Synthesis of Perfluorophenyl Metal Complexes using $(C_6F_5)_2TlBr$ as Oxidant

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Summary Previously unknown perfluorophenyl–transition-metal complexes have been prepared by a new method involving the oxidation of derivatives of the transition metal in a lower oxidation state with $(C_6F_5)_2TlBr$, which is reduced to thallium(I) bromide with transfer of two C_6F_5 groups.

BISPERFLUOROPHENYLMONOBROMOTHALLIUM(III),[1] which is dimeric, reacts in benzene solution with unco-ordinated (*e.g.* Hg_2Cl_2) or co-ordinated (*e.g.* $Ph_3P \rightarrow AuCl$) post-transition-metal halides to produce bis-perfluorophenyl derivatives of an oxidation state *two* higher than that of the metal in the original compound (execpt for Hg_2Cl_2) with the precipitation of thallium(I) bromide. $Ph_3P \rightarrow AuCl$ gives

$$cis\text{-}(C_6F_5)_2ClAu^{III} \leftarrow PPH_3;\dagger$$

Hg_2Cl_2 forms $(C_6F_5)_2Hg$, described earlier;[2] and stannous chloride produces $(C_6F_5)_2SnCl_2$, previously reported by Tatlow *et al.*[3] Nesmeyanov[4] *et al.* observed that diphenylthallium(III) bromide gives rise to diphenyltin dichloride (see below). *trans*-$PdCl_2(PPh_3)_2$ gives rise to the Pd^{IV} complex $(C_6F_5)_2PdCl_2(PPh_3)_2$. The properties of these complexes are shown in the Table.

Properties of perfluorophenyl metal compounds[a]

Compound	*Colour*	M.p.	*Molec. calc.*	*Weight found*
$(C_6F_5)_2Hg$	white	119°	535	512
$(C_6F_5)_2SnCl_2$	colourless	Lqd.		
cis-$(C_6F_5)_2Pt(PPh_3)_2$ ..	white	245°	1054	1089
cis-$(C_6F_5)_2AuCl(PPh_3)$ ..	white	150°	798	785
$C_6F_5Au(PPh_3)$	white	160° dec.	626	627
$(C_6F_5)_2RhCl(PPh_3)_2$ ..	yellow-brown	265°	997	787
$(C_6F_5)_2PdCl_2(PPh_3)_2$ ..	pale yellow	250° decomp.	1036	1015

[a] Satisfactory analytical data were obtained in all cases.

Interesting reactions are shown by these C_6F_5 complexes on reduction. Thus when $(C_6F_5)_2$ $AuCl(PPh_3)$ is treated