localized on the para than on the ortho carbon atoms of the ring. Hence, the LUMO is a metal-carbyne π antibond, largely localized on the ring and isolated in energy from the HOMO and from the next lowest unoccupied molecular orbital. If this is also true about the real osmium compound, the reported addition of nucleophile H^- to the para position of the ring may well be frontier rather than charge controlled.[63]

Acknowledgment. We are grateful to Dr. Ulrich Schubert of the Technische Universität, München, West Germany, for preprints of articles and for a useful suggestion. This research was supported by the National Science Foundation (Grant CHE 7517744). N.M.K. has been a Fulbright Fellow since 1978 and is a Procter and Gamble Fellow for 1981-1982.

Registry No. *trans*-$BrCr(CO)_4CMe$, 51005-78-8; *trans*-$BrCr(CO)_4CPh$, 50701-13-8; *trans*-$BrCr(CO)_4CNEt_2$, 57091-06-2; *trans*-$ClCr(CO)_4CMe$, 62938-49-2; *trans*-$ICr(CO)_4CMe$, 50701-14-9; *trans*-$PMe_3Cr(CO)_4CMe^+$, 54460-85-4; *trans*-$ClCr(CO)_4CPh$, 68851-67-2; *trans*-$ICr(CO)_4CPh$, 50938-50-6; *mer*-$BrCr(CO)_3(PMe_3)CMe$, 52175-60-7; *cis*-$BrCr(CO)_2(CNMe)_2CPh$, 79992-51-1; *trans*-$BrCr(CO)_2(CNMe)_2CPh$, 800-37-5; *cis*-$BrCr(CO)_2[P(OH)_3]_2CPh$, 80028-17-7; *trans*-$BrCr(CO)_2[P(OH)_3]_2CPh$, 80080-80-4; *trans*(PH_3)-$(PH_3)_2(CO)_2FeCPh^+$, 79992-52-2.

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Synthesis and Molecular Structure of $C_5H_5(P\text{-}i\text{-}Pr_3)Pd(\eta^1,\eta^3\text{-}C_3H_4)Pd(P\text{-}i\text{-}Pr_3)Br$: A Compound Formed through Insertion of Allene into a Metal-Metal Bond[1]

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The reaction of $(\mu\text{-}C_5H_5)(\mu\text{-}Br)Pd_2(P\text{-}i\text{-}Pr_3)_2$ (4) with allene leads to a 1:1 adduct $C_5H_5(P\text{-}i\text{-}Pr_3)Pd(\eta^1,\eta^3\text{-}C_3H_4)Pd(P\text{-}i\text{-}Pr_3)Br$ (5) which has been characterized by elemental analysis, mass spectroscopy, NMR spectroscopy, and single-crystal X-ray investigations. The compound crystallizes in the space group $C2/c$ with $a = 25.179$ (9) Å, $b = 17.173$ (8) Å, $c = 16.065$ (9) Å, $\beta = 91.86$ (4)°, and $V = 6943$ (6) Å^3. Full-matrix least-squares refinement gave final discrepancy factors $R_1 = 0.064$ and $R_2 = 0.078$. The molecule contains a bridging allyl group which is (in 2-position) σ bonded to $Pd(P\text{-}i\text{-}Pr_3)(\eta^5\text{-}C_5H_5)$ and π bonded to $Pd(P\text{-}i\text{-}Br_3)Br$. The Pd-Pd distance is 3.58 Å (almost 1 Å longer than in 4) indicating that the formation of 5 from 4 involves a real insertion of allene into the Pd-Pd bond. The structure of the previously described 1:1 adduct prepared from $(\mu\text{-}C_5H_5)(\mu\text{-}Cl)Pd_2(P\text{-}i\text{-}Pr_3)_2$ and allene is shown to be almost identical with that of 5.

There is much current interest in the chemistry of binuclear transition-metal compounds which may serve to activate small molecules such as CO, C_2H_2, C_2H_4, etc.[2] Recently, we have investigated the synthesis and reactivity of a new class of palladium and platinum complexes of the general composition $(\mu\text{-}X)(\mu\text{-}Y)M_2L_2$ in which the bridging ligands X and Y are C_5H_5, $2\text{-}R'C_3H_4$, RCOO, SR, Cl etc. and L is a two-electron donor such as PR_3, $P(OR)_3$, or AsR_3.[3] The most general route for the preparation of these complexes involves the reaction of (X)M(Y) (sometimes only stable as a dimer) with the coordinatively unsaturated compounds ML_2 (e.g., $M(P\text{-}i\text{-}Pr_3)_2$, $M(P\text{-}c\text{-}Hx_3)_2$, etc.) or suitable precursors $(L')ML_2$ where L', for example, is a substituted olefin.[4]

During our investigations of the synthesis of the complexes $(\mu\text{-}X)(\mu\text{-}Y)Pd_2(P\text{-}i\text{-}Pr_3)_2$ with X = C_5H_5 and Y = $2\text{-}R'C_3H_4$ from $C_5H_5Pd(2\text{-}R'C_3H_4)$ and $Pd(P\text{-}i\text{-}Pr_3)_2$, we observed[5] that for R' = H, Me, or *t*-Bu the expected product $(C_5H_5)(2\text{-}R'C_3H_4)Pd_2$ $(P\text{-}i\text{-}Pr_3)_2$ is formed (eq 1) whereas for R' = Cl the corresponding compound 1 containing chloride rather than 2-chloroallyl as the bridging ligand is obtained (eq 2). An alternative route to the complex 1 has been described by Felkin and Turner, who used $C_5H_5Pd(P\text{-}i\text{-}Pr_3)Cl$ and Mg as starting material.[6]

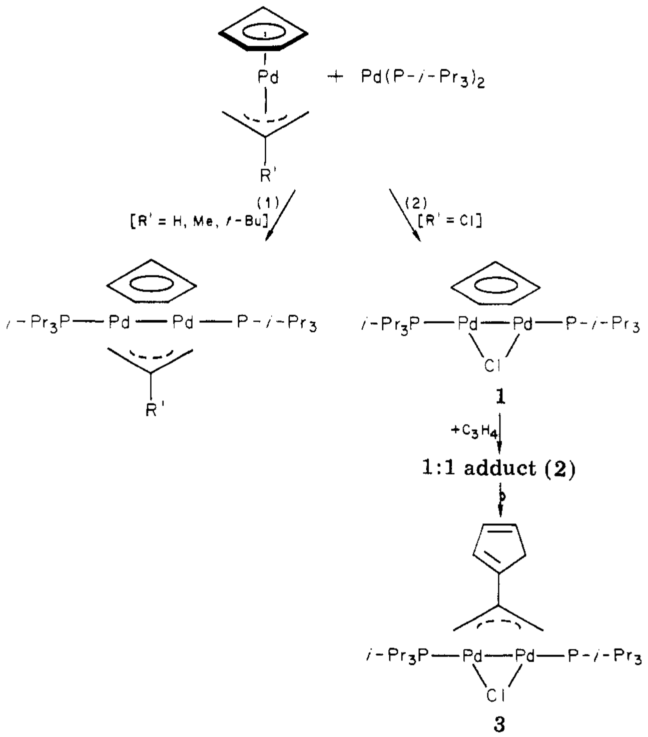

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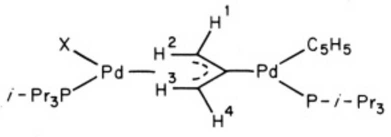
Table I. ^1H NMR Data of **2** (X = Cl) and **5** (X = Br), in C_6D_6 [a]



	2			**5**		
protons	δ	*J*(PH)	*J*(H^1H^4)	δ	*J*(PH)	*J*(H^1H^4)
C_5H_5	5.98 (d)	1.5		5.93 (d)	1.4	
H^1	5.27 (dd)	5.5	2.5	5.30 (dd)	5.6	2.6
H^2	4.17 (d)	8.0		4.15 (d)	9.0	
H^3	2.73 (b s)			2.80 (b s)		
H^4	3.55 (d)		2.5	3.70 (d)		2.6
$PC\underline{H}$ [b]	2.30 (m)			2.30 (m)		
	1.77 (m)			1.77 (m)		
$CHC\underline{H}_3$ [b]	1.30 (m)			1.30 (m)		
	1.02 (m)			1.02 (m)		

[a] δ in parts per million from Me_4Si (internal standard); *J* in hertz. [b] Due to the coordination to two different Pd atoms, the phosphine ligands are different and thus two signals for the $PC\underline{H}$ and two for the $CHC\underline{H}_3$ protons are observed.

The observation that a freshly prepared solution containing the allene and compound **1** in benzene further reacts to give a new binuclear complex **2**, which on warming isomerizes to form the substituted μ-allyl complex **3**[5] prompted us to study the reactivity of **1** and its analogues toward allene in more detail. In this paper we report the preparation of the bromide derivative of **2** and the X-ray structure of this compound which proves that its formation from $(C_5H_5)(Br)Pd_2(P\text{-}i\text{-}Pr_3)_2$[6] involves a real insertion of allene into the Pd–Pd bond.

Results

The reaction of $(C_5H_5)(Br)Pd_2(P\text{-}i\text{-}Pr_3)_2$ (**4**) with allene

$$\underset{\mathbf{4}}{(\mu\text{-}C_5H_5)(\mu\text{-}Br)Pd_2(P\text{-}i\text{-}Pr_3)_2} + C_3H_4 \rightarrow \underset{\mathbf{5}}{C_5H_5(P\text{-}i\text{-}Pr_3)Pd(\eta^1,\eta^3\text{-}C_3H_4)Pd(P\text{-}i\text{-}Pr_3)Br} \quad (3)$$

in toluene at room temperature leads to an orange-red solution which, on addition of pentane, afforded orange-red crystals. Elemental analysis and the mass spectrum indicated that the composition of the product **5** formally corresponds to a 1:1 adduct of **4** and allene; i.e., two palladium atoms are still present. The ^1H NMR spectrum is characteristic of a complex containing an unsymmetrical π-bonded allylic ligand as found in $2\text{-}R'C_3H_4Pd(PR_3)X$ with X = halogen, alkyl, etc.[7] The four allylic protons give rise to four different signals which not only have different chemical shifts but also have different P–H coupling constants. It has been proved by selective decoupling experiments that the P–H coupling of the cyclopentadienyl protons and of the allylic protons are due to two nonequivalent phosphorus atoms. From the ^1H NMR data (Table I) there is no doubt that the structures of **5** and of the previously described compound **2**[5] are almost identical.

Crystal Data and Structure Determination of 5. Crystals of **5** which have been obtained from toluene/pentane are monoclinic with $a = 25.179$ (9) Å, $b = 17.173$ (8) Å, $c = 16.065$ (9) Å, $\beta = 91.86$ (4)°, and $V = 6943$ (6) Å^3. The cell constants resulted from least-squares calculation using 15 strong reflections of the crystal in the range $24° < 2\theta < 26°$. The crystal was ground into a sphere of about 0.2-mm diameter. The space group is $C2/c$ ($Z = 8$) and the density $\rho(\text{pyk}) = 1.42$ g/cm^3 and $\rho(\text{calcd}) = 1.37$ g/cm^3.

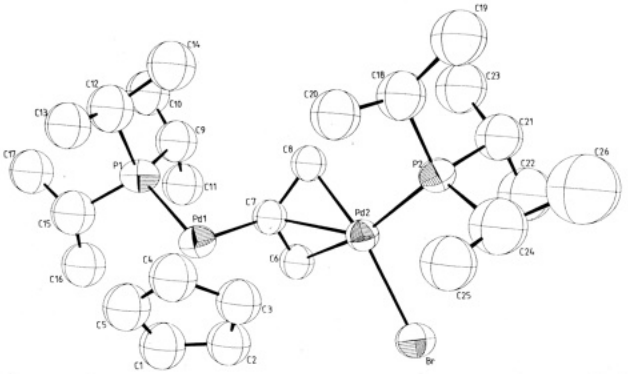


Figure 1. The molecular structure of $C_5H_5(P\text{-}i\text{-}Pr_3)Pd(\eta^1,\eta^3\text{-}C_3H_4)Pd(P\text{-}i\text{-}Pr_3)Br$ (**5**).

Intensity data were collected on a Syntex-$P2_1$ four circle automatic diffractometer using Mo Kα radiation (graphite monochromator, λ = 0.71069 Å, ω scan, Δω = 1°) with 1720 symmetrically independent reflections measured in the range of $2° < 2\theta < 35°$. Corrections for absorption and extinction were not applied ($\mu_{Mo} = 2.34$ mm^{-1}). The heavy-atom part of the structure could be solved by direct methods (program SHELX[8]). Positions of the remaining atoms (except hydrogen) were located from Fourier and difference Fourier maps. Refinement of the atomic parameters by full-matrix least squares gave the final discrepancy factors $R_1 = 0.064$ and $R_2 = 0.078$ for 1720 reflections. All reflections were given unit weight. These calculations were carried out by means of the XTL program package[9] on a NOVA 1200 minicomputer with structure factors for uncharged atoms as given in ref 10, corrected for anomalous dispersion. As the data set was limited (due to radiation damage) only Pd, Br, and P atoms were treated anisotropically, thus limiting the number of free variables to 150.

In the final difference Fourier map the maxima were smaller than 1.1 e/Å^3. The highest peaks were in the regions of the methyl groups of the phosphine ligands which, in accordance with the thermal parameters of the carbon atoms C9–C26 and the variation of the C–C distances, point to a small disorder of these groups.

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Table II. Positional and Thermal Parameters and Their Estimated Standard Deviations

atom	x	y	z	B_{11}	B_{22}	B_{33}	B_{12}	B_{13}	B_{23}
Pd1	0.2790 (1)	0.5539 (1)	0.3251 (1)	4.8 (1)	4.4 (1)	4.2 (1)	−0.2 (1)	−0.3 (1)	0.7 (1)
Pd2	0.1922 (1)	0.3919 (1)	0.3532 (1)	4.8 (1)	3.8 (1)	4.0 (1)	−0.0 (1)	−0.2 (1)	−0.1 (1)
Br	0.1437 (1)	0.3504 (2)	0.2220 (2)	7.9 (2)	6.0 (2)	4.8 (2)	0.4 (1)	−1.2 (1)	−1.4 (1)
P1	0.3522 (2)	0.5771 (4)	0.4054 (4)	4.6 (3)	5.0 (4)	5.2 (4)	−0.4 (3)	−0.0 (3)	1.2 (4)
P2	0.1220 (2)	0.3921 (4)	0.4408 (4)	4.6 (3)	4.5 (4)	4.3 (4)	−0.5 (3)	−0.5 (3)	−0.1 (3)

atom	x	y	z	B, Å^2	atom	x	y	z	B, Å^2
C1	0.2695 (11)	0.5987 (17)	0.1847 (17)	7.4 (7)	C14	0.2989 (12)	0.6033 (19)	0.5546 (19)	9.6 (9)
C2	0.2268 (11)	0.5522 (16)	0.2028 (17)	7.0 (7)	C15	0.4001 (11)	0.6313 (17)	0.3427 (19)	8.2 (8)
C3	0.1966 (9)	0.5824 (14)	0.2661 (16)	5.8 (6)	C16	0.4153 (10)	0.5908 (16)	0.2609 (18)	7.7 (7)
C4	0.2183 (10)	0.6560 (16)	0.2893 (17)	6.9 (7)	C17	0.4528 (12)	0.6585 (19)	0.3936 (20)	9.8 (9)
C5	0.2668 (10)	0.6662 (15)	0.2404 (17)	6.5 (7)	C18	0.1329 (10)	0.4586 (15)	0.5300 (16)	6.4 (7)
C6	0.2730 (8)	0.3817 (13)	0.3034 (14)	4.6 (6)	C19	0.0870 (11)	0.4579 (16)	0.5961 (18)	8.1 (8)
C7	0.2714 (8)	0.4412 (13)	0.3632 (15)	4.3 (5)	C20	0.1406 (10)	0.5464 (16)	0.4992 (17)	7.1 (7)
C8	0.2534 (8)	0.4189 (12)	0.4458 (14)	4.6 (5)	C21	0.1172 (10)	0.2947 (16)	0.4949 (17)	7.4 (7)
C9	0.3804 (11)	0.4904 (17)	0.4608 (18)	7.9 (8)	C22	0.1144 (12)	0.2283 (19)	0.4247 (20)	10.0 (9)
C10	0.4218 (11)	0.5071 (17)	0.5369 (19)	8.8 (8)	C23	0.1634 (11)	0.2828 (16)	0.5595 (18)	7.8 (7)
C11	0.4085 (12)	0.4419 (19)	0.3913 (20)	9.7 (9)	C24	0.0561 (12)	0.4031 (18)	0.3849 (19)	8.9 (8)
C12	0.3402 (11)	0.6466 (17)	0.4937 (19)	8.5 (8)	C25	0.0542 (11)	0.4880 (17)	0.3438 (18)	8.3 (8)
C13	0.3207 (10)	0.7268 (16)	0.4645 (17)	7.2 (7)	C26	0.0099 (17)	0.3700 (26)	0.4183 (27)	15.2 (14)

Table III. Bond Lengths (Å) in 5[a]

Pd1-Pd2	3.575 (3)	C9-C10	1.61 (4)
Pd1-P1	2.250 (7)	C9-C11	1.58 (4)
Pd2-P2	2.294 (7)	C12-C13	1.53 (4)
Pd2-Br	2.505 (3)	C12-C14	1.63 (4)
Pd1-C1	2.39 (3)	C15-C16	1.55 (4)
Pd1-C2	2.33 (3)	C15-C17	1.61 (4)
Pd1-C3	2.31 (2)	C6-C7	1.41 (3)
Pd1-C4	2.38 (3)	C7-C8	1.47 (3)
Pd1-C5	2.38 (3)	P2-C18	1.85 (3)
Pd1-C7	2.04 (2)	P2-C21	1.89 (3)
Pd2-C6	2.22 (2)	P2-C24	1.87 (3)
Pd2-C7	2.17 (2)	C18-C19	1.60 (4)
Pd2-C8	2.16 (2)	C18-C20	1.60 (4)
P1-C9	1.86 (3)	C21-C22	1.60 (4)
P1-C12	1.89 (3)	C21-C23	1.55 (4)
P1-C15	1.85 (3)	C24-C25	1.60 (4)
		C24-C26	1.42 (5)

[a] Numbers in parentheses are estimated standard deviations in the least significant digits.

Table IV. Bond Angles (Deg) in 5[a]

P1-Pd1-C7	94.5 (6)	P1-Pd1-Pd2	123.9 (2)
P2-Pd2-Br	98.8 (2)	P2-Pd2-Pd1	124.2 (2)
P2-Pd2-C7	132.8 (6)	Br-Pd2-Pd1	113.5 (1)
Br-Pd2-C7	126.6 (6)		
C6-C7-C8	116.4 (19)		
Pd1-C7-C6	118.6 (16)		
Pd1-C7-C8	123.7 (16)		
Pd1-P1-C9	115.1 (9)	Pd2-P2-C18	112.3 (8)
Pd1-P1-C12	113.3 (10)	Pd2-P2-C21	110.1 (9)
Pd1-P1-C15	108.3 (10)	Pd2-P2-C24	113.3 (10)
C9-P1-C12	102.4 (13)	C18-P2-C21	101.5 (12)
C9-P1-C15	114.7 (13)	C18-P2-C24	114.7 (13)
C12-P1-C15	102.4 (13)	C21-P2-C24	103.9 (13)
P1-C9-C10	116.7 (19)	P2-C18-C19	114.8 (18)
P1-C9-C11	104.8 (19)	P2-C18-C20	111.0 (17)
P1-C12-C13	113.4 (20)	P2-C21-C22	107.9 (19)
P1-C12-C14	106.4 (15)	P2-C21-C23	111.6 (18)
P1-C15-C16	114.9 (20)	P2-C24-C25	107.7 (20)
P1-C15-C17	114.4 (20)	P2-C24-C26	120.3 (26)
C10-C9-C11	109.7 (23)	C19-C18-C20	108.1 (20)
C13-C12-C14	112.9 (23)	C22-C21-C23	113.1 (23)
C16-C15-C17	109.9 (23)	C25-C24-C26	120.5 (29)

[a] Numbers in parentheses are estimated standard deviations in the least significant digits.

The final atomic coordinates are listed in Table II, and selected intramolecular bond lengths and bond angles in Tables III, and IV, respectively.

The molecular structure is shown in Figure 1. The most characteristic feature is that the two different palladium-containing units, $C_5H_5(P\text{-}i\text{-}Pr_3)Pd$ and $Pd(P\text{-}i\text{-}Pr_3)Br$, are bridged by a bent C_3H_4 group. The Pd–Pd distance of 3.58 Å in **5** is much longer than in **4** (2.61 Å), indicating that due to the insertion of the allene into the metal-to-metal bond the two palladium atoms in the resulting complex are no longer bonded to each other.

Whereas only the central carbon atom C(7) of the C_3H_4 group is σ bonded to Pd(1), all three allylic carbon atoms C(6)–C(8) are π bonded to Pd(2). The coordination in this part of the molecule is very similar to that in (π-allyl)palladium complexes of the general composition 2-$R'C_3H_4Pd(PR_3)X$ which means, for example, that the distance Pd(2)–C(8) which is trans to Br is significantly shorter than the distance Pd(2)–C(6). A comparison shows that the bond lengths and bond angles of the allylpalladium moiety in **5** and in the complex 2-$MeC_3H_4Pd(PPh_3)Cl$[11] are very similar.

The bond length of the σ bond between the palladium atom Pd(1) and the carbon atom C(7) corresponds to the value which had been anticipated.[12] Together with the η^5-cyclopentadienyl and the phosphine ligands, this part of the molecule is similar to that of other complexes $C_5H_5Pd(PR'_3)R$ where R is alkyl, aryl, etc. It should be noted that the metal-substituted 2-PdC_3H_4 unit is not planar and that both palladium atoms are located on the same side of the allyl group.

Discussion

There are only a few examples describing the addition of allenes to M–M-bonded binuclear transition-metal complexes reported in the literature. Cotton and coworkers[13] studied the reactions of $(C_5H_5)_2M_2(CO)_4$ compounds (M = Mo and W) which contain M–M triple bonds with various allenes $C_3H_2R_2$ (R = H and Me) and isolated the 1:1 adducts $(C_5H_5)_2M_2(CO)_4(C_3H_2R_2)$. According to the X-ray structure of $(C_5H_5)_2Mo_2(CO)_4(C_3H_4)$, the allene

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is V shaped (C–C–C = 146°) and bridges the Mo–Mo bond; it may be considered to form one olefin–metal bond to each molybdenum atom.

The structure of the binuclear palladium complex **5** is very different from that of Cotton's Mo_2 compound. It is not only that the C–C–C angle is much smaller but also, more important, that the bonding mode of the C_3H_4 moiety is not of the same type. As far as we know, there is precedent for the σ-alkyl-plus-π-allyl function of the C_3H_4 group only in two other complexes, namely, $Fe_2(CO)_6L(C_3H_4)$ (L = CO and PPh_3)[14] and $(C_5H_5)_2Ru_2(CO)_3(C_3H_4)$.[15] The iron complexes differ from the Pd_2 compound **5** insofar as in both $Fe_2(CO)_7(C_3H_4)$ and $Fe_2(CO)_6PPh_3(C_3H_4)$ a M–M bond is still present. However, it is worth noting that the structural data for the bridging allyl ligand in **5** (C–C = 1.41 and 1.47 Å, C–C–C = 116.4°) and in $Fe_2(CO)_6PPh_3(C_3H_4)$ (C–C = 1.41 and 1.45 ± 0.02 Å, C–C–C = 116 ± 1.3°)[14] are very similar.

Experimental Section

NMR spectra were recorded on a Varian T 60 and mass spectra on a Varian MAT CH 7. All experiments were carried out under purified nitrogen. The synthesis of $C_5H_5(P\text{-}i\text{-}Pr_3)Pd(\eta^1,\eta^3\text{-}C_3H_4)Pd(P\text{-}i\text{-}Pr_3)Cl$ (**2**) has been described previously.[5]

Preparation of $C_5H_5(P\text{-}i\text{-}Pr_3)Pd(\eta^1,\eta^3\text{-}C_3H_4)Pd(P\text{-}i\text{-}Pr_3)Br$ (5). $(\mu\text{-}C_5H_5)(\mu\text{-}Br)Pd_2(P\text{-}i\text{-}Pr_3)_2$ (**4**) (0.55 g, 0.81 mmol)[6] was dissolved in toluene (10 mL), and allene was bubbled through the solution for 30 min. An orange-red solution and a flocky precipitate resulted which was removed by filtration. The solution was concentrated in vacuo, and pentane was added. After the solution was left standing at 0 °C, orange-red crystals of **5** were formed which were washed with pentane and dried in vacuo: yield 0.3 g (53%); mp 86 °C; mass spectrum (70 eV), *m/e* 717 (32%, M^+), 451 (56, $M^+ - PdP\text{-}i\text{-}Pr_3$), 426 (98, $Pd(P\text{-}i\text{-}Pr_3)_2^+$), 371 (95, $C_5H_5Pd(C_3H_4)P\text{-}i\text{-}Pr_3^+$), 266 (100, $PdP\text{-}i\text{-}Pr_3^+$).

Anal. Calcd for $(C_5H_5)(C_3H_4)Pd_2(P\text{-}i\text{-}Pr_3)_2Br$: C, 43.47; H, 7.20; Pd, 29.62. Found: C, 43.15; H, 7.08; Pd, 29.90.

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Supplementary Material Available: Table V, structure factors as observed and calculated for $C_5H_5(P\text{-}i\text{-}Pr_3)Pd(\eta^1,\eta^3\text{-}C_3H_4)Pd(P\text{-}i\text{-}Pr_3)Br$ (9 pages). Ordering information is given on any current masthead page.

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The Reactivity of $Fe_3(\mu_3\text{-}Te)_2(CO)_9$ toward Lewis Bases. 1

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The compound $Fe_3(\mu_3\text{-}Te)_2(CO)_9$, **1**, reacts with a range of Lewis bases, L, to form adducts $Fe_3(\mu_3\text{-}Te)_2(CO)_9L$ where L = PPh_3, *t*-BuNC, CO, and amines. Spectroscopic evidence indicates that, contrary to previous suggestions, the base is bound to an iron center and *not* to the tellurium atoms. X-ray crystallography of the PPh_3 adduct proves this point: the structure consists of an isosceles triangle of iron atoms tethered by capping μ_3-Te atoms. The basal $Fe_2(CO)_6$ unit contains a Fe–Fe bond while the apical $Fe(CO)_3PPh_3$ is octahedral, two coordination sites being occupied by the bridging tellurium atoms. We suggest that in **1** the μ_3-Te moieties are constrained to acute (strained) ~60° Fe–Te–Fe angles which are fixed by Fe–Fe bonding. Upon adduct formation, one Fe–Fe vector elongates by 1.4 Å and one pair of the acute Fe–Te–Fe angles opens up to 98°. As such, **1** represents an unusual example of a strained metal cluster compound and the difference in its chemical behavior relative to the analogous but less strained $Fe_3(\mu_3\text{-}E)_2(CO)_9$ (E = S, Se) can thus be understood. Treatment of **1** with potentially chelating bis(tertiary phosphines) demonstrates that **1** is effectively coordinatively unsaturated with respect to only one base addition: in this way monodentate derivatives of $Ph_2P(CH_2)_nPPh_2$ (n = 1–3) were prepared. For $Ph_2PCH_2CH_2PPh_2$(dppe), the chelate-bridged bis cluster compound $[Fe_3(\mu_3\text{-}Te)_2(CO)_9]_2$(dppe) was isolated and characterized.

Introduction

Tellurium-containing transition metal clusters have been little studied[1-8] as they are few in number and they have been assumed to be chemically analogous to the more numerous sulfur and selenium derivatives. Certain characteristics of tellurium suggest, however, that the chemistry of its transition metal clusters may prove distinctive. First, tellurium has a relatively large covalent radius (1.36 Å); therefore one might expect geometrical differences between tellurium-bridged clusters and those containing sulfur and

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[8] The second paper in this series will describe the stereochemistry of substituted derivatives of $Fe_3(\mu_3\text{-}Te)_2(CO)_9$.

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