STRUCTURES OF ORGANO-TRANSITION METAL COMPLEXES DETERMINED BY DIFFRACTION METHODS. REPORTS APPEARING DURING 1978.*

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This summary of structures of organo-transition metal complexes determined by diffraction methods, and reported during 1978, mentions 553 complexes contained in some 495 reports. Section A lists structures arranged by ligand in order of increasing number of carbon atoms bonded to the metal atom (as commonly denoted by the η symbol). Where several different groups are present, the structure is mentioned under the heading of the largest group. Section B contains complexes containing metal-metal bonds, while Section C lists reports on cluster compounds, including metalloboranes and -carboranes. The general arrangement follows the pattern of last year's listing. Reference numbers (as superscripts in square brackets []) refer to the list at the end of the article. Only those structures which are not immediately obvious from the formulas are illustrated. Section D contains a summary of structures ordered by transition metal present, the entry number in Sections A, B or C being used. It is interesting to note that while the total number of structures in Sections A and B are closely comparable for the last two years, the total of 106 cluster complex structures, 68% up on 1977, is a graphic demonstration of interest in this area.

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* Survey for 1977: M.I. Bruce, *J.Organometallic Chem.*, 167 (1979) 361.

Table 1 presents a summary of determined structures arranged by molecular formula in order of increasing C, H content. As previously, the number of data and R factors have been quoted, to give an indication of the accuracy of the determination. The majority of structures were determined by X-ray diffraction methods at ambient temperature; if data was collected at a significantly different (usually lower) temperature, this is shown in the Notes column of the summary table. For convenience, this column also indicates the few complexes studied by electron (ED) or neutron diffraction (ND) methods.

Tables 2, 3, 4 and 5 summarise structural determinations on metal hydride and borohydride complexes, nitrosyls, dinitrogen and related complexes, and transition metal complexes containing tertiary phosphines as the only ligands.

Electron and neutron diffraction studies

The only electron diffraction study reported was of the high- and low-spin forms of $Mn(C_5H_4Me)_2$.[104]

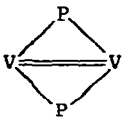
Neutron-diffraction work has concentrated on the location of hydrogen atoms, and includes studies on $Hf(BH_4)_2(C_5H_5)_2$,[111] $\{Fe[P(OMe)_3]_3(\eta^3\text{-}C_8H_{13})\}BF_4$, where a strong C-H...M interaction was confirmed,[222] and the cluster complexes $HFeCo_3(CO)_9[P(OMe)_3]_3$[237,238] and $H_3Ni_4(C_5H_5)_4$.[237] The reader is directed to the recent account by Bau[527] of his work in this area.

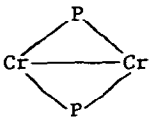
Comparative X-ray/neutron diffraction studies have been used to locate hydrogen atoms in metal-metal bonded and cluster complexes, such as $(ppn)[HCr_2(CO)_{10}]$,[52] $HMo_2(PMe_2)(CO)_4(C_5H_5)_2$,[76] $W_2(C_8H_8)_3$,[322] $H_2Os_3(CO)_{10}$,[1] $H_2Os_3(CO)_{10}(CH_2)$[68] and $H_2Os_3(CO)_{10}(C_2H_3)$.[1,2] A semi-empirical method for the indirect location of hydride ligands in metal carbonyl clusters has been proposed by Orpen,[3] who uses optimised positions at suitable potential energy minima defined by intramolecular non-bonded interactions between the hydride and other atoms. The method is exemplified in the cases of $H_2Os_6(CO)_{18}$ and $H_3Os_4(CO)_{11}(C_6H_9)$.

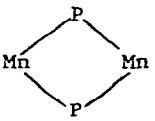
Other papers of note

High angle X-ray data have been used in a detailed study of $[Cr(C_5H_5)]_2(\eta\text{-}C_8H_8)$,[229] and the structure of *trans*-$[Fe(CO)_2(C_5H_5)]_2$ has been examined by X-ray and neutron diffraction at 74K.[141] In the region of the Fe-Fe bond, little electron density was found, and the authors question "the intuitive concept that bonding implies necessarily a concentration of electron density between the bonded atoms". A significant distortion of the cyclopentadienyl rings was also found.

A paper describing the structures of $[M(PMe_2)(CO)_4]_2$ (M=V, Cr, Mn)[97] shows a distinct shortening of the M-M bond distances, although the formal V=V double bond does not result in any difference in the molecular frameworks of the V and Cr complexes because of intramolecular steric hindrance:







M-M	2.733	2.905	3.675Å
M-P-M'	70.8	77.6	103.1°
P-M-P'	109.3	102.4	76.9°

Absolute configurations of several complexes of molybdenum,[284,356,365] manganese,[259] iron[366,405,406] and rhodium[175] were reported. The absolute configurations of a large number of complexes of the type $FeX(CO)(PPh_3)(C_5H_5)$ [X = Br, I, Me, Et, Pr^n, Bu^i, CH_2-*c*-C_3H_5, CH_2Cl, CH_2Br, CH_2I, CH_2Ph, C(O)Me, $S(O)_2R$, $CH_2S(O)_2Omen$] have been deduced from correlations with CD spectra.[406] Maxima in the 300-350 and 350-450 nm regions can be used with reliable indications of the absolute configuration at iron.

A series of papers on bridged ferrocenes[526] begins with a discussion of the correlations between electrode potentials, electronic spectra and Mössbauer spectra and the number of trimethylene bridges. The structures of derivatives containing three,[255] four[300] and five $(CH_2)_3$ bridges[333] were described. In the first and last, the two rings are linked by three bridges, but by only two in the second compound; the remaining bridges are homoannular.

Papers including useful summaries of earlier work include data for 32 allyl-metal complexes,[95] and for 13 compounds containing M≡CR bonds[4]; reference has also been noted to an article describing structures of "new types of π-complexes of transition metals".[5]

Interactions of organic ligands with zeolites have been described. A silver-zeolite A complex, prepared by dehydration and partial decomposition at 400°/5 x 10^{-6} torr/4 days, followed by exposure to ethylene (23°/120 torr) shows two unit cells: 46% contain an $(Ag^{+})_6(Ag_6)$ system, while 54% show an $Ag-C_2H_4$ π-interaction.[6] The structures of cyclopropane complexes of cobalt(II) and manganese(II) (M) in partially exchanged zeolite A (unit cell stoichiometry $M_4Na_4Si_{12}Al_{12}O_{48}.4C_3H_6$) reveal long M-C distances of 2.81 (Co) or 3.09Å (Mn).[7] Further examples of metallocene phase transitions determined from specific heat curves have been reported.[8]

Abbreviations

acac	acetylacetonate
bipy	2,2'-bipyridyl
bqH	benzo[*c*]quinoline
bta	benzotriazolyl
cod	1,5-cyclooctadiene
cot	cyclooctatetraene
Cy	cyclohexyl
dad	1,4-dicyclohexyldiaza-1,3-butadiene
diars	1,2-bis(dimethylarsino)benzene
dien	diethylenetriamine
dmf	dimethylformamide
dmg	dimethylglyoximate
dmp	2-dimethylaminomethylphenyl
dmpe	1,2-bis(dimethylphosphino)ethane
dpam	bis(diphenylarsino)methane
dpmH	dipivaloylmethane

dppe	1,2-bis(diphenylphosphino)ethane
dppm	bis(diphenylphosphino)methane
en	ethylenediamine
Fc	ferrocenyl
Fsalen	N,N'-ethylenebis(3-fluorosalicylideniminato)
hmpa	hexamethylphosphoramide
imH	imidazole
mbt	mercaptobenzothiazolyl
men	menthyl
Mepy	4-methylpyridine
mes	mesityl
nbd	norbornadiene
np_3	$N(CH_2CH_2PPh_2)_3$
oep	octaethylporphyrin
pip	piperidine
pop	$(EtO)_2POP(OEt)_2$
ppn	$[N(PPh_3)_2]^+$
Prsalen	N,N'-ethylenebis(propylsalicylideniminato)
py	pyridine
pz	pyrazolyl
salen	N,N'-ethylenebis(salicylideniminato)
thf	tetrahydrofuran
tol	*p*-tolyl
tpp	*meso*-tetraphenylporphin
ttac	thenoyltrifluoroacetonate
Vi	vinyl
xy	3,5-xylyl

A. ORGANO-TRANSITION METAL COMPLEXES

η^1-LIGANDS

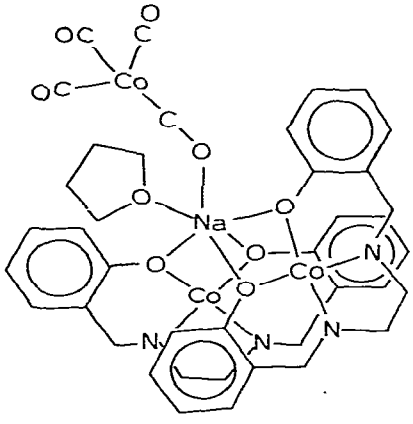
Simple carbonyls and carbonyl anions

(1) [*fac*-$Mn(CO)_3(NH_3)_3$][$Mn(CO)_5$][11]

(2) [$Re(CO)_6$][Re_2F_{11}][24]

(3) [Co(salen)]$_2$NaCo$(CO)_4$(thf)[430]

(4) [$Co(CO)_2(C_5H_4PPh_3)$][$Co(CO)_4$][16]



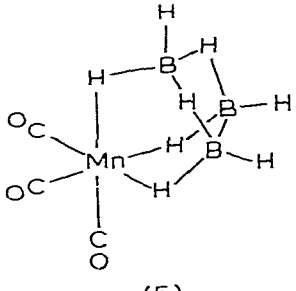
(3)

Carbonyl hydrides and bobohydrides

(5) $Mn(B_3H_8)(CO)_3$[10]

(6) NEt_4[*cis*-$H_2Re(CO)_4$][12]

(7) NEt_4[*trans*-$H_2Re(CO)_4$]$.2${$(NEt_4)_2[Re_4(CO)_{16}]$}[13]



(5)

Carbonyl halides

(*8*) $[MnCl(CO)_4]_2$[41]

(*9*) $Re(CO)_5F.ReF_5$[18]

(*10*) $(oepH_3)[Re_2Cl_3(CO)_6]$[22]

(*11*) $(Ph_3PCH_2Ph)[RuCl_5(CO)]$[9]

Carbonyls containing N-donor ligands

(*12*) $Cr(CO)_5(NCNEt_2)$[58,59]

(*13*) $Cr(CO)_5(NCSMe)$[25]

(*14*) [*fac*-$Mn(CO)_3(NH_3)_3$][$Mn(CO)_5$][11]

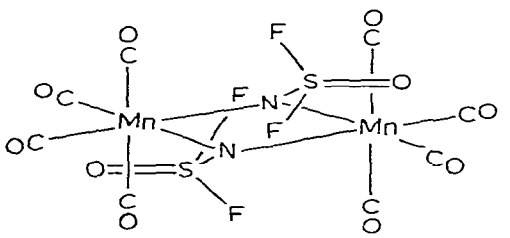
(*15*) $[Mn(CO)_4(NSOF_2)]_2$[42,43]

(*16*) $Fe(CO)_4(C_4H_4N_2)$[29]

(*17*) $[Rh(CO)_2]_2[\mu\text{-}(PhCON)_2]$[224]

(*18*) $Rh_2(CO)_4(C_{22}H_{22}N_4)$[344]

(*19*) $[Rh_2(CO)_4(C_{22}H_{23}N_4)]ClO_4$[344]



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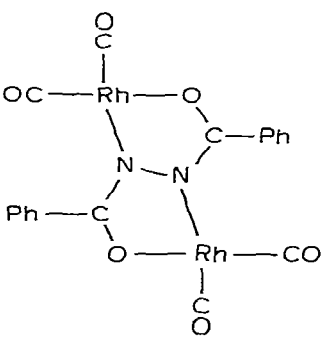

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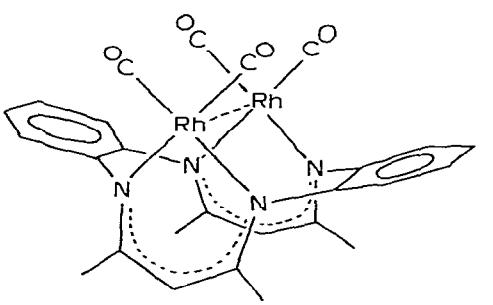

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Carbonyls containing P- or As-donor ligands

(*20*) $[Cr(CO)_4]_2[C_4F_2(PPh_2)_4]$[408]

(*21*) $Cr(CO)_4(C_{32}H_{28}O_3P_2)$[408]

(*22*) $Cr(CO)_5[(AsCH_2)_3CMe]$[57]

(*23*) $Mo(CO)_4\{[Cy_2PC{=}C(CF_2)_2]_2\}$[413]

(*24*) $Mo(CO)(dppe)_2$[478]

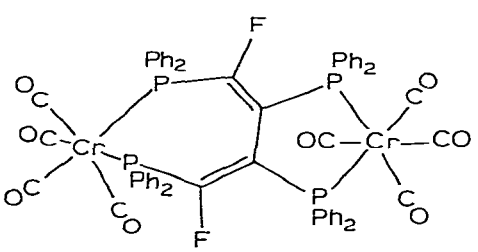
(*25*) $Mo(CO)(N_2)(dppe)_2$[478]

(*26*) $Fe(CO)_4[PFNMe(CH_2)_2NMe]$[35]

(*27*) $Fe(CO)_3[Cy_2PC{:}C(PCy_2)CF_2CF_2]$[388]

(*28*) $Ir(bta)(CO)(PPh_3)_2$[445]

(*29*) $[\frac{1}{2}\{Ni(CO)(np_3)\}.\frac{1}{2}\{Ni(COMe)(np_3)\}]BPh_4$



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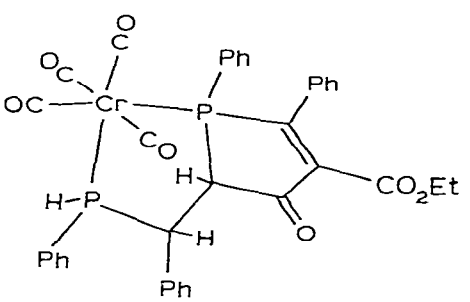

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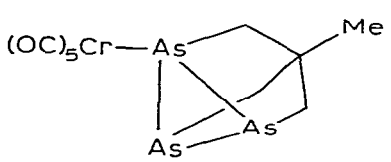

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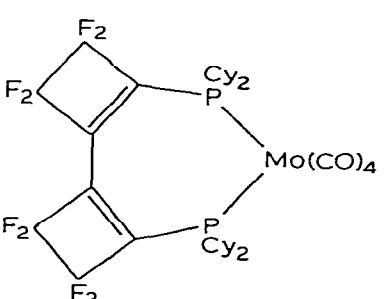


(23)

Carbonyls containing Group VI-donor ligands

(*30*) $Cr(CO)_5(thf)$[47]

(*31*) $Cr(CO)_5(C_4H_6SO)$[45]

(*32*) $NEt_4[W(CO)_5(CF_3COCHCSthienyl)]$[116]

(33) $W(CO)_4[Bu^tS(CH_2)_2SBu^t]$[154]

(34) $W(CO)_4[Bu^tS(CH_2)_3SBu^t]$[154]

(35) $Mn_2(CO)_6[\mu\text{-}SC(SMe)(NMe)]_2$[99]

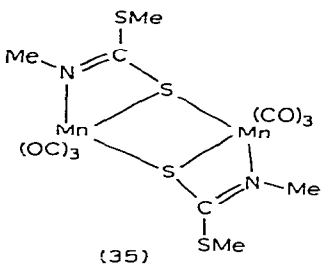
(36) $Mn_2(CO)_6(mbt)_2$[263]

(37) $[Re(CO)_4OPMe_2]_2$[100]

(38) $[Re(CO)_4O_2PPh_2]_2$[389]

(39) $[Re(CO)_3(PMe_3)_2]_2Se$[247]

(40) $Fe(CO)_4(SC_3Ph_2)$[250]



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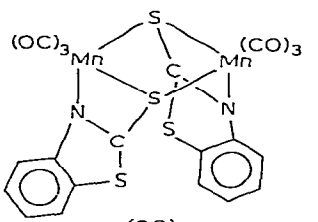

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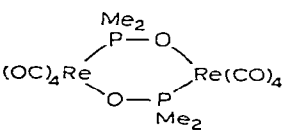

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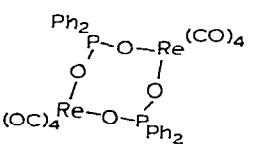

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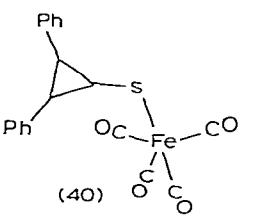


(40)

Carbonyl hydrides containing Group V-donor ligands

(41) $HMn(CO)_3(PPh_3)_2$[426]

(42) $HOsCl(CO)(PCy_3)(SO_2)$[417]

Carbonyl halides containing Group V-donor ligands

(43) $TcCl_3(CO)(PMe_2Ph)_3$[334]

(44) $ReBr_3(CO)_2(bipy)$[92]

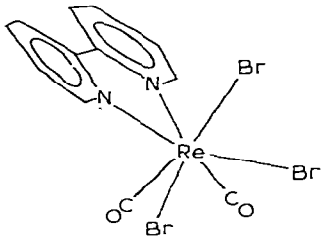
(45) $Re_2Br_2(CO)_6(P_2Ph_4)$[378]

(46) $RuCl(O_2CPh)(CO)(PPh_3)_2$[452]

(47) $OsBr_2(CO)(diars)_2$[289]

(48) $RhCl(CO)[NH(CMe_2CH_2O)(CH_2CH_2O)PPh]$[127]

(49) $IrCl(CO)[Bu^t{}_2PC{\equiv}C(CH_2)_5C{\equiv}CPBu^t{}_2]$[350]



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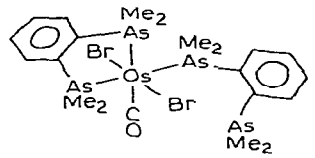

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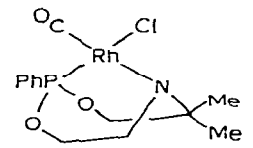


(48)

Carbonyl halides containing Group VI-donor ligands

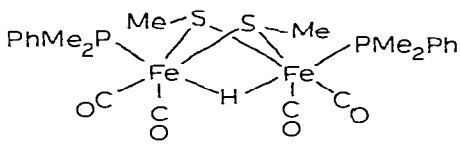
(*50*) $Re_2Br_2(CO)_2(thf)_2$[151]

(*51*) $Re_2Br_2(CO)_6(S_2Me_2)$[32]

(*52*) $\{[Fe(CO)_2(PMe_2Ph)(SMe)]_2(\mu\text{-}H)\}PF_6$[301]

(*53*) $Rh(acac)(CO)(PPh_3)$[319]

(*54*) $Rh(ttac)(CO)(PPh_3)$[351]



(52)

Thiocarbonyls

(*55*) $Cr(CO)_5(CS)$[23]

Selenocarbonyls

See: *318*.

Isocyanide complexes

(*56*) $Cr(CNPh)_6$[439]

(*57*) $[MoBr(CNBu^t)_6]Br$[382]

(*58*) $[RuH(CNBu^t)_5][Me_2C_2B_4H_5]$[158]

(*59*) $\{Co(CNC_6H_4F\text{-}p)_3[P(OMe)_3]_2\}BF_4$[398]

See also: *63, 124, 132, 207, 213, 272, 319, 360-362, 380, 401, 509, 510.*

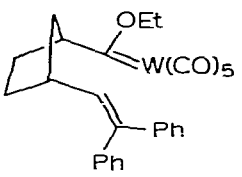
- *Carbene complexes*

(*60*) $W(CO)_5[C(OEt)C_5H_8CH{:}CPh_2]$[355]

(*61*) $Fe(CCl_2)(OH_2)(tpp)$[468]

(*62*) $\{Fe(CO)_2[(CNMe_2)_2S](S_2CNMe_2)\}PF_6$[80]

(*63*) $[Fe(CNMe)_4(C_6H_{12}N_4)](PF_6)_2$[156]



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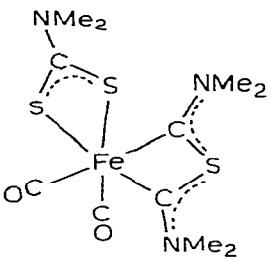

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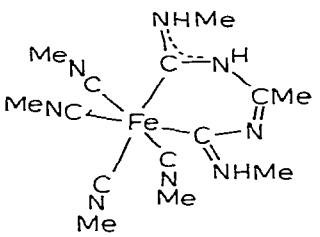


(63)

(*64*) *trans*-$RuCl_2(\overline{CNEtCH_2CH_2NEt})_4$[372]

(*65*) *cis*-$PtCl_2[C(OEt)CH_2Ph](PMe_2Ph)$[234]

(*66*) *trans*-$[PtCl\{C(NMe_2)[(CH_2)_3OH]\}(PMe_2Ph)_2]PF_6$[304]

See also: *80, 117, 119, 235, 255, 281, 282.*

Carbyne complexes

(*67*) *trans*-$CrCl(CPh)(CO)_4$[69]

(*68*) *trans*-$CrBr(CPh)(CO)_4$[69]

(*69*) (-)-*trans*-$CrBr[C(men)](CO)_4$[174]

(*70*) *trans*-$CrBr[C(NEt_2)](CO)_4$[49]

(*71*) *trans*-$CrBr(CFc)(CO)_4$[165]

(*72*) *trans*-$WBr(CMe)(CO)_4$[19]

(*73*) *trans*-$WI(CMe)(CO)_4$[19]

See also: *261, 369.*

Complexes with M-C σ bonds

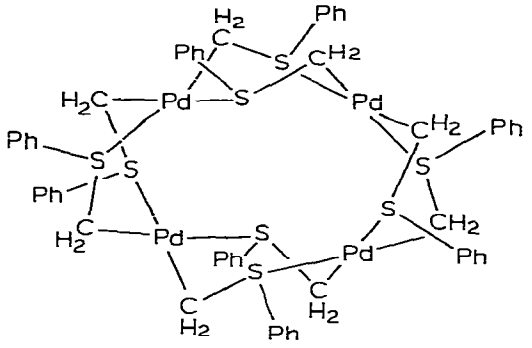
Homoleptic alkyls, vinyls and aryls

(*74*) $V(C_6H_2Me_3)_4$[414]

(*75*) $Cr[CH(SiMe_3)_2]_3$[292]

(76) $Cr(CPh{:}CMe_2)_4$[431]

(77) $[Pd(CH_2SPh)_2]_4$[487]



(77)

Alkyls, vinyls and aryls containing other ligands

(78) $Li(thf)_4\{YbCl[CH(SiMe_3)_2]_3\}$[291]

(79) $Ti(CH_2Ph)_2[N(SiMe_2NMe)_2SiMe_2]_2$[383]

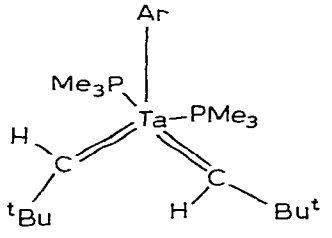
(80) $Ta(C_6H_2Me_3)(CHBu^t)_2(PMe_3)_2$[335]

(81) $MoCl(CH_2SiMe_3)_3(PMe_3)$[180]

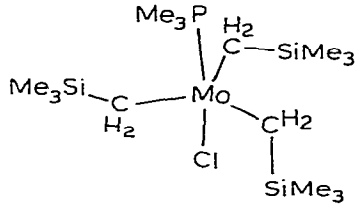
(82) $NEt_4\{W(CO)_5[CH(OMe)Ph]\}$[120]

(83) $Mn[C(CF_3){:}C{:}C(CF_3)_2](CO)_4(PPh_3)$[364]

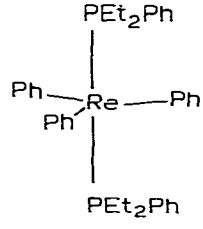
(84) $RePh_3(PEt_2Ph)_2$[424]



(80) Ar = 2,4,6-$Me_3C_6H_2$



(81)



(84)

(85) $Co[CH_2C(O)Me](tpp)$[460]

(86) $Co[CH_2C(O)Me](OH_2)(Fsalen)$[253]

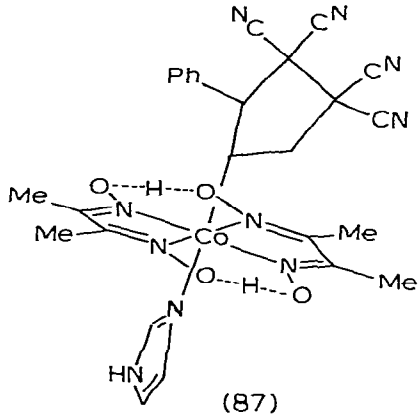
(87) $Co[C_5H_4(CN)_4Ph](imH)(dmg)_2$[346]

(88) $CoCl[CH(NC_5H_5)COPh](dmg)_2$[367]

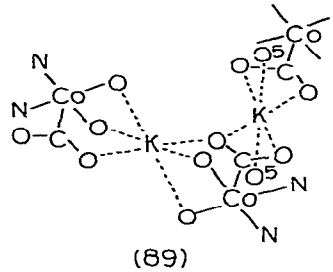
(89) $[Co_2(CO_2)_2K_2(thf)_2(Prsalen)_2]_n$ [482]

(90) $[RhClBrMe(CO)(PMe_2Ph)]_2$ [279]

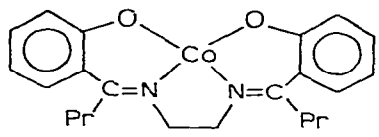
(91) $NiPh(OCHPh{:}CHPPh_2)(PPh_3)$ [453]



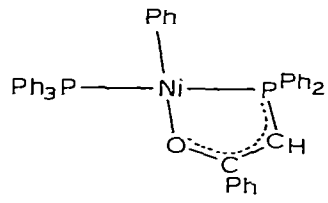
(87)



(89)



Co (pr-salen) in (89)



(91)

(92) $[Ni(C_9H_{11}O_2)(PCy_3)]_4$ [483]

(93) *trans*-$PdCl(CO_2Me)(PPh_3)_2$ [422]

(94) $PdCl[\overline{C{:}CHC(O)C(:CHCO_2Me)N(tol)}](PEt_3)_2$ [349]

(95) $Pd[C_4Ph(tol)_4](acac)(PMe_2Ph)$ [456]

(96) $\{PtMe[PMe_2(C_6F_5)]_3\}PF_6$ [225]

(97) $PtMe_2[(Ph_2PCH_2)_3CMe]$ [449]

(98) *trans*-$PtH(CH_2CN)(PPh_3)_2$ [421]

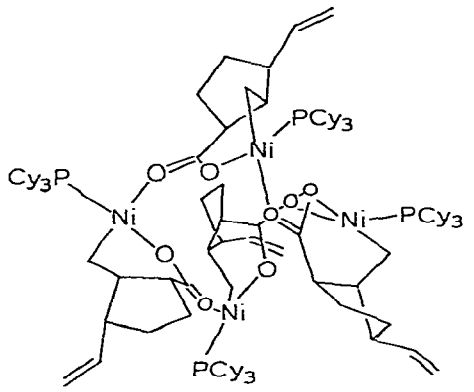
(99) *trans*-$PtCl(CH_2CN)(PPh_3)_2$ [421]

(100) *cis*-$Pt(CF_3)_2[PMe_2(C_6F_5)]_2$ [225]

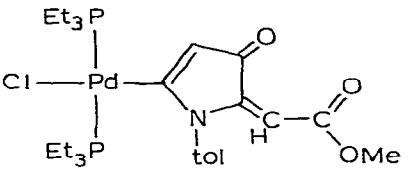
(101) $(ppn)\{cis\text{-}PtCl_2[C(CO_2Et){:}CCl(CO_2Pr^i)](CO)\}$ [64]

(102) *cis*-$PtCl_2[C(CH_2\overset{+}{N}HEt_2){:}CMe_2](PPh_3)$ [359]

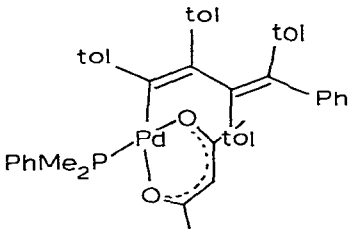
(103) *trans*-$PtCl(C_2Ph)(PEt_2Ph)_2$ [368]



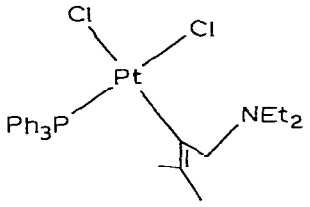
(92)



(94)



(95)



(102)

(*104*) *cis*-PtCl(tol)$(PEt_3)_2$[242]

(*105*) *cis*-PtCl$(C_6F_5)(PEt_3)_2$[242]

(*106*) $\overline{Pt[C(CN)_2CH(CN)O]}(PPh_3)_2$[433]

See also: *125, 140, 243, 250-252, 254, 255, 266, 288-290, 345, 363-369, 371-378, 385, 424, 460, 516.*

Acyls

(*107*) $[MoCl(COCH_2SiMe_3)(CO)_2(PMe_3)]_2$[180]

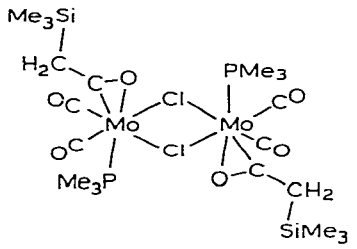
(*108*) *cis*-Re[C(O)Me][C(NHPh)Me]$(CO)_4$[147]

(*109*) $[Ru_3Cl_3(COEt)_2(OH)(CO)_6]_2$[318]

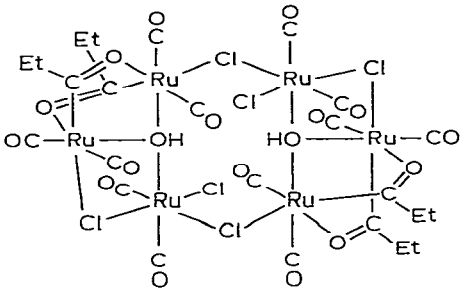
(*110*) $[Ni(COMe)(np_3)]BPh_4$[448]

(*111*) $[\frac{1}{2}\{Ni(COMe)(np_3)\}.\frac{1}{2}\{Ni(CO)(np_3)\}]BPh_4$[448]

See also: *266, 275, 291.*



(107)



(109)

Chelate ylid complexes

(*112*) $Ti_2[(CH_2)_2PMe_2]_2(OMe)_6$[159]

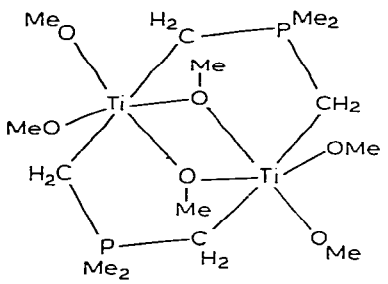
(*113*) $Ni[(CH_2PMe_2)_2BH_2]_2$[114]

(*114*) $AuMe_2[(CH_2PMe_2)_2CH]$[39]

(*115*) $AuMe_2[(CH_2PMe_2)_2N]$[39]

(*116*) $[Au(CH_2)_2P(CH_2)_4]_2$[112]

See also: *244, 367, 370.*



(112)

Complexes containing chelating σ-bonded ligands

(*117*) $\{\overline{Pt[C(NHtol)(NHC_6H_3Me)]}(dppe)\}ClO_4$[438]

(*118*) $[\overline{Pd(C_6H_4CH_2NMe_2)}(OH_2)(bqH)]ClO_4$[299]

(*119*) $\overline{PdCl[C(O)CH_2CH_2NEt_2]}[C(NHMe)(NEt_2)]$[132]

(*120*) $\{\overline{PtI[C_6H_3Me(CH_2NMe_2)_2]}\}BF_4$[130]

(*121*) $\overline{IrHI(p\text{-}MeC_6H_3N{:}NH)}(PPh_3)_2$[446]

(*122*) $[\overline{IrF(p\text{-}FC_6H_3N{:}NH)}(CO)(PPh_3)_2]BF_3(OH)$[444]

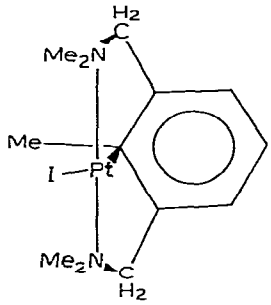
(*123*) $IrCl_2[(o\text{-}MeC_6Cl_3O)P(OC_6H_4Me\text{-}o)](py)(PMe_3)$ [374]

(*124*) $Ir(CNMe)[CH_2CMe_2PBu^tC_6H_3(OMe)O][OC_6H_3(OMe)(PBu^t_2)]$ [394]

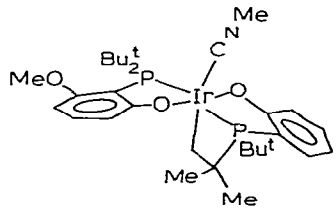
(*125*) $Pt(C_6H_4PPh_2)[C(CO_2Me):CH(CO_2Me)](PPh_3)$ [441]

(*125a*) $[Pt(CH:CMeC_6H_4AsPh_2\text{-}o)]_2(\mu\text{-}O_2CMe)_2$ [458]

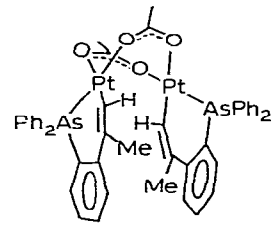
See also: *201, 245, 246, 379, 516.*



(120)



(124)



(125a)

η^2-LIGANDS

Metallocycles

(*126*) $(ppn)\{Mn[C(O)OCHPhC(O)](CO)_4\}$ [117]

(*127*) $Fe[C_4Ph_2(COMe)_2CO](CO)_3$ [316]

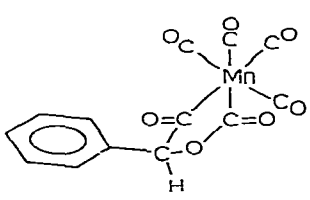
(*128*) $Rh(C_4O_2Cl_2)Cl(OH_2)(PMe_2Ph)_2$ [274]

(*129*) $Pd(C_4H_4O_3)(PPh_3)_2$ [428]

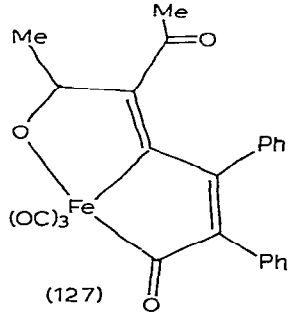
(*130*) $\{[PdC_4(CO_2Me)_4](C_5H_3Me_2N)\}_2$ [423]

(*131*) $Pd[CH(CO_2Me)COCH(CO_2Me)](PPh_3)_2$ [447]

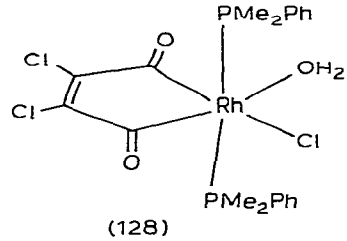
(*132*) $Pt[CH(CH:CH_2)(CH_2)_2CH(CH:CH_2)](CNBu^t)_2$ [81]



(126)



(127)



(128)

(*133*) $Pt[CH(CH{:}CH_2)(CH_2)_2CH(CH{:}CH_2)](PMe_3)_2$[81]

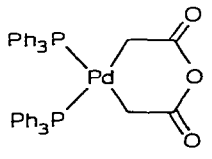
(*134*) $Pt[C_3HPh(CN)_3(CO_2Et)](PPh_3)_2$[469]

(*135*) $Pt[C_3HPh(CN)_4](PPh_3)_2$[469]

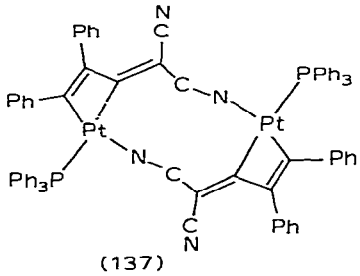
(*136*) $Pt\{CPh{:}CPhC[{:}C(CN)_2]\}(PPh_3)_2$[479]

(*137*) $[Pt\{CPh{:}CPhC[{:}C(CN)_2]\}(PPh_3)]_2$[479]

See also: *203, 248, 249, 397, 447.*



(129)



(137)

Olefin complexes

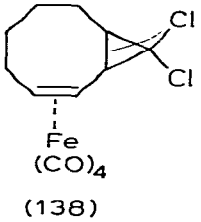
(*138*) $Fe(CO)_4(C_9H_{12}Cl_2)$[122]

(*139*) $Ru(CH_2{:}CHPh)_2(PPh_3)_2$[475]

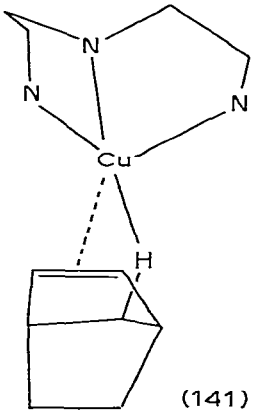
(*140*) $PtMe(C_2F_4)[HB(pz)_3]$[103]

(*141*) $[Cu(C_7H_{10})(dien)]BPh_4$[82]

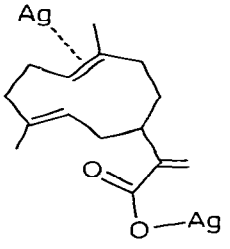
(*142*) Costunolide.$2AgNO_3$[178]



(138)



(141)



(142)

Olefin-metal halide complexes

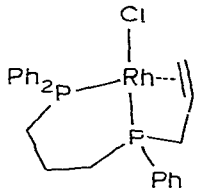
(*143*) $RuCl_2(CO)(C_2H_4)(PMe_2Ph)_2$ [257]

(*144*) $RhCl[Bu^t{}_2P(CH_2)_2CH{:}CH(CH_2)_2PBu^t{}_2]$ [305]

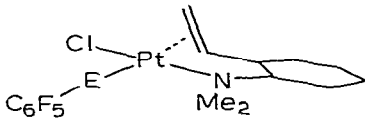
(*145*) $RhCl[Ph_2P(CH_2)_3PPh(CH_2)_2CH{:}CH_2]$ [332]

(*146*) $NEt_4\{PtCl_3[CH_2{:}CH(OEt)]\}$ [14]

(*147*) $PtCl_3(C_4H_{12}N_2)$ [15]



(145)



(150) E = O
(151) E = S

(*148*) $PtCl_3(C_5H_{12}N)$ [15]

(*149*) $PtCl_3[CH_3(CH_2)_2CH{:}\overset{+}{C}H\overset{+}{N}H_2Me]$ [20]

(*150*) $PtCl(OC_6F_5)(CH_2{:}CHC_6H_4NMe_2\text{-}o)$ [197]

(*151*) $PtCl(SC_6F_5)(CH_2{:}CHC_6H_4NMe_2\text{-}o)$ [197]

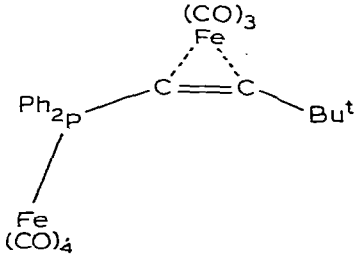
See also: *155, 156, 211, 300, 481.*

Alkyne complexes

(*153*) $W(CO)(C_2H_2)(S_2CNEt_2)_2$ [131]

(*154*) $Fe_2(CO)_8(Ph_2PC_2Bu^t)$ [341]

(*155*) $Rh(C_2H_4)(C_4F_6)(acac)$ [75]



(154)

(*156*) $Rh(C_8H_{14})(C_4F_6)(acac)$ [220]

(*157*) $RhCl(CO)[Bu^t{}_2P(CH_2)_4C{\equiv}C(CH_2)_4PBu^t{}_2]$ [305]

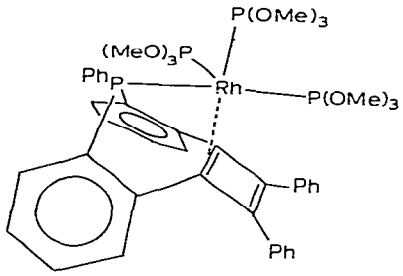
See also: *259*.

Complexes containing η^2*-cyclobutadienes or* η^2*-arenes.*

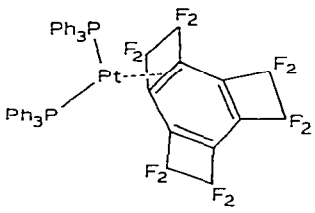
(*158*) $\{Rh[P(OMe)_3]_3[PhP(C_6H_4)_2C_4Ph_2]\}ClO_4$ [450]

(*159*) $Pt(C_{12}F_{12})(PPh_3)_2$ [462]

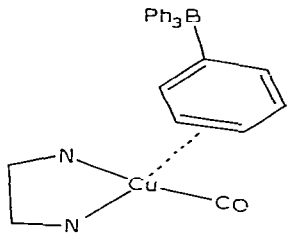
(*160*) $Cu(en)(CO)(PhBPh_3)$ [357]



(158)



(159)



(160)

Complexes containing η^2*-heteroatom ligands*

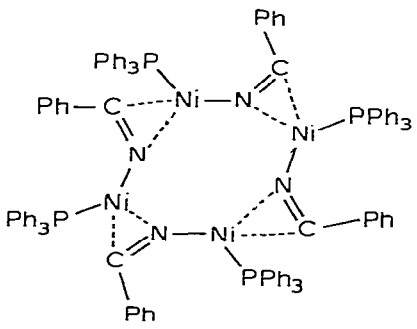
(*161*) $Ru[\eta^2\text{-tolN:Ctol}]Cl(CO)(PPh_3)_2$ [474]

(*162*) $[Ni(\eta^2\text{-N}{\equiv}\text{CPh})(PPh_3)]_4$ [495]

(*163*) $Fe(\eta^2\text{-S:CNMe}_2)(CO)_2(S_2CNMe_2)$ [36]

(*164*) $Fe(\eta^2\text{-S:CS})(CO)_2(PMe_3)(PPh_3)$ [321]

(*165*) $Os(\eta^2\text{-S:Ctol})(O_2CCF_3)(CO)(PPh_3)$ [461]



(162)

(*166*) $[Ir(\eta^2\text{-}S{:}CNMe_2)_2(CO)(PPh_3)]BF_4$ [331]

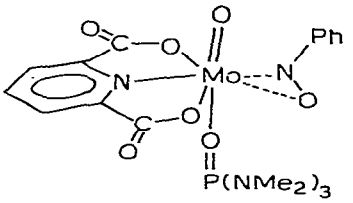
(*167*) $Fe(\eta^2\text{-}PhAs{:}AsPh)(CO)_4$ [190]

(*168*) $Mo(\eta^2\text{-}O{:}NPh)(O)(hmpa)[C_5H_3(CO_2)_2N]$ [258]

(*169*) $Pt(\eta^2\text{-}OS{:}NC_6H_2Me_3)(PPh_3)_2$ [455]

(*170*) $RuCl(\eta^2\text{-}O{:}SO)(NO)(PPh_3)_2$ [410]

See also: *107*, *267*.



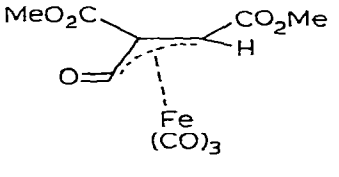
(168)

η^3-LIGANDS

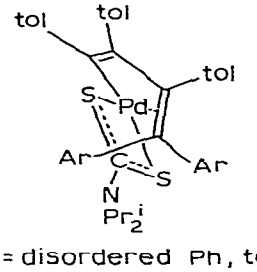
(η^1 + η^2)-Ligands

(*171*) (ppn)$[Fe(CO)_3(C_7H_7O_5)]$ [56]

(*172*) $Pd[C_4Ph(tol)_4](S_2CNPr^i{}_2)$ [456]



(171)



Ar = disordered Ph, tol

(172)

η^3-Allyls

(*173*) $Mo(CO)_2(py)(acac)(C_3H_5)$ [173]

(*174*) $Mo(CO)_2[MeGa(pz)_3](C_3H_5)$ [172]

(*175*) $\{Fe[P(OMe)_3]_3(C_8H_{13})\}BF_4$ [222]

(*176*) $[Fe(CO)_3(C_3H_5)]_2$ [95]

(177) $AsPh_4[Fe(CO)_3(C_7H_7)]$ [55]

(178) $Ru(NO)(PPh_3)(C_3H_5)$ [286]

(179) $[Co(CO)_3]_2(n\text{-}C_3H_4CH_2CH_2C_3H_4)$ [145]

(180) $\{Co(CO)_2[P(OMe)_3]\}_2(\mu\text{-}C_3H_4CH_2COCH_2C_3H_4)$ [145]

(181) $IrHCl(PPh_3)_2(C_3H_4Ph)$ [454]

(182) $[Ni(PCy_3)(C_{11}H_{16}O_2)]_2$ [483]

(183) $[PdCl(C_8H_8Cl)]_2$ [201]

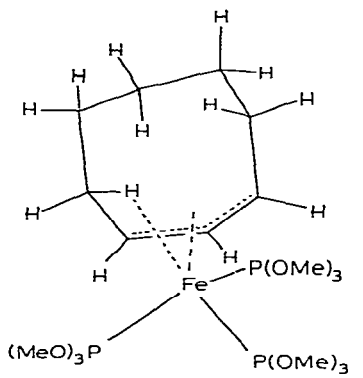
(184) $[Pd(Me_2pz)(C_3H_5)]_2$ [207]

(185) $[Pd(C_4H_7)]_2(\mu\text{-}PdCl_4)$ [37]

(186) $[Pt(PCy_3)_2(C_3H_5)]PF_6$ [427]

(187) $[Pt(PPh_3)_2(C_{13}H_8OEt)]BF_4$ [472]

See also: *272, 273, 277-279, 371, 388, 399, 400.*



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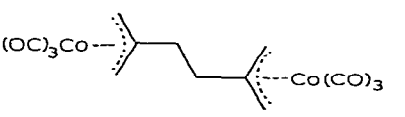

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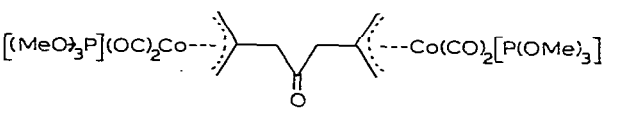
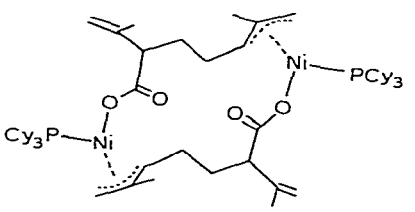
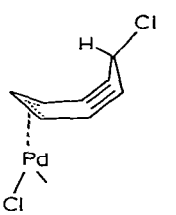


(180)

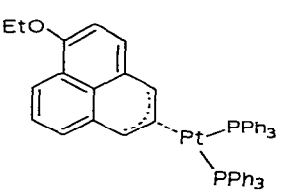


(182)



Half of molecule shown

(183)



(187)

η^3-Heteroatom ligand

(*188*) $MoO(S_2CSPr^i)_2$[38]

η^4-LIGANDS

$(\eta^1 + \eta^3)$-Ligands

(*189*) $Fe(CO)_2(PPh_3)[C(O)C(OMe)C(CO_2Me)CH_2]$[354]

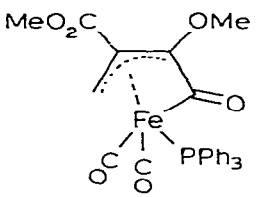
(*190*) $Fe(CO)_3[C(O)C_3HPh_3]$[327]

(*191*) $Fe(CO)_3[C(O)NCyCPhCHCHPh]$[330]

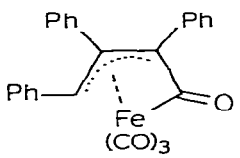
(*192*) $Fe(CO)_3(C_{10}H_9N_3O_3)$[118]

(*192a*) $Fe(CO)_3(C_6H_7CN)$[54]

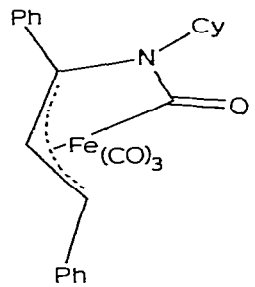
(*193*) $Pt(C_8H_{12})(PMe_3)$[81]



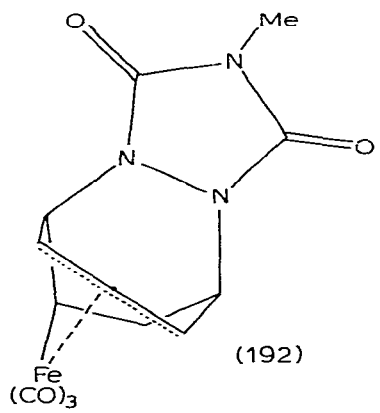
(189)



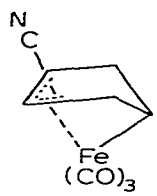
(190)



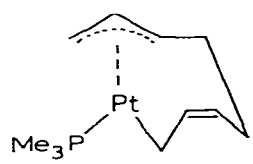
(191)



(192)



(192 a)



(193)

$2\eta^2$-Ligands

(*194*) $Fe(CO)_3(C_{18}H_{20}OS)$[285]

(*195*) $(Ph_3PCH_2Ph)[RuCl_3(CO)(nbd)]$[9]

(*196*) $RuHCl(pip)_2(cod)$[245]

(*197*) $[RuHCl(cod)]_2(\mu\text{-}NH_2NMe_2)$[244]

(*198*) $[RuH(NH_2NMe_2)_3(cod)]PF_6$[157]

(*199*) $Rh(acac)(C_8H_{14}O)$[129]

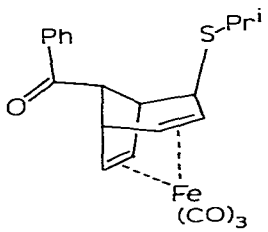
(*200*) $Rh(MeCOCHCOPh)(C_8H_{10}Cl_2)$[232]

(*201*) $Ir[(MeC_6H_3O)P(OC_6H_4Me\text{-}o)_2][P(OCH_2)_3CMe](cod)$[403]

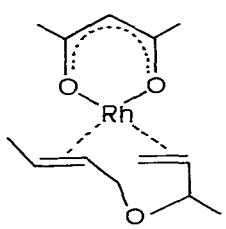
(*202*) $PdCl_2(C_8H_8)$[33]

(*203*) $Pt[CH(CH{:}CH_2)CH_2CH_2CH(CH{:}CH_2)](cod)$[81]

See also: *257*, *358*, *451*.



(194)



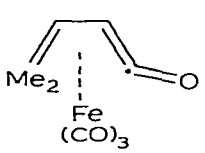
(199)

η^4-Dienes

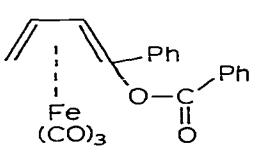
(*204*) $Fe(CO)_3(C_6H_8O)$[48]

(*205*) $Fe(CO)_3(C_{17}H_{14}O_2)$[266]

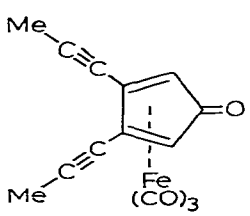
(*206*) $Fe(CO)_3(C_{13}H_{12}O)$[193]



(204)



(205)



(206)

(*207*) $Fe(CO)_2(CNEt)(C_6H_8)$[77]

(*209*) $Fe(CO)_3(C_9H_6Me_2O)$[146]

(*210*) $Fe(CO)_3(C_9H_6Me_2S)$[146]

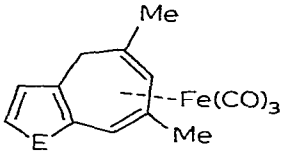
(*211*) $Fe_2(CO)_7(C_8H_8O)$[164]

(*212*) $[Fe(CO)_3]_2[C_{14}H_{20}(OH)_2]$[272]

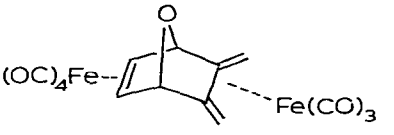
(*213*) $Fe(CNBu^t)_3(Bu^tN{:}C{:}CPhCPh{:}C{:}NBu^t)$[361]

(*214*) $[RuH(C_4H_6)(PMe_2Ph)_3]PF_6$[371]

See also: *274*, *386*, *387*, *394*.



(209) E = O
(210) E = S



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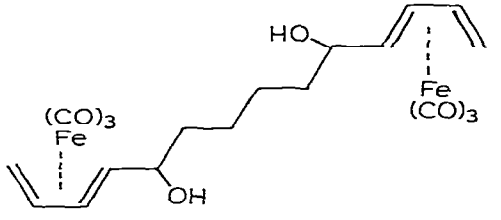
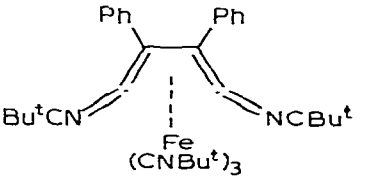


(212)



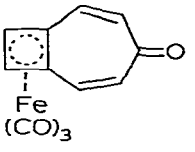
(213)

Cyclobutadiene complexes

(*215*) $Mo(CO)_2(C_4Ph_4)_2$[488]

(*216*) $Fe(CO)_3(C_9H_6O)$[91]

See also: *256*, *258*.



(216)

η^5-LIGANDS

Cyclopentadienyls

(217) $[Mn(C_5H_5)_2]_n$ [62]

(218) $Mn(C_5H_4Me)_2$ [104]

(219) $Fe(C_5H_5)_2$ (thiourea clathrate) [60]

(220) $[Fe(C_5H_5)_2]FeCl_4$ [61]

(221) $[Co(C_5H_5)(C_5H_4CO_2H)]PF_6$ [72]

Cyclopentadienyls with anionic ligands

(222) $[Th(\mu\text{-}O_2C_2Me_2)(C_5Me_5)_2]_2$ [465]

(223) $UCl_3(OPPh_3)_2(C_5H_5)$ [435]

(224) $U(NCS)(NCMe)(C_5H_5)_3$ [231]

(225) $Ti(S_2CNMe_2)_3(C_5H_5)$ [155]

(226) $TiCl_2(C_5H_5)(C_5H_4men)$ [280]

(227) $[TiCl(C_5H_5)_2]_2MnCl_2$ [270]

(228) $\{[Ti(OH_2)(C_5H_5)_2]_2O\}(ClO_4)_2$ [276]

(229) $\{[Ti(OH_2)(C_5H_5)_2]_2O\}S_2O_6$ [277]

(230) $[Ti(pz)(C_5H_5)_2]_2$ [345]

(231) $[Ti(C_5H_5)_2]_2(\mu\text{-}N_2H_3)$ [273] (contains Ti-Ti bond)

(232) $ZrCl_2(C_5H_4CH_2Ph)_2$ [317]

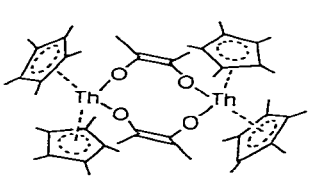
(233) $[ZrI(C_5Me_5)_2]_2(\mu\text{-}OCH{:}CHO)$ [443]

(234) $Hf(BH_4)_2(C_5H_4Me)_2$ [111]

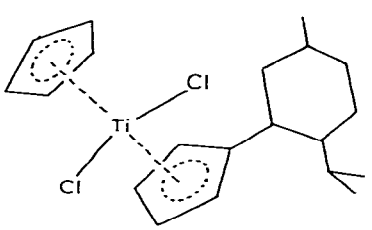
(235) $TaCl(CHBu^t)(C_5H_5)_2$ [176,177]

(236) $[Cr(O_2CCF_3)_3(C_5H_5)]_2Cr$ [293]

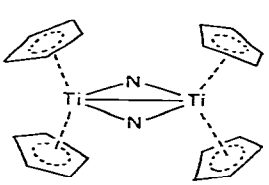
(237) $Mo_2O_4(C_5H_5)_2$ [63]



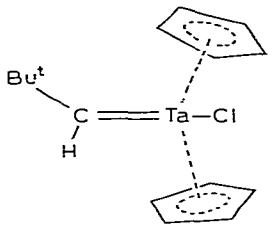
(222)



(226)



(231)



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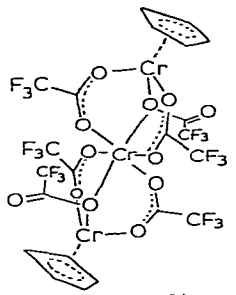


(236)

(*238*) $[Mo_2O_4(C_5H_4Me)_2]_2$[105]

(*239*) $Mo_2S_4(C_5H_4Me)_2$[105]

(*240*) $[Co_2(\mu\text{-}Cl)_3(C_5Me_4Et)_2]FeCl_4$[303]

(*241*) $[RhBr(C_5Me_5)]_2(\mu\text{-}Br)_2$[281]

(*242*) Partially Cl-exchanged complex (*241*)[281]

Cyclopentadienyls containing other η*-hydrocarbon ligands*

(*243*) $(C_5H_5)_2YMe_2AlMe_2$[153]

(*244*) $\{U[(\mu\text{-}CH)CH_2PPh_2](C_5H_5)_2\}_2$[464]

(*245*) $Ti(C_6H_4CH_2NMe_2)(C_5H_5)_2$[256]

(*246*) $Ti[OC(CPh_2)OC(CPh_2)](C_5H_5)_2$[419]

(*247*) $[Ti(C_2Ph_2O)(C_5H_5)_2]_2$[419,463]

(*248*) $Ti[C_8H_4(C_6F_5)_2](C_5H_5)_2$[358]

(*249*) $Ti(C_8H_4Ph(SiMe_3)](C_5H_5)_2$[358]

(*250*) $Zr(CH_2CMe_3)_2(C_5H_5)_2$[243]

(*251*) $Zr(CH_2SiMe_3)_2(C_5H_5)_2$[243]

(*252*) $ZrPh[CH(SiMe_3)_2](C_5H_5)_2$[243]

(*253*) $Zr(\eta^1\text{-}C_5H_5)(\eta^5\text{-}C_5H_5)_3$[271]

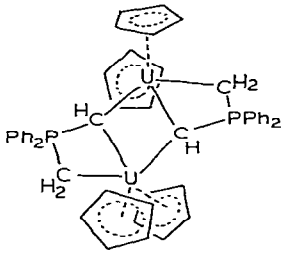
(*254*) $V(C_2C_6H_2Me_3)(C_5Me_4Et)_2$[400]

(*255*) $Ta(CH_2Ph)(CHPh)(C_5H_5)_2$[320]

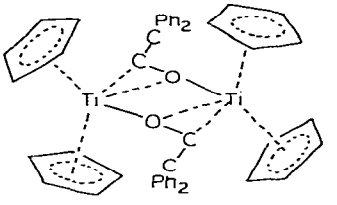
(*256*) $Co(trans\text{-}C_4Ph_2Fc_2)(C_5H_5)$[434]

(*257*) $Rh(C_{10}H_{14}O)(C_5H_5)$[175]

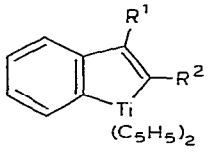
(*258*) $Rh(C_{28}H_{18})(C_5H_5)$[396]



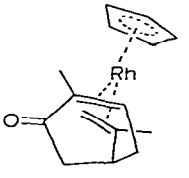
(244)



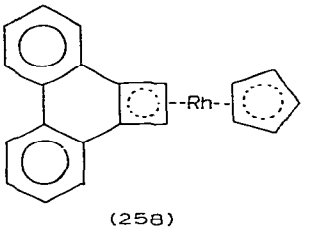
(247)



	R^1	R^2
(248)	C_6F_5	C_6F_5
(249)	Ph	$SiMe_3$



(257)



(258)

Cyclopentadienyl complexes containing CO, PR_3 or CNR ligands

(259) $Ti(CO)(C_2Ph_2)(C_5H_5)_2$ [329]

(260) *cis*-$V(CO)_2(dppe)(C_5H_5)$ [397]

(261) $TaCl(CPh)(PMe_3)_2(C_5Me_5)$ [313]

(262) $[Ta(dmpe)(C_5H_5)_2]Cl$ [209]

(263) $NMe_4[Cr(CO)_3(C_5H_5)]$ [31]

(264) $Cr(CO)_2(NS)(C_5H_5)$ [26]

(265) $Cr(CO)_3(C_8H_{11}N)$ [74]

(266) $Mo(\eta^1\text{-MeCNPh})(CO)_2[P(OPh)_3](C_5H_5)$ [169]

(267) $Mo(\eta^2\text{-MeCNPh})(CO)_2(C_5H_5)$ [169]

(268) $MoCl(CO)_2(Ph_2PNMeCHMePh)(C_5H_5)$ [365]

(269) $Mo(CO)(NO)(Ph_2PNMeCHMePh)(C_5H_5)$ [356]

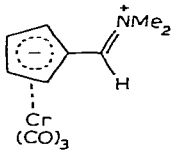
(270) $Mo(CO)_2(pyCMeNHCHMePh)(C_5H_5)$ [298]

(271) $[Mo(CO)_2(pyCH{:}NCHMePh)(C_5H_5)]PF_6$ [284]

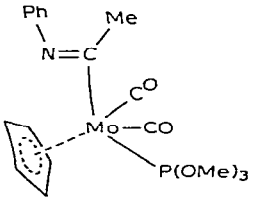
(272) $Mo(CO)(CNBu^t)[\overline{CMeC_2Me_2C(O)O}](C_5H_5)$ [219]

(273) $Mo(CO)(PPh_3)(C_6H_7O)(C_5H_5)$ [379]

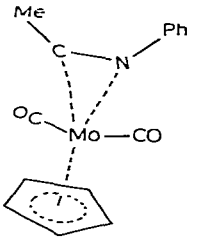
(274) $\overline{Mo(CO)[C(O)C_4Me_4C(CF_3)O]}(C_5H_5)$ [219]



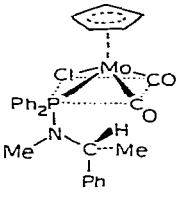
(265)



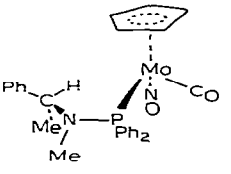
(266)



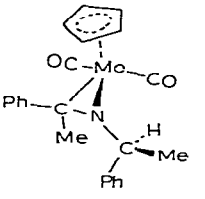
(267)



(−)-(268)



(−)-(269)



(270)

(*275*) $W(CONHMe)(CO)_2(NH_2Me)(C_5H_5)$ [65]

(*276*) $[W(CO)_3(NH_2NCMe_2)(C_5H_5)]PF_6$ [78]

(*277*) $W(CO)_2(\eta^3\text{-}C_5H_5)(\eta^5\text{-}C_5H_5)$ [96]

(*278*) $W(CO)_2(\eta^3\text{-}C_9H_7)(\eta^5\text{-}C_9H_7)$ [267]

(*279*) $W(CO)_2[\eta^3\text{-}C_5H_5(C_5H_5)_2](C_5H_5)$ [297]

(*280*) $[Mn(CO)_3(C_5H_4)]_2SnCl_2$ [188]

(*281*) $Mn(CO)_2[C(OMe)(men)](C_5H_5)$ [259]

(*282*) $[Mn(CO)_2(C_5H_4Me)]_2(C_{10}H_8)$ [343]

(*283*) $[Mn(CO)_2(C_5H_5)]_2AsCl$ [138]

(*284*) $[Mn(CO)_2(C_5H_5)]_2SbPh$ [268]

(*285*) $[Mn(CO)_2(C_5H_5)]_2[\mu\text{-}(Me_2P)_2S]$ [233]

(*286*) $[Mn(CO)_2(C_5H_5)]_2[\mu\text{-}(Me_2P)_2S_2]$ [233]

(*287*) $[Mn(CO)_2(SMe_2Et)(C_5H_4Me)]PF_6$ [108]

(*288*) $ReH(CH_2Ph)(CO)_2(C_5H_5)$ [149]

(*289*) $Fe(CH_2Omen)(CO)(PPh_3)(C_5H_5)$ [406]

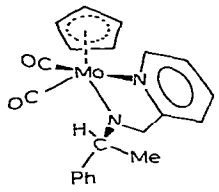
(*290*) $Fe(CH_2CO_2men)(CO)(PPh_3)(C_5H_5)$ [406]

(*291*) $Fe(CO_2men)(CO)(PPh_3)(C_5H_5)$ [405]

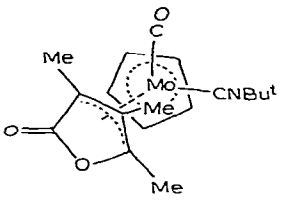
(*292*) $Fe(SO_2CH_2CHMe_2)(CO)(PPh_3)(C_5H_5)$ [366]

(*293*) $\{[Fe(CO)_2(C_5H_5)]SbPh_3\}PF_6$ [328]

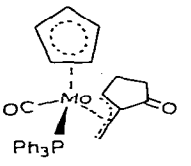
(*294*) $Fe(SEt)(CO)_2(C_5H_5)$ [50]



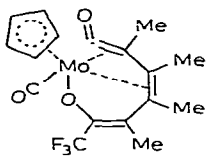
(+)-(271)



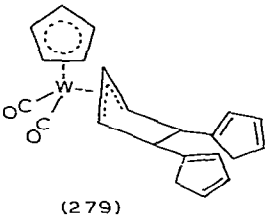
(272)



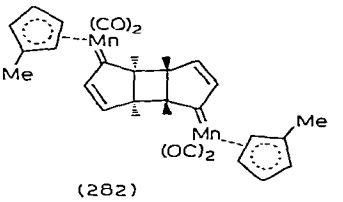
(273)



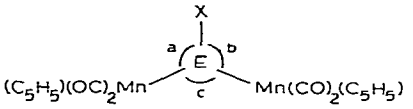
(274)



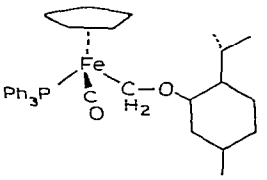
(279)



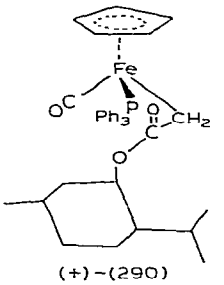
(282)



	E	X	a	b	c
(283)	As	Cl	110	108	142°
(284)	Sb	Ph	110	110	140°



(+)-(289)



(+)-(290)

(*295*) $[Fe(NCMe)(dppe)(C_5H_5)]BPh_4$ [399]

(*296*) $Ru(CO)(SC_6H_3Me\text{-}o\text{-}SC_6H_4Me)(C_5H_5)$ [269]

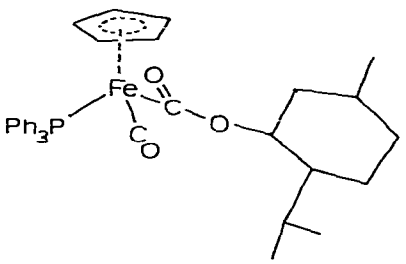
(*297*) $[Co(CO)_2(C_5H_4PPh_3)][Co(CO)_4]$ [16]

(*298*) $CoCl_2(PPh_3)(C_5Me_4Et)$ [375]

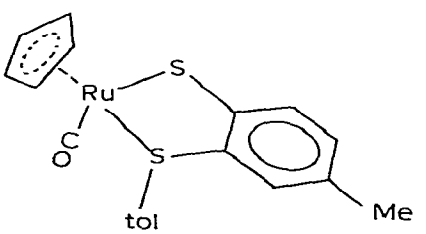
(*299*) $Co(CS_2)(PMe_3)(C_5H_5)$ [51]

(*300*) $Rh(C_2H_4)(PPh_3)(C_5Me_5)$ [381]

(*301*) $Ni[Ph_2P(C_4O_3)(C_5H_6)PPh_2](C_5H_5)$ [420]

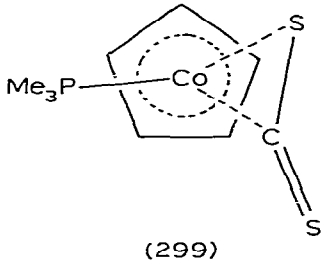


(−)-(291)

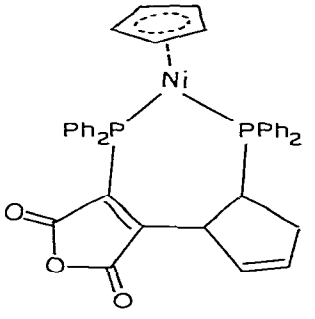


(296)

A large number of other complexes also contain η-cyclopentadienyl groups: *312, 315, 328, 338, 412, 413, 419, 422, 425, 426-447, 452, 454-458, 462, 483, 499, 524-527, 537-539, 542, 544, 545, 551-553.*



(299)



(301)

Ferrocenes

(*302*) $Fe(C_5HMe_4)_2$[235]

(*303*) $Fe(C_5Me_5)_2$[235]

(*304*) $Fe\{C_5H_2[(CH_2)_3]_3C_5H_2\}$[255]

(*305*) $Fe\{(CH_2)_3C_5H[(CH_2)_3]_2C_5H(CH_2)_3\}$[300]

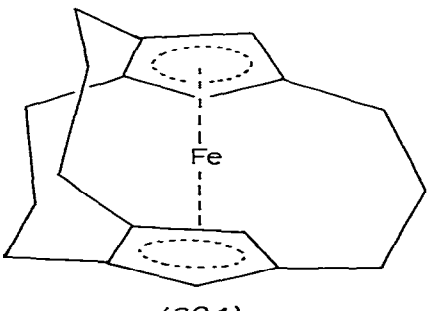
(*306*) $Fe\{(CH_2)_3C_5[(CH_2)_3]_3C_5(CH_2)_3\}$[333]

(*307*) $[Fc_2CH]BF_4$[283]

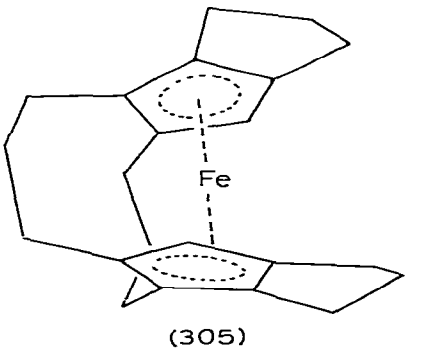
(*308*) $[Fe(C_5H_4Li)_2(C_9H_{23}N_3)]_2$[425]

(*309*) $[Fe(1\text{-}Me_2NCH_2\text{-}2\text{-}AgC_5H_3)(C_5H_5)]_4$[476]

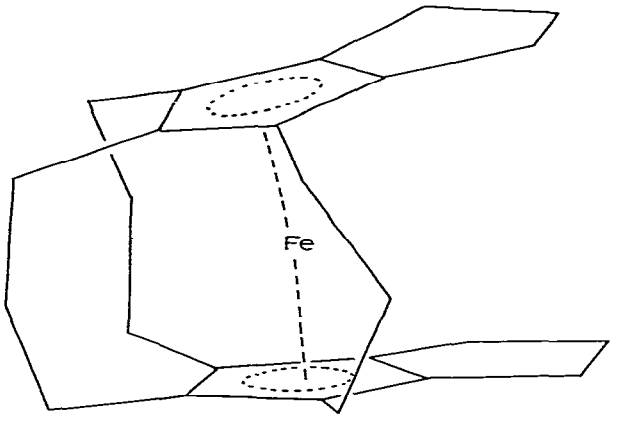
See also: *71, 256.*



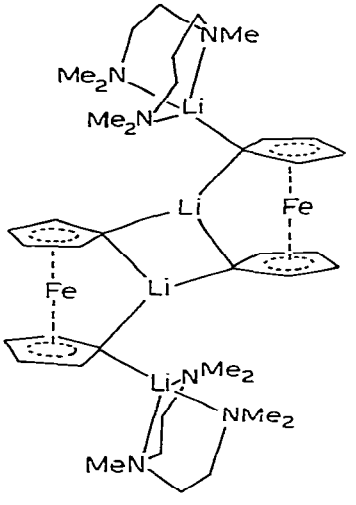
(304)



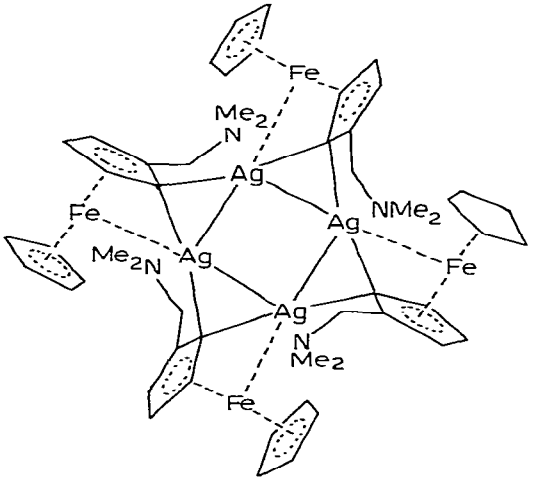
(305)



(306)



(308)



(309)

Other complexes containing η^5*-ligands*

(*310*) $Cr(CO)_3(C_{18}H_{16}OS)$ (isomer 1)[282]

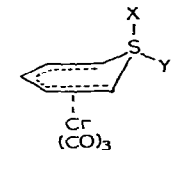
(*311*) $Cr(CO)_3(C_{18}H_{16}OS)$ (isomer 2)[282]

(*312*) $[Mn(CO)_3]_2(C_{14}H_8Me_2)$[295]

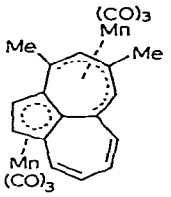
(*313*) $[\{Fe(CO)_2[P(OPh)_3]\}_2(\mu\text{-}C_{16}H_{16})](PF_6)_2$[485]

(*314*) $[Fe(CO)_3(C_{10}H_{11}O)]PF_6$[121]

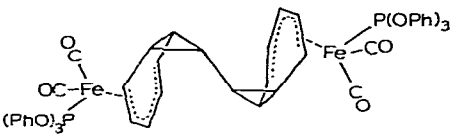
See also: *341*.



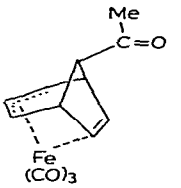
	X	Y
(310)	O	Me
(311)	Me	O



(312)



(313)



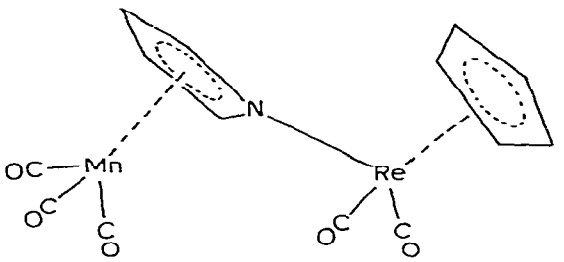
(314)

η^5-*Heteroatom ligands*

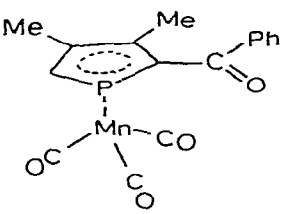
(*315*) $Mn(CO)_3[C_4H_4NRe(CO)_2(C_5H_5)]$[136]

(*316*) $Mn(CO)_3[PCHC_2Me_2CC(O)Ph]$[168]

See also: *536–539*.



(315)



(316)

η^6-LIGANDS

Arene complexes

(*317*) $[Cr(PhEt)_2]I$[204]

(*318*) $Cr(CO)_2(CSe)(PhCO_2Me)$[70]

(*319*) $Cr(CO)_2(CNCOPh)(PhCO_2Me)$[227]

(*320*) $Cr(CO)_3(C_{16}H_{16})$[252]

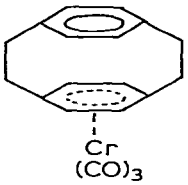
(*321*) $Cr(CO)_3(exo\text{-}C_{10}H_{12}O)$[123]

(*322*) $Cr(CO)_3(endo\text{-}C_{10}H_{12}O)$[123]

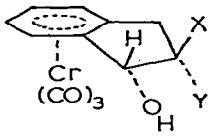
(*323*) $Cr(CO)_3[C_9H_5(OMe)(NEt_2)_2]$[288]

(*324*) $Cr(CO)_3\{C_{10}H_5(OH)Ph[CH{:}CMe(OMe)]\}$[309]

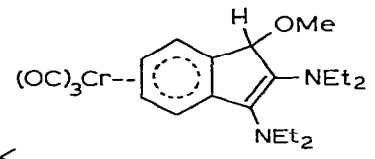
(*326*) $NEt_4[Mo(CO)_3(\eta^6\text{-}Ph)BPh_3]$[352]



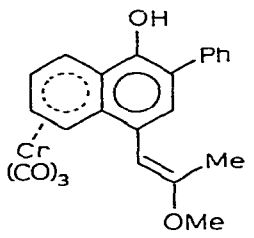
(320)



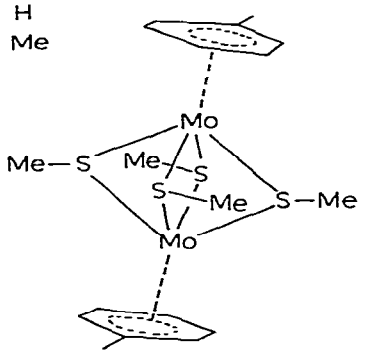
	X	Y
(321)	Me	H
(322)	H	Me



(323)



(324)



(326)

(*326*) $\{[Mo(PhMe)]_2(\mu\text{-}SMe)_4\}(BPh_4)_2$ [239]

(*327*) $[RuCl(NH_3)_2(C_6H_6)]PF_6$ [246]

See also: *334*.

Other η^6*-ligands*

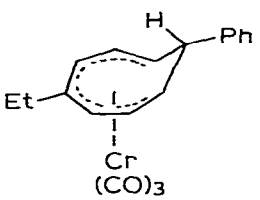
(*328*) $Mn(C_5H_4Me)(exo\text{-}C_7H_7Ph)$ [254]

(*329*) $Cr(CO)_3(C_{10}H_{16})$ [126]

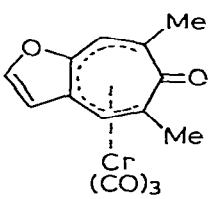
(*330*) $Cr(CO)_3(C_{11}H_{10}O_2)$ [139]

(*331*) $Mo(CO)_3(C_7H_7CHMeCOMe)$ [148]

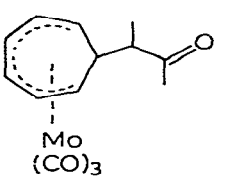
(*332*) $Cr(CO)_3(C_{13}H_{18})$ [203]



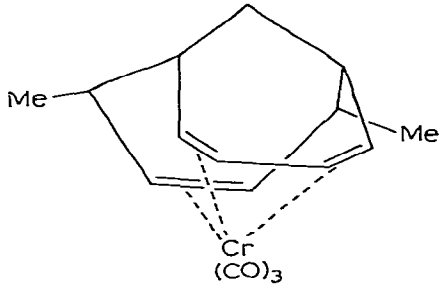
(329)



(330)



(331)



(332)

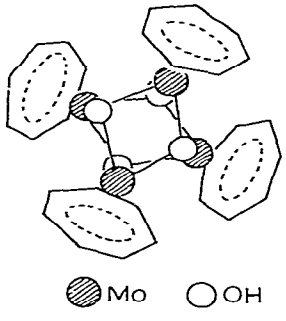
η^7-LIGANDS

(*333*) $Mo(NCS)(acac)(C_7H_7)$[124]

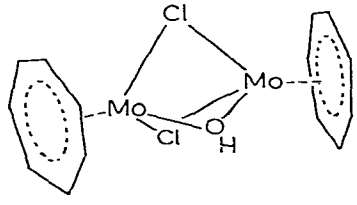
(*334*) $Mo(\eta^6\text{-}PhBPh_3)(C_7H_7)$[352]

(*335*) $\{[Mo(\mu\text{-}OH)(C_7H_7)]_4\}[(C_7H_7)Mo(\mu\text{-}Cl)_2(\mu\text{-}OH)Mo(C_7H_7)]Cl$[150]

See also: *403*.



$[(C_7H_7)Mo(\mu\text{-}OH)]_4$



$[(C_7H_7)Mo(\mu\text{-}Cl)_2(\mu\text{-}OH)Mo(C_7H_7)]$

(3 3 5)

η^8-LIGANDS

(*336*) $[Nd(thf)_2(C_8H_8)][Nd(C_8H_8)_2]$[202]

B. COMPLEXES CONTAINING METAL-METAL BONDS

TRANSITION METAL–MAIN GROUP METAL BONDS

Main Group IV

(*337*) $Cr[Ge(Smes)_2](CO)_5$ [310]

(*338*) $Mo(HgCl)(CO)_3(C_5H_5)$ [30]

(*339*) $Mn(SnBrMe_2)(CO)_3(PPh_3)_2$ [436]

(*340*) $[Mn(CO)_5]_3SnBr$ [181]

(*341*) $Ru(SiMe_3)(CO)_2[C_8H_8(SiMe_3)]$ [208]

(*342*) $Ru(SnCl_3)Cl(OCMe_2)(CO)(PPh_3)_2$ [429]

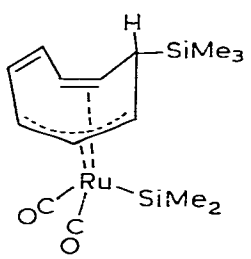
(*343*) $[Ni(SnPh_3)(np_3)]BPh_4$ [489]

(*344*) *trans*-$HPt(SiH_3)(PCy_3)_2$ [415]

(*345*) *cis*-$Pt(HgCF_3)(CF_3)(PPh_3)_2$ [418]

(*346*) $Au(SnCl_3)(PMe_2Ph)_2$ [206]

See also: *357*, *395*.



(341)

Main Group V

(*347*) $MnFe(AsMe_2)(CO)_8(PMe_3)$-*cis* [125]

(*348*) $MnFe(AsMe_2)(CO)_8(PMe_3)$-*trans* [125]

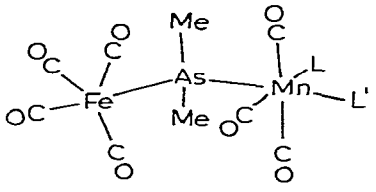
(*349*) $[Fe(AsMe)(CO)_3]_4$ [192]

(*350*) $Co(P_3)[(Ph_2PCH_2)_3CMe]$ [437]

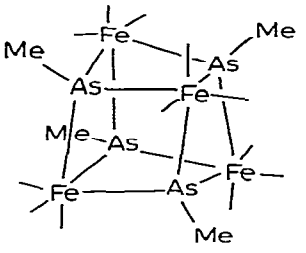
(*351*) $Co(P_3)(np_3)$ [442]

(*352*) $[\{Ni[(Ph_2PCH_2)_3CMe]\}_2(\mu\text{-}P_3)](BF_4)_2$ [437]

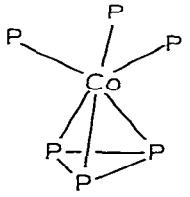
(*353*) $[\{Co[(Ph_2PCH_2)_3CMe]\}_2(\mu\text{-}As_3)](BPh_4)_2$ [494]



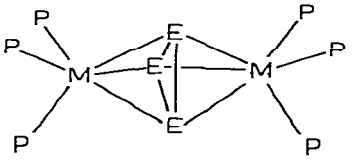
	L	L'
(347)	PMe_3	CO
(348)	CO	PMe_3



(349)



Coordination about cobalt in (350) and (351)



Coordination about metal

	M	E
(352)	Ni	P
(353)	Co	As

BINUCLEAR TRANSITION METAL COMPLEXES

(*354*) $(ppn)[Cr_2(CO)_{10}(\mu\text{-}H)]$ [52]

(*355*) $(ppn)[Fe_2(CO)_8(\mu\text{-}H)]$ [28]

(*356*) $(C_5H_5)Nb(\mu\text{-}H)Fe(CO)_5$ [167]

(*357*) $[Pt(\mu\text{-}H)(SiEt_3)(PCy_3)]_2$ [467]

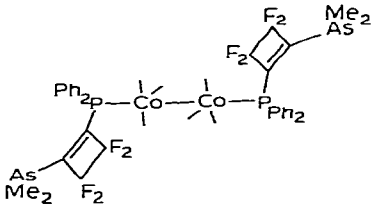
(*358*) $[Co(CO)_2(nbd)]_2$ [228]

(*359*) $\{Co(CO)_3[Ph_2PC{:}C(AsMe_2)CF_2\overline{CF_2}]\}_2$ [440]

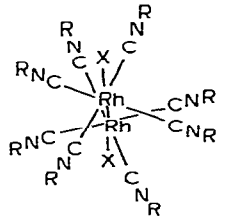
(*360*) $Fe_2(CNEt)_9$ [361]

(*361*) $[Rh_2(CNPh)_8](BPh_4)_2$ [484]

(*362*) $[Rh_2I_2(CNtol)_8](PF_6)_2$ [492]



(359)



(361) R = Ph, X not present
(362) R = tol, X = I

Metal-metal bonded alkyls, aryls, etc.

(*363*) $Mo_2Me_2(NMe_2)_4$[66]

(*364*) $[Li(OEt_2)]_4[W_2Me_8]$[290]

(*365*) $[Li(thf)]_4[W_2Me_xCl_{8-x}]$[290]

(*366*) $[Cr(CH_2SiMe_3)(PMe_3)]_2(\mu\text{-}CH_2SiMe_3)_2$[248,308]

(*367*) $[Mo_2(CH_2SiMe_3)_2(PMe_3)_3][\mu\text{-}(CH_2)_2SiMe_2]$[248]

(*368*) $[Mo(CH_2SiMe_3)(PMe_3)]_2(\mu\text{-}O_2CMe)_2$[248]

(*369*) $[W(\mu\text{-}CSiMe_3)(CH_2SiMe_3)_2]_2$[325]

(*370*) $Cr_2[(CH_2)_2PMe_2]_4$[210]

(*371*) $[Ni(\mu\text{-}Me)(C_5H_9)]_2$[113]

(*372*) $[Pt_2H_2Ph(PEt_3)_4]PF_6$[384]

(*373*) $Cr_2[C_6H_3Me(OMe)]_4$[392]

(*374*) $Cr_2[C_6H_3(OMe)_2]_4$[393]

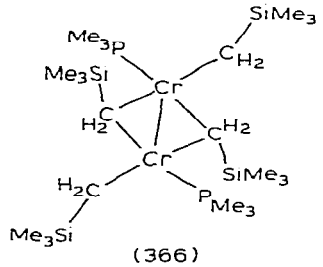
(*375*) $Mo_2[C_6H_3(OMe)_2]_4$[393]

(*376*) $Cr_2[C_6H_2(OMe)_3]_4$[393]

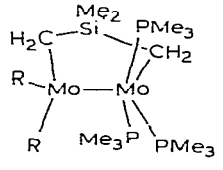
(*377*) $[Li(OEt_2)]_6[Cr_2(C_6H_4O)_4]Br_2$[466]

(*378*) $[Cr(C_6H_4OBu^t)(O_2CMe)]_2$[323]

(*379*) $W_2(CO)_2[N(xy)CHN(xy)]_3[CH_2N(xy)CHN(xy)]$[480,481]

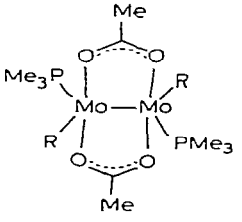


(366)



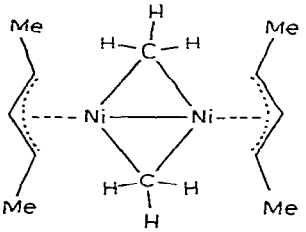
R = CH_2SiMe_3

(367)

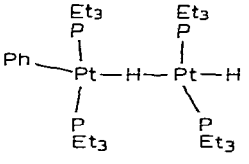


R = CH_2SiMe_3

(368)



(371)



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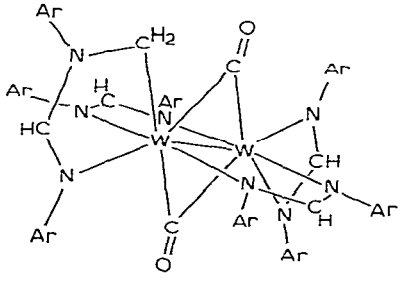


(379) Ar = 3,5-xylyl

(*380*) $[Mn(CO)_2(dppm)]_2(\mu\text{-CNtol})$ [490]

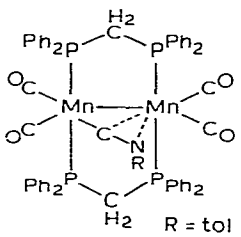
(*381*) $[Fe(CO)_2(pop)]_2(\mu\text{-CO})$ [128]

(*382*) $\{[Rh(CO)(dppm)]_2(\mu\text{-Cl})(\mu\text{-CO})\}BPh_4$ [477]

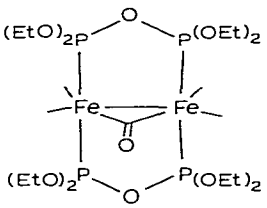
(*383*) $[RhCl(dppm)]_2(\mu\text{-}SO_2)$ [470]

(*384*) $[PdCl(dpam)]_2(\mu\text{-CO})$ [473]

(*385*) $[PtMe_2(Mepy)]_2(\mu\text{-}O_2CCF_3)_2$ [278]



(380)



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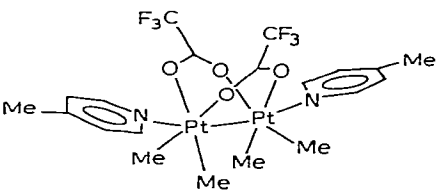


(385)

Metal–metal bonds bridged by hydrocarbon ligands

(*386*) $Mo_2(C_8H_8)_3$ [322]

(*387*) $W_2(C_8H_8)_3$ [322]

(*388*) $Re_2(C_3H_5)_4$ [110]

(*389*) $Fe_2(CO)_5(C_{12}H_{14})$ [216]

(*390*) $Fe_2(CO)_6(C_3Ph_3H)$ [327]

(*391*) $Fe_2(CO)_6[C(CHO)PPh_2(C_6H_4)]$ [338]

(*392*) $Fe_2(CO)_6(C_{10}H_{10})$ [191]

(*393*) $Fe_2(CO)_6(C_9H_8N_2O)$ [163]

(*394*) $Fe_3(CO)_8(C_{14}H_8Me_2)$ [314]

(*395*) $[Ru(GeMe_3)(CO)_2]_2(C_8H_6)$ [230]

(*396*) $[Co(CO)_2(PMe_3)]_2(C_2H_2)$ [109]

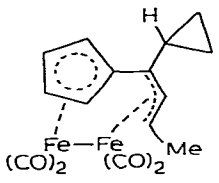
(*397*) $Co_2(CO)_5(C_8H_{12})_2$ [287]

(*398*) $[Rh(CO)(dpmC_4F_6)]_2(C_4F_6)$ [412]

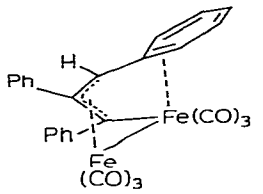
(*399*) $[Ni_2(CO)_2(\mu\text{-Cl})(\mu\text{-}C_3Cl_3)]_2$ [67]

(*400*) $Pd_3(acac)_2[C_3Ph(C_6H_4OMe\text{-}p)_2]_2$ [486]

(*401*) $[Pt(CNBu^t)_2]_2[\mu\text{-}(PhC)_2CO]$ [407]



(389)



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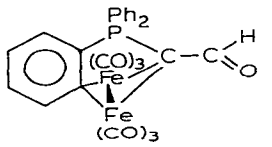

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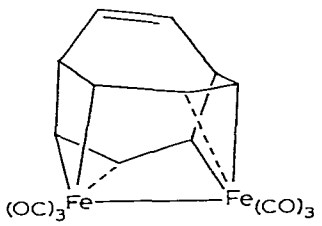
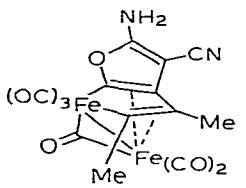


(392)



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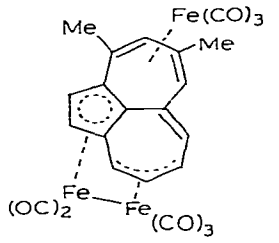

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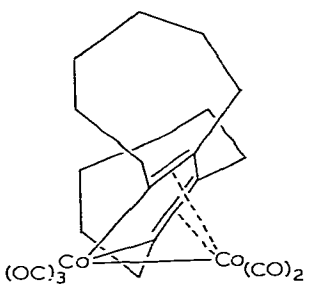

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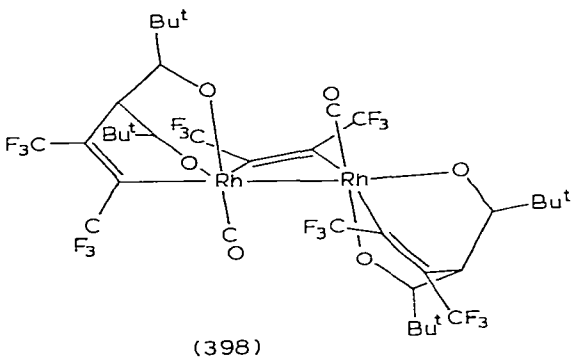

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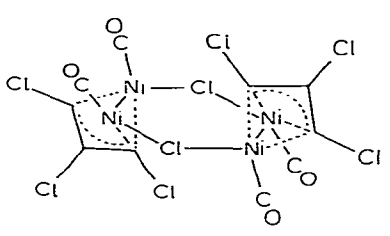

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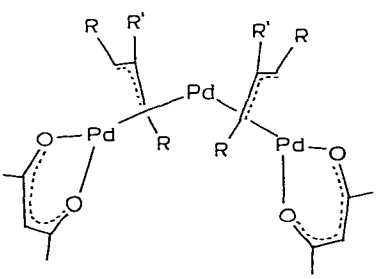


R = P — $MeOC_6H_4$

R = Ph

(400)

Metal-metal bonds bridged by other ligands

(*402*) $Mo_2(OBu^t)_6(CO)$ [336]

(*403*) $Mo_2(CO)_2[P(OMe)_3](\mu\text{-}SBu^t)_3(C_7H_7)$ [324]

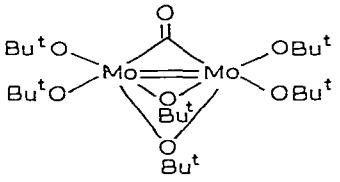
(*404*) $Fe_2(CO)_6(C_{16}H_{17}NO_4)$ [296]

(*405*) $Fe_2(CO)_6(\mu\text{-}N{:}CMe_2)(\mu\text{-}ON{:}CMe_2)$ [98]

(*406*) $Fe_2(CO)_6(dad)$[275]

(*407*) $Fe_2(CO)_6[tolNC(O)S]$[119]

(*408*) $Fe_2(CO)_6(C_5F_5PCy_2)$[311]



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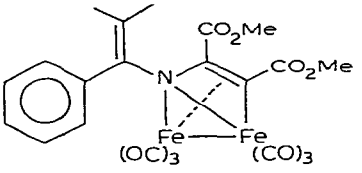

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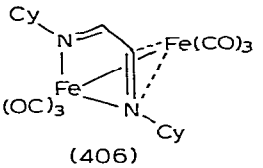

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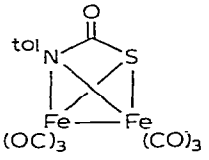

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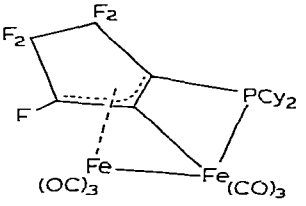


(408)

Metal-metal bonded complexes containing ER_2 (E = P or As) ligands.

(*409*) $[V(PMe_2)(CO)_4]_2$[97]

(*410*) $[Cr(PMe_2)(CO)_4]_2$[97]

(*411*) $[Mn(PMe_2)(CO)_4]_2$[97] (no Mn–Mn bond)

(*412*) $Cr_2(AsMe_2)(CO)_7(C_5H_5)$[144]

(*413*) $Mo_2(H)(PMe_2)(CO)_4(C_5H_5)_2$[76]

(*414*) $Fe_2(PPh_2)(CO)_6[CC(PhCy_2)Ph]$[402]

(*415*) $Fe_2(PPh_2)(CO)_6[C(NHCy)CHPh]$[391]

(*416*) $Fe_2(PPh_2)(CO)_6[CHC(NHCy)Ph]$[391]

(*417*) $Fe_2(PPh_2)(CO)_6[\overbrace{CPhC(CNMeCH_2CH_2NMe)}]$[386]

(*418*) $Fe_2(PF_2)(CO)(PF_2{:}NMe)[(PF_2)_2NMe]_3$[17]

(*419*) $Fe_2(PF_2)(MeN{:}PF_2)[(PF_2)_2NMe](C_5H_5)_2$[106] (no Fe–Fe bond)

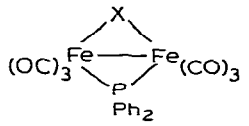
(*420*) $[Fe(\overbrace{POCH_2CMe_2CH_2O}^{})(CO)_3]_2$[205]

(*421*) $Fe_2[PhPCr(CO)_5](CO)_8$[249]

(*422*) $Co_2(PMe_2)(CO)_4(C_5H_5)$[73]

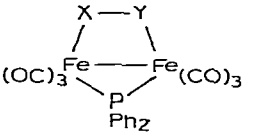
(*423*) $[Co(PMe_2)(CO)_2]_3$[107]

(*424*) $Pt_2(PPh_2)Ph(SNC_6H_2Me_2N)(PPh_3)_2$[491] (no Pt–Pt bond)

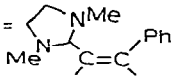


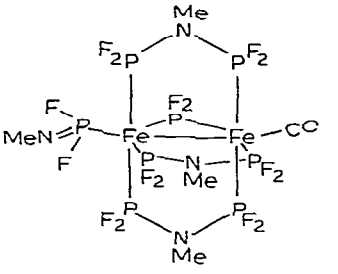
(414) X = C=C(Ph)PHCy$_2$

(416) X = C—C(Ph)NHCy



(415) X–Y = CyNH=C—CHPh

(417) X–Y = 



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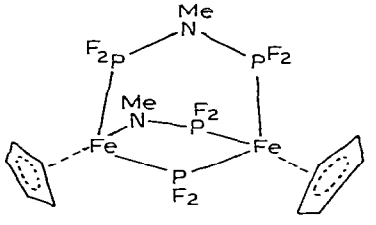

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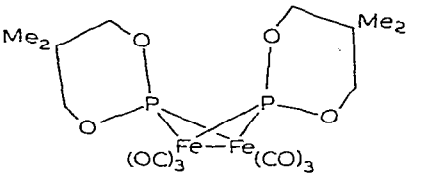

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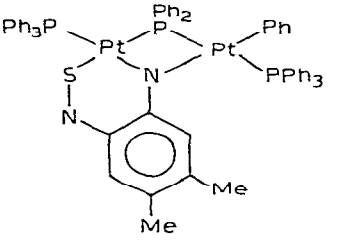


(424)

Cyclopentadienyls

(425) $V_2(CO)_5(C_5H_5)_2$ [166]

(426) $[Cr(CO)_2(C_5H_5)]_2$ [140]

(427) $[Mo(CO)_2(C_5H_5)]_2$ [142]

(428) $[Mo(CO)_2(C_5H_5)]_2(C_3H_4)$ [217]

(429) $[Mo(CO)_2(C_5H_5)]_2(C_2H_2)$ [194]

(430) $[W(CO)_2(C_5H_5)]_2(C_2H_2)$ [195]

(431) $[Mo(CO)_2(C_5H_5)]_2(C_2Et_2)$ [194]

(432) $[Mo(CO)_2(C_5H_5)]_2(C_2Ph_2)$ [194]

(433) $[Cr(C_5H_5)]_2(\mu\text{-}CO)(\mu\text{-}C_4Ph_4)$ [353,381]

(434) $[Cr(C_5H_5)]_2(C_8H_8)$ [229]

(435) $[Mo(C_5H_5)]_2\{\mu\text{-}C_2H_2[C_2(CO_2Me)_2]_3\}$[380]

(436) $[Mo(CO)_2(C_5H_5)]_2(NCNMe_2)$[218]

(437) $[Mo(CO)_2(C_5H_5)]_2(\mu\text{-}SPh)_2$[342] (no Mo–Mo bond)

(438) $[Cr(NSiMe_3)(C_5H_5)]_2(\mu\text{-}NSiMe_3)_2$[306]

(439) $[Mn(C_5H_5)]_2(\mu\text{-}N{:}NSiMe_3)_2$[307]

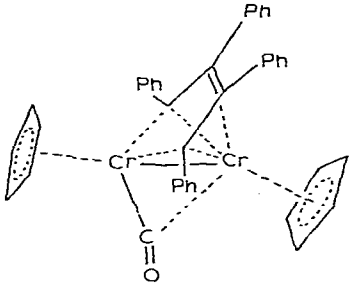
(440) *trans*-$[Fe(CO)_2(C_5H_5)]_2$[141]

(441) $[Ru(CO)_2(C_5Me_4Et)]_2$[348]

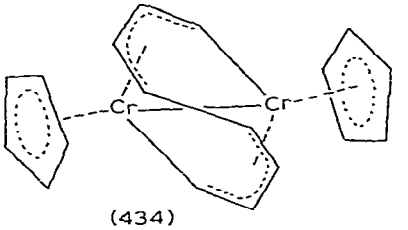
(442) $[Fe_2(CO)_3(CSEt)(C_5H_5)_2]BF_4$[200]

(443) $[Fe_2(CO)_3(SEt)(C_5H_5)_2]BPh_4$[170]

(444) $\{[Fe(CO)_2(C_5H_5)]_2SEt\}BF_4$[50]



(433)



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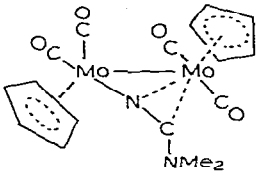

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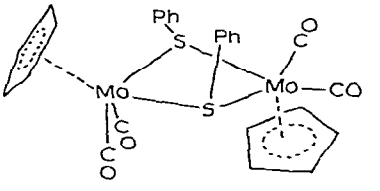

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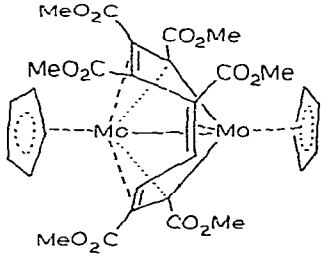
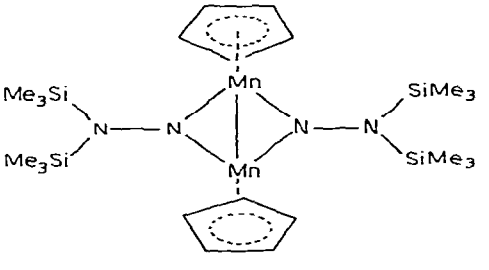
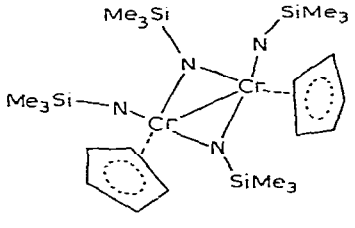


(435)



(439)

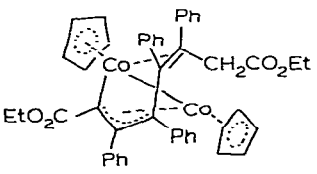


(438)

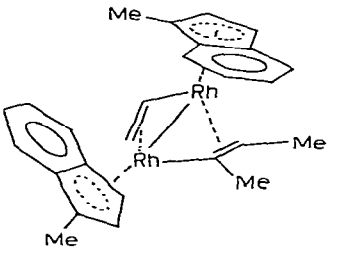
(445) $[Co(C_5H_5)]_2[\mu\text{-}C(CO_2Et)C_4Ph_4CH_2CO_2Et]$ [459]

(446) $[Rh(C_9H_6Me)]_2(\mu\text{-}CH{:}CH_2)(\mu\text{-}CMe{:}CHMe)$ [347]

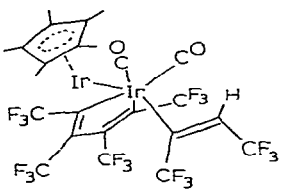
(447) $Ir_2(C_4F_5H)(C_8F_{12})(CO)_2(C_5Me_5)$ [315]



(445)



(446)



(447)

C. CLUSTER COMPLEXES

CLUSTERS CONTAINING MAIN GROUP ELEMENTS

(448) $Mn_2(CO)_8[\mu\text{-}Sn(Cl)Mn(CO)_5]_2$ [181]

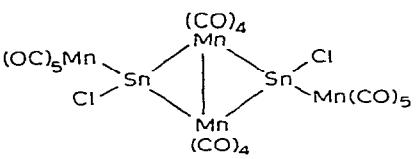
(449) $Fe_3S(CO)_9(SNBu^t)$ [119]

(450) $Fe_4S(CO)_{12}(CSNMe_2)(CNMe_2)$ [226]

(451) $Co_3(CEt)(CO)_7(nbd)$ [215]

(452) $Co_3(CMe)(CO)_4(C_5H_5)_2$ [198]

(453) $[(CO)_9Co_3C]_2S_2$ [133]



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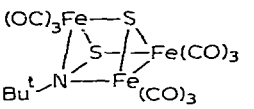
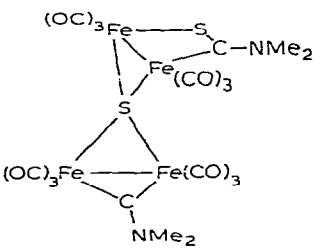


(449)



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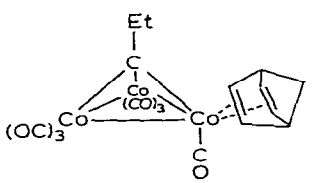
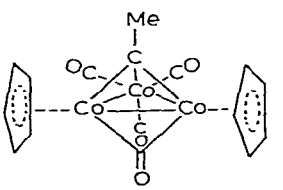
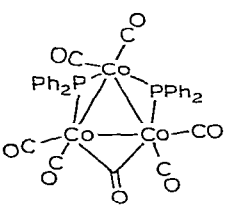


(451)



(452)



(459)

(454) $(CO)_9Co_3COTiCl(C_5H_5)_2$[264]

(455) $(CO)_9Co_3COHfCl(C_5H_5)_2$[264]

(456) $[(CO)_9Co_3CO]_2Zr(C_5H_5)_2$[264]

(457) $[(CO)_9Co_3CO]_2Hf(C_5H_5)_2$[264]

(458) $[(CO)_9Co_3CO]_2Ti[Co(CO)_4](C_5H_5)$[373]

(459) $Co_3(PPh_2)_2(CO)_7$[285]

TRANSITION METAL CLUSTER COMPLEXES

3-atom clusters

(460) $Re_3Cl_3(CH_2SiMe_3)_6$[326]

(461) $(NEt_4)_2[HRe_3(CO)_{12}]$[13]

(462) $Fe_3(CO)_7(HC_2Et)_4$[312]

(463) $Ru_3(CO)_{10}(\mu\text{-NCO})[\mu\text{-NC}(CH_2)_5]$[213]

(464) $Ru_3(CO)_6(C_{12}H_{20})(C_{12}H_{20}CO)$[387]

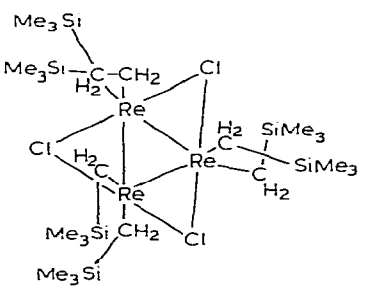
(465) $Ru_3(CO)_9[(Bu_2P)_3SiMe]$[404]

(466) $HRu_3(CO)_{10}(SCH_2CO_2H)$[89]

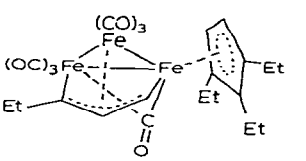
(467) $HRu_3(CO)_9(C_7H_4NS_2)$[186]

(468) $Os_3(CO)_{11}[P(OMe)_3]$[137]

(469) $Os_3(CO)_8(NO)_2[P(OMe)_3]$[71]



(460)



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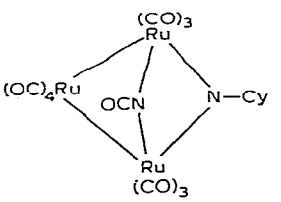

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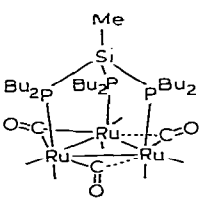
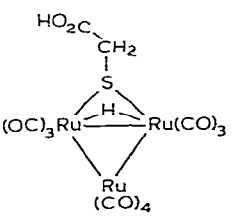


(465)



(466)

(*470*) $Os_3(CO)_{10}(cis\text{-}C_4H_6)$ [135]

(*471*) $Os_3(CO)_{10}(trans\text{-}C_4H_6)$ [135]

(*472*) $H_2Os_3(CO)_{10}$ [1]

(*473*) $H_2Os_3(CO)_{10}(CH_2)$ [68]

(*474*) $H_2Os_3(CO)_{10}(CH{:}CH_2)$ [1,2]

(*475*) $HOs_3(CO)_{10}(CF_3C{:}CHCF_3)$ [134]

(*476*) $HOs_3(CO)_{10}(\bar{C}HCH{:}\overset{+}{N}Et_2)$ [199]

(*477*) $H_2Os_3(CO)_9(OC_6H_3CH_2Ph)$ [294]

(*478*) $HOs_3(CO)_9(CHNPh)$ [187]

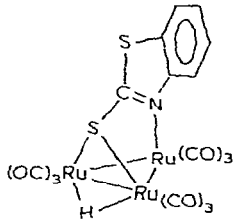
(*479*) $HOs_3(CO)_{10}(PhCNMe)$ [223]

(*480*) $HOs_3(CO)_8[\overline{C(O)C(CHMe)CHCHEt}]$ [196]

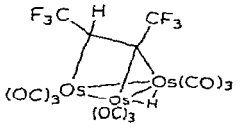
(*481*) $HOs_3(CO)_9(C_2H_4)(SMe)$ [93]

(*482*) $(ppn)[Os_3(CO)_9(SH)]$ [44]

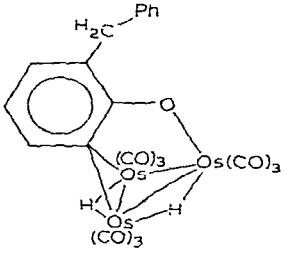
(*483*) $(ppn)[Rh_3(CO)_4(C_5H_5)_2]$ [143]



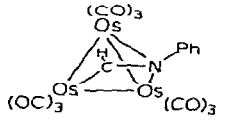
(467)



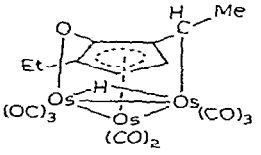
(475)



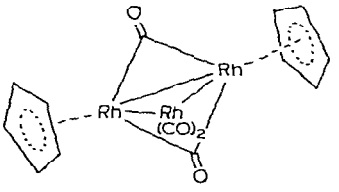
(477)



Os–H–Os not located
(478)



(480)



(483)

4-atom clusters

(*484*) $(NEt_4)_2[Re_4(CO)_{16}].\frac{1}{2}NEt_4[trans\text{-}H_2Re(CO)_4]$ [13]

(*485*) $Fe_4(CO)_{11}(HC_2Et)_2$ [251]

(*486*) $H_4Ru_4(CO)_{12}$ [90]

(*487*) (ppn)$[H_3Ru_4(CO)_{12}]$ (2 isomers)[88]

(*488*) $H_4Ru_4(CO)_{10}(PPh_3)_2$[457]

(*489*) $H_4Ru_4(CO)_{10}$(dppe)[409]

(*490*) $H_3Os_4(CO)_{12}I$[86]

(*491*) $NMe_4[H_3Os_4(CO)_{12}]$[87]

(*492*) $(ppn)_2[H_2Os_4(CO)_{12}]$[84]

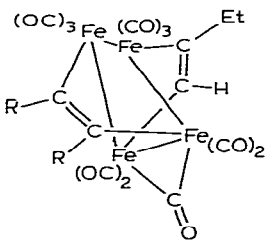
(*493*) $H_3Os_4(CO)_{11}(C_6H_9)$[3]

(*494*) $Ir_4(CO)_{12}$[115]

(*495*) $(ppn)_2[H_2Ir_4(CO)_{10}]$[53]

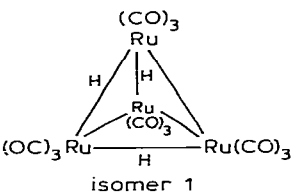
(*496*) $PPh_4[Ir_4(CO)_{11}Br]$[83]

(*497*) $Ir_4(CO)_5(C_8H_{12})_2(C_8H_{10})$[376]

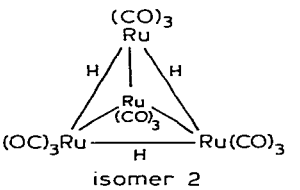


R = H, Et disordered

(485)



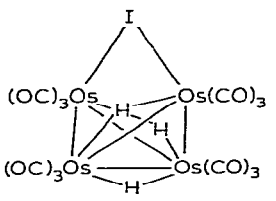
isomer 1



isomer 2

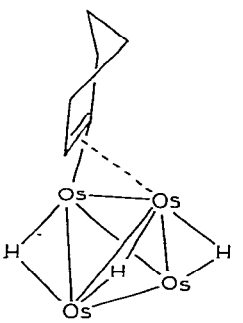
Ru–Ru bonds bridged by H indicated

(487)

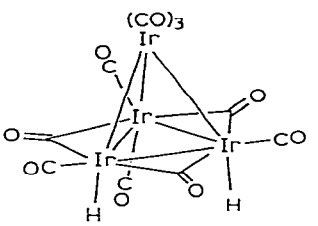


H not located

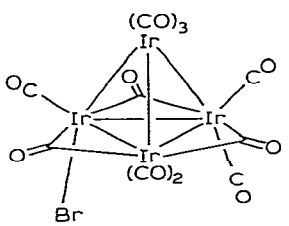
(490)



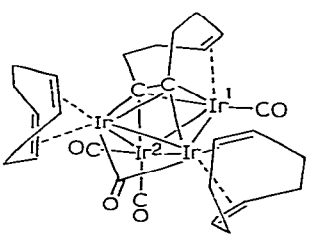
(493)



(495)

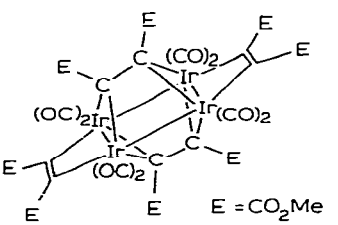


(496)



CO bridging Ir^1–Ir^2 omitted

(497)



(498)

(*498*) $Ir_4(CO)_8[C_2(CO_2Me)_2]_4$[390]

(*499*) $H_3Ni_4(C_5H_5)_4$[237]

(*500*) $Pd_4(CO)_4(OAc)_4$[101,102]

5-atom clusters

(*501*) $H_2Os_5(CO)_{16}$[184]

(*502*) $(ppn)[HOs_5(CO)_{15}]$[162]

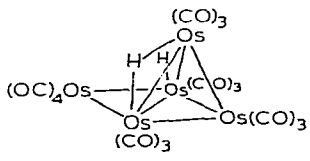
(*503*) $(ppn)[Os_5(CO)_{15}I]$[182]

(*504*) $HOs_5C(CO)_{13}[OP(OMe)OP(OMe)_2]$[214]

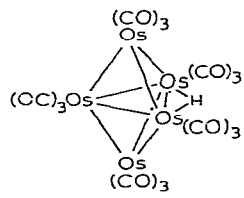
(*505*) $HOs_5C(CO)_{14}[OP(OMe)_2]$[212]

(*506*) $Os_5(CO)_{15}(POMe)$[185]

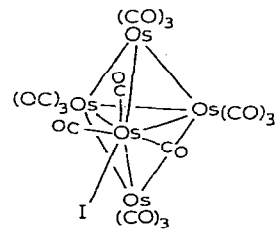
(*507*) $Pt_5(CO)_6(PPh_3)_4$[493]



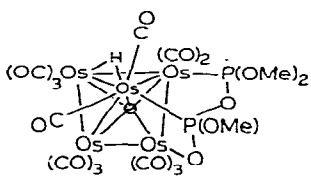
(501)



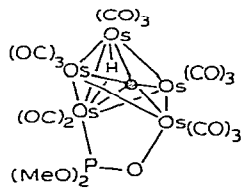
(502)



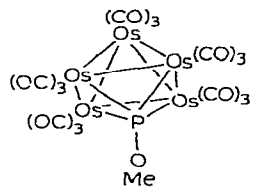
(503)



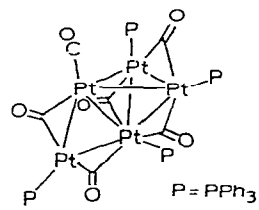
(504)



(505)



(506)



(507) P = PPh_3

6-atom clusters

(*508*) $H_2Os_6(CO)_{18}$[3]

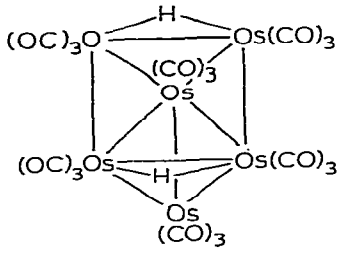
(*509*) $Os_6(CO)_{16}(CNBu^t)_2$[339,340]

(*510*) $Os_6(CO)_{18}(CNtol)_2$[339,401]

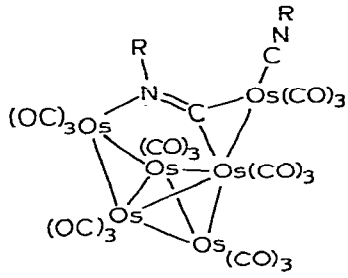
(*511*) $Os_6(CO)_{16}(CMe)_2$[262]

(*512*) $Os_6(CO)_{16}(CPh)_2$[377]

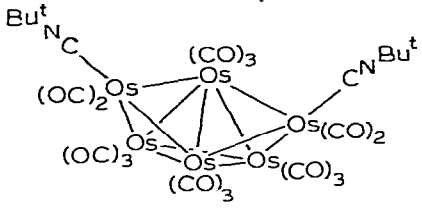
(*513*) $Os_6C(CO)_{16}(C_2Me_2)$[262]



(508)



(510)



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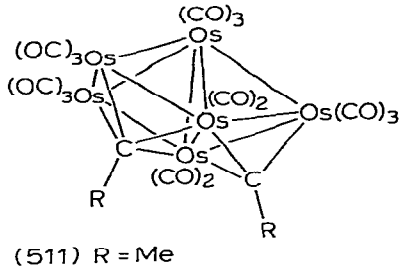
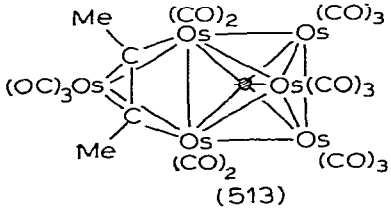


(511) R = Me
(512) R = Ph



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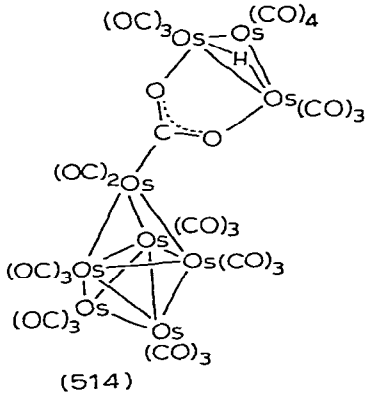
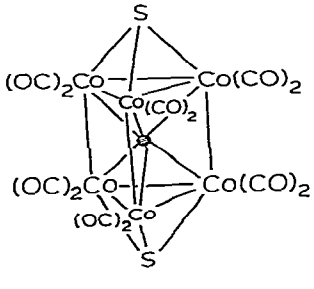
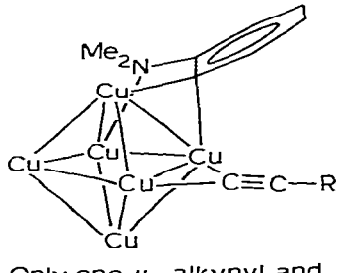


(514)



(515)



Only one μ_3-alkynyl and one μ_2-$Me_2NC_6H_4$ group shown
R = *p*-tol

(516)

(*514*) $(ppn)[HOs_3(CO)_{10}O_2COs_6(CO)_{17}]$[363]

(*515*) $Co_6C(S)_2(CO)_{12}$[133]

(*516*) $Cu_6(C_2tol)_2(C_6H_4NMe_2)_4$[471]

Clusters containing 7 to 17 metal atoms

(*517*) $Ir_7(CO)_{12}(C_8H_{12})(C_8H_{11})(C_8H_{10})$[411]

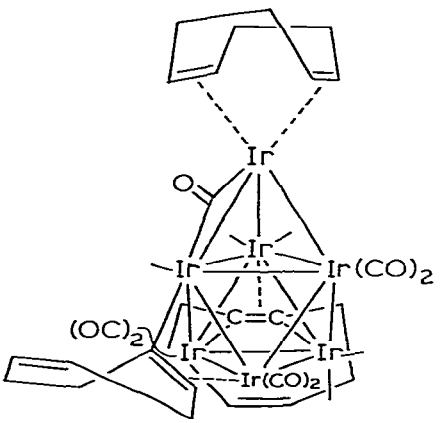
(*518*) $[NMe_3(CH_2Ph)]_2[Co_8C(CO)_{18}]$[260]

(*519*) $Rh_{12}C_2(CO)_{25}$[362]

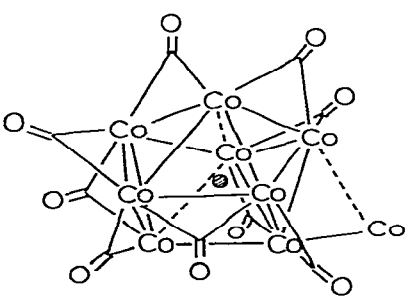
(*520*) $(NEt_4)_4[Rh_{14}(CO)_{25}]$[337]

(*521*) $(NMe_4)_3[Rh_{15}(CO)_{27}]$[337]

(*522*) $[NEt_3(CH_2Ph)]_3[Rh_{17}S_2(CO)_{32}]$[395]

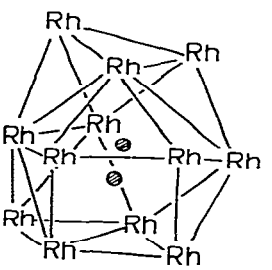


(517)



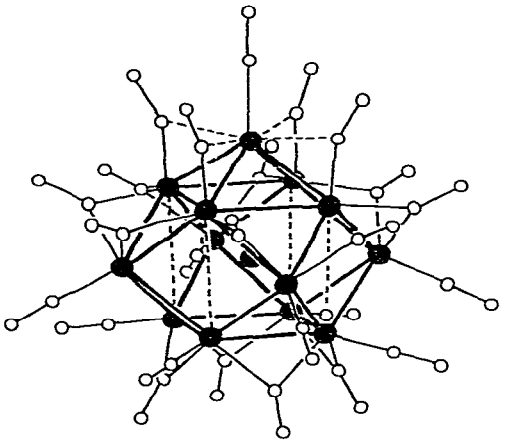
One terminal CO on each Co omitted

(518)

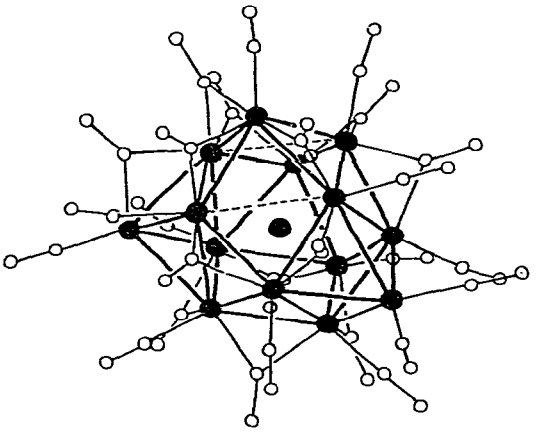


$Rh_{12}C_2$ skeleton

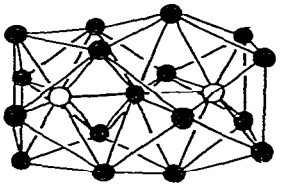
(519)



(520)



(521)



$Rh_{17}S_2$ skeleton

(522)

Mixed-metal clusters

(*523*) $CrFe_2(PPh)(CO)_{11}$[211]

(*524*) $HWOs_3(CO)_{12}(C_5H_5)$[189]

(*525*) $H_3WOs_3(CO)_{11}(C_5H_5)$[189]

(*526*) $MoCo_2(CPh)(CO)_8(C_5H_5)$[265]

(*527*) $Mo_2Pd_2(CO)_6(PEt_3)_2(C_5H_5)_2$[370]

(*528*) $H_2Re_2Os_3(CO)_{20}$[261]

(*529*) $FeCo_2[SCr(CO)_5](CO)_9$[161]

(*530*) $HFeCo_3(CO)_9[P(OMe)_3]_3$[236,237,238]

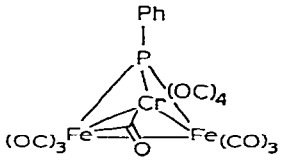
(*531*) $H_3Os_3Co(CO)_{12}$[85]

(*532*) $H_2Os_3Pt(CO)_{10}(PCy_3)$[369]

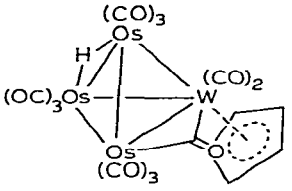
(*533*) $H_2Os_2Pt_2(CO)_8(PPh_3)_2$[451]

(*534*) $Co_2Pt_3(CO)_9(PEt_3)_3$[360]

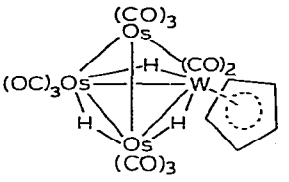
(*535*) $(ppn)[Rh_5Pt(CO)_{15}]$[183]



(523)



(524)



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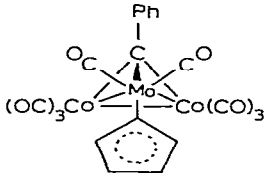
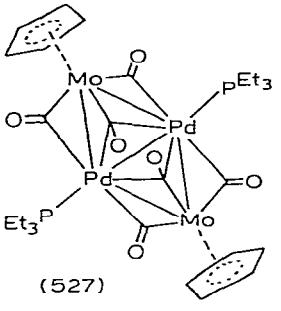
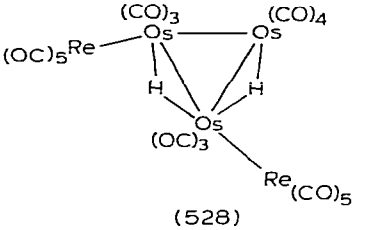


(526)



(527)



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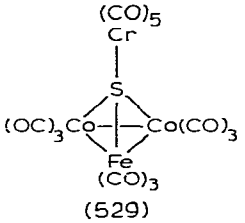

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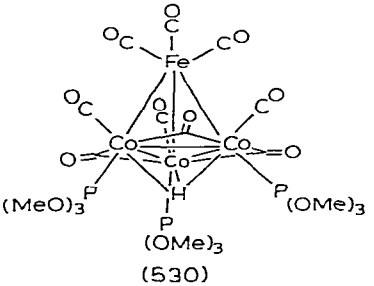
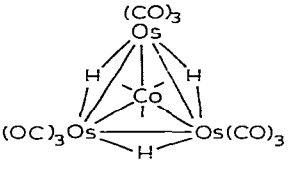
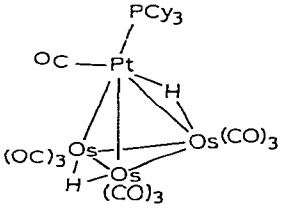


(530)

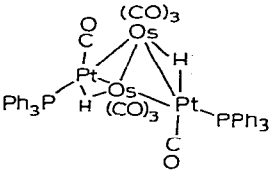


3 CO's attached to Co

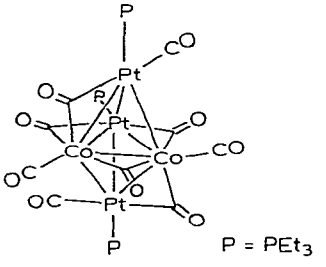
(531)



(532)

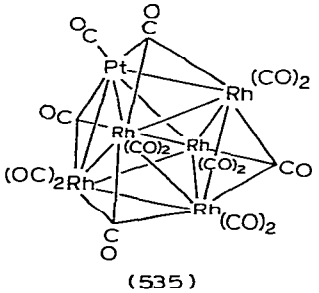


(533)



P = PEt_3

(534)



(535)

METALLOCARBORANE COMPLEXES

(arranged in order of increasing polyhedron size)

(536) $[Mn(CO)_3]_2[S(BMe_2)(CEt)_2]_2Fe$[302]

(537) $[Co(C_5H_5)]_2(B_3C_5H_7)$[171]

(538) $(C_5H_5)Ni[CMe(BEt)_2(CEt)_2]$[221]

(539) $[(C_5H_5)Co(C_5H_4)][Me_2C_2B_4H_3]Co[Me_2C_2B_3H_5]$[240]

(540) *trans*-$PtH(C_2B_4H_7)(PEt_3)_2$[158]

(541) $(Et_3P)_2PtMe_2C_2B_4H_4$[158]

(542) $(C_5H_5)_2CoNiCB_7H_8$[79]

(543) $(Ph_3P)_2PtCB_8H_{12}$[416]

(544) $NMe_4[Fe(C_5H_5)(CB_9H_{10})]$[21]

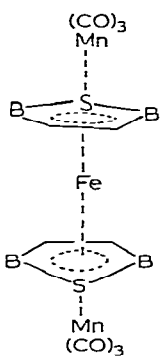
(545) $(C_5H_5)_2FeCoC_2B_7H_9$[94]

(546) $[(Ph_3P)RhC_2B_9H_{11}]_2$[432]

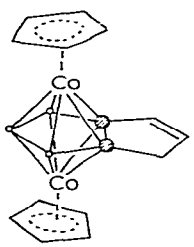
(547) $[C_2H_4(NMe_2)_2]PdC_2B_9H_{11}$[40]

(548) $(Me_3P)_2PdC_2B_9H_{11}$[40]

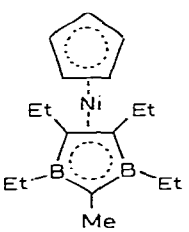
(549) $(Et_3P)_2PtC_2B_9H_{11}$[160]



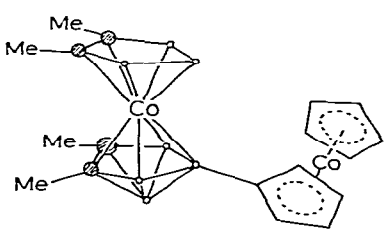
(536)



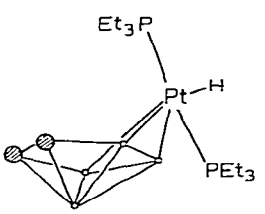
(537)



(538)



(539)



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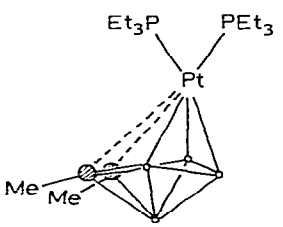
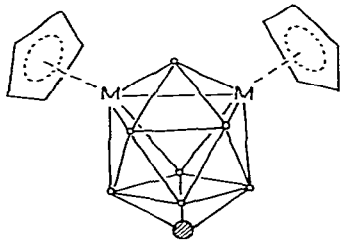
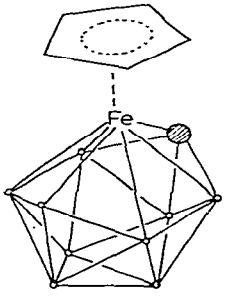


(541)

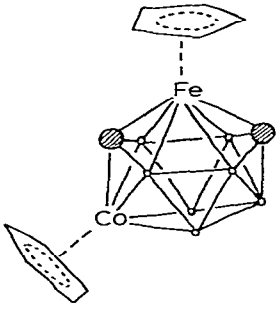


M = disordered Co, Ni

(542)



(544)



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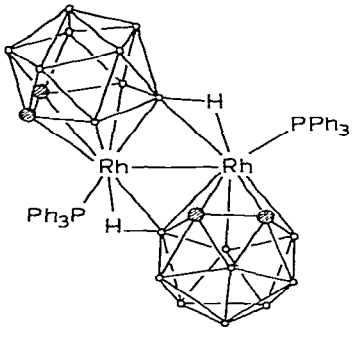
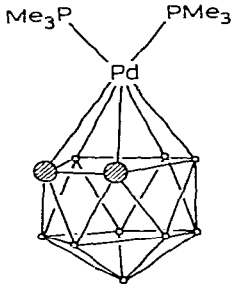


(546)



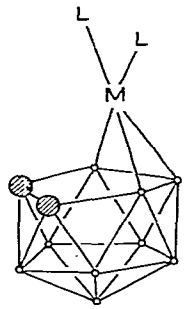
(547)

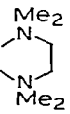
(*550*) $(Et_2NCS_2)AuC_2B_9H_{11}$ [27]

(*551*) $(C_5H_5)CoMe_4C_4B_7H_6(OEt)$ [179]

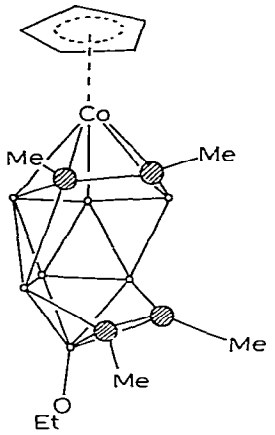
(*552*) $(C_5H_5)_2Co_2C_4B_6H_{10}$ [152]

(*553*) $(C_5H_5)_2Fe_2Me_4C_4B_8H_8$ [241]

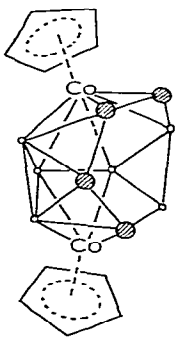


(548) ML_2 = 

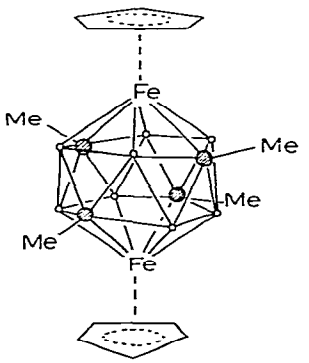
(549) $ML_2 = Pt(PEt_3)_2$



(551)



(552)



(553)

D. STRUCTURES ORDERED BY TRANSITION METAL

Sc: *566* (1).

Ti: *79, 112, 225, 226, 227, 228, 229, 230, 231, 245, 246, 247, 248, 249, 259, 454, 458* (17).

V: *74, 254, 260, 409, 425, 574* (6).

Cr: *12, 13, 20, 21, 22, 30, 31, 55, 56, 67, 68, 69, 70, 71, 75, 76, 236, 263, 264, 265, 310, 311, 317, 318, 319, 320, 321, 322, 323, 324, 329, 330, 332, 337, 354, 366, 370, 373, 374, 376, 377, 378, 410, 412, 421, 426, 433, 434, 438, 523, 529, 584* (52).

Mn: *1, 5, 8, 14, 15, 35, 36, 41, 83, 126, 217, 218, 227, 280, 281, 282, 283, 284, 285, 286, 287, 312, 315, 316, 328, 339, 340, 347, 348, 380, 411, 439, 448, 536* (34).

Fe: *16, 26, 27, 40, 52, 61, 62, 63, 71, 127, 138, 154, 163, 164, 167, 171, 175, 176, 177, 189, 190, 191, 192, 194, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 216, 219, 220, 289, 290, 291, 292, 293, 294, 295, 302, 303, 304, 305, 306, 307, 308, 309, 313, 314, 347, 348, 349, 355, 356, 360, 381, 389, 390, 391, 392, 393, 394, 404, 405, 406, 407, 408, 414, 415, 416, 417, 418, 419, 420, 421, 440, 442, 443, 444, 449, 450, 462, 485, 523, 529, 530, 536, 544, 545, 553, 573, 582* (97).

Co: *3, 4, 59, 85, 86, 87, 88, 89, 179, 180, 221, 240, 256, 297, 298, 299, 350, 351, 358, 359, 396, 397, 422, 423, 445, 451, 452, 453, 454, 455, 456, 457, 458, 459, 515, 518, 526, 529, 530, 531, 534, 537, 539, 542, 545, 551, 552, 575, 580, 583* (50).

Ni: *91, 92, 110, 111, 113, 162, 182, 301, 343, 352, 353, 371, 399, 499, 538, 542, 558, 578* (18).

Cu: *141, 160, 516, 570, 586* (5).

Y: *243, 568* (2).

Zr: *232, 233, 250, 251, 252, 253, 456* (7).

Nb: *356* (1).

Mo: *23, 24, 25, 57, 81, 107, 168, 173, 174, 188, 215, 237, 238, 239, 266, 267, 268, 269, 270, 271, 272, 273, 274, 325, 326, 331, 333, 334, 335, 338, 363, 367, 368, 375, 386, 402, 403, 413, 427, 428, 429, 431, 432, 435, 436, 437, 526, 527, 563, 577* (50).

Tc: *43* (1).

Ru: *11, 46, 58, 64, 109, 139, 143, 161, 170, 178, 195, 196, 197, 198, 214, 296, 327, 341, 342, 395, 441, 463, 464, 465, 466, 467, 486, 487, 488, 489, 576* (31).

Rh: *17, 18, 19, 48, 53, 54, 90, 128, 144, 145, 155, 156, 157, 158, 199, 200, 241, 242, 257, 258, 300, 361, 362, 382, 383, 398, 446, 483, 519, 520, 521, 522, 535, 546, 557, 560, 579* (37).

Pd: *77, 93, 94, 95, 118, 119, 129, 130, 172, 183, 184, 185, 202, 384, 400, 500, 527, 547, 548* (19).

Ag: *142, 309* (2).

Nd: *336* (1).

Yb: *78* (1).

Hf: *234, 455, 457* (3).

Ta: *80, 235, 255, 261, 262, 571* (6).

W: *32, 33, 34, 60, 72, 73, 82, 153, 275, 276, 277, 278, 279, 364, 365, 369, 379, 387, 430, 524, 525, 563* (22).

Re: *2, 6, 7, 9, 10, 37, 38, 39, 44, 45, 50, 51, 84, 108, 288, 315, 388, 460, 461, 484, 528, 554, 559, 572* (24).

Os: *42, 47, 165, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 490, 491, 492, 493, 501, 502, 503, 504, 505, 506, 508, 509, 510, 511, 512, 513, 514, 524, 525, 528, 531, 532, 533, 556* (42).

Ir: *28, 49, 121, 122, 123, 124, 166, 181, 201, 447, 494, 495, 496, 497, 498, 517, 555, 562, 581* (19).

Pt: *65, 66, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 117, 120, 125, 131, 132, 133, 134, 135, 136, 137, 140, 146, 147, 148, 149, 150, 151, 152, 159, 169, 186, 187, 193, 203, 344, 345, 357, 372, 385, 401, 424, 507, 532, 533, 534, 535, 540, 541, 543, 549, 561, 585* (55).

Au: *114, 115, 116, 346, 550* (5).

Th: *222* (1).

U: *223, 224, 244, 564, 565, 567, 569* (7).

TABLE 1. ORGANO-TRANSITION METAL COMPLEXES

No.	Formula	Complex	Data	R	R_w	Notes	Reference
	Cl						
11	$CCl_5ORu^-.C_{25}H_{22}P^+.2CH_2Cl_2$	$[PPh_3(CH_2Ph)][RuCl_5(CO)].2CH_2Cl_2$	1010	8.3			9
	C3						
5	$C_3H_8B_3MnO_3$	$Mn(\eta^3\text{-}B_3H_8)(CO)_3$	1333	4.7	5.8	178	10
14	$C_3H_9MnN_3O_3^+.C_5MnO_5^-$	$[fac\text{-}Mn(CO)_3(NH_3)_3][Mn(CO)_5]$	751	6.1			11
	C4						
6	$C_4H_2O_4Re^-.C_8H_{20}N^+$	$NEt_4[cis\text{-}H_2Re(CO)_4]$	1586	7.1	9.3		12
7	$\frac{1}{2}C_4H_2O_4Re^-.C_{16}O_{16}Re_4^{2-}.2\frac{1}{2}C_8H_{20}N^+$	$\frac{1}{2}NEt_4[trans\text{-}H_2Re(CO)_4].(NEt_4)_2\text{-}[Re_4(CO)_{16}]$	520	5.2			13
146	$C_4H_8Cl_3OPt^-.C_8H_{20}N^+$	$NEt_4[PtCl_3(CH_2{:}CHOEt)]$	1602	2.2			14
147	$C_4H_{12}Cl_3N_2Pt$	$PtCl_3(C_4H_{12}N_2)$	1808	4.0	5.1	*a*	15
4	$C_4CoO_4^-.C_{25}H_{19}CoO_2P^+$	$[Co(CO)_2(C_5H_4PPh_3)][Co(CO)_4]$	3155	5.35			16

[a] $C_4H_{12}N_2$ = *cis*-but-2-en-1,4-diammonium.

	C5						
148	$C_5H_{12}Cl_3NPt$	$PtCl_3(C_5H_{12}N)$	1849	4.0	5.1	*b*	15
418	$C_5H_{12}F_{16}Fe_2N_4OP_8$	$Fe_2(CO)[(PF_2)_2NMe]_4$	2376	4.89	4.85		17
9	$C_5F_6O_5Re_2$	$Re(CO)_5F.ReF_5$	1969	6.1			18
1	$C_5MnO_5^-.C_3H_9MnN_3O_3^+$	[*fac*-$Mn(CO)_3(NH_3)_3$][$Mn(CO)_5$]	751	6.1			11
	C6						
72	$C_6H_3BrO_4W$	*trans*-$WBr(CMe)(CO)_4$	744	7.5			19
73	$C_6H_3IO_4W$	*trans*-$WI(CMe)(CO)_4$	493	6.5		243	19
149	$C_6H_{14}Cl_3NPt$	$PtCl_3[Me(CH_2)_2CH{:}CHNH_2Me]$	911	3.8	5.6		20
544	$C_6H_{15}B_9Fe^-.C_4H_{12}N^+$	$NMe_4[Fe(C_5H_5)(CB_9H_{10})]$	1760		5.3		21
327	$3C_6H_{12}ClN_2Ru^+.H_4N^+.4F_6P^-$	$3[RuCl(NH_3)_2(C_6H_6)]PF_6.NH_4PF_6$	738	8.4			246
10	$C_6Cl_3O_6Re_2^-.C_{36}H_{47}N_4^+$	$(oepH_3)[Re_2Cl_3(CO)_6]$	3463	4.6	4.7		22
55	C_6CrO_5S	$Cr(CO)_5(CS)$	846	5.4	5.4		23
2	$C_6O_6Re^+.F_{11}Re_2^-$	$[Re(CO)_6][Re_2F_{11}]$	763	7.7			24
	C7						
13	$C_7H_3CrNO_5S$	$Cr(CO)_5(NCSMe)$	2720	3.2		203	25
264	$C_7H_5CrNO_2S$	$Cr(CO)_2(NS)(C_5H_5)$	848	2.5			26
550	$C_7H_{22}AuB_9NS_2$	$Au(S_2CNEt_2)(B_9C_2H_{11})$	1962	3.9	4.7		27

[b] $C_5H_{12}N$ = *cis*-pent-2-enylammonium.

C8

355	$C_8HFe_2O_8^-.C_{36}H_{30}NP_2^+$	(ppn)[$HFe_2(CO)_8$]	3330	8.1	8.9		28
16	$C_8H_4FeN_2O_4$	$Fe(CO)_4(C_4H_4N_2$-1,2)	967	3.5	5.5		29
338	$C_8H_5ClHgMoO_3$	$Mo(HgCl)(CO)_3(C_5H_5)$	854	5.8	6.2		30
263	$C_8H_5CrO_3^-.C_4H_{12}N^+$	$NMe_4[Cr(CO)_3(C_5H_5)]$	1375	5.5			31
51	$C_8H_6Br_2O_6Re_2S_2$	$Re_2Br_2(CO)_6(\mu$-$S_2Me_2)$	1989	8.7	9.7		32
202	$C_8H_8Cl_2Pd$	$PdCl_2$(cot)	1508	1.89	2.92		33
195	$C_8H_8Cl_3ORu^-.C_{25}H_{22}P^+$	$[PPh_3(CH_2Ph)][RuCl_3(CO)$(nbd)]	2859	4.5			9
26	$C_8H_{10}FFeN_2O_4P$	$Fe(CO)_4[\overline{PFNMe(CH_2)_2NMe}]$	1818	4.4		*c*	35
163	$C_8H_{12}FeN_2O_2S_3$	$Fe(CO)_2(\eta^2$-$CSNMe_2)(S_2CNMe_2)$	1780	6.2	8.4		36
185	$C_8H_{14}Cl_4Pd_3$	$Pd_3Cl_4(\eta^3$-$C_4H_7)_2$	1024	6.7			37
188	$C_8H_{14}MoOS_6$	$MoO(S_2CSPr^i)(\eta^3$-$S_2CSPr^i)$	1450	5.9	7.6		38
115	$C_8H_{22}AuNP_2$	$AuMe_2[(CH_2PMe_2)_2N]$	1899	5.80	6.42		39
548	$C_8H_{27}B_9N_2Pd$	3-$[C_2H_4(NMe_2)_2]$-3,1,2-$PdC_2B_9H_{11}$	2070	3.0			40
547	$C_8H_{29}B_9P_2Pd$	3,3-$(PMe_3)_2$-3,1,2-$PdC_2B_9H_{11}$	2214	2.6			40
8	$C_8Cl_2Mn_2O_8$	$[Mn(CO)_4]_2(\mu$-$Cl)_2$	2000	6.91	5.06		41
15	$C_8F_4Mn_2N_2O_{10}S_2$	$[Mn(CO)_4(NSOF_2)]_2$	1050	8.0	7.1		42,43

c Ligand = 2-F-1,3-Me_2-1,3,2-diazaphospholidine.

C9

482	$C_9HO_9Os_3S^-.C_{36}H_{30}NP_2^+$	(ppn)[$Os_3(CO)_9(SH)$]	3186	5.7	5.7		44
31	$C_9H_6CrO_6S$	$Cr(CO)_5(C_4H_6SO)$	1629	4.0	4.5	*d*	45,46
30	$C_9H_8CrO_6$	$Cr(CO)_5$(thf)	926	3.5	3.2		47
204	$C_9H_8FeO_4$	$Fe(CO)_3(C_6H_8O)$	896	3.3	3.7	*e*	48
70	$C_9H_{10}BrCrNO_4$	*trans*-CrBr[$C(NEt_2)$]$(CO)_4$					4,49
294	$C_9H_{10}FeO_2S$	Fe(SEt)$(CO)_2(C_5H_5)$	885	4.9			50
299	$C_9H_{14}CoPS_2$	Co$(PMe_3)(CS_2)(C_5H_5)$	906	5.3			51
114	$C_9H_{23}AuP_2$	$AuMe_2[(CH_2PMe_2)_2CH]$	1742	6.66	7.75		39

C10

354	$C_{10}HCr_2O_{10}^-.C_{36}H_{30}NP_2^+$	(ppn)[$HCr_2(CO)_{10}$]	1594 2357	5.5 5.1	6.0 7.1	 ND	} 52
495	$C_{10}H_2Ir_4O_{10}^{2-}.2C_{36}H_{30}NP_2^+$	$(ppn)_2[H_2Ir_4(CO)_{10}]$	2234	4.0			53
472	$C_{10}H_2O_{10}Os_3$	$H_2Os_3(CO)_{10}$	3132 713	4.4 3.0	4.9 2.6	 ND	} 1
192a	$C_{10}H_7FeNO_3$	$Fe(CO)_3(C_6H_7CN)$	803	7.0	5.7	*f*	54
177	$C_{10}H_7FeNO_3^-.C_{24}H_{20}As^+$	$AsPh_4[Fe(CO)_3(C_7H_7)]$	1730	5.3			55
171	$C_{10}H_7FeO_8^-.C_{36}H_{30}NP_2^+$	(ppn)[$Fe(CO)_3(C_7H_7O_5)$]	5373	6.8	9.5	*g*	56

d C_4H_6SO = 2,5-H_2thiophene-1-oxide. *e* C_6H_8O = η^4-4,4-Me_2buta-1,3-dienone. *f* C_6H_7CN = 5-*exo*-CN-cyclohexa-1,3-diene.

g $C_7H_7O_5$ = η^3-*trans*-2,3-$(CO_2Me)_2$acryloyl.

22	$C_{10}H_9As_3CrO_5$	$Cr(CO)_5[(AsCH_2)_3CMe]$	1696	3.26		*h*	57
12	$C_{10}H_{10}CrN_2O_5$	$Cr(CO)_5(NCNEt_2)$	896	3.9	3.9		58,59
219	$C_{10}H_{10}Fe.3CH_4N_2S$	$Fe(C_5H_5)_2.3CS(NH_2)_2$	711	7.9		100	60
220	$C_{10}H_{10}Fe^+.Cl_4Fe^-$	$[Fe(C_5H_5)_2]FeCl_4$	1579	4.9	4.8		61
217	$nC_{10}H_{10}Mn$	$[Mn(C_5H_5)_2]_n$	343	8.4			62
237	$C_{10}H_{10}Mo_2O_4$	$Mo_2O_4(C_5H_5)_2$	1512		3.8		63
101	$C_{10}H_{12}Cl_3O_5Pt^-.C_{36}H_{30}NP_2^+$	(ppn){*cis*-$PtCl_2(CO)[C(CO_2Et):CCl-(CO_2Pr^i)]$}	3142	5.4			64
275	$C_{10}H_{14}N_2O_3W$	$W(CONHMe)(NH_2Me)(CO)_2(C_5H_5)$	2091	6.2	7.0	247	65
363	$C_{10}H_{30}Mo_2N_4$	$Mo_2Me_2(NMe_2)_4$	1716	3.7	6.0		66
399	$C_{10}Cl_8Ni_4O_4$	$[Ni_2(CO)_2(\mu\text{-}Cl)(\mu\text{-}C_3Cl_3)]_2$	2304	4.8	6.1		67
	C11						
473	$C_{11}H_4O_{10}Os_3$	$H_2Os_3(CH_2)(CO)_{10}$	2258 731	7.5	9.7	ND	68
68	$C_{11}H_5BrCrO_4$	*trans*-$CrBr(CPh)(CO)_4$	234	5.5			69
67	$C_{11}H_5ClCrO_4$	*trans*-$CrCl(CPh)(CO)_4$	145	3.8			69
318	$C_{11}H_8CrO_4Se$	$Cr(CO)_2(CSe)(PhCO_2Me)$	2135	11.1	10.8		70
469	$C_{11}H_9N_2O_{13}Os_3$	$Os_3(CO)_8(NO)_2[P(OMe)_3]$	1369	6.14	6.20		71

h Ligand = 4-Me-1,2,6-triarsatricyclo[2.2.1.$0^{2,6}$]heptane.

221	$C_{11}H_{10}CoO_2^+.F_6P^-$	$[Co(C_5H_5)(C_5H_4CO_2H)]PF_6$	3346	5.1	6.6	238,*i*	72
422	$C_{11}H_{11}Co_2O_4P_2$	$Co_2(PMe_2)(CO)_4(C_5H_5)$	1635	5.9			73
265	$C_{11}H_{11}CrNO_3$	$Cr(CO)_3(C_8H_{11}N)$	895	3.5		*j*	74
155	$C_{11}H_{11}F_6O_2Rh$	$Rh(acac)(C_2H_4)[C_2(CF_3)_2]$	1228	5.3			75
207	$C_{11}H_{13}FeNO_2$	$Fe(CO)_2(CNEt)(C_6H_8)$	573	8.9			77
276	$C_{11}H_{13}N_2O_3W^+.F_6P^-$	$[W(NH_2NCMe_2)(CO)_3(C_5H_5)]PF_6$	2141	3.0	3.6		78
542	$C_{11}H_{18}B_7CoNi$	$2,3\text{-}(C_5H_5)_2NiCo\text{-}10\text{-}CB_7H_8$	2048	4.7			79
62	$C_{11}H_{18}FeN_3O_2S_3^+.F_6P^-.\frac{1}{2}C_2H_4Cl_2$	$\{Fe(CO)_2(S_2CNMe_2)[(CNMe_2)_2S]\}\text{-}PF_6.\frac{1}{2}C_2H_4Cl_2$	2084	5.1	5.7		80
193	$C_{11}H_{21}PPt$	$Pt(C_8H_{12})(PMe_3)$	1285	6.2	5.4	220,*k*	81
141	$C_{11}H_{23}CuN_3^+.C_{24}H_{20}B^-$	$[Cu(C_7H_{10})(dien)]BPh_4$	1525	4.8		*l*	82
496	$C_{11}BrIr_4O_{11}^-.C_{24}H_{20}P^+$	$PPh_4[Ir_4Br(CO)_{11}]$	2682	5.9			83
	C12						
461	$C_{12}HO_{12}Re_3^{2-}.2C_8H_{20}N^+$	$(NEt_4)_2[HRe_3(CO)_{12}]$	1303	6.1	7.6		13
492	$C_{12}H_2O_{12}Os_4^{2-}.2C_{36}H_{30}NP_2^+$	$(ppn)_2[H_2Os_4(CO)_{12}]$	5972	6.7	6.6		84
531	$C_{12}H_3CoO_{12}Os_3$	$H_3CoOs_3(CO)_{12}$	3125	3.8	3.6		85
490	$C_{12}H_3IO_{12}Os_4$	$H_3Os_4I(CO)_{12}$	2724	3.6	3.9		86

i H-bonded dimers. *j* $C_8H_{11}N$ = 6-Me_2N-fulvene. *k* Disordered; C_8H_{12} = 1,2,3,8-η^4-octa-2,6-diene-1,8-diyl.

l C_7H_{10} = bicyclo[2.2.1]hept-2-ene.

491	$C_{12}H_3O_{12}Os_4^-.C_4H_{12}N^+$	$NMe_4[H_3Os_4(CO)_{12}]$	1034	3.7	3.1		87
487	$C_{12}H_3O_{12}Ru_4^-.C_{36}H_{30}NP_2^+$	(ppn)$[H_3Ru_4(CO)_{12}]$ (isomer I)	6050	5.45			88
		(isomer II)	10945	4.32			88
474	$C_{12}H_4O_{10}Os_3$	$HOs_3(C_2H_3)(CO)_{10}$	2463	3.2	2.9		1,2
			1197	2.92	2.87	ND	1,2
466	$C_{12}H_4O_{12}Ru_3S$	$HRu_3(SCH_2CO_2H)(CO)_{10}$	2908	4.9	5.3		89
486	$C_{12}H_4O_{12}Ru_4$	$H_4Ru_4(CO)_{12}$	4361	6.3	7.4	98	90
216	$C_{12}H_6FeO_4$	$Fe(CO)_3(C_9H_6O)$	2160	3.9	4.9	*m*	91
44	$C_{12}H_8Br_3N_2O_2Re$	$ReBr_3(CO)_2(bipy)$	1120	7.9			92
481	$C_{12}H_8O_9Os_3S$	$HOs_3(SMe)(C_2H_4)(CO)_9$	2014	5.5	5.7		93
545	$C_{12}H_9B_7CoFe$	$1,8\text{-}(C_5H_5)_2FeCo\text{-}2,3\text{-}C_2B_7H_9$	1346	4.0	4.4		94
176	$C_{12}H_{10}Fe_2O_6$	$[Fe(CO)_3(C_3H_5)]_2$	1675	6.9	4.9		95
277	$C_{12}H_{10}O_2W$	$W(CO)_2(\eta^3\text{-}C_5H_5)(\eta^5\text{-}C_5H_5)$	933	6.3			96
410	$C_{12}H_{12}Cr_2O_8$	$[Cr(PMe_2)(CO)_4]_2$	2596	3.9			97
405	$C_{12}H_{12}Fe_2N_2O_7$	$Fe_2(CO)_6(\mu\text{-}N{:}CMe_2)(\mu\text{-}ON{:}CMe_2)$	2446	3.7	4.0		98
35	$C_{12}H_{12}Mn_2N_2O_6S_4$	$Mn_2(CO)_6[\mu\text{-}SC(SMe)(NMe)]_2$	3239	2.9	3.8		99
411	$C_{12}H_{12}Mn_2O_8$	$[Mn(PMe_2)(CO)_4]_2$	927	7.2			97
409	$C_{12}H_{12}O_8V_2$	$[V(PMe_2)(CO)_4]_2$	4561	3.9			97
37	$C_{12}H_{12}O_{10}P_2Re_2$	$[Re(CO)_4(PMe_2O)]_2$	1688	5.3			100
500	$C_{12}H_{12}O_{12}Pd_4.2C_2H_4O_2$	$Pd_4(OAc)_4(CO)_4.2AcOH$	2596	4.3			101,102

[m] C_9H_6O = 1,7,8,9-η^4-bicyclo[5.2.0]nona-1(7),2,5,8-tetraen-4-one.

140	$C_{12}H_{13}BF_4N_6Pt$	$PtMe(C_2F_4)[HB(pz)_3]$	1801	3.7	3.6		103
218	$C_{12}H_{14}Mn$	$Mn(C_5H_4Me)_2$				ED	104
239	$C_{12}H_{14}Mo_2S_4$	$Mo_2S_4(C_5H_4Me)_2$	1018	3.5	3.7		105
419	$C_{12}H_{16}F_8Fe_2N_2P_4$	$[Fe(C_5H_5)]_2(PF_2)(MeN{:}PF_2)$-$[(PF_2)_2NMe]$	2253	4.22	4.64		106
423	$C_{12}H_{18}Co_3O_6P_3$	$[Co(PMe_2)(CO)_2]_3$	1705	4.1			107
287	$C_{12}H_{18}MnO_2S^+.F_6P^-$	$[Mn(CO)_2(SMe_2Et)(C_5H_4Me)]PF_6$	2179	6.4	8.3		108
396	$C_{12}H_{20}Co_2O_4P_2$	$[Co(CO)_2(PMe_3)]_2(\mu\text{-}C_2H_2)$	1085	2.4	2.3		109
388	$C_{12}H_{20}Re_2$	$Re_2(C_3H_5)_4$	1755	5.1	6.38		110
234	$C_{12}H_{22}B_2Hf$	$Hf(BH_4)_2(C_5H_5)_2$	695	9.0	11.7	ND	111
116	$C_{12}H_{24}Au_2P_2$	$[Au(CH_2)_2P(CH_2)_4]_2$		6			112
371	$C_{12}H_{24}Ni_2$	$[Ni(\mu\text{-}Me)(C_5H_9)]_2$	730	1.4			113
113	$C_{12}H_{36}B_2NiP_4$	$Ni[(CH_2PMe_2)_2BH_2]_2$	1227	5.0			114
494	$C_{12}Ir_4O_{12}$	$Ir_4(CO)_{12}$	1172	5.76	4.65		115
	C13						
32	$C_{13}H_4F_3O_6S_2W^-.C_8H_{20}N^+$	$NEt_4[W(CO)_5(ttsac)]$	2559	3.8	4.7	*n*	116
126	$C_{13}H_6MnO_7^-.C_{36}H_{30}NP_2^+$	$(ppn)\{\overline{Mn[C(O)OCHPhC(O)]}(CO)_4\}$	2994	5.5	5.8	113	117
192	$C_{13}H_9FeN_3O_6$	$Fe(CO)_3(C_{10}H_9N_3O_3)$	1657	3.9		*o*	118
449	$C_{13}H_9Fe_3NO_9S_2$	$Fe_3(CO)_9(Bu^tNS)S$	1637	6.7			119

n ttsac = $CF_3COCHCS$thienyl. *o* $C_{10}H_9N_3O_3$ = 8,9,10,12-η^4-tricyclo[5.3.2.$^{1,7}O^{2,6}$]dodeca-2,4,6-triaza-4-Me-3,5,11-trioxo-8,9-dienyl.

82	$C_{13}H_9O_6W^-.C_8H_{20}N^+$	$NEt_4\{W(CO)_5[CH(OMe)Ph]\}$	2941	3.55	4.31		120
314	$C_{13}H_{11}FeO_4^+.F_6P^-$	$[Fe(CO)_3(C_{10}H_{11}O)]PF_6$	1207	4.7	4.6	*p*	121
138	$C_{13}H_{12}Cl_2FeO_4$	$Fe(CO)_4(C_9H_{12}Cl_2)$	1420	9.2		*q*	122
322	$C_{13}H_{12}CrO_4$	$Cr(CO)_3$(*endo*-$C_{10}H_{12}O$)	1484	8.0	9.3	*r*	123
321	$C_{13}H_{12}CrO_4$	$Cr(CO)_3$(*exo*-$C_{10}H_{12}O$)	1617	7.2	8.1	*r*	123
333	$C_{13}H_{14}MoNO_2S$	$Mo(acac)(NCS)(C_7H_7)$	2788	6.9	7.0		124
347	$C_{13}H_{15}AsFeMnO_8P$	*cis*-$FeMn(AsMe_2)(CO)_4(PMe_3)$	2101	4.4			125
348	$C_{13}H_{15}AsFeMnO_8P$	*trans*-$FeMn(AsMe_2)(CO)_4(PMe_3)$	1592	4.0			125
329	$C_{13}H_{16}CrO_3$	$Cr(CO)_3(C_{10}H_{16})$	2069	6.7		*s*	126
48	$C_{13}H_{18}ClNO_3PRh$	$RhCl(CO)[NH(CMe_2CH_2O)(CH_2CH_2O)PPh]$	1860	2.98	3.08		127
381	$C_{13}H_{20}Fe_2O_{10}P_2$	$Fe_2(CO)_5(pop)_2$	3154	8.8	11.0		128
199	$C_{13}H_{21}O_3Rh$	$Rh(acac)(C_8H_{14}O)$	1988	4.5		*t*	129
120	$C_{13}H_{22}IN_2Pt^+.BF_4^-$	$\{PtI[C_6H_3Me(CH_2NMe_2)_2]\}BF_4$	3498	11			130
153	$C_{13}H_{22}N_2OS_4W$	$W(CO)(C_2H_2)(S_2CNEt_2)_2$	6000	3.8			131
119	$C_{13}H_{28}ClN_3OPd$	$PdCl[C(O)CH_2CH_2NEt_2]$-[C(NHMe)(NEt_2)]	4093	3.7	4.2		132
515	$C_{13}Co_6O_{12}S_2$	$Co_6C(S)_2(CO)_{12}$	1975	6.6			133

[p] $C_{10}H_{11}O$ = 2-4:6,7-η^5-8-acetylbicyclo[3.2.1]octadienylium. [q] $C_9H_{12}Cl_2$ = 9,9-Cl_2bicyclo[6.1.0]non-3-ene. [r] $C_{10}H_{12}O$ = 2-Me-1-indanol. [s] $C_{10}H_{16}$ = 3-Et-*endo*-7-Ph-cycloheptatriene. [t] $C_8H_{14}O$ = but-2-enyl 1-methylallyl ether.

475	$C_{14}H_2F_6O_{10}Os_3$	$HOs_3(CO)_{10}(CF_3C{:}CHCF_3)$	3681	12.3			134
470	$C_{14}H_6O_{10}Os_3$	$Os_3(CO)_{10}(S\text{-}cis\text{-}C_4H_6)$	2418	3.6	4.1		135
471	$C_{14}H_6O_{10}Os_3$	$Os_3(CO)_{10}(S\text{-}trans\text{-}C_4H_6)$	2473	3.6	4.4		135
407	$C_{14}H_7Fe_2NO_7S$	$Fe_2(CO)_6[tolNC(O)S]$	974	7.1			119
315	$C_{14}H_9MnNO_5Re$	$Mn(CO)_3[C_4H_4NRe(CO)_2(C_5H_5)]$	2259	6.2			136
468	$C_{14}H_9O_{14}Os_3P$	$Os_3(CO)_{11}[P(OMe)_3]$	2781	3.1			137
283	$C_{14}H_{10}AsClMn_2O_4$	$[Mn(CO)_2(C_5H_5)]_2AsCl$	1112	5.3			138
330	$C_{14}H_{10}CrO_5$	$Cr(CO)_3(C_{11}H_{10}O_2)$	1039	7.3		*u*	139
426	$C_{14}H_{10}Cr_2O_4$	$[Cr(CO)_2(C_5H_5)]_2$	1216	6.0	6.4		140
440	$C_{14}H_{10}Fe_2O_4$	*trans*-$[Fe(CO)_2(C_5H_5)]_2$	5074 1697	3.0 1.6	5.3 3.8	74 ND,74	141
427	$C_{14}H_{10}Mo_2O_4$	$[Mo(CO)_2(C_5H_5)]_2$	871	4.3	5.4		142
483	$C_{14}H_{10}O_4Rh_3^-.C_{36}H_{30}NP_2^+$	$(ppn)[Rh_3(CO)_4(C_5H_5)_2]$	2502	5.3			143
412	$C_{14}H_{11}AsCr_2O_7$	$Cr_2(AsMe_2)(CO)_7(C_5H_5)$	1124	8.4			144
179	$C_{14}H_{12}Co_2O_6$	$\{Co(CO)_3[(CH_2)_2CCH_2]\}_2$	1168	2.1	2.7		145
210	$C_{14}H_{12}FeO_3S$	$Fe(CO)_3(C_{11}H_{12}S)$	582	6.9		*v*	146
209	$C_{14}H_{12}FeO_4$	$Fe(CO)_3(C_{11}H_{12}O)$	834	7.8		*w*	146
108	$C_{14}H_{12}NO_5Re$	*cis*-Re(COMe)(MeCNHPh)$(CO)_4$	1214	3.3	4.0		147

u $C_{11}H_{10}O_2$ = 3a,4:8,8a-η^4-5,7-Me_2cyclohepta[*b*]furan-6-one. *v* $C_{11}H_{12}S$ = 3a,4:8,8a-η^4-5,7-Me_2-4*H*-cyclohepta[*b*]thiophene.

w $C_{11}H_{12}O$ = 3a,4:8,8a-η^4-5,7-Me_2-4*H*-cyclohepta[*b*]furan.

331	$C_{14}H_{13}MoO_4$	$Mo(CO)_3(\eta^6\text{-}C_7H_7CHMeCOMe)$	2934	5.5			148
288	$C_{14}H_{13}O_2Re$	$ReH(CH_2Ph)(CO)_2(C_5H_5)$	852	3.8			149
335	$C_{14}H_{15}Cl_2Mo_2^+.Cl^-.C_{28}H_{32}Mo_4O_4.$- C_6H_5Cl	$\{[Mo(\mu\text{-}OH)(C_7H_7)]_4\}[(C_7H_7)Mo(\mu\text{-}Cl)_2$- $(\mu\text{-}OH)Mo(C_7H_7)]Cl.C_6H_5Cl$	6331		6.1		150
50	$C_{14}H_{16}Br_2O_8Re_2$	$[Re(CO)_3(thf)]_2(\mu\text{-}Br)_2$	1522	7.4	9.5		151
552	$C_{14}H_{20}B_6Co_2$	$(C_5H_5)_2Co_2C_4B_6H_{10}$	1586	4.6	5.5		152
243	$C_{14}H_{22}AlY$	$(C_5H_5)_2YMe_2AlMe_2$	663	5.9			153
33	$C_{14}H_{22}O_4S_2W$	$W(CO)_4[Bu^tS(CH_2)_2SBu^t]$	3677	6.3	6.7		154
225	$C_{14}H_{23}N_3S_6Ti.C_6H_6$	$Ti(S_2CNMe_2)_3(C_5H_5).C_6H_6$	5072	7.7	7.9		155
63	$C_{14}H_{24}FeN_8^{2+}.2F_6P^-$	$[Fe(CNMe)_4(C_6H_{12}N_4)](PF_6)_2$	2727	9.2		85,*x*	156
133	$C_{14}H_{30}P_2Pt$	$Pt(CHViCH_2CH_2CHVi)(PMe_3)_2$	4925	5.2	6.2	213	81
198	$C_{14}H_{37}N_6Ru^+.F_6P^-$	$[RuH(NH_2NMe_2)_3(cod)]PF_6$	1780	6.3			157
540	$C_{14}H_{38}B_4P_2Pt$	*trans*-$PtH(B_4C_2H_7)(PEt_3)_2$	5106	6			158
112	$C_{14}H_{38}O_6P_2Ti$	$Ti_2[(CH_2)_2PMe_2]_2(OMe)_6$	1046	8.2			159
549	$C_{14}H_{41}B_9P_2Pt$	3,3-$(Et_3P)_2$-3,1,2-$PtC_2B_9H_{11}$	6068	4.7	5.7	215	160
529	$C_{14}Co_2CrFeO_{14}S$	$FeCo_2[SCr(CO)_5](CO)_9$	1406	7.3			161

x $C_6H_{12}N_4$ = dicarbene ligand from MeNC + acetamidine.

502	$C_{15}HO_{15}Os_5^-.C_{36}H_{30}NP_2^+$	(ppn)[$HOs_5(CO)_{15}$]	6001	6.0	5.9		162
393	$C_{15}H_8Fe_2N_2O_7.C_2H_3N$	$Fe_2(CO)_6(C_9H_8N_2O).CH_3CN$	2628	3.6		*y*	163
211	$C_{15}H_8Fe_2O_8$	$Fe_2(CO)_7(C_8H_8O)$	1929	2.3		*z*	164
71	$C_{15}H_9BrCrFeO_4$	*trans*-CrBr(CFc)$(CO)_4$	756	5.4			165
425	$C_{15}H_{10}O_5V_2$	$V_2(CO)_5(C_5H_5)_2$	1134	4.4	7.0		166
356	$C_{15}H_{11}FeNbO_5$	NbFe(μ-H)$(CO)_5(C_5H_5)_2$	3063	3.3	4.2		167
267	$C_{15}H_{13}MoNO_2$	$Mo(CO)_2(\eta^2$-MeCNPh)(C_5H_5)	1875	3.9	3.7		169
443	$C_{15}H_{15}Fe_2O_3S^+.C_{24}H_{20}B^-$	$[Fe_2(CO)_3(SEt)(C_5H_5)]BPh_4$	3973	8.8	9.6		170
537	$C_{15}H_{17}B_3Co_2$	$[Co(C_5H_5)]_2(B_3C_5H_7)$	2012	5.9	7.2		171
174	$C_{15}H_{17}GaMoN_6O_2$	$Mo(CO)_2(C_3H_5)$[MeGa$(pz)_3$]	2582	3.0	3.1		172
173	$C_{15}H_{17}MoNO_4$	$Mo(CO)_2$(acac)(py)(C_3H_5)	2275	3.2	3.6		173
69	$C_{15}H_{19}BrCrO_4$	(-)-*trans*-CrBr[C(men)]$(CO)_4$	1003	7.0			174
257	$C_{15}H_{19}ORh$	$Rh(C_{10}H_{14}O)(C_5H_5)$	1172	2.7	4.1	*aa*	175
235	$C_{15}H_{20}ClTa$	TaCl(CHBu^t)$(C_5H_5)_2$	1870	2.7	2.3		176,177
142	$C_{15}H_{20}Ag_2O_2^{2+}.2NO_3^-$	$[Ag_2(C_{15}H_{20}O_2)](NO_3)_2$	2183	4.3		*ab*	178

y $C_9H_8FeN_2O$ = 2,6,7,8-η^4-[1-ferra-3-oxa-4-NH_2-5-CN-7,8-Me_2bicyclo[3.3.$0^{2,6}$]octa-2,4,7-triene.

z C_8H_8O = 5,6-dimethylene-7-oxabicyclo[2.2.1]hept-2-ene. *aa* $C_{10}H_{14}O$ = carvone[(+)-*p*-mentha-1,8-dien-2-one].

ab $C_{15}H_{20}O_2$ = costunolide.

34	$C_{15}H_{24}O_4S_2W$	$W(CO)_4[Bu^tS(CH_2)_3SBu^t]$	2829	4.6	4.9		154
551	$C_{15}H_{28}B_7CoO$	$[Co(C_5H_5)]Me_4C_4B_7H_6(OEt)$	1808	6.5	8.3		179
81	$C_{15}H_{42}ClMoPSi_3$	$MoCl(CH_2SiMe_3)_3(PMe_3)$	2302	3.4			180
540	$C_{15}BrMn_3O_{15}Sn$	$[Mn(CO)_5]_3SnBr$	2283	3.6			181
503	$C_{15}IO_{15}Os_5^-.C_{36}H_{30}NP_2^+$	$(ppn)[Os_5I(CO)_{15}]$	3500	4.0	3.3		182
535	$C_{15}O_{15}PtRh_5^-.C_{36}H_{30}NP_2^+$	$(ppn)[Rh_5Pt(CO)_{15}]$				*ae*	183
	C16						
501	$C_{16}H_2O_{16}Os_5$	$H_2Os_5(CO)_{16}$	3408	7.8	7.8		184
506	$C_{16}H_3O_{16}Os_5P$	$Os_5(CO)_{15}(POMe)$	3310	6.0	6.0		185
467	$C_{16}H_5NO_9Ru_3S_2$	$HRu_3(CO)_9(C_7H_4NS_2)$	2374	4.0	4.9	*ad*	186
478	$C_{16}H_7NO_9Os_3$	$(\mu\text{-}H)Os_3(CO)_9(\mu\text{-}CHNPh)$	2468	3.4	4.0		187
280	$C_{16}H_8Cl_2Mn_2O_6Sn$	$[Mn(CO)_3(C_5H_4)]_2SnCl_2$					188
525	$C_{16}H_8O_{11}Os_3W$	$(\mu\text{-}H)_3Os_3W(CO)_{11}(C_5H_5)$	1433	5.4			189
167	$C_{16}H_{10}As_2FeO_4$	$Fe(CO)_4(\eta^2\text{-}PhAs_2Ph)$	2346	4.8			190
392	$C_{16}H_{10}Fe_2O_6$	$Fe_2(CO)_6(C_{10}H_{10})$	2686	3.1	3.7	*ae*	191
349	$C_{16}H_{12}As_4Fe_4O_{12}$	$[Fe(AsMe)(CO)_3]_4$	717	5.1			192
206	$C_{16}H_{12}FeO_4$	$Fe(CO)_3[\eta^4\text{-}C_4(C_3H_3)_2Me_2CO]$	1038	3.2	4.7		193
316	$C_{16}H_{12}MnO_4P$	$Mn(CO)_3[\eta^5\text{-}\overline{PCHCMeCMeCC}(CO)Ph]$	1047	4.6	5.6		168
429	$C_{16}H_{12}Mo_2O_4$	$[Mo(CO)_2(C_5H_5)]_2(\mu\text{-}C_2H_2)$	3876	3.8	4.9		194

ac no data given. *ad* $C_7H_4NS_2$ = mercaptobenzothiazolate. *ae* $C_{10}H_{10}$ = ligand derived from bullvalene.

430	$C_{16}H_{12}O_4W$	$[W(CO)_2(C_5H_5)]_2(\mu\text{-}C_2H_2)$	2332	7.3	8.8		195
480	$C_{16}H_{12}O_9Os_3$	$HOs_3(CO)_8[\overline{C(O)C(CHMe)CH}CHEt]$	2608	5.3	4.5		196
150	$C_{16}H_{13}ClF_5NOPt$	$PtCl(OC_6F_5)(CH_2{:}CHC_6H_4NMe_2\text{-}o)$	3071	3.3	4.0		197
151	$C_{16}H_{13}ClF_5NPtS$	$PtCl(SC_6F_5)(CH_2{:}CHC_6H_4NMe_2\text{-}o)$	2243	4.5	5.1		197
452	$C_{16}H_{13}Co_3O_4$	$Co_3(CMe)(CO)_4(C_5H_5)_2$	905	6.7			198
476	$C_{16}H_{13}NO_{10}Os_3$	$HOs_3(CO)_{10}(\bar{C}HCH{:}\overset{+}{N}Et_2)$	1434	5.03	4.59		199
442	$C_{16}H_{15}Fe_2O_3S^+.BF_4^-$	$[Fe_2(CO)_3(CSEt)(C_5H_5)_2]BF_4$	2132	9			200
444	$C_{16}H_{15}Fe_2O_4S^+.BF_4^-$	$\{[Fe(CO)_2(C_5H_5)]_2SEt\}BF_4$	2197	3.0			50
183	$C_{16}H_{16}Cl_4Pd_2$	$[PdCl(C_8H_8Cl)]_2$	1492	3.0			201
330	$C_{16}H_{16}Nd^-.C_{16}H_{24}NdO_2^+$	$[Nd(thf)_2(C_8H_8)][Nd(C_8H_8)_2]$	3351	4.6	3.7		202
413	$C_{16}H_{17}Mo_2O_4P$	$Mo_2(H)(PMe_2)(CO)_4(C_5H_5)_2$	2850	4.02	8.74	*af*	76
332	$C_{16}H_{18}CrO_3$	$Cr(CO)_3(C_{13}H_{18})$	596	6.9			203
317	$C_{16}H_{20}Cr^+.I^-$	$[Cr(PhEt)_2]I$	549	7			204
420	$C_{16}H_{20}Fe_2O_{10}P_2$	$[Fe(CO)_3(\overline{POCH_2CMe_2CH_2O})]_2$	2982	3.4	4.7		205
346	$C_{16}H_{22}AuCl_3P_2Sn$	$Au(SnCl_3)(PMe_2Ph)_2$	1766	5.93	7.35		206
184	$C_{16}H_{24}N_4Pd_2$	$[Pd(Me_2pz)(C_3H_5)]_2$	2974	4.5	5.6		207
336	$C_{16}H_{24}NdO_2^+.C_{16}H_{16}Nd^-$	$[Nd(thf)_2(C_8H_8)][Nd(C_8H_8)_2]$	3351	4.6	3.7		202
203	$C_{16}H_{24}Pt$	$\overline{Pt[CH(Vi)CH_2CH_2CH(Vi)]}(cod)$	870	11.1	14.7	*ag*	81
341	$C_{16}H_{26}O_2RuSi_2$	$Ru(SiMe_3)(CO)_2[C_8H_8(SiMe_3)]$	3146	3.5	4.5		208

af $C_{13}H_{18}$ = 6,9-Me_2bicyclo[4.4.1]undeca-1,3,7-triene. *ag* Twinned.

262	$C_{16}H_{26}P_2Ta^+.Cl^-.C_2H_3N$	$[Ta(dmpe)(C_5H_5)_2]Cl.MeCN$	2767	2.0	3.0		209
541	$C_{16}H_{40}B_4P_2Pt$	*closo*-1,1-$(Et_3P)_2$-2,3-Me_2-1,2,3-$PtC_2B_4H_4$	7237	6.7			158
370	$C_{16}H_{40}Cr_2P_4$	$Cr_2[(CH_2)_2PMe_2]_4$	766	6.4	8.9		210
484	$C_{16}O_{16}Re_4^{2-}.\frac{1}{2}C_4H_2O_4Re^-.2\frac{1}{2}C_8H_{20}N^+$	$(NEt_4)_2[Re_4(CO)_{16}].\frac{1}{2}NEt_4$-[*trans*-$H_2Re(CO)_4$]	520	5.2			13

C17

523	$C_{17}H_5CrFe_2O_{11}P$	$CrFe_2(PPh)(CO)_{11}$	1497	6.3			211
524	$C_{17}H_6O_{12}Os_3W$	$(\mu\text{-}H)Os_3W(CO)_{12}(C_5H_5)$	1446	5.5			189
505	$C_{17}H_7O_{17}Os_5P$	$HOs_5C(CO)_{14}[OP(OMe)_2]$	4781	3.9	4.1		212
463	$C_{17}H_{10}N_2O_{11}Ru_3$	$Ru_3(CO)_{10}(\mu\text{-}NCO)[\mu\text{-}NC(CH_2)_5]$	4637	2.7	3.3		213
504	$C_{17}H_{10}O_{18}Os_5P_2$	$HOs_5C(CO)_{13}[OP(OMe)OP(OMe)_2]$	6137	4.5	4.3		214
493	$C_{17}H_{12}O_{11}Os_4$	$H_3Os_4(CO)_{11}(C_6H_9)$				*ah*	3
451	$C_{17}H_{13}Co_3O_7$	$Co_3(CEt)(CO)_7(nbd)$	1008	5.3			215
389	$C_{17}H_{14}Fe_2O_5$	$Fe_2(CO)_5(C_{12}H_{14})$	2108	2.8		*ai*	216
428	$C_{17}H_{14}Mo_2O_4$	$[Mo(CO)_2(C_5H_5)]_2(C_3H_4)$	1276	3.0	4.6		217
436	$C_{17}H_{16}Mo_2N_2O_4$	$[Mo(CO)_2(C_5H_5)]_2(NCNMe_2)$	1998	5.4	8.1		218
219	$C_{17}H_{17}F_3MoO_3$	$Mo[C(O)(CMe)_4C(CF_3)O](CO)(C_5H_5)$	5228	10.3	12.7		219
156	$C_{17}H_{21}F_6O_2Rh$	$Rh(acac)(C_8H_{14})[C_2(CF_3)_2]$	1296	4.8			220

ah Diagram only. *ai* $C_{12}H_{14}$ = 6-cyclopropyl-6-(*trans*-1-propenyl)fulvene.

538	$C_{17}H_{28}B_2Ni$	$Ni(C_5H_5)[CMe(BEt)_2(CEt)_2]$	1927	3.81	4.42		221
175	$C_{17}H_{40}FeO_9P_3^+.BF_4^-$	$\{Fe[P(OMe)_3]_3(\eta^3\text{-}C_8H_{13})\}BF_4$	2748	9.8		ND,110	222
	C18						
508	$C_{18}H_2O_{18}Os_6$	$H_2Os_6(CO)_{18}$				*ah*	3
479	$C_{18}H_9NO_{10}Os_3$	$HOs_3(CO)_{10}(PhCNMe)$	3805	4.4	5.7		223
17	$C_{18}H_{10}N_2O_6Rh_2$	$[Rh(CO)_2]_2[\mu\text{-}N_2(COPh)_2]$	727	4.6	5.1		224
100	$C_{18}H_{12}F_{16}P_2Pt$	*cis*-$Pt(CF_3)_2(PMe_2C_6F_5)_2$	2673	2.3			225
450	$C_{18}H_{12}Fe_4N_2O_{12}S_2$	$Fe_4(CO)_{12}S(\mu\text{-}CSNMe_2)(\mu\text{-}CNMe_2)$	2881	4.6	5.6		226
319	$C_{18}H_{13}CrNO_5$	$Cr(CO)_2(CNCOPh)(PhCO_2Me)$	1035 1614	8.0 9.9	7.9 10.1	*aj* *ak*	227
358	$C_{18}H_{16}Co_2O_4$	$Co_2(CO)_4(nbd)_2$	920	12.4			228
434	$C_{18}H_{18}Cr_2$	$[Cr(C_5H_5)]_2(C_8H_8)$	3349	4.0		*al*,103	229
395	$C_{18}H_{18}Ge_2O_4Ru_2$	$[Ru(GeMe_3)(CO)_2]_2(C_8H_6)$	2089	6.7	7.0	*am*	230
224	$C_{18}H_{18}N_2SU$	$U(NCS)(MeCN)(C_5H_5)_3$	1694	7.3	7.8		231
200	$C_{18}H_{19}Cl_2O_2Rh$	$Rh(MeCOCHCOPh)(C_8H_{10}Cl_2)$	3522	3.0		*an*	232
285	$C_{18}H_{22}Mn_2O_4P_2S$	$[Mn(PMe_2)(CO)_2(C_5H_5)]_2S$	1520	5.3			233
286	$C_{18}H_{22}Mn_2O_4P_2S_2$	$[Mn(PMe_2S)(CO)_2(C_5H_5)]_2$	1751	5.5			233

ah Diagram only. *aj* Triclinic form. *ak* Monoclinic form. *al* C_8H_8 = μ-octatetraen-1,8-diyl. *am* C_8H_6 = pentalene.

an $C_8H_{10}Cl_2$ = 1,6-Cl_2-cycloocta-1,5-diene. *ao* Only Zr-C bond length recorded.

65	$C_{18}H_{23}Cl_2OPPt$	*cis*-$PtCl_2(PMe_2Ph)[C(OEt)CH_2Ph]$	2166	3.6			234
272	$C_{18}H_{23}MoNO_3$	$Mo(CO)(CNBu^t)[\eta^3$-$\overline{CMeC_2Me_2C(O)O}]$-$(C_5H_5)$	3412	5.8	7.0		219
302	$C_{18}H_{26}Fe$	$Fe(C_5HMe_4)_2$	2611	4.4	4.3		235
530	$C_{18}H_{28}Co_3FeO_{18}P_3$	$HFeCo_3(CO)_9[P(OMe)_3]_3$	6057 7669	6.1 7.0	6.7 3.5	134 90,ND	236 237,23
326	$C_{18}H_{28}Mo_2S_4^{2+}.2C_{24}H_{20}B^-$	$\{[Mo(PhMe)]_2(\mu$-$SMe)_4\}(BPh_4)_2$	4324	2.6	3.2		239
539	$C_{18}H_{29}B_7Co$	$Co(C_5H_5)[C_5H_4$-5-$(2,3$-$Me_2C_2B_4H_3)]$-$Co[2,3$-$Me_2C_2B_3H_5]$	1725	6.3	7.1		240
553	$C_{18}H_{30}B_8Fe_2$	$[Fe(C_5H_5)]_2Me_4C_4B_8H_8$	2226	5.9	6.6		241
105	$C_{18}H_{30}ClF_5P_2Pt$	*cis*-$PtCl(C_6F_5)(PEt_3)_2$	1284	4.8			242
132	$C_{18}H_{30}N_2Pt$	$\overline{Pt[CH(CH:CH_2)CH_2CH_2CH(CH:CH_2)]}$-$(CNBu^t)_2$	3129	12.6	15.7	220	81
251	$C_{18}H_{32}Si_2Zr$	$Zr(CH_2SiMe_3)_2(C_5H_5)_2$	2688	2.84	3.07	*ao*	243
197	$C_{18}H_{34}Cl_2N_2Ru_2$	$[RuHCl(cod)]_2(\mu$-$NH_2NMe_2)$	1487	7.3			244
196	$C_{18}H_{35}ClN_2Ru$	$RuHCl(C_5H_{10}NH)_2(cod)$	3280	3.9	4.3		245
39	$C_{18}H_{36}O_6Re_2Se$	$[Re(CO)_3(PMe_3)_2]_2Se$	2315	6.8			247
368	$C_{18}H_{46}Mo_2O_4P_2Si_2$	$Mo_2(CH_2SiMe_3)_2(OAc)_2(PMe_3)_2$				*ah*	248
448	$C_{18}Cl_2Mn_4O_{18}Sn_2$	$Mn_2(CO)_8[\mu$-$Sn(Cl)Mn(CO)_5]_2$	3294	2.7			181

ah Diagram only. *ao* Only Zr-C bond length recorded.

C19

421	$C_{19}H_5CrFe_2O_{13}P$	$Fe_2[PhPCr(CO)_5](CO)_8$	1942	7.5			249
40	$C_{19}H_{10}FeO_4S$	$Fe(CO)_4(C_3Ph_2S)$	1987	3.8			250
485	$C_{19}H_{12}Fe_4O_{11}$	$Fe_4(CO)_{11}(HC_2Et)_2$	2204	4.3			251
320	$C_{19}H_{16}CrO_3$	$Cr(CO)_3(C_{16}H_{16})$	3313	6.7	7.1	*ap*	252
86	$C_{19}H_{19}CoF_2N_2O_4.0.39C_3H_6O.0.32H_2O$	$Co(CH_2COMe)(OH_2)(C_{16}H_{12}F_2N_2O_2).-$ $0.39Me_2CO.0.32H_2O$	2627	5.1	1.5	*aq*	253
328	$C_{19}H_{19}Mn$	$Mn(C_5H_4Me)(7\text{-}exo\text{-}PhC_7H_7)$	999	9.7			254
304	$C_{19}H_{22}Fe$	$Fe\{C_5H_2[(CH_2)_3]_3C_5H_2\}$	3934	6.3	8.7		255
245	$C_{19}H_{22}NTi$	$Ti(C_6H_4CH_2NMe_2)(C_5H_5)_2$	1038	14	18		256
143	$C_{19}H_{26}Cl_2OP_2Ru$	$RuCl_2(CO)(C_2H_4)(PMe_2Ph)$	2998	4.4	5.5		257
168	$C_{19}H_{26}MoN_5O_7P$	$MoO(\eta^2\text{-}O\text{:}NPh)(hmpa)[C_5H_3N(CO_2)_2]$	4827	5.9		115	258
281	$C_{19}H_{27}MnO_3$	$(-)\text{-}Mn(CO)_2[C(OMe)(men)](C_5H_5)$	1001	7.1	6.7		259
180	$C_{19}H_{30}Co_2O_{11}P_2$	$\{Co(CO)_2[P(OMe)_3][(CH_2)_2CCH_2]\}CO$	2134	6.2	5.3		145
104	$C_{19}H_{37}ClP_2Pt$	$cis\text{-}PtCl(tol)(PEt_3)_2$	1064	4.8			242
518	$C_{19}Co_8O_{18}^{2-}.2C_{10}H_{16}N^+$	$[NMe_3(CH_2Ph)]_8[Co_8C(CO)_{18}]$	3539	6.4	7.6		260

ap $C_{16}H_{16}$ = 3-8-η^6-[2.2]paracyclophane. *aq* $C_{16}H_{12}F_2N_2O_2$ = N,N'-ethylenebis(3-F-salicylideniminato); H-bonded dimer.

C20

528	$C_{20}H_2O_{20}Os_3Re_2$	$(\mu\text{-H})_2Os_3Re_2(CO)_{20}$	2913	5.7	6.0		261
511	$C_{20}H_6O_{16}Os_6$	$Os_6(CO)_{16}(CMe)_2$	1941	10.5	9.1		262
36	$C_{20}H_8Mn_2N_2O_6S_4$	$[Mn(CO)_3(mbt)]_2$	2090	4.0	4.8		263
455	$C_{20}H_{10}ClCo_3HfO_{10}$	$Co_3[COHfCl(C_5H_5)_2](CO)_9$	2394	8.4			264
454	$C_{20}H_{10}ClCo_3O_{10}Ti$	$Co_3[COTiCl(C_5H_5)_2](CO)_9$	2702	3.8			264
526	$C_{20}H_{10}Co_2MoO_8$	$Co_2Mo(CPh)(CO)_8(C_5H_5)$	1703	3.6			265
205	$C_{20}H_{14}FeO_5$	$Fe(CO)_3(C_{17}H_{14}O_2)$				*ar*	266
278	$C_{20}H_{14}O_2W$	$W(CO)_2(\eta^3\text{-}C_9H_7)(\eta^5\text{-}C_9H_7)$	2319	6.7			267
284	$C_{20}H_{15}Mn_2O_4Sb$	$[Mn(CO)_2(C_5H_5)]_2SbPh$	1340	13.0			268
296	$C_{20}H_{18}ORuS_2$	$Ru(CO)(SC_6H_3Me\text{-}o\text{-}SC_6H_4Me)(C_5H_5)$	1945	6.3			269
227	$C_{20}H_{20}Cl_4MnTi_2.2C_4H_8O$	$[TiCl(C_5H_5)_2]_2MnCl_2.2thf$	2768	5.7	9.5		270
431	$C_{20}H_{20}Mo_2O_4$	$[Mo(CO)_2(C_5H_5)]_2(\mu\text{-}C_2Et_2)$	2029	3.6	5.7		194
253	$C_{20}H_{20}Zr$	$Zr(\eta^1\text{-}C_5H_5)(\eta^5\text{-}C_5H_5)_3$	1461	4.6			271
212	$C_{20}H_{22}Fe_2O_8$	$[Fe(CO)_3]_2[C_{14}H_{20}(OH)_2]$	2248	2.4	3.3	*as*	272
231	$C_{20}H_{23}N_2Ti_2$	$Ti_2N_2H_3(C_5H_5)_4$	777	7.9	8.9	*at*	273
499	$C_{20}H_{23}Ni_4$	$H_3Ni_4(C_5H_5)_4$				ND	237
128	$C_{20}H_{24}Cl_3O_3P_2Rh$	$Rh(C_4Cl_4O_2)Cl(OH_2)(PMe_2Ph)_2$	2878	4.6			274

ar $C_{17}H_{14}O_2$ = 1-4-η^4-1-Ph-1-$PhCO_2$-buta-1,3-diene. *as* $C_{14}H_{20}(OH)_2$ = 1-4-η:11-4-η-1,3,11,13-tetradecatetraene-5,10-diol.

at Number of H atoms uncertain.

406	$C_{20}H_{24}Fe_2N_2O_6$	$Fe_2(CO)_6(CyNCHCHNCy)$	2961	3.6	4.0		275
228	$C_{20}H_{24}O_3Ti_2^{2+}.2ClO_4^-.2H_2O$	$\{[Ti(OH_2)(C_5H_5)_2]_2O\}(ClO_4)_2.2H_2O$	1114	6.1			276
229	$C_{20}H_{24}O_3Ti_2^{2+}.O_6S_2^{2-}$	$\{[Ti(OH_2)(C_5H_5)_2]_2O\}S_2O_6$	1261	6.1			277
385	$C_{20}H_{26}F_6N_2O_4Pt_2$	$[PtMe_2(O_2CCF_3)(4\text{-Mepy})]_2$	1798	4.9			278
90	$C_{20}H_{28}Br_2Cl_2O_2P_2Rh_2$	$[RhMeBrCl(CO)(PMe_2Ph)]_2$	570	7.3	7.8		279
226	$C_{20}H_{28}Cl_2Ti$	$TiCl_2(C_5H_5)[(-)\text{-}C_5H_4men]$	2375	4.3	3.6		280
242	$C_{20}H_{30}Br_{0.76}Cl_{3.23}Rh_2$	$[RhBr_{0.33}Cl_{0.67}(C_5Me_5)]_2$-$(\mu\text{-}Br_{0.05}Cl_{0.95})_2$	1479	4.4	5.1	*au*	281
241	$C_{20}H_{30}Br_4Rh_2$	$[RhBr(C_5Me_5)]_2(\mu\text{-}Br)_2$	3208	5.1	2.7		281
303	$C_{20}H_{30}Fe$	$Fe(C_5Me_5)_2$	514	15.3	16.0		235
250	$C_{20}H_{32}Zr$	$Zr(CH_2CMe_3)_2(C_5H_5)_2$	487	3.3		*av*	243
107	$C_{20}H_{40}Cl_2Mo_2O_6P_2Si_2$	$[MoCl(COCH_2SiMe_3)(CO)_2(PMe_3)]_2$	2579	2.0			180
453	$C_{20}Co_6O_{18}S_2$	$[Co_3(CS)(CO)_9]_2$	2258	9.5			133
	C21						
513	$C_{21}H_6O_{16}Os_6$	$Os_6C(CO)_{16}(C_2Me_2)$	4007	3.9	4.4		262
310	$C_{21}H_{16}CrO_4S$	$Cr(CO)_3(C_{18}H_{16}OS)$ (isomer I)	1363	6.1	4.9	*aw*	282
311		(isomer II)	3451	3.0	3.6		

au Cl/Br ratio determined by X-ray; halide exchange with 1,2-Cl_2-ethane. *av* Only Zr-C bond length recorded.

aw $C_{18}H_{16}OS$ = η^5-1-Me-3,5-Ph_2thiabenzene-1-oxide.

307	$C_{21}H_{19}Fe_2^+.BF_4^-$	$[Fc_2CH]BF_4$	2648	9.3			283
271	$C_{21}H_{19}MoN_2O_2$	$[(+)\text{-}Mo(CO)_2(C_5H_4NCH{:}NCHMePh)]PF_6$	2634	5.6			284
194	$C_{21}H_{20}FeO_4S$	$Fe(CO)_3(C_{18}H_{20}OS)$	2045	3.0	3.3	*ax*	285
178	$C_{21}H_{20}NOPRu$	$Ru(NO)(PPh_3)(C_3H_5)$	2190	2.99	3.83		286
397	$C_{21}H_{24}Co_2O_5$	$Co_2(CO)_5(C_8H_{12})_2$	4682	4.4	3.1		287
323	$C_{21}H_{28}CrN_2O_4$	$Cr(CO)_3[C_9H_5(OMe)(NEt_2)_2]$	1318	6.7			288
47	$C_{21}H_{32}As_4Br_2OOs$	$OsBr_2(CO)(diars)_2$	2047	4.8	5.9		289
365	$C_{21}H_{47}Cl_3Li_4O_4W_2$	$[Li(thf)]_4W_2Me_xCl_{8-x}$ ($x \sim 5$)	436	4.1	4.5		290
78	$C_{21}H_{57}ClSi_6Yb^-.C_{16}H_{32}LiO_4^+$	$[Li(thf)_4][YbCl[CH(SiMe_3)_2]_3]$	3356	6.0			291
75	$C_{21}H_{57}CrSi_6$	$Cr[CH(SiMe_3)_2]_3$	548	6.7	7.5		292
367	$C_{21}H_{60}Mo_2P_3Si_3$	$Mo_2(CH_2SiMe_3)_2[\mu\text{-}(CH_2)_2SiMe_2]\text{-}(PMe_3)_3$				*ay*	248

C22

236	$C_{22}H_{10}Cr_3F_{18}O_{12}$	$Cr_3(O_2CCF_3)_6(C_5H_5)_2$	1532	5.6	7.4		293
477	$C_{22}H_{12}O_{10}Os_3$	$H_2Os_3(CO)_9(OC_6H_3CH_2Ph)$	4275	5.15			294
312	$C_{22}H_{14}Mn_2O_6$	$Mn_2(CO)_6(C_{14}H_8Me_2)$	1079	6.8	5.3	*az*	295
404	$C_{22}H_{17}Fe_2NO_{10}$	$Fe_2(CO)_6(C_{16}H_{17}NO_4)$	3726	10.0		*ba*	296

ax $C_{18}H_{20}OS$ = 3,4:6,7-η^4-2-isopropylthio-8-benzoylbicyclo[3.2.1]octadiene. *ay* No data given. *az* $C_{14}H_8Me_2$ = 3,5-Me_2aceheptylene. *ba* $C_{16}H_{17}NO_4$ = $Me_2C{:}CPhNC(CO_2Me){:}C(CO_2Me)$.

279	$C_{22}H_{22}O_2W$	$W(CO)_2(C_{15}H_{15})(C_5H_5)$	2661	8.8		297
270	$C_{22}H_{22}MoN_2O_2$	$Mo(CO)_2(\eta^2\text{-}C_5H_4NCMe{:}NCHMePh)(C_5H_5)$	3268	5.4		298
118	$C_{22}H_{23}N_2OPd^+.ClO_4^-$	$[Pd(dmp)(bqH)(OH_2)]ClO_4$	1976	5.34	5.41	299
305	$C_{22}H_{26}Fe$	$Fe\{(CH_2)_3C_5H[(CH_2)_3]_2C_5H(CH_2)_3\}$	3768	3.5	4.8	300
52	$C_{22}H_{29}Fe_2O_4P_2S_2^+.F_6P^-$	$\{[Fe(CO)_2(PMe_2Ph)(SMe)]_2(\mu\text{-}H)\}PF_6$	2146	7.1		301
536	$C_{22}H_{32}B_4FeMn_2O_6S_2$	$[Mn(CO)_3]_2Fe[S(BMe)_2(CEt)_2]_2$	3836	4.6		302
240	$C_{22}H_{34}Cl_3Co_2^+.Cl_4Fe^-$	$[Co_2(\mu\text{-}Cl)_3(C_5Me_4Et)_2]FeCl_4$	2108		8.6	303
66	$C_{22}H_{35}ClNOP_2Pt^+.F_6P^-$	*trans*-$[PtCl\{C(NMe_2)[(CH_2)_3OH]\}$-$(PMe_2Ph)_2]PF_6$	3442	4.7	5.4	304
144	$C_{22}H_{46}ClP_2Rh$	$RhCl[Bu^t_2P(CH_2)_2CH{:}CH(CH_2)_2PBu^t_2]$	1417	6.9	7.6	305
438	$C_{22}H_{46}Cr_2N_4Si_4$	$[Cr(NSiMe_3)_2(C_5H_5)]_2$	1340	7.9		306
439	$C_{22}H_{46}Mn_2N_4Si_4$	$[Mn(NSiMe_3)_2(C_5H_5)]_2$	952	5.7		307
366	$C_{22}H_{62}Cr_2P_2Si_4$	$[Cr(CH_2SiMe_3)(PMe_3)]_2(\mu\text{-}CH_2SiMe_3)_2$	4345	2.93	3.01	248,308
	C23					
324	$C_{23}H_{18}CrO_5$	$Cr(CO)_3\{C_{10}H_5(OH)Ph[CH{:}CMe(OMe)]\}$	2139	5.4		309
337	$C_{23}H_{22}CrGeO_5S_2$	$Cr(CO)_5[Ge(SC_6H_2Me_3)_2]$	1661	7		310
408	$C_{23}H_{22}F_5Fe_2O_6P$	$Fe_2(CO)_6[(Cy_2P)\overline{CCCF(CF_2)_2}]$	2313	3.7	4.5	311
462	$C_{23}H_{24}Fe_3O_7$	$Fe_3(CO)_7(HC_2Et)_4$	2953	4.2		312
252	$C_{23}H_{34}Si_2Zr$	$ZrPh[CH(SiMe_3)_2](C_5H_5)_2$	2712	4.8		243
261	$C_{23}H_{38}ClPTa$	$TaCl(CPh)(PMe_3)_2(C_5Me_5)$	3140	4.1	3.5	313

C24

394	$C_{24}H_{14}Fe_3O_8$	$Fe_3(CO)_8(C_{14}H_8Me_2)$	1930	5.6	4.6	*az*	314
377	$C_{24}H_{16}Cr_2O_4^{4-}.6C_4H_{10}LiO^+.2Br^-$	$[Li(OEt_2)]_6[Cr_2(C_6H_4O\text{-}o)_4]Br_2$	1548	7.2	9.0		466
447	$C_{24}H_{16}F_{18}Ir_2O_2$	$Ir_2(CO)_2(C_4F_6)_3H(C_5Me_5)$	2061	7.2	6.8		315
127	$C_{24}H_{16}FeO_6$	$Fe(CO)_3[C_4Ph_2(COMe)_2CO]$	1630	2.7			316
232	$C_{24}H_{22}Cl_2Zr$	$ZrCl_2(C_5H_4CH_2Ph)_2$		7.7			317
109	$C_{24}H_{22}Cl_6O_{18}Ru_6.C_6H_6$	$[Ru_3Cl_3(COEt)_2(OH)(CO)_6]_2.C_6H_6$	3101	7.6			318
53	$C_{24}H_{22}O_3PRh$	$Rh(acac)(CO)(PPh_3)$	2493	4.3			319
355	$C_{24}H_{23}Ta$	$Ta(CH_2Ph)(CHPh)(C_5H_5)_2$	1917	5.9	6.4		320
165	$C_{24}H_{24}FeO_2P_2S_2$	$Fe(\eta^2\text{-}S{:}CS)(CO)_2(PMe_3)(PPh_3)$	1881	3.9	4.6		321
386	$C_{24}H_{24}Mo_2$	$Mo_2(C_8H_8)_3$	2753	3.08	4.38		322
387	$C_{24}H_{24}W_2$	$W_2(C_8H_8)_3$	2063 1739	3.8 12.2	4.8 14.2	 ND,110	322
238	$C_{24}H_{28}Mo_4O_8$	$[Mo_2O_4(C_5H_4Me)_2]_2$	1671	7.2	8.2		105
378	$C_{24}H_{32}Cr_2O_6$	$[Cr(o\text{-}Bu^tOC_6H_4)(O_2CMe)]_2$	1814	5.6	9.0		323
403	$C_{24}H_{43}Mo_2O_5PS_3$	$Mo_2(CO)_2[P(OMe)_3](\mu\text{-}SBu^t)_3(C_7H_7)$	5151	4.6			324
369	$C_{24}H_{62}Si_6W_2$	$W_2(CSiMe_3)_2(CH_2SiMe_3)_4$	2396	7.0	8.3		325
364	$C_{24}H_{64}Li_4O_4W_2$	$[Li(OEt_2)]_4W_2Me_8$	2556	6.9	9.1		290
460	$C_{24}H_{66}Cl_3Re_3Si_6$	$Re_3Cl_3(CH_2SiMe_3)_6$	4170	6.2	6.4		326

az $C_{14}H_8Me_2$ = 3,5-Me aceheptylene.

C25

190	$C_{25}H_{16}FeO_4$	$Fe(CO)_3(C_3Ph_3HCO)$	2555	3.4		327
297	$C_{25}H_{19}CoO_2P^+.C_4CoO_4^-$	$[Co(CO)_2(C_5H_4PPh_3)][Co(CO)_4]$	3155	5.35		16
293	$C_{25}H_{20}FeO_2Sb^+.F_6P^-$	$\{[Fe(CO)_2(C_5H_5)]SbPh_3\}PF_6$	2102	3.5		328
259	$C_{25}H_{20}OTi$	$Ti(CO)(C_2Ph_2)(C_5H_5)_2$	1647	6.7	7.3	329
96	$C_{25}H_{21}F_{15}P_3Pt^+.F_6P^-$	$\{PtMe[PMe_2(C_6F_5)]_3\}PF_6$	5374	2.9		225
191	$C_{25}H_{23}FeNO_4$	$Fe(CO)_3[C(O)NCyCPhCHCHPh]$	1912	5.0		330
166	$C_{25}H_{27}IrN_2OPS_2^+.BF_4^-$	$[Ir(\eta^2\text{-}S{:}CNMe_2)_2(CO)(PPh_3)]BF_4$	3858	5.2		331
145	$C_{25}H_{28}ClP_2Rh$	$RhCl[CH_2{:}CH(CH_2)_2PPh(CH_2)_3PPh_2]$	3569	4.7	5.6	332
306	$C_{25}H_{30}Fe$	$Fe\{(CH_2)_3C_5[(CH_2)_3]_3C_5(CH_2)_3\}$	3839	8.0	12.0	333
43	$C_{25}H_{33}Cl_3OP_3Tc.C_2H_6O$	$TcCl_3(CO)_2(PMe_2Ph)_3.EtOH$	1794	9.3		334
58	$C_{25}H_{46}N_5Ru^+.C_4H_{11}B_4^-$	$[RuH(CNBu^t)_5][2,3\text{-}Me_2C_2B_4H_5]$	2337	18		158
80	$C_{25}H_{49}PTa$	$Ta(CHBu^t)_2(C_6H_2Me_3)(PMe_3)_2$	3946	5.3		335
402	$C_{25}H_{54}Mo_2O_7$	$Mo_2(OBu^t)_6(CO)$	1237	6.7	8.5	336
520	$C_{25}O_{25}Rh_{14}^{4-}.4C_8H_{20}N^+$	$(NEt_4)_4[Rh_{14}(CO)_{25}]$	876	5.2		337

C26

391	$C_{26}H_{15}Fe_2O_7P$	$Fe_2(CO)_6[C(CHO)PPh_2(C_6H_4)]$	4070	5.0	4.4	338
509	$C_{26}H_{18}N_2O_{16}Os_6$	$Os_6(CO)_{16}(CNBu^t)_2$	3283	4.2	3.9	339,340
154	$C_{26}H_{19}Fe_2O_8P$	$Fe_2(CO)_8(Ph_2PC_2Bu^t)$	2682	3.6		341

437	$C_{26}H_{20}Mo_2O_4S_2$	$[Mo(CO)_2(C_5H_5)]_2(\mu\text{-}SPh)_2$	2995	3.9			342
282	$C_{26}H_{22}Mn_2O_4$	$[Mn(CO)_2(C_5H_4Me)]_2(C_{10}H_8)$	1352	7.6		*bb*	343
18	$C_{26}H_{22}N_4O_4Rh_2$	$Rh_2(CO)_4(C_{22}H_{22}N_4)$	5302	4.62	6.30	*bc*	344
19	$C_{26}H_{23}N_4O_4Rh_2^+.ClO_4^-.C_7H_8$	$[Rh_2(CO)_4(C_{22}H_{23}N_4)]ClO_4.PhMe$	1259	6.6	7.5	*bd*	344
230	$C_{26}H_{26}N_4Ti_2$	$[Ti(pz)(C_5H_5)_2]_2$	1994	6.1	7.1		345
87	$C_{26}H_{27}CoN_{10}O_4$	$Co[C_5H_4(CN)_4Ph](imH)(dmg)_2$	2973	4.6			346
446	$C_{26}H_{28}Rh_2$	$Rh_2(CH{:}CH_2)(CMe{:}CHMe)(C_9H_6Me)_2$	6928	5.7			347
441	$C_{26}H_{34}O_4Ru_2$	$[Ru(CO)_2(C_5Me_4Et)]_2$	1068	2.59			348
94	$C_{26}H_{42}ClNO_3P_2Pd$	$PdCl[CCHC(O)C(:CHCO_2Me)N(tol)]$-$(PEt_3)_2$	5043	4.6	6.7		349
49	$C_{26}H_{46}ClIrOP_2$	$IrCl(CO)[Bu^t{}_2PC{\equiv}C(CH_2)_5C{\equiv}CPBu^t{}_2]$	3085	2.6	2.6		350
	C27						
390	$C_{27}H_{16}Fe_2O_6$	$Fe_2(CO)_6(C_3Ph_3H)$	2148	2.9			327
54	$C_{27}H_{19}F_3O_3PRh$	$Rh(ttac)(CO)(PPh_3)$	2665	5.2			351
325	$C_{27}H_{20}BMo_3^-.C_8H_{20}N^+$	$NEt_4[Mo(CO)_3(\eta^6\text{-}Ph)BPh_3]$	4939	4.3		138	352
189	$C_{27}H_{23}FeO_6P$	$Fe(CO)_2(PPh_3)[C(O)C(OMe)C(CO_2Me)$-$CH_2]$	5473	8.0			354

bb $C_{10}H_8$ = tetracyclic dicarbene ligand. *bc* $C_{22}H_{22}N_4$ = 7,6-dihydro-6,8,15,17-Me_4-dibenzo[*b*,*i*]-1,4,8,11-tetrazacyclotetradecinato.

bd $C_{22}H_{23}N_4$ = protonated $C_{22}H_{22}N_4$.

60	$C_{27}H_{24}O_6W$	$W(CO)_5[C(OEt)C_5H_8CH{:}CPh_2]$	4339	9.6			355
269	$C_{27}H_{27}MoN_2O_2P$	(-)-$Mo(CO)(NO)\{PPh_2[NMe(CHMePh)]\}$-$(C_5H_5)$	2794	4.3	5.3		356
160	$C_{27}H_{28}BCuN_2O$	$Cu(CO)(en)(PhBPh_3)$	3150	4.9			357
249	$C_{27}H_{28}SiTi$	$Ti[C_8H_4Ph(SiMe_3)](C_5H_5)_2$	2198	3.2	3.2		358
102	$C_{27}H_{34}Cl_2NPPt$	*cis*-$PtCl_2[CMe_2{:}CCH_2\overset{+}{N}HEt_2)(PPh_3)$	3630	10.0			359
534	$C_{27}H_{45}Co_2O_9P_3Pt_3$	$Co_2Pt_3(CO)_4(\mu\text{-}CO)_5(PEt_3)_3$	2680	7.5			360
360	$C_{27}H_{45}Fe_2N_9$	$Fe_2(CNEt)_9$	3054	11.0		223	361
157	$C_{27}H_{52}ClOP_2Rh$	$RhCl(CO)[Bu^t{}_2P(CH_2)_4C{\equiv}C(CH_2)_4$-$PBu^t{}_2]$	1768	9.7	11.2		305
519	$C_{27}O_{25}Rh_{12}$	$Rh_{12}C_2(CO)_{25}$	3450	3.7	4.5		362
521	$C_{27}O_{27}Rh_{15}^{3-}.3C_4H_{12}N^+$	$(NMe_4)_3[Rh_{15}(CO)_{27}]$	3730	8.3			337
	C28						
514	$C_{28}HO_{29}Os_9^-.C_{36}H_{30}NP_2^+$	$(ppn)[HOs_3(CO)_{10}O_2COs_6(CO)_{17}]$	3274	7.6	7.2		363
83	$C_{28}H_{15}F_9MnO_4P$	$Mn[C(CF_3){:}C{:}C(CF_3)_2](CO)_4(PPh_3)$					364
432	$C_{28}H_{20}Mo_2O_4$	$[Mo(CO)_2(C_5H_5)]_2(\mu\text{-}C_2Ph_2)$	2628	4.6	7.4		194
268	$C_{28}H_{27}ClMoNO_2P$	$MoCl(CO)_2(Ph_2PNMeCHMePh)(C_5H_5)$	942	11			365
292	$C_{28}H_{29}FeO_3PS$	(-)-$Fe[SO_2CH_2CHMe_2](CO)(PPh_3)$-$(C_5H_5)$	3059	6.4	8.1		366

335	$C_{28}H_{32}Mo_4O_4.C_{14}H_{15}Cl_2Mo_2^+.Cl^-.C_6H_5Cl$	$\{[Mo(\mu\text{-}OH)(C_7H_7)]_4\}[(C_7H_7)Mo(\mu\text{-}Cl)_2(\mu\text{-}OH)Mo(C_7H_7)]Cl.C_6H_5Cl$	6331		6.1	150
88	$C_{28}H_{33}ClCoN_5O_5$	$CoCl(pyCHCOPh)(dmg)_2$	1997	6.8		367
103	$C_{28}H_{35}ClP_2Pt$	*trans*-$PtCl(C_2Ph)(PEt_2Ph)_2$	1877	4.6	4.8	368
532	$C_{28}H_{35}O_{10}Os_3PPt$	$H_2Os_3Pt(CO)_{10}(PCy_3)$	6586	4.6	4.8	369
527	$C_{28}H_{40}Mo_2O_6P_2Pd_2$	$Mo_2Pd_2(CO)_6(PEt_3)_2(C_5H_5)_2$	3179	3.2		370
214	$C_{28}H_{40}P_3Ru^+.F_6P^-$	$[RuH(C_4H_6)(PMe_2Ph)_3]PF_6$	2429	7.0		371
64	$C_{28}H_{56}Cl_2N_8Ru$	*trans*-$RuCl_2(\overline{CNEtCH_2CH_2NEt})_4$	2641	5.5	8.7	372
	C29					
458	$C_{29}H_5Co_7O_{24}Ti$	$Ti[Co(CO)_4][COCo_3(CO)_9]_2(C_5H_5)$	3560	6.44		373
123	$C_{29}H_{31}Cl_5IrNO_3P_2$	$IrCl_2[P(OC_6Cl_3Me\text{-}o)(OC_6H_4Me\text{-}o)_2](py)(PMe_3)$	3256	5.6		374
298	$C_{29}H_{32}Cl_2CoP.C_7H_8$	$CoCl_2(PPh_3)(C_5Me_4Et).PhMe$	2679		6.1	375
497	$C_{29}H_{34}Ir_4O_5$	$Ir_4(CO)_5(C_8H_{12})_2(C_8H_{10})$	3163	3.4	4.4	376
	C30					
457	$C_{30}H_{10}Co_6HfO_{20}$	$Hf[COCo_3(CO)_9]_2(C_5H_5)_2$	3125	8.9		264
456	$C_{30}H_{10}Co_6O_{20}Zr$	$Zr[COCo_3(CO)_9]_2(C_5H_5)_2$	3152	6.5		264
512	$C_{30}H_{10}O_{16}Os_6$	$Os_6(CO)_{16}(CPh)_2$	5811	6.2	5.9	377
248	$C_{30}H_{14}F_{10}Ti.\frac{1}{2}C_6H_{14}$	$Ti[C_8H_4(C_6F_5)_2](C_5H_5)_2$	1993	7.0	7.8	358

45	$C_{30}H_{20}Br_2O_6P_2Re_2$	$[Re(CO)_3]_2(\mu\text{-}Br)_2(\mu\text{-}P_2Ph_4)$	3758	6.8	6.8		378
273	$C_{30}H_{27}MoO_2P$	$Mo(CO)(PPh_3)(C_6H_7O)(C_5H_5)$				*be*	379
435	$C_{30}H_{30}Mo_2O_{12}$	$[Mo_2(C_5H_5)_2]\{C_2(CO_2Me)_2(C_2H_2)\text{-}[C_2(CO_2Me)_2]_2\}$	3450	5.4			380
300	$C_{30}H_{34}PRh$	$Rh(C_2H_4)(PPh_3)(C_5Me_5)$	2359	3.7			381
57	$C_{30}H_{54}BrMoN_6^+.Br^-$	$[MoBr(CNBu^t)_6]Br$	2425	6.4	8.0		382
79	$C_{30}H_{62}N_6Si_6Ti$	$Ti(CH_2Ph)_2[\overline{N(SiMe_2NMe)_2SiMe_2}]_2$	4820	10.8	14.2		383
372	$C_{30}H_{67}P_4Pt_2^+.F_6P^-$	$[H_2Pt_2Ph(PEt_3)_4]PF_6$	5924	7.3			384
	C31						
459	$C_{31}H_{20}Co_3O_7P_2$	$Co_3(PPh_2)_2(CO)_7$	1902	6.97			385
417	$C_{31}H_{25}Fe_2N_2O_6P$	$[Fe_2(CO)_6](\mu\text{-}PPh_2)\text{-}[\mu\text{-}C(\overline{\overset{+}{C}NMeCH_2CH_2NMe})\overset{-}{C}Ph]$	3377	5.6			386
334	$C_{31}H_{27}BMo$	$Mo[(\eta^6\text{-}Ph)BPh_3](C_7H_7)$	3938	4.5		138	352
464	$C_{31}H_{40}O_7Ru_3$	$Ru_3(CO)_6(C_{12}H_{20})(C_{13}H_{20}O)$	3687	3.7			387
27	$C_{31}H_{44}F_4FeO_3P_2$	$Fe(CO)_3[Cy_2P\overline{C{:}C(PCy_2)CF_2CF_2}]$	1240	4.3			388

be C_6H_7O = η^3-methylenecyclopentenone.

C32

38	$C_{32}H_{20}O_{12}P_2Re_2$	$[Re(CO)_4O_2PPh_2]_2$	1271	3.6			389
498	$C_{32}H_{24}Ir_4O_{24}$	$Ir_4(CO)_8[C_2(CO_2Me)_2]_4$	2655	2.5	2.3		390
416	$C_{32}H_{28}Fe_2NO_6P$	$Fe_2(PPh_2)(CO)_6[CHC(NHCy)Ph]$	3454	2.5	2.8		391
415	$C_{32}H_{28}Fe_2NO_6P$	$Fe_2(PPh_2)(CO)_6[C(NHCy)CHPh]$	2665	4.3	4.9		391
373	$C_{32}H_{36}Cr_2O_4$	$Cr_2[C_6H_3Me(OMe)]_4$	1108	7.7	10.8		392
374	$C_{32}H_{36}Cr_2O_8$	$Cr_2[C_6H_3(OMe)_2]_4$	2438	5.9	8.01		393
375	$C_{32}H_{36}Mo_2O_8$	$Mo_2[C_6H_3(OMe)_2]_4$	2769	4.48	5.75		393
124	$C_{32}H_{50}IrNO_4P_2$	$Ir(CNMe)[CH_2CMe_2PBu^tC_6H_3(OMe)O]$-$[OC_6H_3(OMe)(PBu^t_2)]$	4683	4.9			394
522	$C_{32}O_{32}Rh_{17}S_2^{3-}.3C_{13}H_{22}N^+$	$[NEt_3(CH_2Ph)]_3[Rh_{17}S_2(CO)_{32}]$	12820	5.0	6.6		395

C33

258	$C_{33}H_{23}Rh$	$Rh(C_{28}H_{18})(C_5H_5)$	8081	3.6		*bf*	396
266	$C_{33}H_{28}MoNO_5P$	$Mo(\eta^1\text{-MeCNPh})(CO)_2[P(OPh)_3](C_5H_5)$	2621	6.7	7.5		169
260	$C_{33}H_{29}O_2P_2V$	*cis*-$V(CO)_2(dppe)(C_5H_5)$	3300	4.8			397
59	$C_{33}H_{30}CoF_3N_3O_6P_2^+.BF_4^-$	$\{Co(CNC_6H_4F\text{-}p)_3[P(OMe)_3]_2\}BF_4$	1372	9.1	8.8		398
295	$C_{33}H_{32}FeNP_2^+.C_{24}H_{20}B^-$	$[Fe(MeCN)(dppe)(C_5H_5)]BPh_4$	4963	5.9	6.4	238	399
254	$C_{33}H_{42}V$	$V(C_2C_6H_2Me_3)(C_5Me_4Et)_2$	2016	9.2		243	400

bf $C_{28}H_{18}$ = η^4-cyclobuta[*l*]phenanthrene.

	C34						
510	$C_{34}H_{14}N_2O_{18}Os_5$	$Os_6(CO)_{18}(CNC_6H_4Me\text{-}p)$	3400	6.4	6.5		339,401
201	$C_{34}H_{41}IrO_6P_2$	$Ir[(MeC_6H_3O)P(OC_6H_4Me\text{-}o)_2]$-$[P(OCH_2)_3CMe](cod)$	2541	4.8			403
465	$C_{34}H_{57}O_9P_3Ru_3Si$	$Ru_3(CO)_9[MeSi(PBu_2)_3]$	3255	6.1	7.0		404
	C35						
291	$C_{35}H_{39}FeO_3P$	(-)-$Fe(CO_2men)(CO)(PPh_3)(C_5H_5)$	3426	6.6	7.1		405
289	$C_{35}H_{41}FeO_2P$	(+)-$Fe(CH_2Omen)(CO)(PPh_3)(C_5H_5)$	3655	6.2	7.8		406
401	$C_{35}H_{46}N_4OPt_2$	$Pt_2[\mu\text{-}(PhC)_2CO](CNBu^t)_4$	4494	7.0	6.9		407
	C36						
21	$C_{36}H_{28}CrO_7P$	$Cr(CO)_4(C_{32}H_{28}O_3P)$	2679	4.7		*bg*	408
489	$C_{36}H_{28}O_{10}P_2Ru_4$	$H_4Ru_4(CO)_{10}(dppe)$	3630	3.8	2.5		409
170	$C_{36}H_{30}ClNO_3P_2RuS.CH_2Cl_2$	$RuCl(NO)(\eta^2\text{-}O:SO)(PPh_3)_2.CH_2Cl_2$	5379	6.3	7.5		410
517	$C_{36}H_{33}Ir_7O_{12}$	$Ir_7(CO)_{12}(C_8H_{10})(C_8H_{11})(cod)$	3307	5.5	6.2		411
398	$C_{36}H_{38}F_{18}O_6Rh_2$	$Rh_2(CO)_2(C_4F_6)(dpmC_4F_6)_2$	4515	9.8			412
290	$C_{36}H_{41}FeO_3P$	(+)-$Fe(CH_2CO_2men)(CO)(PPh_3)(C_5H_5)$	3665	8.4	10.2		406
376	$C_{36}H_{44}Cr_2O_{12}$	$Cr_2[C_6H_2(OMe)_3]_4$	1688	6.6	9.1		393
23	$C_{36}H_{44}F_8MoO_4P_2$	$Mo(CO)_4\{[Cy_2\overline{PC:C(CF_2)_2}]_2\}$	2022	3.4			413

bg $C_{32}H_{28}O_3P$ = chelate phosphine ligand from coordinated $LiPPh_2$ and $C_2(CO_2Me)_2$.

74	$C_{36}H_{44}V$	$V(C_6H_2Me_3)_4$	2354	6.1	6.0	414
344	$C_{36}H_{70}P_2PtSi$	*trans*-$PtH(SiH_3)(PCy_3)_2$	4165	4.9		415
	C37					
543	$C_{37}H_{42}B_8P_2Pt$	9-$[(Ph_3P)_2Pt]$-6-CB_8H_{12}				416
42	$C_{37}H_{67}ClO_3OsP_2S.2CHCl_3$	$OsHCl(CO)(PCy_3)_2(SO_2).2CHCl_3$	4450	5.5		417
	C38					
345	$C_{38}H_{30}F_6HgP_2Pt$	*cis*-$Pt(HgCF_3)(CF_3)(PPh_3)_2$				418
246	$C_{38}H_{30}O_2Ti$	$Ti[OC(CPh_2)OC(CPh_2)](C_5H_5)_2$	1157	6.1		419
301	$C_{38}H_{31}NiO_3P_2$	$Ni[Ph_2P(C_4O_3)C_5H_6PPh_2](C_5H_5)$	2160	8.2	8.1	420
99	$C_{38}H_{32}ClNP_2Pt$	*trans*-$PtCl(CH_2CN)(PPh_3)_2$	4313	3.8		421
93	$C_{38}H_{33}ClO_2P_2Pd$	*trans*-$PdCl(CO_2Me)(PPh_3)_2$				422
98	$C_{38}H_{33}NP_2Pt$	*trans*-$PtH(CH_2CN)(PPh_3)_2$	2544	3.9		421
414	$C_{38}H_{38}Fe_2O_6P_2$	$Fe_2(PPh_2)(CO)_6[CC(PHCy_2)Ph]$	3156	6.8	7.5	402
130	$C_{38}H_{42}N_2O_{16}Pd_2$	$\{[PdC_4(CO_2Me)_4](C_5H_3Me_2N)\}_2$	8287	3.6	5.0	423
84	$C_{38}H_{45}P_2Re$	$RePh_3(PEt_2Ph)_2$	1887	4.1		424
308	$C_{38}H_{62}Fe_2Li_4N_6$	$[Fe(C_5H_4Li)_2(Me_5dien)]_2$	2132		6.1	425

C39

433	$C_{39}H_{30}Cr_2O$	$[Cr(C_5H_5)]_2(\mu\text{-}CO)(\mu\text{-}C_4Ph_4)$	1826	11.3			353
433	$C_{39}H_{30}Cr_2O.\frac{1}{2}CH_2Cl_2$	$[Cr(C_5H_5)]_2(\mu\text{-}CO)(\mu\text{-}C_4Ph_4).\frac{1}{2}CH_2Cl_2$	3166	6.6			381
41	$C_{39}H_{31}MnO_3P_2$	$HMn(CO)_3(PPh_3)_2$	1945	4.83			426
213	$C_{39}H_{55}FeN_5$	$Fe(CNBu^t)_3(Bu^tN{:}C{:}C_2Ph_2{:}C{:}NBu^t)$	4327	9.0		193	361
186	$C_{39}H_{71}P_2Pt^+.F_6P^-.C_7H_8$	$[Pt(C_3H_5)(PCy_3)_2]PF_6.PhMe$	3495	4.7	7.2		427

C40

129	$C_{40}H_{34}O_3P_2Pd$	$\overline{Pd[CH_2C(O)OC(O)CH_2]}(PPh_3)_2$	4732	5.8	7.0		428
342	$C_{40}H_{36}Cl_4O_2P_2RuSn.C_3H_6O$	$RuCl(SnCl_3)(CO)(PPh_3)_2(OCMe_2).$-					
		Me_2CO	3601	3.7			429
3	$C_{40}H_{36}Co_3N_4NaO_9$	$[Co(salen)]_2Na[COCo(CO)_3](thf)$	2849	4.9			430
76	$C_{40}H_{44}Cr$	$Cr(CPh{:}CMe_2)_4$	1407	7.8			431
546	$C_{40}H_{52}B_{18}P_2Rh_2.2CH_2Cl_2$	$[Rh(PPh_3)(C_2B_9H_{11})]_2.2CH_2Cl_2$	5535	4.7	7.2		432

C41

106	$C_{41}H_{31}N_3OP_2Pt$	$\overline{Pt[C(CN)_2CH(CN)O]}(PPh_3)_2$	1780	4.8			433
256	$C_{41}H_{33}CoFe_2$	$Co(\textit{trans}\text{-}C_4Ph_2Fc_2)(C_5H_5)$	7315	3.9	5.8		434
223	$C_{41}H_{35}Cl_3O_2P_2U.C_4H_8O$	$UCl_3(OPPh_3)_2(C_5H_5).thf$	3284	5.4			435
339	$C_{41}H_{36}BrMnO_3P_2Sn$	$\textit{mer,trans}\text{-}Mn(SnBrMe_2)(CO)_3(PPh_3)_2$	3735	8.1			436
350	$C_{41}H_{39}CoP_6$	$Co(P_3)[(Ph_2PCH_2)_3CMe]$	1340	4.8			437
117	$C_{41}H_{39}N_2P_2Pt^+.ClO_4^-$	$\{\overline{Pt[C(NHtol)(NHC_6H_3Me)]}(dppe)\}ClO_4$	3252	4.7	5.3		438

C42

56	$C_{42}H_{30}CrN_6$	$Cr(CNPh)_6$	1030	4.4		439
359	$C_{42}H_{32}As_2Co_2F_8O_6P_2$	$\{Co(CO)_3[Ph_2\overline{PC:C(AsMe_2)CF_2CF_2}]\}_2$	1854	5.2	5.2	440
125	$C_{42}H_{36}O_4P_2Pt$	$\overline{Pt(C_6H_4PPh_2)}[C(CO_2Me):CH(CO_2Me)]$-$(PPh_3)$	5208	4.7	4.8	441
351	$C_{42}H_{42}CoNP_6.\frac{1}{2}C_4H_8O$	$Co(P_3)[(Ph_2PCH_2CH_2)_3N].\frac{1}{2}thf$	2320	6.6	7.8	442
233	$C_{42}H_{62}I_2O_2Zr_2$	$[ZrI(C_5Me_5)_2]_2(\mu\text{-}OCH:CHO)$	4344	9.0		443

C43

122	$C_{43}H_{34}F_2IrN_2OP_2^+.HBF_3O^-$	$[\overline{IrF(p\text{-}FC_6H_3N:NH)}(CO)(PPh_3)_2]$-$BF_3(OH)$	2300	5.3		444
28	$C_{43}H_{34}IrN_3OP_2$	$Ir(bta)(CO)(PPh_3)_2$	6321	3.5	4.3	445
121	$C_{43}H_{38}IIrN_2P_2.CHCl_3$	$\overline{IrHI(p\text{-}MeC_6H_3N:NH)}(PPh_3)_2.CHCl_3$	4196	3.4	4.3	446
131	$C_{43}H_{38}O_5P_2Pt$	$\overline{Pt[CH(CO_2Me)COCH(CO_2Me)]}(PPh_3)_2$	7130	4.0		447
111	$[\frac{1}{2}C_{43}H_{42}NNiOP_3.\frac{1}{2}C_{44}H_{45}NNiOP_3]^+.$-$C_{24}H_{20}B^-.2\frac{1}{2}C_4H_8O$	$[\frac{1}{2}\{Ni(CO)(np_3)\}\frac{1}{2}\{Ni(COMe)(np_3)\}]$-$BPh_4.2\frac{1}{2}thf$	1746	10.2	*bh*	448
97	$C_{43}H_{45}P_3Pt$	$PtMe_2[(Ph_2PCH_2)_3CMe]$	3188	9.2		449
158	$C_{43}H_{50}O_9P_4Rh^+.ClO_4^-$	$\{Rh[P(OMe)_3]_3[PhP(C_6H_4)_2C_4Ph_2]\}$-$ClO_4$	2116	10.0	193	450

bh Solid solution.

C44

533	$C_{44}H_{32}O_8Os_2P_2Pt_2$	$H_2Os_2Pt_2(CO)_8(PPh_3)_2$	4427	3.7	4.2	451
46	$C_{44}H_{35}ClO_3P_2Ru$	$RuCl(O_2CPh)(CO)(PPh_3)_2$	2559	6.0		452
91	$C_{44}H_{36}NiOP_2$	$Ni\overline{Ph(OCPhCHPPh_2)}(PPh_3)$	7477	6.7	9.9	453
110	$C_{44}H_{45}NNiOP_3^+.C_{24}H_{20}B^-.2\frac{1}{2}C_4H_8O$	$[Ni(COMe)(np_3)]BPh_4.2\frac{1}{2}thf$	1208	9.4		448

C45

181	$C_{45}H_{40}ClIrP_2$	$IrHCl(PPh_3)_2(C_3H_4Ph)$	3738	2.9		454
169	$C_{45}H_{41}NOP_2PtS$	$Pt(\eta_2\text{-}OS{:}NC_6H_2Me_3)(PPh_3)_2$	3422	6.6		455
172	$C_{45}H_{47}NPdS_2$	$Pd(S_2CNPr^i{}_2)[\eta^3\text{-}C_4(tol)_4Ph]$	3409	5.7		456

C46

488	$C_{46}H_{34}O_{10}P_2Ru_4$	$H_4Ru_4(CO)_{10}(PPh_3)_2$	3512	6.5	9.3	457
125a	$C_{46}H_{42}As_2O_4Pt_2$	$[\overline{Pt(CH{:}CMeC_6H_4AsPh_2)}]_2(\mu\text{-}O_2CMe)_2$	2093	5.9		458
445	$C_{46}H_{42}Co_2O_4$	$[Co(C_5H_5)]_2\{\mu\text{-}[CH(CO_2Et)C_2Ph_2]_2\}$	2666	6.50	7.21	459

C47

85	$C_{47}H_{33}CoN_4O$	$Co[CH_2C(O)Me](tpp)$	6546	5.0	7.6	460
165	$C_{47}H_{37}F_3O_3OsP_2S$	$Os[\eta^2\text{-}S{:}C(tol)](O_2CCF_3)(CO)(PPh_3)_2$	2880	7.3		461

C48

159	$C_{48}H_{30}F_{12}P_2Pt.\frac{1}{2}C_5H_{12}$	$Pt(C_{12}F_{12})(PPh_3)_2.\frac{1}{2}C_5H_{12}$	3316	6.1		*bi*	461
247	$C_{48}H_{40}O_2Ti_2.2C_4H_8O$	$[Ti(Ph_2C_2O)(C_5H_5)_2]_2.2thf$	3545	6.9			419,463
244	$C_{48}H_{46}P_2U_2.C_4H_{10}O$	$\{U[(\mu\text{-}CH)PPh_2CH_2](C_5H_5)_2\}_2.Et_2O$	3993	9.2	11.0		464
222	$C_{48}H_{72}O_4Th_2$	$[Th(\mu\text{-}O_2C_2Me_2)(C_5Me_5)_2]_2$	2402	3.5			465
357	$C_{48}H_{98}P_2Pt_2Si_2$	$[Pt(\mu\text{-}H)(SiEt_3)(PCy_3)]_2$	3100	7.1	8.3		467

C49

61	$C_{49}H_{30}Cl_2FeN_4O$	$Fe(CCl_2)(OH_2)(tpp).2dmf$	3105	8.5			468
135	$C_{49}H_{36}N_4P_2Pt$	$Pt[C_3HPh(CN)_4](PPh_3)_2$	4132	2.9	3.8		469

C50

383	$C_{50}H_{44}Cl_2O_2P_4RhS$	$[Rh_2Cl_2(dppm)_2](\mu\text{-}SO_2)$	5207	5.8	6.7		470
516	$C_{50}H_{54}Cu_6N_4$	$Cu_6(\mu_3\text{-}C_6H_4NMe_2)_4(\mu_2\text{-}C_2tol)_2$	3643	4.4	5.7		471

C51

134	$C_{51}H_{41}N_3O_2P_2Pt.\sim0.8CHCl_3$	$Pt[C_3HPh(CN)_3(CO_2Et)](PPh_3)_2.$- $\sim0.8CHCl_3$	4235	5.6	8.8		469
187	$C_{51}H_{43}OP_2Pt^+.BF_4^-.CH_2Cl_2$	$[Pt(C_{13}H_8OEt)(PPh_3)_2]BF_4.CH_2Cl_2$	3130	7.0		*bj*	472
384	$C_{51}H_{44}As_4Cl_2OPd_2.3C_6H_{14}$	$[PdCl(dpam)]_2(\mu\text{-}CO).3C_6H_{14}$	1698	9.6	9.7		473
95	$C_{51}H_{51}O_2PPd$	$Pd(acac)(PMe_2Ph)[C_4(tol)_4Ph]$	4891	5.4			456

bi $C_{12}F_{12}$ = perfluoro-1,2:3,4:5,6-triethanobenzene. *bj* $C_{13}H_8OEt$ = η^3-ethoxyphenalenyl.

	C52						
161	$C_{52}H_{44}ClNOP_2Ru$	$RuCl(CO)(PPh_3)_2[\eta^2\text{-}C(Ntol)tol]$	3688	5.2			474
139	$C_{52}H_{46}P_2Ru$	$Ru(CH_2{:}CHPh)_2(PPh_3)_2$	6022	7.4			475
309	$C_{52}H_{64}Ag_4Fe_4N_4$	$[Fe(1\text{-}Me_2NCH_2\text{-}2\text{-}AgC_5H_3)(C_5H_5)]_4$	724	5.8			476
	C53						
382	$C_{53}H_{44}ClO_3P_4Rh_2^{+}.C_{24}H_{20}B^{-}$	$[Rh_2Cl(CO)_3(dppm)_2]BPh_4$	8523	11.6	17.1		477
25	$C_{53}H_{48}MoN_2OP_4.\frac{1}{2}C_6H_6$	$Mo(CO)(N_2)(dppe)_2.\frac{1}{2}C_6H_6$	3606	8.4	12.0		478
24	$C_{53}H_{48}MoOP_4$	$Mo(CO)(dppe)_2$	7122	7.6	8.7		478
	C54						
136	$C_{54}H_{40}N_2P_2Pt$	$Pt\{C[:C(CN)_2]CPh{:}CPh\}(PPh_3)_2$	1080	5.4			479
379	$C_{54}H_{59}N_6O_2W_2$	$W_2(CO)_2[CH(Nxy)_2]_3[(Nxy)CH(Nxy)CH_2]$	4646	6.6			480,481
89	$nC_{54}H_{68}Co_2K_2N_4O_{10}$	$\{[KCo(Prsalen)(CO_2)(thf)]_2\}_n$	1096	8.5			482
	C56						
361	$C_{56}H_{40}N_8Rh_2^{2+}.2C_{24}H_{20}B^{-}$	$[Rh_2(CNPh)_8](BPh_4)_2$	2820	5.7			484
313	$C_{56}H_{46}Fe_2O_{10}P_2^{2+}.2F_6P^{-}$	$[\{Fe(CO)_2[P(OPh)_3]\}_2(\mu\text{-}C_{16}H_{16})]\text{-}(PF_6)_2$	2378	11.0			485
400	$C_{56}H_{52}O_8Pd_3$	$Pd_3(acac)_2[C_3Ph(C_6H_4OMe\text{-}p)_2]_2$	2259	6.0			486
77	$C_{56}H_{56}Pd_4S_8.CH_2Cl_2$	$[Pd(CH_2SPh)_2]_4.CH_2Cl_2$	4363	8.9	12.0	113	487

	C58						
215	$C_{58}H_{40}MoO_2$	$Mo(CO)_2(C_4Ph_4)_2$	1659	6.3	4.1		488
182	$C_{58}H_{98}Ni_2O_4P_2$	$[Ni(C_{11}H_{16}O_2)(PCy_3)]_2$		5.8		*bk*	483
	C60						
20	$C_{60}H_{40}Cr_2F_2O_8P_4$	$[Cr(CO)_4]_2[C_4F_2(PPh_2)_4]$	5353	5.1			408
343	$C_{60}H_{57}NNiP_3Sn^+.C_{24}H_{20}B^-$	$[Ni(SnPh_3)(np_3)]BPh_4$	1919	8.8	9.4		489
	C62						
380	$C_{62}H_{51}Mn_2NO_4P_4$	$[Mn_2(CO)_4(dppm)_2](\mu\text{-CNtol})$	6669	11.1			490
424	$C_{62}H_{53}N_2P_3Pt_2S$	$Pt_2S[N(\mu\text{-}NC_6H_2Me_2)]Ph(\mu\text{-}PPh_2)(PPh_3)$	4077	6.4			491
	C64						
362	$C_{64}H_{56}I_2N_8Rh_2^{2+}.2F_6P^-$	$[Rh_2I_2(CNtol)_8](PF_6)_2$	4228	11			492
	C72						
137	$C_{72}H_{50}N_4P_2Pt_2.2C_6H_6$	$[Pt\{CPh{:}CPhC[{:}C(CN)_2]\}(PPh_3)]_2.2C_6H_6$	2577	7.5			479
	C78						
507	$C_{78}H_{60}O_6P_4Pt.3C_7H_8$	$Pt_5(CO)_6(PPh_3)_4.3PhMe$	4723	5.6	6.8		493

bk $C_{11}H_{16}O_2$ = $CH_2CMeCHCH_2CH_2CH(C_3H_5)C(O)O$.

	C82					
353	$C_{82}H_{78}As_3Co_2P_6^{2+}.2C_{24}H_{20}B^-$	$[\{Co[(Ph_2PCH_2)_3CMe]\}_2(\mu\text{-}As_3)](BPh_4)_2$	2230	13.9		494
352	$C_{82}H_{78}Ni_2P_9^{2+}.2BF_4^-$	$[\{Ni[(Ph_2PCH_2)_3CMe]\}_2(\mu\text{-}P_3)](BF_4)_2$	4285	11.0		437
	C100					
162	$C_{100}H_{80}N_4Ni_4P_4.C_6H_{14}.2C_7H_8.C_8H_{12}$	$[Ni(PhCN)(PPh_3)]_4.C_6H_{14}.2PhMe.cod$	3441	11.7	*bl*	495
	C108					
92	$C_{108}H_{180}Ni_4O_8P_4$	$[Ni(C_9H_{12}O_2)(PCy_3)]_4$		6.6		483

bl Clathrate complex.

TABLE 2. TRANSITION METAL HYDRIDE, BOROHYDRIDE AND ALUMINOHYDRIDE COMPLEXES.

No.	Formula	Complex	Data	R	R_w	Notes	Reference
554	$C_{16}H_{29}P_2Re$	$ReH_7(PMe_2Ph)_2$					496
555	$C_{24}H_{36}IrP_3$	$IrH_3(PMe_2Ph)_2$					496
556	$C_{24}H_{37}OsP_3$	$OsH_4(PMe_2Ph)_3$				ND	496
557	$C_{24}H_{56}ClP_2Rh$	$RhH_2Cl(PBu^t_3)_2$	1910	5.5			497
558	$C_{36}H_{71}BNiP_2$	$NiH(H_2BH_2)(PCy_3)_2$	4314	7.5			498
559	$C_{40}H_{68}P_4Re_2$	$Re_2H_8(PEt_2Ph)_4$				ND	496
560	$C_{54}H_{46}P_3Rh.C_2H_7N.C_4H_8O$	$RhH(PPh_3)_3.NHMe_2.thf$	1701	7.2	7.6		499
561	$C_{54}H_{82}P_3Pt^+.F_6P^-$	*trans*-$[PtH(PPh_3)(PCy_3)_2]PF_6$	6197	7.3			500
562	$C_{69}H_{121}Ir_3N_3P_3^{2+}.2F_6P^-$	$\{[IrH_2(py)(PCy_3)]_3(\mu\text{-}H)\}PF_6$	6324	5.8			501
563	$HCl_8MoW^{3-}.3Rb^+$	$Rb_3[MoWHCl_8]$	354	7.1	8.1		502
564	$C_2H_{22}B_4OU$	$U(BH_4)_4(OMe_2)$	851	3.6	4.5		503
565	$C_4H_{26}B_4OU$	$U(BH_4)_4(OEt_2)$	3206	2.2	2.6		503
566	$C_8H_{28}B_3O_2Sc$	$Sc(BH_4)_3(thf)_2$	1549	3.9			504
567	$C_8H_{32}B_4O_2U$	$U(BH_4)_4(thf)_2$	789	2.7	3.2		505
568	$C_{12}H_{36}B_3O_3Y$	$Y(BH_4)_3(thf)_3$	804	5.3	4.8		506
569	$C_{12}H_{60}B_8O_2U_2$	$[U(BH_4)_4(OPr_2)]_2$	833	6.3	6.6		507

570	$C_{39}H_{43}BCuP_3$	$Cu(BH_4)(PMePh_2)_3$	3105	2.5	2.5	508
571	$C_{36}H_{96}Al_2O_8P_8Ta_2$	$[Ta\{H_2Al(OC_2H_4OMe)_2\}(dmpe)_2]_2$	2558	7.1		509

Other (non-cluster) complexes containing hydride ligands are: *6, 7, 41, 42, 52, 58, 98, 121, 181, 196-198, 214, 288, 344, 354-357, 372, 413.* Complexes *6* and *234* contain borohydride ligands.

TABLE 3. COMPLEXES CONTAINING NITROSYL GROUPS

No.	Formula	Complex	Data	R	R_w	Notes	Reference
572	$C_5H_5Cl_4N_2ORe^-.C_8H_{20}N^+$	$NEt_4[Re(NO)Cl_4(py)]$	2697	3.0	3.8		510
573	$C_5FeN_6O^{2-}.Sr^{2+}.2H_2O$	$Sr[Fe(NO)(CN)_5].2H_2O$	43	13.2			511
574	$C_6N_7OV^{4-}.3K^+.Na^+.2H_2O$	$NaK_3[V(NO)(CN)_6].2H_2O$	957	5.0			512
575	$C_{16}H_{14}CoN_3O_3$	Co(NO)(salen)	4479	4.8	5.8		513
576	$C_{16}H_{42}Cl_4N_2O_{14}P_4Ru_2$	$\{Ru(NO)Cl_2[(EtO)_2PO]_2H\}_2$	3921	4.3	4.4		514
577	$C_{18}H_{42}Mo_2N_2O_8$	$[Mo(NO)(OPr^i)_3]_2$	2052	6.1	9.3		515
578	$C_{37}H_{30}N_2NiOP_2S$	$Ni(NO)(NCS)(PPh_3)_2$	4420	6.5	6.9		516
579	$C_{54}H_{45}NOP_3Rh$	$Rh(NO)(PPh_3)_3$	5456	5.20	6.02		517

Other complexes containing nitrosyl groups: *170, 178, 269, 469.* Complex *264* contains a *thionitrosyl* (NS) group.

TABLE 4. DINITROGEN AND RELATED COMPLEXES

No.	Formula	Complex	Data	R	R_w	Notes	Reference
580	$C_{54}H_{162}Co_6K_6N_{12}P_{18}$	$[KCo(N_2)(PMe_3)_3]_6$	2639	8.5			518
581	$C_{41}H_{30}Cl_5IrN_2P_2$	$IrCl(N_2C_5Cl_4)(PPh_3)_2$		4.7			519

See also: *25*.

TABLE 5. BINARY TRANSITION METAL-TERTIARY PHOSPHINE COMPLEXES

No.	Structure	Complex	Data	R	R_w	Notes	Reference
582	$C_4H_{12}F_{16}FeN_4P_8$	$Fe[(PF_2)_2NMe]_4$	2656	3.91	3.73		520
583	$C_7H_{21}Co_2F_{16}N_5P_8$	$Co_2[PF_2NMe_2]_2[(PF_2)_2NMe]$	777	4.71	4.82		521
584	$C_9H_{27}CrF_{12}N_5P_6$	$Cr[PF_2NMe_2]_4[(PF_2)_2NMe]$	1879	5.19	5.23		522
585	$C_{38}H_{84}P_4Pt_2.C_7H_8$	$\{Pt[Bu^t_2P(CH_2)_3PBu^t_2]\}_2.PhMe$	5350	3.0	4.0		523
586	$C_{76}H_{68}Cu_2P_6.2C_6H_6$	$[Cu(PPh_2)(dppe)]_2.2C_6H_6$	3048 4944	4.8 6			524 525

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