correction, ΔR, are given in Table II. The results are, of course, quite independent of any assumptions that may be made concerning the valencies of the elements concerned.

TABLE I

DATA USED

Element	Form	a_0, kX.	c_0, kX.	Temp., ° C.	Coefficient of thermal expansion × 10^{-6}	R(C.N.12) at 20°, kX.
Fe	α	2.861	..	20		1.273
	γ	3.649	..	950	12[5]	1.276
Ti	α	2.945	4.674	25		1.459
	β	3.32	..	900	9[6]	1.463
Zr	α	3.223	5.123	room		1.597
	β	3.61	..	867	7.5[7]	1.594
Tl	α	3.449	5.520	room		1.713
	β	3.874		262	30[8]	1.708

Room temperature taken as 20°.

TABLE II

VALUES OF ΔR

Element	Value of ΔR Calcd.	Value of ΔR Obs.	Difference in ΔR
Fe	0.033	0.036	+0.003
Ti	0.036	0.032	−0.004
Zr	0.039	0.042	+0.003
Tl	0.041	0.046	+0.005

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(7) R. B. Russell, M.I.T. report No. 1073, October 1951.

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ATOMIC ENERGY RESEARCH ESTABLISHMENT, HARWELL, BERKSHIRE, ENGLAND
J. THEWLIS

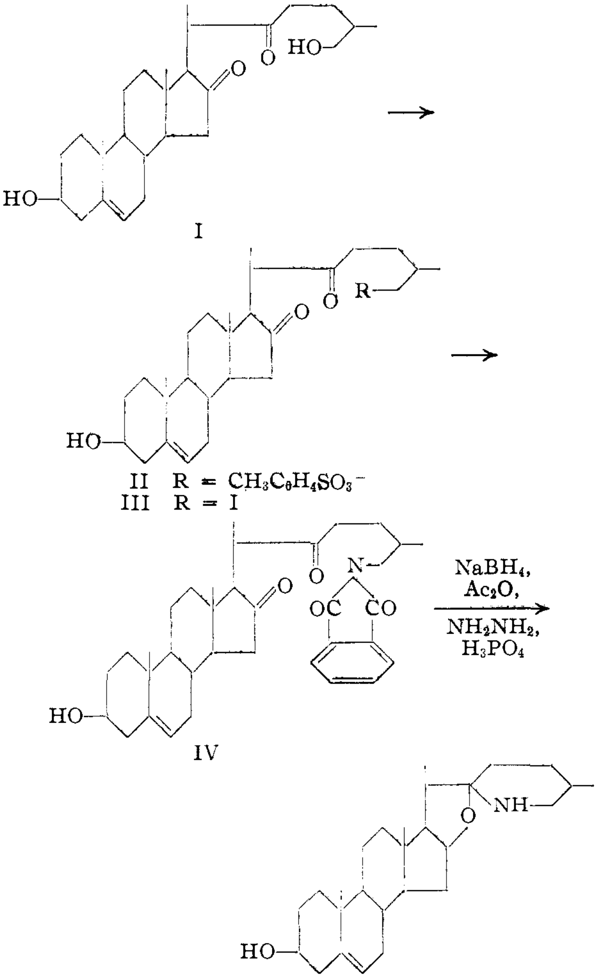
RECEIVED MARCH 12, 1953

THE TRANSFORMATION OF KRYPTOGENIN TO SOLASODINE

Sir:

Inasmuch as the secondary veratrum and solanum alkaloids yield nitrogenous degradation products identical with those derived from their tertiary congeners, the secondary alkamines may be presupposed not remotely allied in skeletal structure to the octahydropyrrocoline nucleus characteristic of solanidine,[1] rubijervine, isorubijervine, and, presumably, of cevine, germine, protoverine and zygadenine. While jervine and veratramine have been categorized as complex 2-substituted-5-methylpiperidine derivatives[2] and steroid C_{20} piperidine derivatives of this type have become available by partial synthesis,[3] a further skeletal variation consonant with the chemical behavior of other members of these series finds expression as a hexacyclic aminoketal formulation related to that which characterizes the well known spiroketal sapogenins. This representation was first considered as a theoretical possibility in earlier studies on the chemistry of jervine[4] and has more recently been incorporated into the structural postulates advanced for solasodine,[5] tomatidine,[6] and solanocapsine.[7] Solasodine has now been obtained by partial synthesis from non-nitrogenous, naturally occurring steroids.

Kryptogenin, I, has been converted to the mono-*p*-toluenesulfonate II, m.p. 165–166°, $[\alpha]^{25}D$ −144° ($CHCl_3$), *Anal.* Calcd. for $C_{34}H_{48}SO_6$: C, 69.82; H, 8.27; S, 5.48. Found: C, 69.82; H, 8.20; S, 5.28, which, in turn, has been transformed through the iodide III, m.p. 141–142°, $[\alpha]^{25}D$ −161° ($CHCl_3$), *Anal.* Calcd. for $C_{27}H_{41}O_3I$: C, 59.99; H, 7.65; I, 23.48. Found: C, 60.20; H, 7.76; I, 23.20, to the corresponding phthalimido-derivative IV, m.p. 213–214°, *Anal.* Calcd. for $C_{35}H_{45}NO_5$: C, 75.10; H, 8.10; N, 2.50. Found: C, 74.91; H, 8.01; N, 2.60. Reduction of IV with sodium borohydride, followed by treatment with acetic anhydride and subsequent cleavage with hydrazine and phosphoric acid, has afforded solasodine, V, m.p. 200–201°, $[\alpha]^{24.8}D$ −102°



I

II R = $CH_3C_6H_4SO_3^-$
III R = I

IV

V

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(2) J. Fried, O. Wintersteiner, M. Moore, B. M. Iselin and A. Klingsberg, THIS JOURNAL, **73**, 2970 (1951); O. Wintersteiner and N. Hosansky, *ibid.*, **74**, 4474 (1952).

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(5) L. H. Briggs, W. E. Harvey, R. H. Locker, W. A. McGillivray and R. N. Seeyle, *J. Chem. Soc.*, 3013 (1950).

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(7) E. Schlittler and H. Uehlinger, *Helv. Chim. Acta*, **35**, 2034 (1952).

(methanol, $c = 0.33$), *Anal.* Calcd. for $C_{27}H_{43}NO_2$: C, 78.40; H, 10.48; N, 3.39. Found: C, 76.41; H, 10.45; N, 3.42, mixed melting point and infrared spectrum identical with that given by an authentic specimen of solasodine; picrate, m.p. 141–142°, *Anal.* Calcd. for $C_{33}H_{46}N_4O_9$: C, 61.66; H, 7.21; N, 8.72. Found: C, 62.00; H, 7.30; N, 8.95.

The partial synthesis of spiroaminoketal steroid alkaloids by transformation from the sapogenins tigogenin, sarsasapogenin and diosgenin, will be reported shortly.

The author is indebted to Mr. Louis S. Harris and Miss V. Cecile Politis for preparative assistance, to Dr. James A. Moore and Dr. E. L. Wittle, Parke, Davis and Company, for a quantity of kryptogenin diacetate, to Dr. S. M. Nagy and associates of the Massachusetts Institute of Technology for the analytical and spectroscopic determinations, to Prof. L. H. Briggs, Auckland University College, Auckland, New Zealand, for an authentic specimen of solasodine, and to the United States Public Health Service, the Eugene Higgins Trust, and Parke, Davis and Company, of Detroit, Michigan, for financial support.

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BOOK REVIEWS

Colloid Science. Volume I. Irreversible Systems. By H. R. KRUYT, Formerly Professor of Physical Chemistry, Utrecht University, President of the National Council for Applied Scientific Research in the Netherlands, T.N.O., The Hague; English translation by Dr. L. C. Jackson (Bristol). Elsevier Publishing Company, 402 Lovett Blvd., Houston, Texas, 1952. xx + 389 pp. 16.5 × 25 cm. Price, $11.00.

This treatise on colloid science was "for practical reasons" divided into two volumes. Volume I deals with *irreversible systems*, hydrophobic colloids, and Volume II with *reversible systems*, macromolecular and association colloids. Work was started on these volumes prior to World War II but as pointed out by the editor "through accidental circumstances" Volume II was completed and published in 1949 three years before the appearance of Volume I. The volumes were written by the Editor and Dutch collaborators so that the work as a whole is largely representative of the interests and researches of the highly regarded and the highly productive Dutch School of Colloid Science.

Volume I is divided into nine sections. Section I, written by Kruyt, consists of 57 pages, 15 of general introduction discussing the scope and history of colloid systems according to the "material of the particles," followed by 42 pages of discussion of general properties of colloid systems. Many of the topics of this introduction are further developed in later sections. Section II, 51 pages written by J. Th. G. Overbeek and entitled Phenomenology of Lyophobic Systems, is general in nature and relates to methods of preparation of lyophobic sols, to purification of sols, and to properties and stability of sols with theoretical considerations on stability and flocculation. The content of this section is material one might hope to find in a portion of any well organized college text book on colloids. Section III, 25 pages written by G. H. Jonker, deals with a condensed treatment of optical properties of colloidal solutions. Sections IV to IX inclusive, all by Overbeek deal with (IV) Electrochemistry of the double layer, (V) Electrokinetic phenomena, (VI) Interaction between colloidal particles, (VII) Kinetics of flocculation, (VIII) Stability of hydrophobic colloids and emulsions, and (IX) Rheology of lyophobic systems. These sections include material from the fundamental and more generally accepted researches which have been made in the fields represented. Each of these sections is well organized, interestingly presented and ably treated by the author whose own research interests happen to be closely related to these fields.

A minor criticism of the English language edition of Volume I is that, though the translation is adequate for understanding, one is often conscious of reading a translation from a foreign language. The main criticism which will be made of this volume is that many important areas of colloid science are not represented here nor in Volume II. The authors are fully aware of this shortcoming and state in the preface "The present work has no pretention of being a complete thesis. It is only meant to be a guide to the domain of colloid science with the (object) of providing a stimulus in the branch of research with which it deals." The editor and his collaborators have succeeded in their objective. This volume, and its companion volume, will serve to stimulate interest in this continuously expanding field of science. These volumes will probably prove to be of special value as reference books and should be available to all teachers and research workers whose interests carry them into the realm of colloid science.

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Neutron Cross Sections. A Compilation of the AEC Neutron Cross Section Advisory Group. By D. J. HUGHES, Chairman, Advisory Group. Office of Technical Services Department of Commerce, Washington, D. C. 1952. xiv + 186 pp. 42 × 28 cm. Price, $1.00.

This book contains a table giving thermal neutron cross sections and, in addition, a set of experimental curves showing the variation of nuclear cross section (usually σ total) as a function of energy for isotopes scattered throughout the periodic table. In the Introduction the compilers state that they have not included all known data but have assembled what in their judgment is a set of "best values." Since the experimental information now available in this field is far from complete, the curves necessarily cover only a portion of the neutron energy spectrum, generally in the region under 10 Kev., although some extend to 100 Mev.

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Annual Review of Physical Chemistry. Volume 3. By G. K. ROLLEFSON, Editor, University of California and R. E. POWELL, Associate Editor, University of California. Annual Reviews, Inc., Stanford, California. 1952. x + 416 pp. 16 × 23 cm. Price, $6.00.

About a half century ago, it became evident that a scientist could not keep informed about all the published work of