

of an alcohol containing one more carbon atom, as described by Wojcik and Adkins.³ No other hydrocarbon was isolated in quantity sufficient for identification, although there was some evidence that a fraction boiling at 130–50° contained *n*-nonane. However, inasmuch as dodecyl and tetradecyl alcohols are the principal constituents of "Lorol," the amount of hydrocarbon formed from any of the other alcohols present should be small.

(3) Wojcik and Adkins, *THIS JOURNAL*, **55**, 1293 (1933).

DEPARTMENT OF CHEMISTRY
JOHNS HOPKINS UNIVERSITY
BALTIMORE, MARYLAND

RECEIVED JUNE 7, 1933
PUBLISHED SEPTEMBER 5, 1933

COMMUNICATIONS TO THE EDITOR

PHOSPHOROUS FLUROCHLORIDES

Sir:

We have found that the fluorination of PCl_3 by SbF_3 in the presence of SbCl_5 ¹ yields three gases, PF_3 in large amounts and two new gases, PF_2Cl boiling at approximately -48° and melting at approximately -166° , and small amounts of a PFCl_2 boiling a little below room temperature. These new substances are colorless both as gas and liquid, and fume in moist air. Variations of the experimental conditions indicate that the best yields are obtained when 450 parts of PCl_3 and 10 parts of SbCl_5 are vigorously stirred while sublimed SbF_3 is slowly added at room temperature.

The low yields by the above method caused us to try converting the PF_3 to the fluorochlorides. It was found that by passing an equimolecular gaseous mixture of PCl_3 and PF_3 through a glass tube filled with broken porcelain heated by an electric furnace so that the temperature of the exit gases was 200° , 50% of the mixture was converted to PF_2Cl and PFCl_2 in one pass. We are trying this same general method on mixtures of other non-polar chlorides and fluorides. The complete results of these investigations will be reported later.

(1) Booth and Swinehart, *THIS JOURNAL*, **54**, 4751 (1932).

MORLEY CHEMICAL LABORATORY
WESTERN RESERVE UNIVERSITY
CLEVELAND, OHIO

HAROLD SIMMONS BOOTH
ABE R. BOZARTH

RECEIVED JUNE 30, 1933 PUBLISHED SEPTEMBER 5, 1933

AN ATTEMPT TO PREPARE A CHLORIDE OR FLUORIDE OF XENON

Sir:

Frequent attempts have been made to prepare compounds of the noble gases with more electronegative elements, but the results have not been

satisfyingly definite. Von Antropoff¹ has described briefly some experiments which indicate that krypton chloride and bromide exist, but no determinations of their composition and physical properties have been published. Both von Antropoff¹ and Pauling² have suggested that combination might possibly result with krypton or, more probably, with the heavier xenon. We have carried out experiments in which xenon was mixed with both chlorine and fluorine in an attempt to obtain these halides of xenon.

A mixture of xenon (70 mm.) and chlorine (225 mm.) contained in a quartz tube was irradiated with the light from a mercury arc in Pyrex and in quartz, and from a carbon arc. The source of light in all cases was placed close to the container. The pressure was measured by means of a Pyrex click gage attached through a graded seal to the quartz vessel. In no case was any pressure change observed during or at the end of a twelve-hour exposure. When the gas mixture was condensed by means of liquid air, a small amount of red solid was observed whose color disappeared shortly after removing the liquid air. The mixture was next transferred to a Pyrex bulb equipped with tungsten electrodes. After sparking for varying periods of time and then condensing the contents of the bulb with liquid air, larger amounts of the red solid noted above appeared. A number of tests showed that, in all probability, the red substance was the colored modification of hydrogen chloride described by Giauque.³ Small amounts of hydrogen chloride are difficult to remove from chlorine and it was doubtless present as an impurity; some may have also been formed by the action of the highly activated chlorine on small amounts of water adsorbed on the walls of the vessel. No definite evidence for the presence of a xenon chloride was found.

It was found that fluorine, carefully freed from hydrogen fluoride, could be kept for an indefinite period in quartz bulbs which had been baked out under vacuum.⁴ The small amount of silicon tetrafluoride and oxygen formed as the result of sealing the bulbs at long narrow capillary constrictions did not appear to promote any etching action. By means of quartz "break-offs" a mixture of some 600 mm. of fluorine and 30 mm. of xenon was prepared in an all-quartz apparatus provided with copper electrodes. On condensing the mixture in a side tube at -210° no visual evidence of the existence of anything except liquid fluorine and solid xenon was observed. When the refrigerant was removed the fluorine boiled away rapidly, leaving a volatile white solid with all the properties of xenon. A high voltage (30 k.v.) discharge was then passed through the mixed gases for varying intervals of time. The contents of the apparatus were con-

(1) Von Antropoff, Weil and Frauenhof, *Naturwissenschaften*, **20**, 688 (1932).

(2) Private communication.

(3) Giauque, *THIS JOURNAL*, **50**, 101 (1928).

(4) See also von Wartenberg, Sprenger and Taylor, *Z. physik. Chem., Bodenstein Festband*, 61 (1931).

densed out frequently, but the appearance and properties were no different from those observed before applying the discharge. It was noted that the side tube was appreciably attacked after some time, and this might be due to the action of a reactive xenon fluoride (compare rhenium hexafluoride) or to the presence of a small amount of moisture in the xenon. It cannot be said that definite evidence for compound formation was found. It does not follow, of course, that xenon fluoride is incapable of existing. It is known, for example, that nitrogen and fluorine do not combine in an electrical discharge, but when prepared indirectly nitrogen trifluoride is a very stable compound.

We are greatly indebted to Dr. F. J. Allen, who kindly supplied the xenon used in the experiments.

CONTRIBUTION NO. 371 FROM THE
GATES CHEMICAL LABORATORY
CALIFORNIA INSTITUTE OF TECHNOLOGY
PASADENA, CALIFORNIA

DON M. YOST
ALBERT L. KAYE

RECEIVED JULY 7, 1933

PUBLISHED SEPTEMBER 5, 1933

PREPARATION OF PURE 1-BUTENE AND ISOBUTENE

Sir:

Recently [*Compt. rend.*, **196**, 973 (1933)] Matignon, Moureu and Dode reported that pure aluminum oxide yields only 85% of 1-butene, the remainder being 2-butene.

This is not in agreement with the results previously obtained in our laboratories where it has been found that 1-butene without a trace of 2-butene can be prepared by the dehydration of *n*-butyl alcohol with aluminum oxide. The procedure is as follows: *n*-butyl alcohol is passed with a speed of 75 g. per hour through a glass tube (length, 50 cm.; inner diameter, 2 cm.), filled with 6-8 mesh aluminum oxide and maintained at a temperature of 375-425°. The butenes formed are collected and subjected to distillation in a low-temperature Podbielniak precision distilling apparatus [*Ind. Eng. Chem., Anal. Ed.*, **5**, 172 (1933)].

The aluminum oxide was prepared by the precipitation of aluminum nitrate with ammonium hydroxide; activated alumina received from Alcoa Ore Company, St. Louis, Missouri, gives 1-butene 99.6% pure.

The discrepancy between these results and those of Matignon, Moureu and Dode lies probably in the fact that these authors analyzed the product by converting it into dibromide and subjecting the dibromide to distillation. This method of analysis is not a very reliable one, since isomerization of dibromide can readily take place during the distillation.

V. N. Ipatiev [*Ber.*, **36**, 2011 (1903)] obtained pure isobutene by the dehydration of isobutyl alcohol using aluminum oxide. This work has

been repeated in our laboratories and isobutene 100% pure is obtained by this method.

RESEARCH AND DEVELOPMENT LABORATORIES
UNIVERSAL OIL PRODUCTS COMPANY

HERMAN PINES

RECEIVED JULY 24, 1933

PUBLISHED SEPTEMBER 5, 1933

**REMARKS CONCERNING THE PAPER OF G. P. BAXTER AND C. M. ALTER
"THE ATOMIC WEIGHT OF LEAD FROM KATANGA PITCHBLENDE"**

Sir:

G. P. Baxter and C. M. Alter [THIS JOURNAL, **55**, 2785 (1933)] discuss the theory of the origin of the actinium series [Grosse, *Phys. Rev.*, **42**, 565 (1932)] on the basis of their careful and thorough experimental investigations of the atomic weight of uranium lead from Katanga pitchblende. They find that the lead extracted from the altered yellow portions of the mineral has a lower atomic weight than the lead from the original pitchblende and see in this fact a contradiction to the theory.

We consider that their findings support the theory and think the following the most plausible explanation of the facts.

It is usually considered by mineralogists and geologists [see for instance A. Holmes, "The Age of the Earth," pp. 207-217; G. Kirsch, "Geologie and Radioaktivitat," Chapter III] that lead is leached out from pitchblendes with much greater difficulty than uranium. This is due (1) to its much smaller concentration; (2) to the fact that it forms an insoluble uranate, and generally, because of its chemical nature, lead is much less soluble in acid and alkaline waters than uranium, which easily gives soluble uranyl complex salts. It is, therefore, natural to conclude that the uranium, leached out of the original mineral and redeposited in its veins and crevices, will be, to a great extent, free from U-Pb and being of a younger age, will produce, according to the actino-uranium theory, U-Pb containing less AcD and which therefore will have a lower atomic weight, as was actually found by Baxter and Alter. Furthermore, since this secondary uranium mineral is much more exposed to further leaching, its Pb/U ratio might be easily higher than the true ratio and lead to a wrong estimate of its age.

All of these considerations are only valid in the absence of ordinary lead. A strong indication that such is the case here is given by the low atomic weight figures of Baxter and Alter and is definitely proved by F. W. Aston's mass analysis of Katanga lead [*Nature*, **129**, 649 (1932)].

In conclusion we may state that the actino-uranium theory offers new possibilities for checking geological age determinations and elucidating the phenomena of leaching and other alterations of uranium minerals.

KENT CHEMICAL LABORATORY
UNIVERSITY OF CHICAGO
CHICAGO, ILLINOIS

A. V. GROSSE

RECEIVED JULY 27, 1933

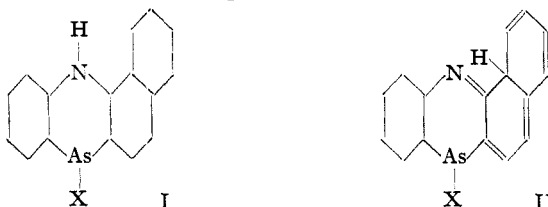
PUBLISHED SEPTEMBER 5, 1933

EVIDENCE FOR AN ASYMMETRICAL TRIVALENT ARSENIC ATOM

Sir:

The resolution of trivalent nitrogen compounds having three different substituent groups has long baffled organic chemists. Based on certain observations recorded in the literature, it would seem that when a molecule contains a nitrogen atom surrounded by three different groups and a lone pair of electrons, it should be asymmetrical, and capable of resolution if it contains the radicals usually employed for this purpose. Failure to accomplish this has been explained in several ways, one of which is that racemization is so rapid that the optically active molecule has too short a life. Assuming that the presence of additional shells of electrons around the kernel would tend to make a more stable arrangement, a properly constituted trivalent arsenic compound might be capable of resolution, thus showing that such a substance is asymmetrical.

7-Chloro-7,12-dihydro- γ -benzophenarsazine (Formula I, X = Cl) is such



a substance. On treatment with silver *d*-bromocamphor sulfonate, dimers (A, B) having different rotations are obtained.

Subs.	Sp. rot.	Mol. rot.	Calcd. half life, min.	Calcd. sp. rot. for As radical
A	+35.11°	+211.4°	70	-24.68°
B	+59.52°	+358.4°	36	+22.65°

Although the arsenic compound has not yet been regenerated from the camphor complex, the formation of these dimers indicates the presence of two asymmetric centers, one of which is in the camphor residue. Both the arsenic and nitrogen atoms are asymmetrical as represented, but since there is yet no recorded case of optical activity of compounds containing trivalent nitrogen, the activity in this instance is probably due to the arsenic. The existence of an asymmetric carbon atom, formed by a 1,3-shift of hydrogen (Formula II), though not excluded seems improbable.

MCGILL UNIVERSITY
MONTREAL, CANADA

C. F. H. ALLEN
F. B. WELLS

RECEIVED JULY 31, 1933

PUBLISHED SEPTEMBER 5, 1933

 ARSENATED DERIVATIVES OF PHENOBARBITAL

Sir:

An investigation of arsenated derivatives of phenobarbital undertaken several years ago in this Laboratory involves the use of 5-nitrophenyl-5-

ethylbarbituric acid and related compounds described by Bousquet and Adams [THIS JOURNAL, 52, 227 (1930)]. Through the Bart reaction, 5-aminophenyl- and 5-nitroaminophenyl-5-ethylbarbituric acids have been converted into the arsonic acids, 5-arsonophenyl- and 5-nitroarsonophenyl-5-ethylbarbituric acids. By means of hypophosphorous acid the latter were reduced to the corresponding arseno compounds.

During the research it became necessary to establish the position of the nitro group in the starting product and it was shown to be meta. In view of a recent article in this field [Rising, Shroyer and Stieglitz, *ibid.*, 55, 2819, footnote (1933)] in which mention is made of a forthcoming communication by Rising and Pierce concerning the structure of 5-nitrophenyl-5-ethylbarbituric acid, a brief outline is given here of the method of proof used in our work. 5-Nitrophenyl-5-ethylbarbituric acid (m. p. 279–280°) [all melting points are corrected] \rightarrow (nitrophenylethylmalonic acid) \rightarrow α -nitrophenylbutyric acid (80% yield, m. p. 115.5–116.3°; neutral equivalent 210, calcd. 209.1) \rightarrow *m*-nitrobenzoic acid (60% yield, m. p. 141–142°; identity confirmed by mixed m. p.).

5-*m*-Aminophenyl-5-ethylbarbituric acid was converted to a 5-(nitro-*m*-aminophenyl)-5-ethylbarbituric acid (dec. 330–340°) by the method of Bousquet and Adams, and by elimination of the amino group a new isomeric 5-nitrophenyl-5-ethylbarbituric acid (dec. 327–330°) was obtained. In the latter the nitro group may occupy the ortho or para position; the difficulty of hydrolyzing this compound has prevented us from establishing its structure.

BAKER LABORATORY OF CHEMISTRY
CORNELL UNIVERSITY
ITHACA, NEW YORK

MILTON T. BUSH
JOHN R. JOHNSON

RECEIVED AUGUST 2, 1933

PRINTED SEPTEMBER 5, 1933

THE NITRATION OF PHENOBARBITAL

Sir:

As stated in a previous publication [THIS JOURNAL, 55, 2817 (1933)] the authors have proved that the nitration of phenobarbital



leads to the formation of 5-*m*-nitrophenyl-5-ethylbarbituric acid.^{1,2} That the product of nitration of melting point 279–280° (corr.) is the meta, and not the para, isomer was proved as follows: 8.4 g. of the nitro-ureide yielded on oxidation 1.0 g. of *m*-nitrobenzoic acid, which was identified by

(1) In confirmation of the findings of the present authors, Bush and Johnson have recently offered evidence for the formation of the meta rather than the para derivative.

(2) It is of interest to note that the sulfonation of phenobarbital leads to a meta derivative. (Stieglitz and Yorán, unpublished dissertation for the doctorate degree, University of Chicago, June, 1933).

means of comparing its properties and those of the corresponding amino acid with the behavior of authentic samples of these substances. The nitrophenobarbital of melting point $279-280^{\circ}$ must therefore be a *m*-nitro compound.

Residues obtained by evaporation of the alcohol used for purification of the crude nitration product will be examined for ortho and para nitro-derivatives.

GEORGE HERBERT JONES CHEMICAL LABORATORY
THE UNIVERSITY OF CHICAGO
CHICAGO, ILLINOIS

MARY M. RISING
ALAN PIERCE

RECEIVED AUGUST 7, 1933

PUBLISHED SEPTEMBER 5, 1933

THE ACTION OF ELECTROLYTES ON WOOL FIBER

Sir:

During an x-ray investigation of the mordant dyeing of wool, an interesting phenomenon was observed. Using monochromatic radiation ($\text{Cu K}\alpha$) and mounting the fiber in a box type Laue camera in place of the usual crystal, pure wool fiber gives a very indistinct fiber diagram as contrasted with that obtained from the coarser keratin fibers [W. T. Astbury, *Trans. Faraday Soc.*, **29**, 193 (1933)] such as hair, quills and feathers. However, when this wool has been treated with certain electrolytes, two quite sharp and distinct rings appear. The inner ring is the more intense of the two, corresponding to a spacing of 4.08 \AA ., while the outer and lighter ring corresponds to a spacing of 3.72 \AA .. In the case of some of the wool samples, a broad ring quite close to the primary beam was observed corresponding to a spacing of 12.9 \AA .. Table I is a summary of the results obtained with all of the electrolytes that have been used. The third column indicates in a very approximate manner the visibility of the two lines (4.08 and 3.72 \AA .) as observed on diagrams obtained after various treatments, relative to the type of treatment. It is interesting to note that wool which has been dyed as in a regular industrial process shows these two rings. The dye used throughout this work was commercial Orange II furnished through the courtesy of the Dupont Dye Company. NaX signifies the sodium salt of this dye. The wool fiber used was also furnished by the Dupont Dye Company.

It is suggested that the action of electrolytes, particularly those of an acid character, causes the wool protein to become crystalline to some extent and that these crystallites so formed are unoriented along the fiber axis as evidenced by the character of the rings. Table II shows the results of a calculation that would lead one to believe that these three rings are but high orders of a period of 77.8 \AA . in length. The data in Table II are averages of all the observations made on many films. The rings on the

TABLE I

Nature of electrolyte	Treatment	Relative visibility of rings on diagram
NaX (5%)	Boiled 5 hours and rinsed in dist. water	Very good
NaX (5%)	Boiled 5 hours and washed 10 hours in boiling water	Faint but distinct
AlCl ₃ (5%) and NaX (5%)	Boiled in AlCl ₃ 2 hours, NaX 10 min. rinsed	Good
CrCl ₃ (5%) and NaX (5%)	Boiled in CrCl ₃ 30 min. NaX 10 min. (soln. 1.5 N HCl)	Faint but distinct
HCl (1.5 N)	boiled in water for 1 hour	
CrCl ₃ (5%)	Boiled in CrCl ₃ 2 hours NaX 10 min. rinsed (all solns. 1.5 N HCl)	Good
NaX (5%)		
HCl (1.5 N)		
HCl (1 N)	Boiled 24 hours, rinsed	Very good
HC ₂ H ₃ O ₂ (1 N)	Boiled 16 hours, rinsed	Very good
H ₂ SO ₄ (0.5 N)	Boiled 16 hours, rinsed	Good
NaOH (3% of wool weight)	Boiled 3 hours, rinsed	Not definite but seems indicated
Na ₂ CO ₃ (3%)	Boiled a few minutes until considerably decomposed	Not definite but seems indicated
NaCl (10%)	Boiled 16 hours, rinsed	Very faint
KI (10%)	Boiled 16 hours, rinsed	Good
NaC ₂ H ₃ O ₂ (10%)	Boiled 16 hours, rinsed	Faint but distinct
Na ₂ SO ₄ (1 M)	Boiled 16 hours, rinsed	Very faint
NaH ₂ PO ₄ (1 M)	Boiled 16 hours, rinsed	Faint but distinct
AlCl ₃ (1 M)	Boiled 5 hours, rinsed	Very faint
AlCl ₃ (1 M)	Boiled 20 hours, rinsed	Faint but distinct
AlCl ₃ (1 M)	Boiled 48 hours, rinsed	Good
Mordant and dye baths	Mordanted and dyed as in commercial process	Faint but distinct

various plates were precisely the same within the experimental error of measurement. Astbury gives 2.8 Å. as the length of a protein residue in wool. The length 77.8 Å. could be divided into 28 periods of 2.78 Å. each, which is very nearly Astbury's value for one protein residue.

TABLE II

Sin θ	d ($n=1$)	Intensity	Assumed n	$\frac{\text{Sin } \theta}{n}$	% Deviation from average
0.05960	12.9	Strong	6	0.00993	+0.4
0.18824	4.08	Medium	19	.00991	+0.2
0.20677	3.72	Weak	21	.00985	-0.4

$$\text{Average sin } \theta/n = 0.00989$$

$$d = 1.54/(2 \times 0.00989) = 77.8 \text{ \AA.}$$

CHEMICAL LABORATORY
JOHNS HOPKINS UNIVERSITY
BALTIMORE, MARYLAND

DONALD A. WILSON
NEIL E. GORDON

RECEIVED AUGUST 10, 1933

PUBLISHED SEPTEMBER 5, 1933

FREE PHENYL RADICALS IN THE GAS PHASE

Sir:

In the past few years a number of investigators have demonstrated the existence of active gaseous hydrocarbon molecules in experiments in which various types of substances were thermally decomposed. These have been called free radicals. So far only the methyl and ethyl radicals have been reported. In some experiments which we have been performing we have strong indications of the existence of the free phenyl radical in the gas phase.

The apparatus was made of quartz and consisted of a chamber to contain the lead tetraphenyl, a short region inside an electric furnace inclined slightly from the horizontal, a chamber to retain the liquid and crystalline products formed (chiefly diphenyl) and a chamber in which mercury was kept refluxing. The procedure was similar to that used in our work on the chemical reactions of gaseous methyl and ethyl [THIS JOURNAL, 55, 2696 (1933)]. The lead tetraphenyl was kept just below its melting point (215–220°) and the apparatus run for six hours at an indicated pressure of 0.01 mm.

The deposit formed in the mercury reflux chamber was recrystallized from alcohol. Among the characteristic broad crystals of diphenyl there appeared scattered needle-like crystals. Several were picked out and an attempt made to determine their melting point. This was in the region of 120° as near as could be determined with this small sample. The melting point of mercury diphenyl is 120°. A qualitative analysis showed mercury.

As neither lead tetraphenyl nor diphenyl reacts with mercury vapor, we believe that active phenyl radicals were present. Further work is in progress on this problem.

DEPARTMENT OF CHEMISTRY
DEPAUL UNIVERSITY, CHICAGO

M. F. DULL
J. H. SIMONS

RECEIVED AUGUST 16, 1933 PUBLISHED SEPTEMBER 5, 1933

THE FORMATION OF FREE RADICALS FROM ALIPHATIC AZO COMPOUNDS

Sir:

In view of the publication of a communication on this subject by Leermakers [THIS JOURNAL, 55, 3499 (1933)] it seems desirable to publish an account of some work we performed in this connection in August, 1931. We found that both azomethane and azoisopropane readily remove antimony mirrors when passed through a furnace heated in the range 450–550°; acetone was used as the carrier gas. The temperature of the furnace was far too low to cause any perceptible decomposition of the acetone.

At that time we were more particularly interested in azoisopropane

because it seemed to offer the possibility of preparing the free isopropyl group. Paneth and his co-workers [*Ber.*, **62**, 1335 (1929); **64**, 2702, 2708 (1931)] had already prepared free methyl and ethyl but had failed to obtain the *n*-propyl or the isobutyl radicals from the corresponding lead compounds; they concluded that a large proportion of the *n*-propyl and isobutyl radicals must have decomposed into methyl groups since zinc dimethyl was identified among the products. It occurred to us, however, that the isopropyl and tertiary butyl radicals should have about the same stability as the ethyl radical, since in all three cases a C-H bond must break in order for the radical to decompose with production of an olefin hydrocarbon, whereas all other paraffin radicals can undergo this decomposition by rupture of a C-C bond. This may be easily seen from the examples given in a previous paper [Rice, *THIS JOURNAL*, **55**, 3036 (1933)].

We first made some measurements of the rate of disappearance of the active fragments according to the method described by Rice, Johnston and Evering [*THIS JOURNAL*, **54**, 3529 (1932)]. The following table gives the results obtained with a 1% solution of azoisopropane in acetone, using a quartz tube 0.4 cm. in diameter and an acetone pressure at the standard mirror of 0.22 mm. of mercury; the fall in pressure down the tube was 0.007 mm. per cu.

<i>d</i> , cm.	15	22	11	30	25	18	13	28	20	30	24
<i>t_m</i> , sec.	51	118	33	225	275	71	42	275	83	305	270

d is the distance from the furnace to the standard mirror and *t_m* is the time of removal of the standard mirror. These results were plotted and compared with the curve obtained for lead tetramethyl under identical conditions. The first parts of the two curves coincide exactly, but at distances greater than 20 cm. from the furnace the concentration of active fragments does not fall off as rapidly in the case of azoisopropane as in the experiments with lead tetramethyl. This behavior would seem to indicate the formation of a fragment of comparatively long life during the decomposition of azoisopropane. However, at that time we had not yet developed any convenient method of identification and therefore could not determine conclusively whether the isopropyl group was formed, perhaps undergoing partial decomposition into propylene and atomic hydrogen.

JOHNS HOPKINS UNIVERSITY
BALTIMORE, MARYLAND

F. O. RICE
B. L. EVERING

RECEIVED AUGUST 19, 1933

PUBLISHED SEPTEMBER 5, 1933

INDIUM AND SCANDIUM IN PEGMATITE

Sir:

Indium and scandium have been found in a pegmatite dyke in Western Utah. Analyses of samples taken at random along the dyke indicate 1.0-2.8% indium and 0.5-1.2% scandium.

It is interesting to note that these metals do not occur in connection with zinc. The chief minerals of the deposits are cordierite, actinolite, antigorite, calcite and molybdenite. Apparently the indium occurs as a partial replacement of aluminum in cordierite. The mode of occurrence of the scandium has not yet been determined.

We have succeeded in developing a method for extracting the scandium. This method will be described shortly in detail (as a contribution from the Chemical Laboratory of the University of Utah).

SALT LAKE CITY, UTAH

HENDRIK ROMEYN, JR.

RECEIVED AUGUST 24, 1933

PUBLISHED SEPTEMBER 5, 1933

NEW BOOKS

Annual Survey of American Chemistry. Volume VII, 1932. Edited by Clarence J. West, Director, Research Information Service, National Research Council. Published for National Research Council by the Chemical Catalog Company, Inc., 330 West 42d Street, New York, 1933. 346 pp. 13.5 × 21.5 cm. Price, \$4.00.

In this volume of the Annual Survey a new policy in regard to the selection of subjects to be considered has been put into effect. The plan followed involves the reduction in the number of fields covered in any year and the treatment of the less important topics once in two or three years. This change was made necessary as the result of the growing size of the volumes from 257 pages in the first year to 543 pages in the sixth year. The number of chapters has been reduced from 37 to 27, which cover 346 pages. Although several topics have been eliminated, the work covered is so extensive that on the average eight references are considered per page, with the result that the discussions are exceedingly brief and limited often to not more than a statement of the titles. Notwithstanding this fact the authors, in general, have produced readable articles which give a clear impression of the recent developments in the subjects treated. The volume is an example of the art of condensation in scientific writing, which is becoming more and more necessary as time goes on and production increases. Since the number of chapters has been reduced it appears to be desirable to list the subjects treated in this volume. They are as follows: theories of solution, kinetics of homogeneous gas reactions, subatomic phenomena, thermodynamics and thermochemistry, colloids, contact catalysis, aliphatic compounds, carbocyclic compounds, heterocyclic compounds, biochemistry, photochemistry, x-ray examination of materials, electrochemical practice, inorganic chemistry 1929-1932, non-ferrous metals, foods, fermentation, water, sewage and trade wastes, soils and fertilizers, coal, petroleum chemistry and technology, textile fibers, dyes and dyeing, rubber, synthetic plastics, chemical engineering. It should be noted that chemical engineering appears for the first time in the Annual Survey. The inclusion of this topic will add to the value of the book.

The Survey has proved of particular value to those who cannot find time to read extensively. It makes it possible for a chemist to learn with little effort something of the developments outside of his own field.

JAMES F. NORRIS