Permethylpolysilanyl Derivatives of Iron

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Recently numerous organosilyl derivatives of transition metals have been prepared.1—5 However, the only known silicon derivative of a transition metal containing a silicon-silicon bond is the cobalt derivative (CO)3CoSi — SiCo3 (CO)9 prepared by Kettle and Khan6 in low yield from Co3(CO)8 and tetraphenylsilane. The reported instability7,8 of silicon-silicon bonds of (CH3)3SiSi(CH3)2H and Cl3Si — SiCl3 in the presence of various platinum compounds makes of interest the preparation of stable transition metal derivatives containing silicon-silicon bonds. This communication reports a novel series of stable compounds containing both silicon-silicon and iron-silicon bonds.

Reaction of chloropentamethyldisilane9 with NaFe(CO)2C5H5 10 yields the orange heptamethyltrisilanyliron derivative

(CH3)3Si(Si(CH3)2Si(CH3)2Fe(CO)2C5H5)2 Fe(CO)2C5H5 (2),

m.p. 22—23°, b.p. 135—145° (0.2 mm.). The infrared, proton n.m.r., and mass spectra all support structure 2 and possess general features similar to those of the pentamethyltrisilanyl derivative.1 Chlorononamethyltetrasilane* and NaFe(CO)2C5H5 similarly gives the orange-yellow liquid nonamethyltetrasilanyliron derivative

(CH3)3Si(Si(CH3)2Si(CH3)2Si(CH3)2Fe(CO)2C5H5)2 (3),

This compound could not be purified readily by vacuum distillation but did survive heating to ~ 200° at 0.5 mm. Chromatography on alumina in pentane solution was useful for the purification of the trisilanyl and tetrasilanyl derivatives.

We have also succeeded in the isolation of the yellow crystalline C5H3Fe(CO)2(Si(CH3)2)2Fe(CO)2C5H5 (3), m.p. 172—173°, from a similar reaction of 1,3-dichlorohexamethyltrisilane with NaFe(CO)2C5H5.10 This compound contains a novel five-atom chain with two iron atoms and three silicon atoms. The volatility of this compound 3 with two —Fe(CO)2C5H5 groups was too low for a satisfactory mass spectrum to be obtained.

Further details on these compounds and related investigations in progress will be reported in future publications. We are indebted to the National Science Foundation for partial support of this work under Grant GP-7081 and to Dr. William Atwell of Dow-Corning Corp. for helpful discussions and generous samples of some organosilicon starting materials.

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1 T. S. Piper, D. Lemal, and G. Wilkinson, Naturwissenschaften 43, 29 [1956].
11 The chlorononamethyltetrasilane was obtained by cleavage9 of decamethyldetrasilane11 with one equivalent of AlCl3/ CH2COCl. It was identified by comparison of its n.m.r. spectrum with that of the other chloropermethylpolysilanes used in this work.

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