evitably some typographical and scientific errors, but these are minimal. It is a volume anyone practising in carbohydrates would wish to own, but its price will mean that it will have to be used mainly through a library.

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Hydrazony (*Hydrazones*), by YU. P. KITAEV AND B. I. BUSYKIN, edited by A. N. KOST (Head Editor) and B. V. KOPYLOVA, approved by the A. E. Arbuzov Institute of Organic and Physical Chemistry, Kazan, Academy of Science of USSR, "Nauka" Publishers, Moscow, 1974, 415 pages, 15.5 × 26 cm, cloth-back, 1450 copies published, Rubles 2.86 (~$3.00).

According to the preface, this monograph is the first attempt to put into one systematic unit all of the scattered information published on the chemistry of hydrazones, and the authors are to be congratulated on their success in this immense task. The book is designed for organic research chemists and chemical engineers working in the medicinal, pharmaceutical, dye, and agricultural industries. Although the monograph is primarily designed for the Soviet professional reader, a reader from the West can also benefit from it.

It is a well-documented monograph (2650 references, to the middle of 1973) that consists of 12 chapters and covers the historical developments and advances of the last ten to twenty years on the subject. Among the topics discussed are new trends, mechanisms, and synthetic methods employing hydrazones (*e.g.*, synthesis of complex heterocyclics); also, hydrazones as analytical reagents for the separation and identification of carbonyl compounds and metal ions, or for synthesis of organometallic compounds (*e.g.*, complexing agents).

In the Introduction (2 pages, 52 references), the authors suggest acceptance of hydrazones as a separate class, rather as derivatives of carbonyl compounds (such as hydrazones, hydrazides, formazans, and osazones).

In Chapter 1 (10 pages, 4 Tables, 34 references), the authors discuss at length some advantages and disadvantages of the current nomenclature for hydrazones and azines (*e.g.*, Rules C-922 and C-923 of the IUPAC Nomenclature), and propose an alternative one. According to the authors' nomenclature, the simplest of hydrazones, namely formaldehyde hydrazone, is chosen as the key hydrazone; all other compounds of similar structure are regarded as derivatives thereof. For example, benzaldehyde methylphenylhydrazone becomes 1,3-(C,N)-diphenyl-3(N)-methylhydrazone; similarly, 1,2-bis(phenylhydrazono)glyoxal is 3,3′-diphenyl-1,1′-dihydrazonyl, and acetaldazine is 1-methyl-3-ethylidenehydrazone.

Chapter 2 (17 pages, 112 references) is concerned with the methods of preparation of hydrazones. These include: condensation reactions of carbonyl compounds or their derivatives (*e.g.*, azines, azomethanes, oximes, and thioketones, and derivatives of other hydrazones) with hydrazine (or substituted hydrazines, *e.g.*, phenylhydrazine),

and reaction of diazonium salts with active methylene compounds (*e.g.*, malononitrile, or cyanoacetamide); also, condensation of hydrazines with unsaturated compounds (*e.g.*, acetylene or nitrile derivatives).

Chapter 3 (85 pages, 19 Tables, 472 references) gives a thorough presentation of the molecular and electronic structure of hydrazones; the stereoisomerism of hydrazones is also discussed in considerable detail. Among the points presented are: hybridization and valency of nitrogen atoms in hydrazones; MO and MINDO calculations of electron distribution (charge density), bond order and bond distances in hydrazones (*e.g.*, the methods of Hückel, Pariser–Parr–Pople, Häfalinger, Skancke, and Kitaev); and the stereoisomerism of hydrazones (*e.g.*, geometrical, optical, and tautomeric equilibria). For example, hydrazones of α-dicarbonyl compounds exist in four geometrical forms: *syn-s-cis*, *syn-s-trans*, *anti-s-cis*, and *anti-s-trans*; however, formazans can, theoretically, exist in eight conformations. This chapter can now be supplemented with a recent, spectroscopic study on geometric isomers of phenylhydrazones of α-dicarbonyl compounds: ^{14}N and ^{15}N isotopomers of acetoacetic acid, ethyl α-methylacetoacetate, and potassium dibenzoylacetate [C. H. Yoder, S. Kennedy, and F. A. Snavely, *J. Org. Chem.*, 43 (1978) 1077]. The additional topics in Chapter 3 include: isomerism of hydrazone–azo types of compounds, isomerism of hydrazone-ene-hydrazine types, chain–ring isomerism, and intermolecular interactions.

Chapters 4–11 are devoted to the chemical reactions of hydrazones. Chapter 4 (32 pages, 311 references) describes the reactions of hydrazones with electrophilic reagents; these reactions are: alkylation, arylation, acylation, and halogenation; reactions with aryldiazonium salts, and nitro and nitroso reagents, and reactions of hydrazones with carbonyl compounds. Chapter 5 (39 pages, 8 Tables, 188 references) deals with reactions of hydrazones with nucleophilic reagents; the topics are: displacement reactions at a carbon atom of the hydrazine group, formation of heterocyclic compounds *via* SN-reactions of hydrazones, interaction of halogenated hydrazones with tertiary amines, and action of tertiary amines on tetra-*N*-hydrazone salts. Chapter 6 (45 pages, 257 references) discusses addition reactions; the topics covered are: addition of hydrazones to unsaturated compounds (*e.g.*, the C=C bond); addition to the C=N bond of hydrazones, and their hydrolysis; cycloaddition; and hydrazones as complexing agents. Chapter 7 (27 pages, 178 references) is devoted to the transformation of arylhydrazones into indole derivatives; this includes: applicability and reaction mechanisms, direction of cyclization of arylhydrazones, role of catalysts in the formation of indoles, exceptions and deviations, and new areas of application. Chapter 8 (29 pages, 1 Table, 198 references) reports on catalytic and thermal transformations of hydrazones; the topics discussed are: the Kishner reaction and its mechanism, the mechanism of elimination and olefinic isomerization accompanying the Kishner reaction, the action of bases on substituted hydrazones, and the pyrolysis and photolysis of hydrazones. Chapter 9 (52 pages, 5 Tables, 348 references) describes the oxidation of hydrazones; the following reactions are surveyed: oxidation of unsubstituted hydrazones, oxidative coupling of hydrazones (formation of diazo dyes), oxidation of monosubstituted hydrazones, oxidative

cyclization of hydrazones, and oxidative degradation of hydrazones. Chapter 10 (22 pages, 3 Tables, 197 references) reports on two methods for the reduction of hydrazones: polarography and chemical reduction. Chapter 11 (16 pages, 121 references) describes some additional reactions of hydrazones; *inter alia*, the interesting transhydrazonation and 1,4-elimination reactions.

The biological applications of hydrazones are treated in Chapter 12 (25 pages, 2 Tables, 163 references). The hydrazone derivatives that are reported to be drugs show activity against tuberculosis, inflammation, and other bacterial diseases. Potent herbicides, insecticides, and fungicides are also discussed.

The book concludes with a Subject Index and a Table of Contents, but an Author Index is not provided. Despite the new nomenclature proposed, there is a tendency to adhere to the Rules of IUPAC Nomenclature; however, several deviations were noted.

In general, the monograph is scientifically sound, and contains an abundance of structural formulae that are adequate. The book was written by specialists actively involved in the field, as evidenced by numerous references (57) to them in Chapters 1, 3, 6. 7, and 10. The monograph also cites the work of their colleagues, and gives references to less-common Russian periodicals.

The book constitutes a valuable, companion volume to recent chapters on phenylhydrazones and osazones of carbohydrates, and synthesis of polyhydroxyalkyl heterocycles [H. S. El Khadem (Ed.), *Synthetic Methods for Carbohydrates*, ACS Symposium Series 39. American Chemical Society, Washington, D.C., 1977]; however, translation of this Russian book into English would require some updating.

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Khimiya Hydrazonov (Chemistry of Hydrazones), edited by YU. P. KITAEV, approved by the A. E. ARBUZOV Institute of Organic and Physical Chemistry, Kazan, Academy of Science USSR, "Nauka" Publishers, Moscow, 1977, 204 pages, 14 × 21.5 cm, paperback, 1300 copies published, Rubles 1.40 (~$2.00).

This well-written monograph, containing references to the middle of 1976, is a supplement to a recently published book on the subject, *Hydrazones*, by Yu. P. Kitaev and B. I. Buzykin [for a review, see *Carbohydr. Res.*, 67 (1978) C22]. According to the editor's introduction, the new monograph reflects the rapid growth in the number of known compounds having the hydrazone structure that are of theoretical interest (*e.g.*, in photoelectron, ^{14}N quadrupole resonance, and X-ray diffraction studies). A similar demand for new hydrazone derivatives has also been observed in the applied fields of organic synthesis and analytical chemistry, and in the medicinal, pharmaceutical, and agricultural industries. Consequently, this book is designed for study by a wide range of research chemists and chemical engineers.

The monograph consists of seven contributed chapters written by experts