The Observation of $^1J(^{187}Os\text{–}H)$ Coupling in the ^1H Nuclear Magnetic Resonance Spectra of Some Osmium Hydrides

By B. E. MANN, C. MASTERS, and B. L. SHAW*
(*School of Chemistry, The University, Leeds* LS2 9JT)

Summary $^1J(^{187}Os\text{–}H)$ has been observed for the complexes $OsH_4(PEt_2Ph)_3$, $OsH_4(AsEt_2Ph)_3$, and a species believed to be $OsH_6(AsEt_2Ph)_2$.

ALTHOUGH osmium has a naturally-occurring isotope with nuclear spin one half (^{187}Os, 1·64% abundant), nuclear spin–spin couplings to osmium have not previously been reported. We have now measured $^1J(^{187}Os\text{–}H)$ for three complexes, $OsH_4(PEt_2Ph)_3$, $OsH_4(AsEt_2Ph)_3$, and a species that we have not isolated or characterized, but believe to be $OsH_6(AsEt_2Ph)_2$. The first two complexes were prepared by the sodium borohydride reduction of $OsCl_3(PEt_2Ph)_3$ or $OsCl_3(AsEt_2Ph)_3$, respectively, under mild conditions, as previously described.[1] These two complexes have been fully characterized. The sodium borohydride reduction of $OsCl_3(AsEt_2Ph)_3$ under more vigorous conditions (reflux in tetrahydrofuran) gave $OsH_4(AsEt_2Ph)_3$ mixed with a second hydride, believed to be $OsH_6(AsEt_2Ph)_2$. We have previously described $OsH_6(PMe_2Ph)_2$.[1]

The n.m.r. data are given in the Table. The reduced coupling constants[2,3] $^1K(^{187}Os\text{–}H)$ are also given in the Table and may be compared with reduced coupling constants for hydrides of tungsten(VI) (^{183}W, $I = \frac{1}{2}$)[4] and platinum(II) (^{195}Pt, $I = \frac{1}{2}$).[5] As would be expected $^1K(^{187}Os\text{–}H)$ lies between $^1K(^{183}W\text{–}H)$ and $^1K(^{195}Pt\text{–}H)$.

^{1}H(*hydride*) *n.m.r. data for some osmium, tungsten, and platinum hydrides* (*in benzene solution*)

	τH	^1J(M–H) Hz	^1K(M–H) × 10^{-20}cm^{-3}
$OsH_4(PEt_2Ph)_3$ ..	21·84	30·8	445
$OsH_4(AsEt_2Ph)_3$ ..	20·42	34·0	492
$OsH_6(AsEt_2Ph)_2$? ..	19·60	33·0	477
$WH_6(PEt_2Ph)_3$[a] ..	11·94	27·8	239
trans-$PtHX(PEt_3)_2$[b] .. (X = anion)	17·6—33·6	780—1370	1220—2100

[a] Data calculated from ref. 4.
[b] Data calculated from ref. 5.

We thank the S.R.C. and Imperial Chemical Industries Ltd. for financial support.

(*Received, June* 17*th*, 1970; *Com.* 937.)

---

[1] P. G. Douglas and B. L. Shaw, *J. Chem. Soc.* (*A*), 1970, **334.**
[2] J. A. Pople and D. P. Santry, *Mol. Phys.*, 1964, **8**, 1.
[3] W. McFarlane, *Quart. Rev.*, 1969, **23**, 187.
[4] J. R. Moss and B. L. Shaw, *Chem. Comm.*, 1968, 632.
[5] J. Powell and B. L. Shaw, *J. Chem. Soc.*, 1965, 3879.