in enhancement of their bond strengths to silicon. Similar explanations are obvious for other central atoms.

Deviations from the linear free energy relationship might be expected where strong non-constant mesomeric interactions take place between the substituent and silicon. This problem is currently being studied and will be treated in a subsequent paper. The effect of temperature and the exchange of other ligands with chlorine on silicon is also being investigated and will be presented at another time.

Physical Organic Research Laboratory, Dow Corning Corporation, Ronald H. Baney
Midland, Mich. (U.S.A.) Robert J. Shindorf

1 G. Calingaert and H. A. Beatty, in H. Gilman, *Organic Chemistry, An Advanced Treatise*, Vol. II, Wiley, New York, N.Y., 1950, p. 1806.
2 J. R. Van Wazer, *Am. Scientist*, 50 (1962) 450.
3 J. C. Lockhart, *Chem. Rev.*, 65 (1965) 131.
4 I. Eliezer and Y. Marcus, *J. Phys. Chem.*, 66 (1962) 1661.
5 L. C. D. Groenweghe and J. Payne, *J. Am. Chem. Soc.*, 83 (1961) 1811.
6 H. A. Skinner, *Rec. Trav. Chim.*, 73 (1954) 991.
7 H. A. Skinner and N. B. Smith, *J. Chem. Soc.*, (1954) 2324.
8a. J. R. Van Wazer and K. Moedritzer, *Inorg. Chem.*, 3 (1964) 268.
8b. J. R. Van Wazer and S. Norval, *Inorg. Chem.*, 4 (1965) 1294.
9 J. R. Van Wazer and L. Maier, *J. Am. Chem. Soc.*, 86 (1964) 811.
10 K. Moedritzer and J. R. Van Wazer, *Inorg. Chem.*, 3 (1964) 139.
11 A. G. Evans and E. Warhust, *Trans. Faraday Soc.*, 3 (1948) 189.
12 D. R. Weyenberg, A. E. Bey and P. J. Ellison, *J. Organometal. Chem.*, 3 (1965) 489.
13 R. W. Taft, Jr., in M. S. Newman, *Steric Effects in Organic Chemistry*, Wiley, New York, N.Y., 1956, pp. 556–675.
14 H. H. Jaffé, *Chem. Rev.*, 53 (1953) 236.
15 H. A. Skinner and N. B. Smith, *J. Chem. Soc.*, (1954) 3930.
16 D. R. Weyenberg, private communication.
17 H. A. Bent, *Chem. Rev.*, (1961) 275.
18 V. A. Pal'm, *Usp. Khim.*, 30 (1960) 1069; *Russ. Chem. Rev. (Engl. Transl.)*, 30 (1960) 471.
19 E. Ebsworth and J. Campbell-Ferguson, private communication.

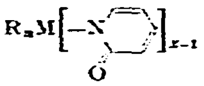
Received April 8th, 1966

Organometal derivatives of 2-pyridone

2-Hydroxypyridine does not exhibit the expected phenolic properties, although etherification with diazomethane gives the *o*-ethyl ether. Methylation with methyl iodide, on the other hand, gives N-methyl-2-pyridone[1,2]. Here we describe reactions of 2-hydroxypyridine, under a variety of conditions[3], with dibutyl dimethoxytin, dimethyldichlorosilane and aluminium ethylate.

The reaction products are prone to hydrolysis. Dibutyldi(2-pyridonato-1)tin and dimethyldi(2-pyridonato-1)silane, for example, hydrolyze quickly when exposed to humid air, to form 2-hydroxypyridine.

The infra-red spectra of dibutyldi(2-pyridonato-1)tin, dimethyldi(2-pyridonato-1)silane and tri(2-pyridonato-1)aluminium have pronounced carbonyl bands at 1670 cm^{-1} and 1650 cm^{-1}. The infra-red spectrum of N-methyl-2-pyridone has pronounced carbonyl bands at 1675 cm^{-1} and 1657 cm^{-1}, while 2-ethoxypyridine has no bands in this range[4–6]. These facts suggest a *n*-pyridone structure for the metal derivatives described above:



R = butyl or methyl; M = Si, Sn or Al:
x = valency of these elements, $n = x - 1$ to 0.

Experimental

(1) Dibutyldi(2-pyridonato-1)tin. A mixture of 12.9 g 2-hydroxypyridine and 20 g dibutyldimethoxytin in a three-necked flask provided with stirrer and condenser was heated at 90° with stirring. The methanol formed was distilled off, at first under normal pressure and then *in vacuo*, to leave a straw-coloured liquid; n_D^{20} 1.5663. (Found: C, 51.5; H, 6.2; N, 7.1; Si, 27.9. $C_{18}H_{26}N_2O_2Sn$ calcd.: C, 51.4; H, 6.18; N, 6.66; Si, 28.2 %.)

(2) Dimethyldi(2-pyridonato-1)silane. A mixture of 25.8 g (0.2 mole) dimethyldichlorosilane, 38 g (0.4 mole) 2-hydroxypyridine and 40.8 g (0.4 mole) triethylamine in 120 ml anhydrous benzene in a three-necked flask provided with stirrer and condenser was refluxed for 3 h. The precipitate was filtered off and the solvent was distilled off. The residue distilled at 113–115°/0.8 mm and at 116–119°/1 mm to give a liquid of n_D^{20} 1.5312 in 85 % yield. (Found: C, 58.5; H, 5.65; N, 11.3; Si, 11.2. $C_{12}H_{14}N_2O_2Si$ calcd.: C, 58.6; H, 5.69; N, 11.4; Si, 11.4 %.)

(3) Tri(2-pyridonato-1)aluminium. Aluminium ethylate (16.2 g, 0.1 mole) was suspended in 50 ml anhydrous benzene in a three-necked flask provided with stirrer, condenser and dropping funnel. A solution of 28.5 g 2-hydroxypyridine (0.3 mole) in 100 ml anhydrous benzene, heated to 60°, was introduced through the dropping funnel with stirring. The reaction mixture was then refluxed for 1 h after which time the benzene was drawn off, to leave a white residue of m.p. 121°. (Found: C, 58.3; H, 4.01; Al, 8.9; N, 13.88. $C_{15}H_{12}AlN_3O_3$ calcd.: C, 58.3; H, 3.89; Al, 8.74; N, 13.6 %.)

Acknowledgement

Dr. FRICK and Dr. BESSLER are gratefully acknowledged for the help in the interpretation of the IR spectra.

Zentral-Laboratorium, Dynamit Nobel Aktiengesellschaft, ROSHDY M. ISMAIL
Troisdorf (Germany)

1 L. F. FIESER AND M. FIESER, *Organic Chemistry*, Reinhold, 3rd ed., 1956, p. 809.
2 F. CRAMER, *Ger. Patent*, 1,203,777 (1965).
3 R. M. ISMAIL, *Helv. Chim. Acta*, 47 (1964) 2405; R. M. ISMAIL, *Ger. Patents*, 11,82,232 (1964) and 1,210,849 (1966).
4 YU. N. SHEINKER AND V. M. REZNIKOV, *Dokl. Akad. Nauk SSSR*, 102 (1955) 109; *Chem. Abstr.*, 49 (1955) 12130*d*.
5 J. A. GIBSON, W. KYNASTON AND A. S. LINDSEY, *J. Chem. Soc.*, (1955) 43040.
6 YU. N. SCHEINKER AND YU. I. POMERANTSEV, *Zh. Fiz. Khim.*, 30 (1956) 79; *Chem. Abstr.*, 50 (1956) 14780*h*.

Received April 4th, 1966