Appendix G

Supplemental Data for Table 13-1. Selected 6- and 7-Vertex Transition Element Metallacarboranes

Compound[a]	Information[b]	References
Synthesis and Characterization		
Yttrium		
7-vertex closo-1,2,3-YC_2B_4 clusters		
$(C_4H_8O)(Cl)$**Y**$[(Me_3Si)RC_2B_4H_4]_2Li(C_4H_8O)_4$ R = $SiMe_3$, Me	S, X($SiMe_3$), H, B. C, IR	[8]
$\{C_4H_8O)_2Cl$**Y**$[(Me_3Si)_2C_2B_4H_4]\}_2 \cdot OC_4H_8$	S, X, H, B, C, IR	[10]
$\{(Me_2C_5H_5)$**Y**$[(Me_3Si)RC_2B_4H_4]\}_2$ R = $SiMe_3$, Me	S, X, H, B, C, IR	[11]
Titanium		
7-vertex closo-1,2,3-TiC_2B_4 clusters		
$(\eta^8\text{-}C_8H_8)$**Ti**$(Et_2C_2B_4H_3)$-5-I	S, B, MS	[12]
$(\eta^8\text{-}C_8H_8)$**Ti**$(Et_2C_2B_4H_2)$-4,5-I_2	S, B, MS	[12]
$\{Cp$**Ti**$[R(Me_3Si)C_2B_4H_4]\}_2$ R = $SiMe_3$, Me, H	S, X($SiMe_3$), ESR($SiMe_3$), MAG, IR	[14,15]
$\{Cp$**Ti**$[Me(Me_3Si)C_2B_4H_4]\}_2$	S, X	[16]
$(Me_3P)_2Cl_2$**Ti**$(Et_2C_2B_4H_4)$ ethylene polymerization precatalyst	S, X, H, B, C, P, UV, IR	[17]
$[Me_2P(CH_2)_nPMe_2]Me_2$**Ti**$(Et_2C_2B_4H_4)$ n = 2,3 ethylene polymerization precatalysts	S, X, H, B, C, P, IR	[17]
$[O{=}P(NMe_2)_3](Me_3P)Cl_2$**Ti**$(Et_2C_2B_4H_4)$	S, H, C, P	[17]
$\{[Me_2P(CH_2)_3PMe_2]Me$**Ti**$(Et_2C_2B_4H_4)\}^+$	S, H, C, P	[17]
$[Me_2P(CH_2)_3PMe_2][^{13}CH_3]_2$**Ti**$(Et_2C_2B_4H_4)$ ethylene polymerization precatalyst	S, H, B, C, P	[17]
Zirconium		
7-vertex closo-1,2,3-ZrC_2B_4 clusters		
$[(C_4H_8O)Cl$**Zr**$[(Me_3Si)_2C_2B_4H_4]^{2-}$ $Li(C_4H_8O)_2{}^+$	S, X, H, B, C, IR	[18]

Continued

Compound	Information	References
$[Mg(C_4H_8O)_3]_2(\mu\text{-}Cl)_3Li\text{-}[(Me_3Si)_2C_2B_4H_4]]_2$**Zr**$(CH_2SiMe_3)Cl$	S, X, H, B, C, IR	[19]
L**Zr**$Cl(OC_4H_8)(Et_2C_2B_4H_4)$ L = Cp, Cp*	S, H, B, C	[20]
$(Me_3P)_2Cl_2$**Zr**$(Et_2C_2B_4H_4)$ ethylene polymerization precatalyst	S, H, P	[17]
Hafnium		
7-vertex closo-1,2,3-HfC_2B_4 clusters		
Cl_2Cp^***Hf**$[Me(Me_3Si)C_2B_4H_4]_2\cdot Li(OC_4H_8)$	S, H, B, C	[23]
Cl_3Cp^***Hf**$[(Me_3Si)_2C_2B_4H_4]_2\cdot Li(OC_4H_8)$	S, H, B, C	[23]
Niobium		
7-vertex closo-1,2,3-NbC_2B_4 clusters		
$CpCl_2$**Nb**$(Et_2C_2B_4H_3\text{-}5\text{-}X)$ X = Cl, Br	S, X(Br), H, B, C, MS	[25]
Tantalum		
7-vertex closo-1,2,3-TaC_2B_4 clusters		
CpLCl**Ta**$(Et_2C_2B_4H_4)$ L = Me, Et, CH_2Ph, CH_2CMe_3	S, H, B, C, IR, UV, MS	[20]
CpL_2**Ta**$(Et_2C_2B_4H_4)$ L = Me, Ph, CH2Ph, CH_2CMe_3, OPh	S, X(Ph), H, B, C, IR, UV, MS	[20]
CpL_2**Ta**$[(SiMe_3)_2C_2B_4H_4$ L = Me, CH_2Ph, CH_2CMe_3	S, H, B, C, IR, UV, MS	[20]
7-vertex closo-1,7,2,3-TaC_2B_3M clusters (triple-decker sandwiches)		
Cp^*Cl_2**Ta**$(Et_2C_2B_3H_3)$**Co**Cp*	S, H, B, C, IR, UV, MS	[20]
$CpCl_2$**Ta**$(Et_2C_2B_3Br_3)$**Co**Cp*	S, X, H, B, C, MS	[25]
$CpCl_2$**Ta**$(Et_2C_2B_3HI_2)$**Co**Cp*	S, H, B, MS	[20,25]
Iron		
6-vertex nido-1,2,3-FeC_2B_3 clusters		
Nido-$(\eta^6\text{-}C_6Me_6)$**Fe**$(Et_2C_2B_3H_{5-n}R_n)$ R_n = 5-Me, 4,5-Me_2, 4,5,6-Me_3, 5-CH_2Ph	S, H, B, IR, MS	[52]
Nido-$(\eta^6\text{-}C_6Me_6)$**Fe**$(Et_2C_2B_3H_3\text{-}4\text{-}I\text{-}5\text{-}Me)$	S, H, B, IR, MS	[52]
Nido-$(\eta^6\text{-}C_6Me_6)$**Fe**$(Et_2C_2B_3H_4)\text{-}5\text{-}C{\equiv}CH$	S, H, B, C, IR, MS	[51]
Nido-$(\eta^5\text{-}Me_4C_4S)$**Fe**$(Et_2C_2B_3H_5)$ thiophene	S, H, B, IR, UV, MS	[55]
5-[*nido*-$(Et_2C_2B_3H_4)$**Fe**$(PhCH_2)$]-$(Et_2C_2B_3H_4)$**Fe**(C_6Me_6)	S, H, B, IR, MS	[57]
p-[*nido*-(C_6Me_6)**Fe**$(Et_2C_2B_3H_4\text{-}5\text{-}CH_2)]_2(C_6H_4)$**Fe**$(Et_2C_2B_3H_4)$	S, H, B, IR, MS	[57]
Nido-$(Et_2C_2B_3H_4)$**Fe**$H(Et_4C_4B_8H_7)$ B—B linked ligands	S, B, IR, MS	[58]
7-vertex closo-1,2,3-FeC_2B_4 clusters		
H_2**Fe**$(Et_2C_2B_4H_3\text{-}4\text{-}Et)_2$	S, H, B, IR, MS	[72]
H_2**Fe**$[(Me_2CH)_2C_2B_4H_4]_2$	S, B, MS	[73]
Cp_2Co^+ [**Fe**$(Et_2C_2B_4H_4)_2]^-$	S, H, UV, MAG	[75]
[Cp**Fe**$(C_2B_4H_6)]^-$	S	[46]
Cp*$\mathbf{Fe}(Et_2C_2B_4H_4)$	Cytotoxic/antitumor activity	[34]

Compound	Information	References
Cp*$\mathbf{Fe}(Et_2C_2B_4H_3$-5-X) X = Br, I	S, H, IR, MS	[48]
$[(Et_2C_2B_4H_4)\mathbf{Fe}H(C_5Me_4)]_2C_6H_4$	S, X, H, B, UV, E	[76]
$[(Et_2C_2B_4H_4)\mathbf{Fe}(C_5Me_4)]_2C_6H_4$	S, H, B, UV, E, MAG	[76]
$(\eta^6$-$C_6H_6)\mathbf{Fe}(Et_2C_2B_4H_3)$-5-$(C_6H_5)\mathbf{Fe}$-$(Et_2C_2B_4H_4)$	E	[78]
$[(\eta^6$-$C_6H_6)\mathbf{Fe}(Et_2C_2B_4H_3)-5]_2$	E	[78]
$[(\eta^6$-$C_6H_6)\mathbf{Fe}(Et_2C_2B_4H_3)$-5-$]_2$R R = C_4H_2S, $C_{14}H_{10}$, $(C_6H_4)_n$ n = 1,2	E	[78]
$(\eta^6$-$C_6H_6)\mathbf{Fe}(Et_2C_2B_4H_3)$-5-R X = H, I	Cytotoxic/antitumor activity	[34]
$(\eta^6$-$C_6H_6)\mathbf{Fe}(Et_2C_2B_4H_3)$-7-R R = Br, I, C≡CSi$Me_3$, C≡CH	S, H, B, C, IR, UV, MS	[51]
$(C_6H_6)\mathbf{Fe}(Bu_2C_2B_4H_4)$	E	[81]
$[(\eta^6$-$C_6H_6)\mathbf{Fe}(Et_2C_2B_4H_3)]_2CHMeCH_2$	S, X, H, B, IR, MS	[49]
$[(\eta^6$-C_6H_5-$C_6H_5)\mathbf{Fe}(Et_2C_2B_4H_3)]_2$	S, H, IR, MS	[49]
$(\eta^6$-C_6H_5-$C_6H_5)\mathbf{Fe}(Et_2C_2B_4H_4)$	S, X, H, C, B, IR, MS	[49]
	E	[79]
p-[*nido*-$(\eta^6$-$C_6Me_6)\mathbf{Fe}(Et_2C_2B_3H_4$-5-$CH_2)]_2(C_6H_4)\mathbf{Fe}(Et_2C_2B_4H_4)$	S, H, B, IR, MS	[57]
$(MeC_6H_5)\mathbf{Fe}(Et_2C_2B_4H_4)$	S, X, H, B, C, IR, MS	[59]
p-[*nido*-$(\eta^6$-$C_6H_4CHMe_2)\mathbf{Ru}(Et_2C_2B_3H_4$-5-$CH_2)]_2(C_6H_4)$- $\mathbf{Fe}(Et_2C_2B_3H_4)$	S, H, B, IR, MS	[57]
$(\eta^6$-$C_6Me_6)\mathbf{Fe}(Me_2C_2B_4H_3$-$C_2Me_2H_3)$ (two isomers)	S, B, MS	[82]
$(\eta^6$-$C_8H_{10})\mathbf{Fe}(Et_2C_2B_4H_3$-5-Br)	S, H, B, C, MS	[48]
$(\eta^6$-$C_8H_{10})\mathbf{Fe}[Ph(CH_2)_nC_2B_4H_5]$ n = 2,3	S, H, B,IR, MS	[53]
$(\eta^6$-$C_8H_{10})\mathbf{Fe}\{[(CO)_3CrPhCH_2](PhCH_2)$-$C_2B_4H_4\}$	S, H, B, IR, MS	[83]
$(\eta^6$-$C_8H_{10})\mathbf{Fe}\{[(CO)_3CrPhCH_2]_2C_2B_4H_4\}$	S, H, B, IR, MS	[83]
$[(\eta^5$-$C_9H_7)H\mathbf{Fe}(Et_2C_2B_4H_4)]_2$	S, H, B, C, IR, MS, E	[54]
$(HNMe_2C_8H_4)\mathbf{Fe}(Et_2C_2B_4H_4)$	Cytotoxic/antitumor activity	[34]
	E	[88]
Fe-wedged-$(C_4H_8O)_2\mathbf{Fe}_2(Et_2C_2B_4H_4)_2$	S, H, IR, UV	[89]
B-wedged-Cp**FeCo**$[(PhCH_2)_2C_2B_4H_4]_2$	S, H, B, IR, MS	[74]
B-wedged-Cp$\mathbf{Fe}_2(Me_2C_2B_4H_4)_2$	B, IR	[91]
$(Me_2C_2B_4H_4)\mathbf{Fe}H_2(Me_2C_2B_5H_5)$	S, H, B, IR, MS	[93]
$(Me_2C_2B_4H_4)\mathbf{Fe}H_2(Me_2C_2B_7H_7)$	S, MS	[93]
7-vertex closo-1,2,4-FeC_2B_4 clusters		
Cp$\mathbf{Fe}(C_2B_4H_5$-$C_{10}H_7)$	S, H, B	[46]
Cp$\mathbf{Fe}(C_2B_4H_5$-$C_2B_5H_6)$	S, H, B, IR	[46]
7-vertex nido,closo-(2,3-C_2B_3)Fe(2,3,5-C_3B_2)M (carborane-diborolyl triple-decker sandwiches)		
Nido, closo-$(Et_2C_2B_3H_5)\mathbf{Fe}(Et_2MeC_3B_2Et_2)$-**Co**Cp	S, MS	[98]

Continued

Compound	Information	References
Nido, closo-[$(PhCH_2)_2C_2B_3H_5$]**Fe**-($Et_2MeC_3B_2Et_2$)**Co**Cp	S, MS	[98]
Cp**Fe**($Et_2MeC_3B_2Et_2$)**Fe**Cp	E	[102]
Cp**Fe**($Me_2HC_3B_2Me_2$)**Fe**Cp	E	[102]
Cp**Fe**($Me_2HC_3B_2Me_2$)**Co**Cp	E	[102]
$(CO)_3$**Fe**($MeEt_2C_3B_2Et_2$)**Co**Cp	S, IR, MS	[103]
$(CO)_3$**Fe**($Et_2MeC_3B_2Me_2$)**Ni**Cp	S, H, IR, MS	[103]
$(CO)_3$**Fe**($Et_2MeC_3B_2Me_2$)**Ni**(CO)(μ-$CO)_2$FeCp	S, H, B, IR, MS	[103]
7-vertex closo,closo-(2,3-C_2B_4)Fe(2,3,5-C_3B_2)M (carborane-diborolyl triple-decker sandwiches)		
[$(PhCH_2)_2C_2B_4H_4$]**Fe**($Et_2MeC_3B_2Et_2$)**Co**Cp	S, H, IR, UV, E, ESR, MS	[98]
{[$(PhCH_2)_2C_2B_4H_4$]**Fe**($Et_2MeC_3B_2Et_2$)-**Co**Cp}$^{n-}$ $n=1,2$	S, H, IR, E, ESR ($n=2$)	[98]
Ruthenium		
6-vertex nido-1,2,3-RuC_2B_3 clusters		
[(MeC_6H_4-$CHMe_2$)**Ru**($Et_2C_2B_3H_3$)]$^{n-}$ $n=1, 2$	S	[96]
($MeC_6H_4CHMe_2$)**Ru**($Et_2C_2B_3H_4$-5-Cl)	S, H, B, IR, MS	[114]
6-vertex nido-1,2,4,5-$Ru_2C_2B_2$ clusters		
Cp*$_2$**Ru**$_2$($Me_2C_2B_2H_5$)-μ-BH_2	S, X, H, B, C, IR, MS	[115]
Cp*$_2$**Ru**$_2$[$HPhC_2B_2H_4Me$]-μ-BH_3	S, H, B, IR, MS	[116]
Cp*$_2$**Ru**$_2$[$HPhC_2B_2H_3(CH_2CH_2Ph)$]-μ-BH_3	S, X, H, B, IR, MS	[116]
Cp*$_2$**Ru**$_2$[$HPhC_2B_2H_6$]-μ-BH_3	S, H, B, IR, MS	[116]
Cp*$_2$**Ru**$_2${[MeC(O)]$C_2B_2H_7$}	S, X, H, B, C, IR, MS	[117]
Cp*$_2$**Ru**$_2${[C(O)OMe]$C_2B_2H_7$}	S, X, H, B, C, IR, MS	[118]
Cp*$_2$**Ru**$_2${[C(O)OMe](BH_2)$C_2B_2H_5$}$_3$-$(CH_2)_2$-C(O)OMe	S, H, B, C, IR, MS	[118]
Cp*$_2$**Ru**$_2$[(OMe)$MeC_2B_2H_5$-3-OH]	S, X, H, B, C, IR, MS	[118]
Cp*$_2$**Ru**$_2${[$B(OH)_2$][C(O)OMe]$C_2B_2H_6$}	S, X, H, B, C, IR, MS	[118]
Cp*$_2$$H_2$**Ru**$_2$($Me_2C_2B_2H_3$)-3-CMeCMeB-$(CMeCHMe)_2$	S, H, B, IR, MS	[119]
Cp*$_2$$H_2$**Ru**$_2$($PhC_2B_2H_5$)-3-$(CH_2)_2$Ph-μ($BH_2$)	S, H, B, IR, MS	[119]
Cp*$_2$$H_2$**Ru**$_2$[(Me)(MeO)$C_2B_2H_3$]-3-OH	S, X, H, B, C	[120]
6-vertex nido-1,2,3,5-RuC_3B_2 clusters (diborolyl complexes)		
Cp*(CO)**Ru**($Et_2MeC_3B_2EtR$) R = Et, CMe_3	S, X(CMe_3), H, B, C, MS	[62]
Cp*(Me_3CNC)**Ru**($R_2R'C_3B_2R''_2$) R, R′, R″ = Me, Et, Bu, CH_2SiMe_3	S, X(Et, Et, Me; Et, Me, Me), H, B, C, MS	[122]
Cp*H_2**Ru**($R_2R'C_3B_2R''_2$) R, R′, R″ = Me, Et, Bu, CH_2SiMe_3	S, H, B, C, MS	[122]
Cp***Ru**(PR_2R')($Me_3C_3B_2Me_2$) R, R′ = H, Ph, Me	S, H, B, C, MS	[123]
Cp***Ru**($Me_3C_3B_2Me_2$)$_2$(CS_2)$_2$	S, H, B, C, MS	[123]
7-vertex closo-1,2,3-RuC_2B_4 clusters		
Cp*H**Ru**($Et_2C_2B_4H_3$-5-Me)	S, H, B, C, MS, UV	[125]

Compound	Information	References
$(MeC_6H_4\text{-}CHMe_2)$**Ru**$(Et_2C_2B_4H_3\text{-}5\text{-}Cl)$	S, H, C, MS	[114]
L**Ru**$(R_2C_2B_4H_4)$ L = 1,4-$CHMe_2C_6H_4Me$, C_6H_6	E	[81]
$(C_{10}H_{14})$**Ru**$[(Me_3Si)_2C_2B_4H_4]$	S, H, B, IR, MS	[126]
7-vertex closo-1,2,4,5-$Ru_2C_2B_3$ clusters		
Cp^*_2**Ru**$_2[HPhC_2B_3H_4]$-*n*-$(CH_2)_2Ph$ *n* = 3,7	S, H, B, IR, MS	[116]
$Cp^*_2H_2$**Ru**$_2(PhC_2B_3H_3)$-3-$(CH_2)_2Ph$	S, H, B, IR, MS	[119]
7-vertex closo-1,7,2,3-RuC_2B_3M clusters (triple-decker sandwiches)		
Closo, nido-$(\eta^6\text{-}MeC_6H_4CHMe_2)$**Ru**-$(Et_2C_2B_3H_2Me)$-**Co**$H(Et_2C_2B_3H_5)$	S, H, B, UV, MS	[128]
Cp***Ru**$(Me_3C_3B_2Me_2)$**Rh**$(Ph_2PCH_2CH_2PPh_2)$-Cl	S, X, H, B, C	[134]
7-vertex 1,7,2,3,5-RuC_3B_2M (diborolyl triple-decker sandwiches)		
Cp^*_2**Ru**$_2(Me_3C_3B_2RCl)$ R = Me, Cl	S, X(Cl), H, B, MS	[1372]
$(\eta^6\text{-}MeC_6H_4CHMe_2)$**Ru**$(Et_2C_2B_3H_2R)$**Os**$(\eta^6\text{-}MeC_6H_4CHMe_2)$ R = H, Cl)	S, H, B, IR, UV, MS	[96]
Cp***Ru**$(Me_3C_3B_2Me_2)$**Rh**$(Et_2C_2B_4H_4)$	S, H, B, C, MS	[136]
Cp***Ru**$(Me_3C_3B_2Me_2)$**Rh**$(C_2B_9H_{11})$	S, H, B, MS	[136]
Cobalt		
6-vertex nido-1,2,3-CoC_2B_3 clusters		
Cp**Co**$(Me_2C_2B_3H_4)$-*nido*-$Me_2C_2B_4H_5$ (two isomers)	S, H, B, IR, UV	[145]
Cp**Co**$(Et_2C_2B_3H_3\text{-}4\text{-}X\text{-}6\text{-}Y)$ X = Br, Y = I; X = Br, Y = H; X = I, Y = H	S, H, B, C, IR, MS	[48]
Cp***Co**$(C_2B_3H_6Cl)$	S, H, B, IR, MS	[126]
Cp***Co**$(RC_2B_3H_6)$ R = Cl, $SiMe_3$	S, H, B, IR, MS	[126]
Cp***Co**$(Me_2C_2B_3H_4)$-5-Me	S, H, B, IR, MS	[148]
Cp***Co**$(Me_2C_2B_3H_3)$-Me_2 (two isomers)	S, H, IR, MS	[148]
Cp***Co**$(Me_2C_2B_3H_4)$-5-Cl	S, H, IR, MS	[148]
Cp***Co**$(Me_2C_2B_3H_4)$-μ-HgCl	S, X, H, B, IR, MS	[150]
	B(2d)	[50]
Cp***Co**$(Et_2C_2B_3H_3)$-4,6-I_2	Cytotoxic/antitumor activity	[34]
Cp***Co**$(Et_2C_2B_3H_4)$-5-R R = NMe_2, $OCMe_3$	S, H, B, C, IR, MS	[152]
R = C≡CH, C≡C$SiMe_3$	S, H, B, C, IR, MS	[151]
Cp***Co**$(Et_2C_2B_3H_{5-n}R_n$ R_n = 4,5-Me_2, 4,5,6-Me_3	S, H, B, IR, MS	[52]
Cp***Co**$(Et_2C_2B_3H_4)$-5-OC_4H_8	S, UV, MS	[154]
Cp***Co**$(Et_2C_2B_3H_2)$-Cl_3	S, H, B, C, IR, UV	[154]
Cp***Co**$(Et_2C_2B_3H_2)$-5-Me-4,6-Cl_2	S, H, B, C, IR, UV	[154]
Cp***Co**$(RR'C_2B_3H_5)$ R = alkyl, arylalkyl	S	[199]
L**Co**$(Et_2C_2B_3H_5)^{2-}$ L = Cp, Cp*	S	[96]

Continued

Compound	Information	References
(η^5-C_5Ph_5)**Co**[$(Me_3Si)_2C_2B_3H_5$]	S, H, IR, MS	[126]
(η^5-C_5H_4I)**Co**($Et_2C_2B_3H_5$)	S, H, B, C, IR, MS	[159]
[η^5-$C_5H_4C(O)Cl$]**Co**($Et_2C_2B_3H_5$)	S, H, B, C, IR, MS	[160]
[($Et_2C_2B_3H_5$)**Co**(η^5-C_5Me_4)—C≡C]$_2$Pd-$(Et_2NH)_2Cl$	S, MS	[161]
($Et_2C_2B_3H_4$-5-CH_2Ph)**Co**(C_5Me_4-CH_2-η^5-C_5H_4)**Fe**($Et_2C_2B_4H_4$)	S, H, B, IR, MS	[86]
(η^5-$PhCH_2C_5Me_4$)**Co**($Et_2C_2B_3H_4$-5-R) R = H, CH_2Ph	S, H, B, IR, MS	[86]
(η^5-$NC_4Me_2R_2$)**Co**($Et_2C_2B_3H_5$) R = Me, H pyrrolyl	S, H, B, IR, UV, MS	[129,162]
(B_9H_{12}-*n*-OC_4H_8)**Co**($Et_2C_2B_3H_5$) *n* = 5, 6	S, H, B, IR, MS	[163]
	X (*n* = 5)	[164]
Nido, closo-(C_2B_3)Co(C_2B_4) complexes		
Closo, nido-($Et_2C_2B_4H_4$)**Co**H($Et_2C_2B_3H_4$-5-*n*-C_4H_9)	S, H	[127]
Nido, closo-($Me_2C_2B_3H_5$)**Co**($Me_2C_2B_4H_4$)$^-$	S, H, B, IR, MS	[165]
Cp_2**Co**$^+$ [*nido, closo*-($Et_2C_2B_3H_4$-5-R)**Co**-$(Et_2C_2B_4H_4)$]$^-$	S, H, B, IR	[75]
Linked 6,7-vertex nido,closo-[(2,3-C_2B_3)Co(2,3-C_2B_3)]$_2$M clusters (tetradecker sandwiches)		
($Et_2C_2B_3H_3$-4-R-5-R′)**Co**(C_5Me_4)-C_6H_4-(C_5Me_4)**Co**[($Et_2C_2B_3H_3$-4-R″-5-R‴) R, R′, R″, R‴ = H, Cl, Br, Me phenylene-bridged	S, H, B	[168]
Other *nido*-**Co**C_2B_3 phenylene-bridged complexes		[168]
1,3,5-[Cp*-**Co**($Et_2C_2B_3H_4$-5-C≡C)]$_3C_6H_3$ benzene-centered	S, H, B, C, IR, UV, MS	[151]
Other *nido*-**Co**C_2B_3 benzene-centered complexes		[161]
[*nido*-($Et_2C_2B_3H_4$-5-Me)**Co**(η^5-C_5H_4)]$_2$ fulvalene-bridged	S, H, B	[168]
Nido, closo-[($Et_2C_2B_3H_4$-5-Me)**Co**(η^5-C_5H_4)$_2$**Co**$_3$($Et_2C_2B_3H_2$-5-Me)$_2$(η^5-C_5H_4)]$_2$ fulvalene-bridged	S, H, UV, MS(FAB)	[168]
Other *nido*-**Co**C_2B_3 fulvalene-bridged complexes		[168]
6-vertex nido-1,2,3,5-CoC_3B_2 clusters (diborolyl complexes)		
Cp**Co**($Et_2H_2C_3B_2Me_2$)	S, H, B, C, MS	[40,169]
Cp**Co**($Et_2HC_3B_2Me_2$)$^-$	S, H	[108]
Cp**Co**($Et_2MeDC_3B_2Et_2$)	S, H, B	[40]
CpH**Co**($R_2R'C_3B_2R''_2$) R = Me, Et; R′ = H, Me; R″ = Me, Et	S, H, B, MS	[171]
Cp**Co**($R_2R'R''C_3B_2R'''_2$) R = Me, Et; R′, R″ = H, Me; R‴ = Me, Et	S, H, B, MS	[171]
$(CO)_3$**Co**[*cyclo*-$(CH_2)_6$-$MeC_3B_2Me_2$]	S, X, H, B, C, MS	[173]

Compound	Information	References
$(CO)_3$**Co**$(MeEt_2C_3B_2Et_2)$	S, H, B, C, MS	[174]
6-vertex nido-1,2,3,4,5-CoC_4B clusters		
Cp**Co**$(H_4C_4B$-Ph)-μ-$SiMe_2$	S, H, B, C, IR, MS	[177]
Cp**Co**$(H_4C_4B$-R) R = Me, Ph	S, H, B, MS	[176]
Cp**Co**$(H_2D_2C_4B$-Ph)	S	[176]
$(CO)_2$R**Co**$(H_4C_4B$-Ph) R = CO, PMe_3	S	[1369]
Cp**Co**$[H_4C_4B$-$N(CHMe_2)_2]$	S, H, B	[180]
(CO)(μ-CO)**Co**$[H_4C_4B$-$N(CHMe_2)_2]$	S, H, B	[180]
Nido, closo-$(CO)_3$**Mn**$(H_4C_4B$-Me)**Co**$(H_4C_4B$-Me)	S, He photoelectron spectra	[181]
Other *nido*-$(CO)_2$**Co**$(3,4$-$R_2H_2C_4B$-Ph) complexes		[184]
Cp**Co**$(Ph_4C_4B$R) R = Br, Ph, *n*-C_4H_9, OH	S, H, B, IR, UV(OH), MS	[186]
Cp**Co**$(Ph_4C_4B$R) R = OMe, $OSiMe_3$	S, H, MS	[186]
$(CO)_2$X**Co**$(H_4C_4B$-R) R = Me, Ph) X = Br, I	S, H, B, IR, MS	[176]
Other *closo,nido*-L**M**$(H_4C_4B$-R)**Co**$(H_4C_4B$-R) complexes		[176]
7-vertex closo-1,2,3-CoC_2B_4 clusters		
Nido, closo-$(Me_2C_2B_3H_5)$**Co**$(Me_2C_2B_4H_3)$-$(\eta^5C_5H_4)$CoCp	X	[166]
Wedged-$(Et_3P)_2$**CoFe**$(Me_2C_2B_4H_4)_2$	S, X, H, B, P, IR	[91]
Wedged-Cp**CoFe**$[(PhCH_2)_2C_2B_4H_4]_2$	S, H, B, IR, MS	[74]
Cp_2Co^+ $[$**Co**$(Et_2C_2B_4H_4)_2]^-$	S, X, H, B, UV, MS	[75]
1,2,3-Cp**Co**$[(Me_3Si)_2C_2B_4H_4]$	S, H, B, MS	[198]
1,2,3-Cp**Co**$[(Me_3Si)_2C_2B_4H_3]$-μ(5)-B_2H_5	S, X, H, B, IR, MS	[198]
1,2,3-Cp*__Co__$(RC_2B_4H_5)$ R = Et, $SiMe_3$	S, H, B, IR, MS	[126,199]
1,2,3-Cp*__Co__$(Me_2C_2B_4H_4)$	S, H, B, IR, MS	[148,149]
	E	[200]
$(2,3$-$Et_2C_2B_4H_4)$**Co**$(Et_4C_4B_8H_7$-$OC_4H_8)$	S, X, H, B, IR, MS	[58]
$(2,3$-$Et_2C_2B_4H_4)$**Co**$(Et_4C_4B_8H_8$-$OC_4H_8)$	S, H, B(2d), IR, MS	[58]
1,2,3-Cp*__Co__$(Et_2C_2B_4H)$-4,5,6-I_3	S, H, B, C, IR, MS	[202]
1,2,3-Cp*__Co__$(Et_2C_2B_4)$-4,6-Me_2-5-R-7-O_3SCF_3 R = Me, I	S, H, B, C, IR, MS	[202]
1,2,3-Cp*__Co__$(Et_2C_2B_4H_3)$-7-$SiMe_3$	S, H, B, UV, MS	[204]
1,2,3-Cp*__Co__$(Et_2C_2B_4H_2)$-5-R-7-R′ R = I, $SiMe_3$; R′ = $SiMe_3$, H	S, H, B, C, UV(H, $SiMe_3$), IR, MS	[204]
1,2,3-Cp*__Co__$(Et_2C_2B_4H_2)$-5-I-7-C≡CR R = H, $SiMe_3$	S, H, B, C, IR, MS	[202]
1,2,3-Cp*__Co__$(Et_2C_2B_4H)$-4,5,6-X_3 X = Cl, I	S, H, B, C, MS	[48]
$[1,2,3$-Cp*__Co__$(C_2B_4H_5)]_2CH_2$	S, H, B, IR, MS	[126]
1,2,3-Cp*__Co__$[(PhCH_2)EtC_2B_4H_4]$	S, H, B, IR, MS	[126]

Continued

Compound	Information	References
1,2,3-Cp*Co[$(Me_3Si)_2C_2B_4H_4]^-$	H (correlated), ESR	[200]
Cp*Co($Et_2C_2B_4H_3$)-5-O$(CH_2)_4$-(η^4-C_5Me_5)-CoH($Et_2C_2B_4H_3$)-5-I	S, X, H, B, C, IR, MS	[152]
p-[1,2,3-Cp*Co($C_2B_4H_5$)$CH_2]_2C_6H_4$ phenylene-bridged	S, H, B, IR, MS	[126]
p-{1,2,3-Cp*Co[$(Me_3Si)C_2B_4H_4]CH_2\}_2C_6H_4$ phenylene-bridged	H (correlated), E	[200]
[1,2,3-($Et_2C_2B_4H_4$)Co(C_5Me_4)$]_2(C_6H_4)_n$ (n=1, 2) phenylene-bridged	S, H, B, IR, UV, MS	[131]
o/*m*/*p*-{Cp*Co[$(SiMe_3)C_2B_4H_4]CH_2\}_2C_6H_4$	S, H, B, IR, MS	[126]
Other CoC_2B_4 phenylene-bridged complexes		[126]
1,3,5-[Cp*Co($Et_2C_2B_4H_2$)-5-X-7-C≡C)$]_3C_6H_3$ X = Br, I, C≡CSiMe_3, C≡CH benzene-centered	S, H, B, C, IR, UV, MS	[202]
1,2,3-$(Ph_2PCH_2)_2$(Cl)Co($Ph_2C_2B_4H_4$)	S, H, B, C, IR, UV, MS	[206]
(η^5-Ph$CH_2C_5Me_4$)Co($Et_2C_2B_4H_4$)	S, H, B, IR, MS	[86]
(η^5-C_5Me_4-C≡CSiMe_3)Co($Et_2C_2B_4H_4$)	S, H, C, MS	[161]
1,2,3-[RC(O)(η^5-C_5H_4)]Co($Et_2C_2B_4H_4$) R = Cl, OH	S, H, B,C, IR, MS	[160]
Other 1,2,3-CoC_2B_4 derivatives		[48,58,127,128,131,152,159,161,163,164]
7-vertex closo-1,7,2,3-CoC_2B_3Co clusters (triple-decker sandwiches)		
CpCo($RC_2B_3H_4$)CoCp R = Ph, SiMe_3	S, H, B, MS	[212]
CpCo($C_2B_3H_4$-5-X)CoCp X = Br, I	S, H, B, MS	[212]
CpCo($Me_2C_2B_3H_2$-4-OEt)CoCp	S, H, B, IR, MS	[213]
Cp*Co[$(Me_3Si)_2C_2B_3H_3$]CoCp*	S, H, B, IR, MS	[148]
Cp*Co[$Et_2C_2B_3H_2$-5-C≡CSiMe_3]CoCp*	S, H, B, C, IR, UV, E, MS	[151]
(η^5-RC_5H_4)Co($C_2B_3H_5$)CoCp R = Me, Et, SiMe_3	S, H, B, MS	[212]
(η^5-NC_4Me_4)Co($Et_2C_2B_3H_2$X)CoCp* X = H, Br, Cl	S, H, B, IR, UV, MS	[129]
(η^5-$PC_4Me_4)_2Co_2(Et_2C_2B_3H_3)$ phospholyl	S, H, B, P, IR, UV, E, MS	[129]
Other (phospholyl)Co(C_2B_3)M triple-decker complexes		[129]
Other Co(2,3-C_2B_3)M triple-decker complexes		[88,148]
7-vertex closo-1,7,2,3-CoC_2B_3M clusters (triple-decker sandwiches)		
Cp*Co($Et_2C_2B_3Br_3$)TaCl_2Cp	S, X, H, B, C, MS	[25]
Cp*Co($Et_2C_2B_3HI_2$)TaCl_2Cp	S, H, B, MS	[20,25]
Cp*Co($Et_2C_2B_3H_3$)TaCpLL′ L = Me, CH_2Ph; L′ = Cl, Me, CH_2Ph, CH_2CMe_3	S, X(Me_2, CH_2Ph; Cl), H, B, C, IR, UV, MS	[20]
CpCl_2Ta($Et_2C_2B_3Br_3$)CoCp*	S, X, H, B, C, MS	[25]
CpCl_2Ta($Et_2C_2B_3HI_2$)CoCp*	S, H, B, MS	[20,25]
CpLL′Ta($Et_2C_2B_3H_3$)CoCp* L = Me, CH_2Ph; L′ = Cl, Me, CH_2Ph, CH_2CMe_3	S, X(Me_2, CH_2Ph; Cl), H, B, C, IR, UV, MS	[20]
CpCl_2Ta($Et_2C_2B_3Br_3$)CoCp*	S, X, H, B, C, MS	[25]

Compound	Information	References
$CpCl_2$**Ta**$(Et_2C_2B_3HI_2)$**Co**Cp*	S, H, B, MS	[20,25]
CpLL′**Ta**$(Et_2C_2B_3H_3)$**Co**Cp* L = Me, CH_2Ph; L′ = Cl, Me, CH_2Ph, CH_2CMe_3	S, X(Me_2, CH_2Ph; Cl), H, B, C, IR, UV, MS	[20]
Cp***Co**$(Et_2C_2B_3H_2$-5-$CH_2Ph)$**Mo**$(CO)_4$	S, X, H, IR, UV, E, MS	[31]
$[(\eta^5$-$NC_4Me_2R_2)$**Co**$(Et_2C_2B_3H_3)$**Ru**(*p*-$CHMe_2C_6H_4Me)$ R = Me, H	S, H, B, IR, UV, E, MS	[129]
Cp***Rh**$(Et_2C_2B_3H_2$-4-R)**Co**Cp* R = H, Cl	S, H, B, IR, E(H), MS	[133]
7-vertex closo-1,7,2,4-CoC_2B_3Co clusters (triple-decker sandwiches)		
Cp**Co**$(2,4$-$RC_2B_3H_4)$**Co**Cp R = Ph, $SiMe_3$	S, H, B, MS	[212]
$(\eta^5$-$RC_5H_4)$**Co**$(2,4$-$C_2B_3H_5)$**Co**Cp R = Me, Et, $SiMe_3$	S, H, B, MS	[212]
7-vertex closo-1,7,2,3,5-CoC_3B_2M clusters (diborolyl triple-decker sandwiches)		
Cp**Co**$(Et_2MeC_3B_2Et_2)$**Co**Cp^+	S, H, B, MS	[100]
Cp**Co**$(Me_3C_3B_2Me_2)$**M**(C_8H_{12}) **M** = Rh, Ir	S, H, B	[220]
Cp**Co**$(Me_3C_3B_2Me_2)$**M**Br_2 **M** = Rh, Ir	S, H, B	[220]
Cp**Co**$(Me_3C_3B_2Me_2)$**M**Cp **M** = Rh, Ir	S, H, B	[220]
1,7,2,3,5-Cp**Co**$(Me_3C_3B_2Me_2)$**Ru**L^+ L = C_6H_6, C_6Me_6, $MeC_6H_4CHMe_2$, η_6-C_7H_8	S, X(C_6H_6, C_6Me_6), H, B, U(CoCp), E	
Cp**Co**$[(CH_2{=}CMe)(CHMe_2)RC_3B_2Me_2]$**Co**Cp R = Me, $MeC{=}CH_2$, $CHMe_2$	S, H, E, MS	[172]
Cp**Co**$[(H_4C_4)RC_3B_2Me_2]$**Co**Cp R = Me, $MeC{=}CH_2$, $CHMe_2$, $CMe_2C_5H_5CoCp$	S, X($CHMe_2$, $CMe_2C_5H_5CoCp$), H, E, MS	[172]
{Cp**Co**$[(H_4C_4)(CHMe_2)C_3B_2Me_2]$**Co**Cp}$^+$	S, H, B, C, MS	[172]
Cp**Co**$[(H_4C_4)RC_3B_2Me_2]$**Co**Cp R = *cyclo*-C_5H_7, *cyclo*-C_5H_9	S, X, H, MS	[172]
Cp**Co**$(Me_2HC_3B_2Me_2)$**Fe**Cp	E	[102]
[Cp**Co**$(Et_2HC_3B_2Me_2)$**Fe**Cp]$^+$	S, H, MAG, Mössbauer	[100]
[Cp**Co**$(Et_2MeC_3B_2Et_2)$**Fe**Cp]$^{n+}$ $n = +1, -1$	ESR	[100]
Cp**Co**$(Me_3C_3B_2Me_2)$**Ru**(C_5R_5)	S, X(H, Me), B, E, UV	[222]
[Cp**Co**$(Et_2MeC_3B_2Et_2)$**Ni**Cp]$^-$	S, ESR	[100]
Cp**Co**$(Et_2HC_3B_2Me_2)$**Ni**(C_3H_5)	S, H, B, MS	[223]
Cp**Co**$(Et_2HC_3B_2Me_2)$**Ni**Cp	S, X, H, MS	[100]
[Cp**Co**$(Et_2MeC_3B_2Et_2)$**Ni**$(CO)]_2$	S, IR, MS	[100]
	S, H, B, MS	[103]
Cp**Co**$(Et_2MeC_3B_2Et_2)$**Ni**$(CO)(\mu$-$CO)_2$FeCp	S, IR, MS	[100]
7-vertex closo,nido-CpCo(2,3,5-C_3B_2)CoL L = borane or thiaborane (diborolyl-borane triple-decker sandwiches)		
Cp**Co**$(MeEt_2C_3B_2Et_2)$**Co**$(S_2B_9H_9)$	S, H, B, MS	[225]
Cp**Co**$(MeEt_2C_3B_2Et_2)$**Co**$(S_2B_6H_8)$	S, X, H, B, C, MS	[225]
7-vertex closo,nido-CpCo(2,3,5-C_3B_2)Co(2,3-C_xB_y) (diborolyl-nido-carborane triple-decker sandwiches)		
Cp**Co**$(MeEt_2C_3B_2Et_2)$**Co**$(C_2B_5H_7)$	S, H, B, MS	[226]
Cp**Co**$(MeEt_2C_3B_2Et_2)$**Co**$(C_2B_9H_{11})$	S, X, H, B, E, MS	[227]

Continued

Compound	Information	References
Cp**Co**($MeEt_2C_3B_2Et_2$)**Rh**($C_2B_7H_9$)	S, H, B, MS	[226]
Cp**Co**($Et_2MeC_3B_2Et_2$)**Fe**($Et_2C_2B_3H_5$)	S, MS	[98]
Cp**Co**($Et_2MeC_3B_2Et_2$)**Fe**[$(PhCH_2)_2C_2B_3H_5$]	S, MS	[98]
Cp**Co**($MeEt_2C_3B_2Et_2$)**Ni**(8-Me-2,3,5-$C_3B_7H_9$)	S, X, H, B, MS	[99]
7-vertex closo,closo-Co(2,3-C_2B_3)M(2,3-C_2B_3)M clusters (tetradecker sandwiches)		
Cp***Co**($Et_2C_2B_3H_4$-5-Cl)**Co**($Et_2C_2B_3H_4$-5-Cl)-**Co**Cp*	S, H, UV, MS	[218]
[(η^6-$MeC_6H_4CHMe_2$)**Ru**($Et_2C_2B_3H_2$-5-X)]$_2$**Co** X = Me, Cl	S, X(Me), H, IR, UV, MS	[114]
[(η^6-$MeC_6H_4CHMe_2$)**Ru**($Et_2C_2B_3Me_3$)]$_2$**Co**	S, IR, UV, MS	[114]
Other Co-Ru tetradecker sandwiches		[114]
[(η^6-$MeC_6H_4CHMe_2$)**Ru**($Et_2C_2B_3H_3$)**Co**-($Et_2C_2B_3H_3$)**Co**Cp	S, H, B, IR, MS, E	[135]
Cp***Co**($Et_2C_2B_3H_4$-5-Cl)**Rh**H($Et_2C_2B_3H_4$-5-Cl)-**M**Cp* **M** = **Ir**, **Co**	S, H, UV, MS	[218]
Cp***Co**($Et_2C_2B_3H_4$-5-Cl)**Ir**($Et_2C_2B_3H_4$-5-Cl)-**Co**Cp*	S, H, UV, MS	[218]
[Cp***Co**($Et_2C_2B_3H_2$-5-X]$_2$**Ni** X = Cl, Br, $CH_2C{\equiv}CMe$	S, H	[229]
[Cp***Co**($Et_2C_2B_3H$-4,5-Cl_2]$_2$**Ni**	S, H, B, C, E, Ms	[138]
[Cp***Co**($Me_2C_2B_3H_2$-5-Me]$_2$**Ni**	S, H, B, IR, MS	[148]
[Cp***Co**($Et_2C_2B_3FCl_2$]$_2$**Ni**	S(electrochem), H, F, E, MS	[138]
[Co(2,3,5-C_3B_2)]$_2$M and [M(2,3,5-C_3B_2)]$_2$Co (diborolyl tetradecker sandwiches)		
[Cp**Co**($MeEt_2C_3B_2Et_2$)]$_2$**Ni**	S, H, E, MS	[227]
[Cp**Co**($Et_2HC_3B_2Me_2$)]$_2$**Ni**$^{2-}$	H	[108]
Rhodium		
6-vertex nido-1,2,3,5-RhC_3B_2 clusters (diborolyl complexes)		
[*nido*-μ-Cl-**Rh**($HMeEt_2C_3B_2Et_2$)]$_2$	S, H, B, MS	[235]
Nido-Cp**Rh**($HMeEt_2C_3B_2Et_2$)	S, H, B, MS	[235]
Nido-Cp**Rh**(Ph_3P-Au-$MeEt_2C_3B_2Et_2$)	S, H, B, P, MS	[170,235]
7-vertex closo-1,2,3,5-RhC_3B_3 clusters		
1,2,3,5-$(OC)_2$**Rh**($Et_3C_3B_3Et_3$)	S, X, H, B, C, P, MS	[1383]
7-vertex closo-1,7,2,3,5-CoC_3B_2Rh clusters (diborolyl triple-decker sandwiches)		
Cp**Co**($Me_3C_3B_2Me_2$)**Rh**(C_8H_{12})	S, H, B	[220]
Cp**Co**($Me_3C_3B_2Me_2$)**Rh**Br_2	S, H, B	[220]
7-vertex closo, closo-M(C_3B_2)Rh(C_xB_y)M′ and Rh(C_2B_3)M(C_3B_2)M′ tetradecker sandwiches		
Cp***Ir**($Et_2C_2B_3H_4$-5-Cl)**Rh**H($Et_2C_2B_3H_4$-5-Cl)-**Ir**Cp*	S, H, UV, MS	[218]
Cp***Ir**($Et_2C_2B_3H_4$-5-Cl)**Rh**H($Et_2C_2B_3H_4$-5-Cl)-**Co**Cp*	S, H, UV, MS	[218]
Cp***Co**($Et_2C_2B_3H_4$-5-Cl)**Rh**H($Et_2C_2B_3H_4$-5-Cl)-**Co**Cp*	S, H, UV, MS	[218]

Compound	Information	References
Nickel		
6-vertex nido-1,2,3,5-NiC_3B_2 clusters (diborolyl complexes)		
Cp**Ni**[*cyclo*-$(CH_2)_6MeHC_3B_2Me_2$]	S, X, H, B, C, MS	[173]
(C_8H_{12})**Ni**[$Et_2(Me_2CH)C_3B_2Me_2$]	S, H, B, C, MS	[238]
Cp**Ni**($Et_2MeC_3B_2Et_2$)	S, H, B	[239]
	X	[240]
$(Et_3HC_3B_2Et_2)_2$**Ni**	S, X, B, C	[1384]
7-vertex closo-1,2,4-NiC_2B_4 clusters		
$(Ph_2PCH_2)_2$**Ni**($C_2B_4H_6$)	S, H, B, IR, MS	[142]
	S, H, B, IR	[1364]
(TMEDA)**Ni**[$(Me_3Si)_2C_2B_4H_4$]	S, IR, ESR	[90]
7-vertex closo-1,2,3,5-NiC_3B_3 clusters		
(C_3H_5)**Ni**[$Et_2(CHMe_2)C_3B_3EtR_2$] R = Me, Et	S, H, B, C(Et), MS	[210]
CpNi(μ-CO)$_2$**Ni**[$(CHMe_2)_2MeC_3B_3Et_3$]	S, H, B, C, IR, MS	[210]
7-vertex closo-1,7,2,3,5-NiC_3B_2M clusters (diborolyl triple-decker sandwiches)		
$(C_3H_5)_2$**Ni**($Me_2RC_3B_2Me_2$)**Ni**(C_3H_5)	S, H, B, C, MS	[245]
Cp**Ni**($Et_2HC_3B_2Me_2$)**Ni**Cp	S, X, MS	[100]
	H(correlated), E	[242]
[Cp**Ni**($Et_2HC_3B_2Me_2$)**Ni**Cp]$^-$	S, H	[100]
(C_3H_5)**Ni**($Me_2HC_3B_2Me_2$)**Ni**$(C_3H_5)_2$	S, H, B, MS	[248]
($Et_2HC_3B_3Me_3$)**Ni**($Et_2HC_3B_2Me_2$)**Ni**-($Et_2HC_3B_3Me_3$)	S, H, ESR, E	[242]
($Me_2HC_3B_3Me_3$)**Ni**($Me_2HC_3B_2Me_2$)**Ni**-($Me_2HC_3B_3Me_3$)	S, H, B, MS	[241]
Cp**Co**($Et_2MeC_3B_2Et_2$)**Ni**(CO)(μ-CO)$_2$FeCp	S, IR, MS	[100,103]
	H	[103]
(CO)$_3$**Fe**($Et_2MeC_3B_2Me_2$)**Ni**(CO)(μ-CO)$_2$FeCp	S, H, B, IR, MS	[103]
(CO)$_3$**Fe**($Et_2HC_3B_2Me_2$)**Ni**Cp	S, H, B, IR, MS	[103]
(CO)$_3$**Fe**($Et_2MeC_3B_2Me_2$)**Ni**Cp	S, H, IR, MS	[103]
[Cp**Co**($Et_2MeC_3B_2Et_2$)**Ni**(CO)]$_2$	S, IR, MS	[100]
	S, H, B, MS	[103]
[Cp**Ni**($Et_2MeC_3B_2Et_2$)**Co**Cp]$^-$	S, ESR	[100]
Cp**Co**($Et_2MeC_3B_2Et_2$)**Ni**(CO)(μ-CO)$_2$**Fe**Cp	S, IR, MS	[100]
7-vertex closo-Ni(2,3,5-C_3B_2)M(C_xB_y) (diborolyl-carborane triple-decker sandwiches)		
Cp**Co**($Et_2MeC_3B_2Et_2$)**Ni**($Et_2C_2B_4H_4$)**Fe**(η^5-C_9H_7)	S, H, B, IR, MS, E	[54]
Cp**Co**($Et_2HC_3B_2Me_2$)**Ni**($Et_2C_2B_4H_4$)**Fe**Cp*	S, H, B, IR, MS	[54]
7-vertex closo,closo-M(C_2B_3)Ni(C_2B_3)M′ and Ni(C_2B_3)M(C_2B_3)M′ tetradecker sandwiches		
[($Me_2HC_3B_3Me_3$)**Ni**($Me_2HC_3B_2Me_2$)]$_2$**Ni**	S, H, MS	[241]
[(η^6-$MeC_6H_4CHMe_2$)**Ru**($Et_2C_2B_3Me_3$)]$_2$**Ni**	S, IR, UV, MS	[114]

Continued

Compound	Information	References
[Cp*$\mathbf{Co}(Et_2C_2B_3H_2$-5-X$]_2\mathbf{Ni}$ X = Cl, Br, $CH_2C{\equiv}CMe$	S, H	[229]
$[(Et_2C_2B_3H_2Me)\mathbf{Co}H(Et_2C_2B_4H_4)]_2\mathbf{Ni}$	S, UV, MS	[128]
7-vertex [closo-M(2,3,5-C_3B_2)]$_2$Ni diborolyl tetradecker sandwiches		
$[Cp\mathbf{Co}(Et_2HC_3B_2Me_2)]_2\mathbf{Ni}^{2-}$	H	[108]
$[Cp\mathbf{Co}(MeEt_2C_3B_2Et_2)]_2\mathbf{Ni}$	S, H, E, MS	[227]
$[Cp\mathbf{Co}(MeEt_2C_3B_2Et_2)]_2\mathbf{Ni}$	S, H, E, MS	[227]
$\{Cp\mathbf{Ni}[(H_4C_4)MeC_3B_2Me_2]\}_2\mathbf{Ni}$	S, X, H	[249]
$[(C_3H_5)\mathbf{Ni}(MeEt_2C_3B_2Et_2)]_2\mathbf{Ni}$	S	[250]
Platinum		
6-vertex nido-1,2,3,5-PtC_3B_2 clusters (diborolyl complexes)		
$(Et_2MeC_3B_2Et_2)_2\mathbf{Pt}$	S, H, B, C, IR, MS	[253]
$[(Et_2MeC_3B_2Et_2)_2\mathbf{Pt}]^{2-}$	S, H, B, C	[253]
$(C_8H_{13})\mathbf{Pt}(Et_2MeC_3B_2Et_2)$	S, X, H, B, C, MS	[255]
$(Et_2MeHC_3B_2Me_2)_2\mathbf{Pt}$	S, X, H(variable T), B, C	[1384]
7-vertex commo-[(2,3,5-C_3B_2)M]$_2$Pt clusters (diborolyl tetradecker sandwiches)		
$(C_8H_{13})\mathbf{Pt}(Et_2MeC_3B_2Et_2)\mathbf{Pt}(C_8H_{12})$	S, H, B, MS	[255]
$(C_8H_{13})\mathbf{Pt}(Me_2HC_3B_2Me_2)\mathbf{Pt}(C_8H_{12})$	S, X, H, B, C, MS	[255]
Lanthanide Metals		
7-vertex LnC_2B_4 clusters		
μ,closo-[$\mathbf{Gd}(SiMe_3)_2C_2B_4H_4]_3[\mu_2$-Li-$(SiMe_3)_2C_2B_4H_4]_3[\mu_3$-OMe)$[\mu_2$-Li $(OC_4H_8)]_3(\mu_3$-O)	S, X, IR	[259]
$\{Cl_2\mathbf{Er}[2,3\text{-}(SiMe_3)_2C_2B_4H_4]_2Li_2(TMEDA)_2\}^-$	S, X, IR, MAG	[260]
$\{[2,3\text{-}(SiMe_3)_2C_2B_4H_4]\mathbf{Er}[2,4\text{-}(SiMe_3)_2C_2B_4H_4]\}^{2-}$	S, X, IR, MAG	[260]
$[(SiMe_3)_2C_2B_4H_4]_2\mathbf{Ln}Cl_2(\mu\text{-}H)_3Li(TMEDA)(\mu\text{-}H)_2(TMEDA)$ **Ln** = **Sm**, **Gd**, **Tb**, **Dy**, **Ho**	S, X, H(Sm), B(Sm), C(Sm), Li(Sm), IR, MAG(Sm, Gd, Dy, Ho)	[262]
$(TMEDA)Li(\mu\text{-}Cl)_2\mathbf{Ho}[2,4\text{-}(SiMe_3)_2C_2B_4H_4]_2(\mu\text{-}H)_4\mathbf{Ho}Cl_2(TMEDA)_2$	S, X	[263]
$\{[(SiMe_3)_2C_2B_4H_4]_2\mathbf{Ho}Cl_2{\cdot}Li_2(TMEDA)_2\}^-$	X	[264]
$(Me_3COH)_2(Me_3CO)\mathbf{Sm}[(SiMe_3)_2C_2B_4H_4]$-μ-(4,5)-Li$(OC_4H_8)$Cl	S, X, H, B, C, IR	[265]
$Li(TMEDA)_2^+\{[(SiMe_3)_2C_2B_4H_4]_2$-$\mathbf{Ce}Cl_2{\cdot}Li_2(TMEDA)_2\}^-$	S, X, IR,MAG	[266]
Nido-2,4-$(SiMe_3)_2C_2B_4H_4$-μ(5,6)-H_2-**Ln**-$[(SiMe_3)_2C_2B_4H_4]_2$ **Ln** = **Er**, **Dy**	X, IR	[267]
$\{[2,4\text{-}(SiMe_3)_2C_2B_4H_4]_2\mathbf{Lu}\}^-\ Na(OC_4H_8)_2^+$	S, X, H, C, IR, MAG	[268]
$\{[2,4\text{-}(SiMe_3)_2C_2B_4H_4]\mathbf{Nd}\}^+\{2,4\text{-}(SiMe_3)_2C_2B_4H_4]_2\mathbf{Nd}(OC_4H_8)_2\}^-$	S, X, I	[270]
$Na^+{}_3\ [(2,4\text{-}(SiMe_3)_2C_2B_4H_4]_2\mathbf{Ln}[\mu\text{-}5,6\text{-}nido\text{-}2,4\text{-}(SiMe_3)_2C_2B_4H_4]^{3-}$ **Ln** = **Dy**, **Er**	S, X, IR	[271]
$O\{(OC_4H_8)\mathbf{Ho}[2,4\text{-}(SiMe_3)_2C_2B_4H_4]\}_4Cl_2$	S, X, IR, MAG	[272]

Compound	Information	References
{1,2,3-$(THF)_m$Br**Ln**[$(Me_3Si)_2C_2B_4H_4$]}$_2$·THF **Ln**=**Ce**, **Pr**; m=1, 2	S, IR	[10]
{1,2,3-(THF)Br**La**[$(Me_3Si)_2C_2B_4H_4$]}$_2$	S, X, H, B, C, IR	[10]
{1,2,3-$(THF)_2$Cl**Lu**[$(Me_3Si)_2C_2B_4H_4$]}$_2$·THF	S, X, H, B, C, IR	[10]
{[$(Me_3Si)MeC_2B_4H_4$]-1,2,3-(μ-H)**Ln**[(Me_3Si)-$RC_2B_4H_4$]}$_2$·$(THF)_n$ **Ln**=**Nd**, **Ho**, **Er**, **Gd**; R=Me, $SiMe_3$	S, X(Nd), IR	[10]
1,2,3-Cp**Ln**[$(Me_3Si)_2C_2B_4H_4$]·$(THF)_n$ **Ln**=**Tb**, **Dy**, **Er**; n=2, 3	S, IR	[10]
(η^8-C_8H_8)**Gd**[$(Me_3Si)_2C_2B_4H_4$](μ-H)·THF	S, X, IR	[10]
[$Me_2N(CH_2)_2NMe_2$]Cl**Dy**[$(Me_3Si)_2C_2B_4H_4$]	S, X	[276]
Theoretical Studies		
Molecular and electronic structure calculations		
1,2,3-**Cr**$(C_2B_4H_6)^{2-}$	MNDO	[30]
1,2,4-$(PH_3)_2$**Pt**$(C_2B_4H_6)$	Extended Hückel, slip-distortion	[277]
Nido, closo-$(CO)_3$**Mn**$(H_4C_4B$-Me)**Co**$(H_4C_4B$-Me)	INDO, *ab initio* (He photoelectron spectra)	[181]
[Cp**Co**(2,3,5-$C_3B_2R_5$)]$_2$**M** **M**=**Cr, Mn, Fe, Co, Ni, Cu, Zn** diborolyl tetradecker sandwiches	Extended Hückel	[278]
Nido-**M**[Cp**Co**(2,3,5-$C_3B_2H_5$)]$_2$ **M**=**Cr**, **Mn**, **Fe**, **Co**, **Ni**, **Cu**, **Zn** diborolyl double-decker sandwiches	Extended Hückel	[278]
1,2,4-H_n**Fe**$(Et_2C_2B_4Et_4)_{n-2}$	DFT: geometry, NMR	[95]
Nido-1,2,3,5-Cp**Fe**$(C_3B_2H_5)$ diborolyl complex	Extended Hückel	[62]
Nido-1,2,4,5-Cp*$_2$**Ru**$_2(Me_2C_2B_2H_5)$(μ-BH_2)	DFT: electronic and molecular structures; ionization potentials; reactions with alkyne analogues	[1381]
Nido-Cp*$_2$**Ru**$_2(Me_2C_2B_2H_6)$ (alternative structure)	DFT: electronic and molecular structures; ionization potentials; reactions with alkyne analogues	[1381]
1,2,4,5-Cp*$_2$**Ru**$_2(Me_2C_2B_3H_3)$	DFT: electronic and molecular structures; ionization potentials; reactions with alkyne analogues	[1381]
1,7,2,3,5-Cp*$_2$**Ru**$_2$[$Me_3C_3B_2R$(=CH_2)] R=Me, Cl	DFT: B=CH_2 bending	[1372]
$(CO)_{12}$H**Ru**$_4$(PhCBH)-μ-CHPh	Fenske-Hall	[112]
HCp**W**$(CO)_{11}$**Ru**$_3$(PhCBH)-μ-CHPh	Fenske-Hall	[112]
1,7,2,3,5-Cp**Co**$(Me_3C_3B_2Me_2)$**M**Cp′$^+$ Cp′=Cp, Cp* **M**=**Co**, **Rh**, **Ir**	DFT: geometry, electrochemistry	[1379]
1,7,2,3,5-Cp**Co**$(Me_3C_3B_2Me_2)$**Ru**L^+ L=C_6H_6, C_6Me_6, $MeC_6H_4CHMe_2$, η_6-C_7H_8	DFT: geometry, electrochemistry	[1379]
(η^6-C_6H_6)**Fe**$(Et_2C_2B_4H_3)$-5-(C_6H_5)**Fe**-$(Et_2C_2B_4H_4)$	DFT, PM3	[78]
[(η^6-C_6H_6)**Fe**$(Et_2C_2B_4H_3)$-5]$_2$	DFT, PM3	[78]

Continued

Compound	Information	References
(η^6-C_6H_6)**Fe**($Et_2C_2B_4H_3$)-5-(C_6H_5)**Fe**-($Et_2C_2B_4H_3$)-5′-(C_6H_5)**Fe**($Et_2C_2B_4H_4$)	DFT, PM3	[78]
1,7,2,3-Cp_2**Co**$_2$($C_2B_3H_5$)	Extended Hückel	[88,284]
Cp**Co**(H_4C_4B-R) R = H, Me	INDO, *ab initio* (He photoelectron spectra)	[285]
1,2,7-Cp**Co**($C_2B_4H_5$)-7-(CH=CH-$C_6H_4NO_2$)	Second-order NLO properties, MOs	[286]
1,2,3-[(O_2N-C_6H_4-CH=CH)C_5H_4]**Co**-($C_2B_4H_6$)	Second-order NLO properties, MOs	[286]
1,2,7-[(O_2N-C_6H_4-CH=CH)C_5H_4]**Co**-($C_2B_4H_6$)	Second-order NLO properties, MOs	[286]
Cp**Co**($Et_2HC_3B_2Me_2$)**Co**Cp	INDO	[100]
nido, closo-**M**$_2$(H_4C_4B-Me)$_3$ **M** = **Co**, **Rh**	INDO, *ab initio* (He photoelectron spectra)	[285]
Cp**Ni**($H_3C_3B_2H_2$)**Ni**Cp diborolyl triple-decker sandwich	Fenske-Hall	[249]
Cp**M**($C_3B_2R_5$)**Co**Cp^{n+} **M** = **Fe**, **Ni**; n = 0,1 diborolyl triple-decker sandwich	Extended Hückel	[284]
Cp**Ni**($C_3B_2R_5$)**Ni**Cp^{n+} n = 1, 0, −1	Extended Hückel	[284]
Cp**Ni**($Et_2RC_3B_2Et_2$)**Co**Cp	INDO	[100]
[Cp**Ni**($H_3C_3B_2H_2$)]$_2$**Ni** diborolyl tetradecker sandwich	Fenske-Hall	[249]
($Et_3HC_3B_2Et_2$)$_2$**Ni**	DFT: molecular structure	[1384]
($Et_2MeHC_3B_2Me_2$)$_2$**Pt**	DFT: molecular structure	[1384]

[a]*Metals incorporated into the cluster framework are shown in* ***boldface****.*
[b]*S, synthesis; X, X-ray diffraction; H, ^{1}H NMR; B, ^{11}B NMR; C, ^{13}C NMR; F, ^{19}F NMR; P, ^{31}P NMR; Li, ^{7}Li NMR; Pt, ^{195}Pt NMR; IR, infrared data; MS, mass spectroscopic data; UV, UV-visible data; E, electrochemical data; ESR, electron spin resonance data; MAG, magnetic susceptibility; COND, electrical conductivity.*