



Employing dioxane, dimethylacetamide, and acetonitrile as solvents for the above reaction, yields ranging from 82 to 86% were obtained. Dimethylformamide gave a yield of 40% which may be consistent with the observation that this solvent is oxidized by NBS.

These dipeptides were prepared as above in THF: Z.D.Ala-Gly.OBz(NO₂), m.p. 116–117° (crystallized from ethanol-water), yield 75% (*anal.* Calcd. for C₂₀H₂₁N₃O₇: C, 57.83; H, 5.10; N, 10.11. Found: C, 58.09; H, 5.29; N, 9.81), Z₂Lys-Gly.OBz(NO₂), m.p. 94° (crystallized from ethanol-water), yield 83% (*anal.* calcd. for C₃₁H₃₄N₄O₉: C, 61.37; H, 5.65; N, 9.24. Found: C, 61.73; H, 5.82; N, 9.19), Z₂Lys-Glu.OBz-OEt (NO₂), m.p. 105–106° (crystallized from ethanol-water), yield 82% (*anal.* Calcd. for C₃₆H₄₂N₄O₁₁: C, 61.18; H, 5.99; N, 7.93. Found: C, 61.44; H, 6.12; N, 8.26), Z.Gly-Phe.OEt oil⁸ yield 76%.

Racemization was tested using the procedure of Anderson and Callahan.⁴ Z.Gly-Phe.OEt was converted to the hydrazide m.p. 142°³ in 94% yield and treated with Gly.OEt and NBS in THF. After crystallization of the product from 2% solution in ethanol, 1.1% of the D,L form (m.p. 118–131°) came out first and the L form (m.p. 116–117°) came out later in 63% yield.

Since carboxyl activation may occur in the presence of a free amino group under the above conditions, the method appeared suitable for the polymerization of tripeptide hydrazides. By treating Pro-Gly-Gly.NHNH₂⁵ in dimethylacetamide with NBS and isolating the material left after dialysis against water, a polymer (PGG)_n was obtained of molecular weight of 1400 as determined by dinitrophenylation with dinitrofluorobenzene.

The method is simple, rapid and should have application to syntheses in which side chains which are sensitive to NBS oxidation are absent.

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BOOK REVIEWS

Amino Acids, Proteins and Cancer Biochemistry. Papers presented at the Jesse P. Greenstein Memorial Symposium, Division of Biological Chemistry, American Chemical Society, September 16, 1959. Edited by John T. Edsall. Academic Press Inc., 111 Fifth Avenue, New York 3, N. Y. 1960. ix + 244 pp. 16 × 23.5 cm. Price, \$7.00.

This symposium was designed to portray some of the major current developments in the two fields of Greenstein's greatest interest, those of amino acid and protein chemistry, and of the biochemistry of cancer. The first chapter is an account of Greenstein's life and work, by Edsall and Meister, and the book ends with a bibliography of his writings. The body of the book consists of ten reviews. All are well written, and should be easily comprehensible to chemists in other specialities. As might be expected from a symposium, each paper reflects the point of view of its authors, although all are well documented.

Six papers deal with amino acids and proteins. Winitz, *et al.*, describe the use of amino acids in chemically defined diets. The value of such diets in metabolic studies is illustrated by experiments on glycine formation in the rat. Meister discusses amino acid activation and peptide bond biosynthesis; his studies on the specificity of the tryptophan-activating enzyme are particularly interesting. Scheraga, *et al.*, give physico-chemical evidence for the existence of internal hydrogen bonds in ribonuclease, and propose a three-dimensional molecular model for the enzyme. Neurath, *et al.*, review their elegant studies on the structure and

function of pancreatic carboxypeptidase A, with particular reference to the role of metals. Sober and Peterson discuss the evaluation of protein mixtures by column chromatography.

A transition to the second subject of the book is effected by the paper of Roberts and Simonsen, on free amino acids and related substances in normal and neoplastic tissues, with special reference to glutamine. Kit discusses the nucleic acids of normal tissues and tumors, and summarizes the evidence (as of 1959) on the nuclear synthesis of RNA. Weinhouse provides a critical review of enzyme activities and tumor progression. He discusses (1), Greenstein's conclusion that tumors, in their biochemical characteristics, resemble one another more closely than they resemble their tissues of origin; (2) the deletion hypothesis of carcinogenesis proposed by the Millers; and (3) his (Weinhouse's) disagreement with the Warburg hypothesis that the cancer process is initiated by the deletion of a crucial stage in respiration, so that fermentation, rather than oxidation of glucose, supplies the energy required for growth. Racker, Wu and Alpers also discuss carbohydrate metabolism in tumor cells. They are in partial agreement with both the Warburg and Weinhouse schools, but make the interesting suggestion that in intact cells glycolysis is limited by the availability of inorganic phosphate; since the transport of phosphate is slow, its availability is limited by its regeneration from ATP; hence rapidly growing cells that convert ATP to ADP in the course of many synthetic processes can express their glycolytic capacity more effectively than other cells. A similar idea,

that of a chemical control mechanism rather than an outright deletion, is proposed by Chance. From studies on ascites tumor cells, he sets up a computer representation of glucose and oxygen metabolism which suggests that the metabolic control mechanism may result from the law of mass action and a "compartmentation" of ATP and reduced diphosphopyridine nucleotide between the cytoplasmic and mitochondrial spaces.

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X-Ray Powder Photography in Inorganic Chemistry.

Sponsored by the United Kingdom Atomic Energy Authority, Harwell. By R. W. M. D'EYE, M.Sc., Ph.D., A.R.I.C., and E. WAIT, M.A., D.Phil., Atomic Energy Research Establishment, Harwell. Academic Press Inc., 111 Fifth Avenue, New York 3, N. Y. 1960. viii + 222 pp. 14.5 × 22.5 cm. Price, 8.50.

This book is one of many devoted to the techniques of X-ray powder photography. Its merits are that it is brief, accurate and quite readable. A large number of ideas are introduced, but the authors limit their discussions only insofar as they apply to routine powder analysis. A number of literature references are included, for the reader who feels that presentation a bit narrow. The book can be recommended as quite useful to the chemist without experience in crystallography who wishes a rapid introduction to the subject.

The most important material is presented in Chapters 3, 4 and 5, and accounts for about 40% of the book. The various cameras in use in powder photography are examined and many of the common experimental problems related to crystal mounting and sample alignment are discussed. A quite detailed account is given on the methods of indexing patterns of unknown material. Actual examples are worked out in detail for crystals of cubic, tetragonal and orthorhombic symmetries. A complete chapter is devoted to the measurement of accurate cell dimensions. The techniques discussed pertain to photographic methods exclusively, no mention being made of counter methods of collecting data.

Two chapters on theory follow those on experimental procedures. The first introduces crystal symmetry and describes the effects of various translational symmetries on the diffraction pattern. The second discusses the intensities of X-ray reflections as a function of atomic parameters. The book is rounded out by an introductory chapter on the generation of X-rays and a final chapter on the application of X-ray diffraction to chemical analysis and to problems of thermal analysis such as the determination of expansion coefficients, transition temperatures and phase diagrams.

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Crystal Structures. Supplement V. By RALPH W. G. WYCKOFF, University of Arizona, Tucson, Arizona; formerly Laboratory of Physical Biology, National Institute of Arthritis and Metabolic Diseases, Bethesda, Maryland. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1960. 676 pp. 19.5 x 24.5 cm. Price, \$26.50.

In 1948, the first section of a compilation of crystal structures by R. W. G. Wyckoff was published. To make it possible to keep information up to date, the material has been issued in loose leaf form. The entire work now consists of fifteen chapters, published in four sections and four previous supplements; five binders, labeled Volumes I-V, are needed to hold the material. The first twelve chapters pertain to inorganic substances and constitute Volumes I-III. Chapter XIII, Aliphatic Compounds, makes up Volume IV and Chapters XIV (Derivatives of Benzene) and XV (Alicyclic and Heterocyclic Compounds) Volume V. The present review concerns the fifth supplement which now completes the work.

This final supplement contains material to be integrated into all volumes. It consists largely of bibliographic sections covering the years 1914-1934, based on Wyckoff's "The Structure of Crystals" (2nd Ed., Reinhold, Publ. Corp.,

New York, N.Y., 1931) and its supplement (Reinhold Publ. Corp., New York, N. Y., 1934), both of which are now out-of-print. While only bibliographic material is included for Chapters II, III, IV, V, VI, VII, VIII, XIV and XV, new structure illustrations (approximate number indicated in parentheses) are also included for Chapters IX, Inorganic Compounds, $R_2(MXm)_n$, (25); X, Hydrates and Ammoniates (49); XI, Misc. Inorg. Compounds (46), XII; Silicates (42); and XIII, Aliphatics (49). A number of these refer to work completed in the 1950's.

Most welcome is the inclusion of a complete index for the five volumes. The Inorganic formula index constitutes about 56 pages with ca. 4000 formulas listed; a mineralogical name index also is provided. These are intended to be placed at the end of Volume III. The organic index comprises about 40 pages and lists the names of ca. 2000 compounds.

The 5th supplement provides a check list of pages which should be in all volumes after the various sections and supplements have been integrated properly. The pagination has become somewhat complex in places but follows a logical order which is carefully described.

All interested in the structure of crystals will benefit immensely from this compendium and I am certain would wish to join this reviewer in an expression of thanks to Dr. Wyckoff for his contribution.

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Kolloidchemie. By JOACHIM STAUFF, Dr. Phil., Apl. Professor für Physikalische Chemie an der Universität Frankfurt a.M. Springer-Verlag, Heidelberger Platz 3, Berlin-Wilmersdorf, Germany. 1960. viii + 744 pp. 16.5 × 23.5 cm. Price, DM. 69.—.

The book is divided into ten large chapters. It begins with a General Introduction (42 pp.) containing some highlights of the history of colloid chemistry, definitions of major terms and classification. The two following chapters represent the center of gravity of the work (pp. 43-289) treating the physical properties of colloids: diffusion, sedimentation, osmotic pressure, viscosity, optical properties, etc. In the fourth chapter (80 pp.) are treated the surface phenomena, the fifth chapter (47 pp.) is concerned with the electrical properties of colloids, whereas in the sixth chapter the author attempts to apply statistical thermodynamics to some disperse systems. The last four chapters treat the dispersion colloids (lyophobic dispersions, emulsions, aerosols, foams), the association colloids (soaps, detergents), the macromolecules (proteins, nucleic acids, etc.), and the gels. Moreover, an appendix contains explanatory treatments of some fundamentals in thermodynamics and optics.

The "Colloid Chemistry" of Stauff is an advanced treatment with a strong emphasis on theory. This is illustrated by the fact that in chapter 2 one finds a section on statistics and two sections on statistical thermodynamics of mixtures. As a consequence, the factual side of the presentation is somewhat sketchy. For example, one finds little on the methods of preparation of dispersion colloids, whereas the theory of flocculation is treated more extensively. Emulsions and foams are described on 20 pages, and aerosols on only 6 pages. Soaps and other detergents are treated more thoroughly (53 pp.), and quite attractively. Although the choice of examples of the factual material in general is satisfactory, some important items of practical value have been omitted, e.g., the author has not mentioned the Northrop-Anson method for diffusion measurement and the precipitation titration (Fällungstitration) of G. V. Schulz. Also the Flory-Scheraga-Mandelkern equations correlating molecular weight with sedimentation constant and viscosity should be given more attention in this size book. Most regrettable, however, is the cursory indexing. The book has no authors' index, and the subject index is inadequate. For example, one finds in the index such items as amino acids, horse methemoglobin, Volta potential, but fails to find gold sols, silver sols, sulfur colloids, albumin, nitrocellulose and molecular weight. It may be doubted if one would ever look in the index for such items as "Kombinatorik" or "Polyform," but it is likely that one interested in colloids will be looking for ferric hydroxide colloids or glob-