however, was not found to be the case. When cooled in a freezing mixture to $-15°$, the ester became a thick liquid of the consistency of glycerine. When cooled in a solid carbon dioxide–ether mixture, it assumed the consistency of Canada balsam and when finally cooled in liquid air it went suddenly and with great contraction in volume into a glassy solid without any trace of crystallization whatever. The solidified ester had the appearance of a block of shattered glass and even by keeping it at the temperature of liquid air for some time no crystals appeared. The benzoate and valerianate behaved similarly.

The physical constants and analyses of the esters prepared are given in Table I.

TABLE I

ESTERS OF α-TETRAHYDROFURFURYL ALCOHOL

Compound	B. p., °C.	Press., mm.	D_0^{20}	Carbon, %		Hydrogen, %	
				Calcd.	Found	Calcd.	Found
Acetate, $C_7H_{12}O_3$	194–195	753	1.061	58.33	58.57	8.33	8.71
					58.78		8.85
Propionate, $C_8H_{14}O_3$	204–207	756	1.044	60.79	60.36	8.86	8.92
	85–87	3			60.27		8.49
Butyrate, $C_9H_{16}O_3$	225–227	759	1.012	62.79	62.61	9.30	9.57
	102–104	4			62.31		9.38
Valerianate, $C_{10}H_{18}O_3$	238–240	756	0.999	64.51	64.36	9.68	9.68
	97–99	2			64.25		9.78
Benzoate, $C_{12}H_{14}O_3$	300–302	750	1.137	69.90	69.25	6.99	6.94
	138–140	2			69.80		6.55
Furoate, $C_{11}H_{12}O_4$	136–138	3	1.194	60.60	60.39	6.06	6.06
					60.59		6.08

The writer is indebted to the Miner Laboratories for kindly supplying him with α-tetrahydrofurfuryl alcohol.

Summary

1. The acetate, propionate, butyrate, valerianate, benzoate and furoate of α-tetrahydrofurfuryl alcohol have been prepared and their properties reported.

NEW YORK, N. Y.

NOTE

Luminescence of Aliphatic Grignard Compounds.—The purpose of this note is to clear up a disagreement in which the writer had a share. In studying the luminescence of Grignard compounds in ether solution when reacting with oxygen, especially of aliphatic compounds, we find on the one hand Möller[1] recording light from ethylmagnesium bromide, propylmagnesium bromide, *iso*-amylmagnesium bromide and benzylmagnesium bromide; and Evans and Diepenhorst[2] reporting light from several

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[1] Möller, *Arch. Pharm. Chem.*, **21**, 449 (1914).

[2] Evans and Diepenhorst, THIS JOURNAL, **48**, 715 (1926).

aliphatic and saturated cyclic compounds, but not from ethylmagnesium bromide. On the other hand, we find Lifschitz,[3] Lifschitz and Kalberer,[4] Dufford, Calvert and Nightingale,[5] and Dufford, Nightingale and Gaddum[6] reporting no light from saturated compounds, even after repeated trials.

It now appears that the reason for these discordant observations probably lies in the effect of concentration. The writer and his colleagues had found that phenylmagnesium bromide was brightest at a concentration of about 2.5 moles to the liter of solvent, and that most of the bright compounds were best at similarly high concentrations; hence solutions less concentrated than 1 M were rarely used. However, incidental to other work carried out the past summer at the Research Laboratories, the writer found that certain aliphatic compounds, like propyl- and butylmagnesium bromides, which gave no light at concentrations as high as 1 M, gave a very faint light at reduced concentrations, the optimum concentration being about $^1/_8$ M.

These results were checked and extended for the writer by Dr. E. Q. Adams and Mr. E. R. H. Charpentier, of the Laboratories, and further extended by the writer and his colleague, Miss Dorothy Nightingale, at the University of Missouri. The results are summarized in the following statements. The aliphatic compounds butyl-, propyl-, ethyl-, and even methylmagnesium bromides, all gave faint light on oxidation; none, however, at concentrations as high as 1 M, but best at about $^1/_8$ M. In all cases the light is exceedingly faint, too weak for accurate measurement; the brightnesses were estimated to be of the order of 10^{-8} lamberts, and were very little above the threshold of visibility. Methylmagnesium iodide was doubtful, but was twice suspected of giving a momentary glow at $^1/_{64}$ M. Ethylmagnesium iodide was also exceedingly faint, but best at $^1/_4$ M. A similar effect, but with the optimum at lower concentrations, in the luminescence accompanying the oxidation of pyrogallol, has been described by E. N. Harvey.[7] The Grignard compound from trimethylene bromide gave a little more light than the compounds named above; that from bromocyclohexane gave still more, and at higher concentrations; the latter and benzylmagnesium bromide, next brightest, have their optimum concentrations above $^1/_2$ M.

These results, therefore, disprove the idea, formerly held by the writer, that it is necessary for the magnesium to be attached directly to an unsaturated carbon atom in order to obtain luminescence in ether solution; though it is still true that this condition is satisfied in all the cases where

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[3] Lifschitz, *Helv. Chim. Acta*, **1**, 482 (1918).

[4] Lifschitz and Kalberer, *Z. physik. Chem.*, **102**, 393 (1922).

[5] Dufford, Calvert and Nightingale, THIS JOURNAL, **45**, 2058 (1923).

[6] Dufford, Nightingale and Gaddum, *ibid.*, **49**, 1858 (1927).

[7] Harvey, *J. Biol. Chem.*, **31**, 325 (1917), Table 3.

any great amount of light is obtained. Nor is the hypothesis advanced by other workers[1,2] borne out that the brightness is proportional to the molecular weight, C_2H_5MgI being fainter than C_2H_5MgBr, but the latter probably little if any fainter than C_3H_7MgBr, or brighter than CH_3MgBr. In connection with this latter idea, the writer is indebted to Dr. N. J. Beaber, of the Mellon Institute, for the suggestion, with strong evidence, that the compound formerly[5,6] regarded as *p*-IC_6H_4MgBr should be assigned the structure *p*-BrC_6H_4MgI. If this be correct, the compound should have been placed in the series *p*-ClC_6H_4MgI, *p*-BrC_6H_4MgI, *p*-IC_6H_4MgI, instead of the series previously suggested by the writer; but, in either case, the series would be one in which the brightness would decrease with increase in molecular weight.

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NEW BOOKS

Handbuch der Anorganischen Chemie. (Handbook of Inorganic Chemistry.) By DR. R. ABEGG, DR. FR. AUERBACH AND DR. I. KOPPEL. Fourth Volume, Third Section, First Part. **The Noble Gases.** By DR. EUGEN RABINOWITSCH. S. Hirzel, Königstrasse 2, Leipzig, 1928. xii + 522 pp. 50 figs. 17 × 24 cm. Price, unbound, M. 45; bound, M. 48.

This volume represents the first instalment of the last subdivision of the Abegg Handbook. The elements which it discusses, although they exhibit scarcely any chemical activity, have nevertheless exerted a profound influence on our views as to the relationship of the elements and the structure of matter.

One can hardly escape a comparison of this volume with the corresponding one of the Gmelin Handbook recently published. Both are excellent, but the methods of presentation are radically different. This volume arranges the material under general headings, such as Occurrence of the Rare Gases; Preparation of the Rare Gases; Detection of the Rare Gases; Nuclear Properties of the Rare Gases; Atomic Properties of the Rare Gases, etc. The corresponding volume of the Gmelin Handbook, except for an introductory chapter, arranges the material wholly under each separate element. This latter method may perhaps make possible the more rapid location of the particular information desired, an advantage that is consonant with the general purposes of the Gmelin Handbook. The arrangement of the present volume, however, makes the subject matter more interesting and readable. This effect is still further favored by the inclusion of much more explanatory material and discussion of theoretical considerations. Apparently, also, a fuller presentation of the available numerical data has been attempted. Finally, it should be