# Stabilisation of Metals in a Low Co-ordinative Environment using the Bis(trimethylsilyl)methyl Ligand; Coloured $Sn^{II}$ and $Pb^{II}$ Alkyls, $M[CH(SiMe_3)_2]_2$

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*Summary* $(Me_3Si)_2CHLi$ and $SnCl_2$ in ether at 0° give $Sn[CH(SiMe_3)_2]_2$, which is diamagnetic at room temperature and behaves chemically as a singlet 'stannylene', yielding complexes such as $R_2SnM'(CO)_5$ ($M' = Cr$ or Mo).

RECENTLY some thermally-stable binary alkyls of the early transition metals have been reported, notably those having $Me_3SiCH_2^-$ or $Me_3CCH_2^-$ as ligands.[1] We now describe the first examples of the use as a ligand of the more bulky $(Me_3Si)_2CH^-$ (see ref. 2). This is isoelectronic with $(Me_3Si)_2N^-$, a ligand often found in low co-ordinate metal dialkylamides.[3]

Organotin(II) derivatives, $SnR_2$, are not well-established except for the rather ionic cyclopentadienyls and related compounds, and attempts to prepare them lead to oligomers, $(Sn^{IV}R_2)_n$.[4] We now find that tin(II) chloride reacts with $(Me_3Si)_2CHLi$[5] in ether at 0° to give the red, crystalline (*X*-ray studies are in hand), monomeric (cryoscopy in $C_6H_6$), diamagnetic (20°) $Sn[CH(SiMe_3)_2]_2$. This shows the monomeric molecular ion in the mass spectrum, and has other spectral properties consistent with the $Sn^{II}$ formulation. It behaves chemically as a singlet 'stannylene' or carbene-analogue: thus, with $M'(CO)_6$ ($M' = Cr$ or Mo) in hexane at 20° under u.v. irradiation it affords stannylene complexes (see Table). [The type $R_2Sn(THF)M'(CO)_5$ has been described].[6] The reaction with $\gamma$-picoline gives a 1 : 1-adduct which reversibly dissociates in solution at 20°. All the compounds shown in the Table are analytically-pure, air-sensitive, and soluble in non-polar media.

TABLE

| Compound | M.p. (°C) | Colour | Yield (%) |
|---|---|---|---|
| $[(Me_3Si)_2CH]_2Sn$[a] .. .. | 135—137 | Red | 54 |
| $[(Me_3Si)_2CH]_2SnCr(CO)_5$ .. | 120 | Orange | 27 |
| $[(Me_3Si)_2CH]_2SnMo(CO)_5$[b] .. | 109—110 | Yellow | 64 |
| $[(Me_3Si)_2CH]_2Sn\cdot 4\text{-}MeC_5H_4N$ | 77—81 (decomp.) | Orange | 65 |
| $[(Me_3Si)_2CH]_2Pb$ .. .. | 43—45 | Purple | 3 |

[a] *M* 446 (required 438). [b] *M* 672 (cryoscopy in $C_6H_6$) (required 674).

The He(I) photoelectron spectrum of $Sn[CH(SiMe_3)_2]_2$ shows a doublet at low ionisation energy (7·42 and 8·33 eV); the 5*p* level in atomic tin lies at 7·32 eV. The colour is attributed to charge transfer between Sn non-bonding and vacant Si 3*d*-levels. The colour fades reversibly upon cooling to liquid nitrogen temperature, suggesting close-lying, thermally-accessible electronic states. The $^{119}Sn$ Mössbauer spectrum shows an isomer shift of 0·06 mm $s^{-1}$ (relative to $\alpha$-Sn) and a quadrupole splitting of 2·31 mm $s^{-1}$. The former value is unusually low for a $Sn^{II}$ complex, but is considerably higher than for $Sn^{IV}$ species. A wide C–Sn–C angle would lower Sn 5*s*-electron density with consequential low isomer shift; the latter parameter is, however, also affected by other factors, such as bond ionicity.

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