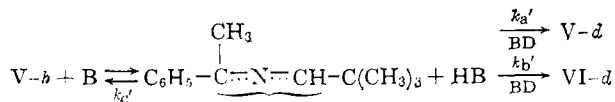


was 16.6% isomerized (ultraviolet and v.p.c. analysis). The recovered starting material (v.p.c.) was 57% isotopically exchanged (combustion and falling drop method) but only $3.02 \pm 0.06\%$ racemized. The isolated (v.p.c.) product, VI, had undergone 62% exchange of one atom of hydrogen for deuterium in the neopentyl position. The imine was hydrolyzed in acid, and the benzamide of the amine produced was analyzed (combustion and falling drop method). In a control experiment, V did not isomerize, racemize, or exchange in *t*-butyl alcohol at 75° in the absence of base.

If k_e' is the rate constant for exchange of V at the benzyl position, then $k_e'/k_i \sim 4.7$.⁵ This value approximates the ratio of rate constants for collapse of a carbanion to give V and VI (k_a'/k_b') if all carbanion collapse to V involves exchange. The % intramolecularity for conversion of V to VI is calculated from the

(5) The amount of V regenerated from carbanion at 17% conversion of V to VI is too small to affect this value substantially. The primary isotope effect, however, does affect k_e'/k_i because the value of k_i decreases as deuterium accumulates in V. A run carried to 6.6% isomerization gave $k_e'/k_i \sim 3.6$.

exchange observed in VI to be a minimum of 38%. If exchange of V before isomerization is taken into account, the intramolecularity becomes roughly 50%. Correction of the collapse ratio accordingly gives $(k_a' + k_c')/k_b' \sim 7$. If k_a' is the rate constant for racemization of the starting material, then $k_e'/k_a' \sim 28$. This value indicates that isotopic exchange of V occurs with high retention of configuration in *t*-butyl alcohol.



Clearly carbanions intervene as intermediates in these isomerization, racemization, and exchange reactions, and the claim for a bimolecular mechanism of prototropy is without secure foundation.

D. J. Cram, R. D. Guthrie

Contribution No. 1749, The Department of Chemistry
The University of California at Los Angeles

Los Angeles 24, California

Received August 24, 1964

Book Reviews

Separation Methods in Biochemistry. By C. J. O. R. MORRIS, Ph.D., and P. MORRIS, B. Sc., Department of Experimental Biochemistry, London Hospital Medical College. John Wiley and Sons, Inc., 605 Third Ave., New York 16, N. Y. 1964. 887 pp. 16 × 23.5 cm. Price, \$17.50.

This book might have been given a title such as "Chromatography and Related Methods" since more than two-thirds of the book is devoted to chromatography. Much of the remainder discusses the related differential migration methods of counter-current distribution (one chapter) and electrophoresis (two chapters). There is also a chapter on membrane separation and one on miscellaneous methods (differential sedimentation and differential solubility). The part of the book on chromatography is organized into the classical divisions of adsorption, partition, and ion exchange. In each case there are separate chapters on theory, experimental methods, and applications. Paper chromatography is considered separately. There are also chapters on general theory and detection of solutes in effluents.

The emphasis on chromatography does not reflect a bias of the authors but rather the current state of biochemistry. As the authors note, it is only necessary to peruse recent biochemical journals to be impressed by the importance which chromatographic methods have achieved. This revolution has occurred in recent years and is only now approaching a plateau where further advances will be largely technical improvements. For this reason, this book appears at an opportune time. It includes the most recent techniques (such as gradient elution and molecular sieve chromatography) and should not soon be out of date.

Since the book has only two authors, it has the coherence which is so often lacking when there are many authors. At the same time it does not suffer greatly from the fact that two authors cannot be expert in every area discussed. The writing is clear, the organization is logical, and coverage of the subject is detailed and in general complete.

A good index, a comprehensive (though not complete) bibliography, and the inclusion of experimental details and numerous tables and figures make this book valuable as a reference. However, I would foresee its greatest use as a textbook for a graduate course in biochemical separation methods or chromatography. Its writing arose out of a series of lectures, and perhaps its availability will

stimulate the addition of this course to graduate school curriculums.

Karl A. Piez

National Institute of Dental Research
National Institutes of Health, Bethesda, Maryland

Neutron Irradiation and Activation Analysis. By DENIS TAYLOR, Chief Scientist, Plessey Company (U. K.) Ltd. D. Van Nostrand Co., Inc., 120 Alexander St., Princeton, N. J. 1964. ix + 185 pp. 14 × 22.5 cm. Price, \$8.75.

The rapidly increasing application of radioactivation analysis makes this a most welcome book for anyone interested in problems in chemical analysis and for the student, especially in view of the paucity of books in the field.

Little knowledge of the phenomena of radioactivity is assumed. For those who feel the need of some review of such information, a summary of the fundamentals of radioactive decay characteristics and measurement is given in an appendix. As the title suggests, the discussion of activation analysis is limited to that following neutron irradiation, the most available type. In addition to the usual modern methods employed in activation analysis, with and without chemical separations, the use of the more recently developed technique of measuring the "prompt radiation" emitted after neutron capture is also emphasized.

Numerous illustrations of applications to analysis are given. These have been carefully selected with a view to bringing out the variety, sensitivity, errors, limitations, and difficulties of which one should be aware in making the necessary measurements. The application of automation, including possible use of computers, to instrumental radioactivation analysis is the subject of one chapter. The closing chapter takes a brief look at special applications, some current and some for future development.

The book is recommended as supplying an excellent review of the modern aspects of activation analysis. It is not intended as a text or operations manual; such information can be obtained from the numerous references to the original literature.

Edwin O. Wiig

Department of Chemistry
The University of Rochester, Rochester, New York