-

date treatise on thermogravimetry. A word of appreciation is also due the translator for making the French manuscript available in English.

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Research in Surface Forces. Edited by B. V. DERYAGIN. Authorized translation from the Russian. Consultants Bureau Enterprises, Inc., 227 W. 17th St., New York 11, N. Y. 1963. 190 pp. 21.5 × 27.5 cm. Price, \$27.50.

This monograph is a jubilee number commemorating "the twenty-fifth anniversary of the organization of the Laboratory of Surface Phenomena of the Institute of Physical Chemistry of the Academy of Sciences of the USSR, March, 1960. The organizer and permanent director of this laboratory is B. V. Deryagin, Corresponding Member of the Academy of Sciences of the USSR. The original staff of three—B. V. Deryagin, M. M. Kusakov, and V. P. Lazarev—was augmented somewhat later by the addition of L. S. Lebedeva (1936), N. N. Zakhavaeva (1937), and A. S. Titievskaya (1938)."

Fortunately, all of the contributions have been translated. The first one comprises a comprehensive review of the first 25 years in the Laboratory of Surface Phenomena. It is particularly useful to American readers in that the testing of the principal discoveries since 1935, their importance to science, and the names of the workers involved are set forth in clear, readable style by N. N. Zakhavaeva. It is helpful for an understanding of the papers that follow to have the evolution of the researches of this Institute so clearly depicted with the particular contributions of each of the authors set forth.

These six pages of historical review ends with the statement: "An extensive effort has been made to popularize the work of the Laboratory. More than 600 journal articles have been written since the Laboratory was founded; the staff has actively participated in various conferences and discussions (more than 100, many abroad) and carried out innumerable consultations. A colloquium functions regularly in the Laboratory and attracts numerous scientific workers from other institutions and representatives of industry. Representatives of other institutions have defended their dissertations under the direction of, or in consultation with, the Laboratory staff. The fact that the work of the Laboratory has embraced so extensive a field of surface phenomena is reflected in the title, Laboratory of Surface Phenomena, which it has carried since 1953.

"Thus, twenty-five years have seen a great change, from a laboratory engaged in the study of the properties of thin polymeric liquid films to an extensive laboratory working with a wide range of surface effects."

The breadth and depth of the contributions of this volume can be seen from the following titles:

- Twenty-five Years in the Laboratory of Surface Phenomena of the Institute of Physical Chemistry of the Academy of Sciences of the USSR by N. N. Zakhavaeva
- Surface Forces and Their Effect on the Properties of Heterogeneous Systems by B. V. Deryagin
- A Study of the State of Connate Water in Oil Reservoirs by M. M. Kusakov and L. I. Mekenitskaya
- The General Theory of Type II Capillary Effects by L. M. Shcherbakov
- Diffusional Surface Forces in the Neighborhood of a Liquid Interface by S. S. Dukhin

- A Luminescence Study of the Adhesion Bonding of Polymers by N. A. Krotova and L. P. Morozova
- The Effect of Molecular Weight, Polydispersion and Polarity on the Adhesion of High Polymers to High-Molecular Substrata by S. S. Voyutskii, V. L. Vakula, V. E. Gul', and Ho Yun-tsu
- The Role of Surface Forces in Mica Crystals by M. S. Metsik
- The Double Layer at a Solid Surface Resulting from Acceptor-Donor Bonds by V. P. Smilga
- The Application of Infrared Spectroscopy to the Studying of the Interaction of Adhesive and Substrate (Polymer-Glass) by N. A. Krotova and L. P. Morozova
- Measurement of the True Density of the Double Electric Layer at a Metal-Dielectric Interface by B. V. Deryagin and I. N. Aleinikova
- The Physical Basis of the Fundamental Law of Surface Function by A. S. Akhmatov
- The Properties of Solutions of Organic Acids in Liquid Hydrocarbons at Solid Surfaces by G. I. Fuks
- Certain Considerations Concerning the Laws Applying to Type I Friction by D. M. Tolstoi
- New Experimental Data on External Friction by D. M. Tolstoi, R. L. Kaplan, Lin Fu-sheng, and Pan Pin-yao
- A Cinematographic Study of the Flow of Thin Films of Polymer Solutions by B. V. Deryagin, N. N. Zakhavaeva, S. V. Andreev, A. A. Milovidov, and A. M. Khomumov
- The Effect of Electrolyte Concentration on the Height of the Force Barrier for Adhesion of Platinum Wires by T. N. Voropaeva, B. V. Deryagin, and E. N. Kabanov
- A Radioisotope Study of the Movement of Moisture in Peats by M. P. Volarovich and N. V. Churaev
- Surface Effects in Soil Mechanics by S. V. Nerpin and B. V. Deryagin
- The Theory of Coagulation of Lyophobic Sols by Mixtures of Electrolytes by Yu. M. Glazman
- Studies on the Filtration of Solutions of Electrolytes Through Highly Dispersed Powders by B. V. Derjagin, N. N. Zakhavaeva, and A. M. Lopatina
- A Study of Slow Hydrosol Coagulation Using the Continuous Flow Ultramicroscope by N. M. Kudryavtseva and B. V. Deryagin
- An Experimental Study of the Filtration of Air Through Porous Bodies in the Region of Transition Pressures by M. V. Talaev, B. V. Deryagin, and N. N. Zakhavaeva
- A Metallic Apparatus for Determining Specific Surfaces of Powders and Porous Bodies by B. V. Deryagin, N. N. Zakhavaeva, M. V. Talaev, B. N. Parfanovich, and E. V. Makarova
- Diffusional Phoresis of Aerosol Particles by B. V. Deryagin, S. P. Bakanov, S. S. Dukhin, and G. A. Batova
- The Behavior of Small Aerosol Particles in a Nonuniformly Heated Gaseous Mixture by S. P. Bakanov and B. V. Deryagin
- A Differential Counter for Condensation Nuclei by A. I. Storozhilova
- A New Method for Obtaining Constant and Uniform Supersaturations by B. V. Deryagin, P. S. Prokhorov, M. V. Velichko, and L. F. Leonov
- Solution of the Kinetic Equation for Coagulation by G. A. Martynov and S. P. Bakanov.

American scientists interested in colloids in general, and aerosols and hydrosols in particular, along with fundamental studies on atomic and surface forces can only stand in awe and amazement at the tremendous advances this Institute has made over the past 25 years. Deryagin has been to Russian science what Irving Langmuir was to America. The Division of Colloid and Surface Chemistry of the A.C.S. would do well to invite Deryagin and some of his collaborators to visit us.

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The Pyrimidines. By D. J. BROWN, The Australian National University, Canberra. With an Essay by S. F. MASON, The University, Exeter, England. Interscience Division, John Wiley and Sons, Inc., 440 Park Avenue South, New York 16, N. Y. 1962. xxv + 774 pp. 16 × 23.5 cm. Price, \$40.00.

This book is a welcome addition to the library of monographs since the pyrimidine portion of heterocyclic chemistry is so large and is still growing rapidly in spite of its age (145 years). This monograph is an excellent critical summary of the synthetic organic chemistry of pyrimidines by an experienced worker in the field who is well qualified for this tremendous task. The biological, biochemical, and medicinal significance of pyrimidines is briefly discussed at appropriate places. Inclusion of the formation of the pyrimidine ring in fused heterocycles such as purines and pteridines provides a tie-in with the frequent use (not in-

cluded) of substituted pyrimidines as foundations for building up such ring systems.

The monograph comprises an introduction (30 pp.), two chapters on ring synthesis (85 pp.), nine chapters on substituted pyrimidines (348 pp.), a chapter on physical properties (36 pp.), a tabulated appendix of simple pyrimidines (with melting points, boiling points, and references, 175 pp.) and an index (98 pp.) of the book exclusive of the appendix.

The introduction provides a good perspective of general aspects, reactions, and physical properties and discusses five reactivity factors which form the basis of the chemistry of pyrimidines [and of other heterocycles]. Its general summary of reactions is partly by reaction types and partly descriptive so that electrophilic and nucleophilic substitutions are not all under these headings. The use of separate reaction headings "Direct Nucleophilic Substitution" [of hydrogen], "Nucleophilic Metatheses" [nucleophilic substitution of halo, methoxy, methylthio, or methylsulfonyl], and "Other Metatheses" [nucleophilic substitution of mercapto, amino, or trimethylammonio] is misleading. Quaternization and N-oxide formation would be preferably classified¹ as electrophilic reactions at ring-nitrogen rather than as "Addition Reactions." This discussion of reactions has useful cross references to the fuller treatment in subsequent chapters.

Ring synthesis is presented in excellent fashion with the scope and the validity of assigned structures evaluated. One chapter deals systematically with "The Principal Synthesis" (C-C-C plus N-C-N) which provides wide synthetic scope by variation of reagents. The other includes ring formation from alternative reagents (C-C-C-N plus C-N, N-C-C-C-N plus C, etc.) and from other ring systems as well as pyrimidine ring closures to give fused bicyclics. In these chapters and throughout, the practical aspects (time, temperature, solvent, yield, and side reactions) are discussed adequately enough to provide the "feel" of the subject without reference to the original literature.

The chapters on substituted pyrimidines are each subdivided into preparations, properties, and reactions. Interrelated preparations and reactions are cross-referenced and not duplicated. This wealth of material is written in a very concise but nonetheless readable style. Included in the chapter on physical properties is a valuable twenty-two page discussion by S. F. Mason of experimental and theoretical work on ultraviolet, infrared, and Raman spectra of pyrimidines.

Systematic Tables of Simple Pyrimidines in the appendix cover the literature "up to 1957, with addition of important compounds described up to 1960." This appendix comprises 8 tables covering compounds with one or more of a single kind of substituent [plus C-alkyl homologs], 19 tables covering compounds with one or more of only two kinds [21 possible combinations] of substituents [plus C-alkyls], and 7 tables of those with one or more of three or four kinds of substituents [plus C-alkyls]. An additional 3 tables result from the partial subdivision of pyrimidones into N-H and N-alkyl categories. Using these tables to locate a polyfunctional compound is complicated by the large number of subdivisions and by the author's concept of major (amino, oxy, and thio) and minor (all others) substituents. The definitions on p. 502 must be read carefully before using the tables. Some aspects of the definitions requiring attention are: amidino is in the Amino table but in the Carboxypyrimidine chapter; carboxymethylthio is in the chapter on S-containing pyrimidines but is in the Carboxypyrimidines Systematic Table. The latter also contains isocyanate, thiocyanate, and isothiocyanate but no other 1-carbon acyl derivatives of oxy or amino compounds. The publisher would have done well to (1) repeat the title on each continued page (about three-fourths of the total) of the tables to assist the reader and (2) locate the list of their titles (now rather hidden on p. xxiv) right with the 37 tables since referral to this list facilitates use of the Appendix. The content of the tables as far as examined was consistent with the definitions with two exceptions. Oxy and alkoxy compounds bearing in addition only C-oxy- or C-alkoxy-alkyl substituents are in both Tables XXV (eight compounds) and XXVI (three other compounds). On p. 573, 4-amino-5-carbamoyl-2-ethylthiopyrimidine occurs with the amino oxy compounds by mistake but is also included on p. 582 in its proper place.

A check of accuracy of 50 scattered references and of physical properties of 20 compounds in the Systematic Tables revealed one error in each category. Typographical errors are moderate in number and involve mainly incorrect spelling.

In a book of this size, the publisher should consider using an over-all list of references (total of 119 pp.) to save duplication from chapter to chapter and again in the appendix. If it were alphabetical, such a list could serve as an author index to the subject and would eliminate the author portion of the present index.

It might be of value for the author and publisher to consider a paper-back version of the book consisting of the text (about 500

(1) A. R. Katritzky and J. M. Lagowski, "Heterocyclic Chemistry," Methuen, London, 1960.