Hexamethyltungsten

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Summary The interaction of tungsten hexachloride and methyl-lithium produces hexamethyltungsten, $W(CH_3)_6$.

The hydride transfer–alkene elimination reaction, which is the common mode of decomposition of binary alkyls of transition metals, does not, of course, apply to methyl compounds.[1] The methyl compounds are normally more stable than other simple alkyls.[1,2] Co-ordinatively unsaturated methyls such as $Mn(CH_3)_2$ or $Ti(CH_3)_4$ decompose below room temperature, although the halides $MCl_2(CH_3)_3$ (M = Nb, Ta)[3] and $WCl_5(CH_3)$[4] are more stable. There seemed *no* reason for hexamethyltungsten to be unstable as it would be co-ordinatively saturated, particularly since $W(NMe_2)_6$ is known[5] and we have suggested[1] that there may be no substantial difference in metal to nitrogen and metal to carbon bond energies. The compound can indeed be obtained by the interaction of tungsten hexachloride with methyl-lithium in ether. It is a red solid, m.p., *ca.* 30° which may be kept indefinitely at −78°. It is extremely volatile and sublimes in vacuum at room temperature; at this temperature it is slightly unstable and it decomposes rapidly above 50°. Both the solid and its solutions in organic solvents, in which it is very soluble, are air-sensitive.

Mass spectra do not show the parent ion [*cf.* the weak parent ions of $M(CH_3)_4$ (M = Si, Sn, Pb[6])] and the highest abundant species is $W(CH_3)_5^+$, with other peaks corresponding to loss of further methyl groups. The n.m.r. spectrum has but a single peak at τ 8·18 with J (W^{183}–H) = 3·0 Hz and the i.r. spectrum is simple as expected.

The compound is [illegible]urse, co-ordinatively saturated and is reasonably [illegible] chemical attack. It reacts rapidly with hydrog[illegible]ve intense blue solutions, which decompose very rapidly. With strong acids it gives methane, with halogens, methyl halides, and it also reacts with CO and NO undergoing insertion reactions.

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