CHEM 304: π–Acceptor Ligands

Topic: Examples of metal nitrosyls with structural data

Table. The literature data on the bond lengths, bond angles, and infrared spectroscopic ν(NO) vibrations of different metal nitrosyl complexes; x denotes the number of $\{Fe(NO)_n\}^x$ valence electrons according to the Enemark and Feltham notation. Along, the reference documents are given in the last column.

Complex	x	ν(NO) (cm^{-1})	∠MNO (°)	dM–N (A°)	dN–O (A°)	Reference
[Ru(pybuS$_4$')(HNO)]	8	1358	130	1.875	1.242	[1]
[OsCl$_2$(CO)(PPh$_3$)$_2$(HNO)]	8	1410	136.9	1.915	1.193	[2]
[IrHCl$_2$(PPh$_3$)$_2$(HNO)]	8	1493	129.8	1.879	1.235	[3]
[Co(NO)(diars)$_2$(NCS)]$^+$	8	1587	132			
[Fe(PaPy$_3$)NO](ClO$_4$)	7	1615	141.29	1.7515	1.19	[4]
[Fe(cyclam-ac)NO](PF$_6$)	7	1615	148.7	1.722	1.166	[5]
[Fe(NO)(diars)$_2$(NCS)]$^+$	7	1620	159			
[Fe(NO)(pyN$_4$)]$^{2+}$	7	1620	139			
[Fe(pyN$_4$)NO]Br$_2$	7	1620	139.4	1.737	1.175	[6]
[Fe(TPP)(1-MeIm)NO]	7	1625	142.1	1.743	1.121	[7]
[Co(NO)(S$_2$CNMe$_2$)$_2$]	8	1630	136			
[Fe('pyS$_4$')NO]	7	1648	143.8	1.712	1.211	[8]
[Fe(NO)(oep)]	7	1666	144			
[Fe(TpivPP)(NO$_2$)NO]	7	1668	137.4	1.84	1.134	[9]
[Fe(NO)(tpp)]	7	1670	149			
[Co(NO)(oep)]	8	1677	123			[10]
[Fe(Lpr)NO]	7	1682	147	1.749	1.182	[11]
[Fe(NO)(S$_2$CNMe$_2$)$_2$]	7	1690	170			
[Fe(Me$_3$TACN)(N$_3$)$_2$NO]	7	1690	155.5	1.738	1.142	[12]
[Fe(NO)(salen)]	7	1710	147			
[Fe(NO(diars)$_2$]$^{2+}$	7	1760	173			
(PPh$_4$)$_2$[OsCl$_5$NO]	6	1802	178.5	1.83	1.147	[13]
[Fe(NO)(oep)]$^+$	6	1838	173			
[Fe(NO)(oep)(C$_6$H$_4$F-p)]	6	1839	157			
K$_2$[RuCl$_5$NO]	6	1843	176.7	1.738	1.131	[14]
[Co(NO)(diars)$_2$]$^{2+}$	8	1852	179			
[Ru(2-phpy)(trpy)NO](PF$_6$)$_2$	6	1858	167.1	1.826	1.139	[15]
[Ru(bpb)(Cl)NO](ClO$_4$)$_3$	6	1867	172.37	1.7534	1.1444	[16]
trans-[Ru(OH)(py)$_4$NO](C1O$_4$)$_2$	6	1868	172.8	1.756	1.145	[17]
trans-[RuCl(cyclam)NO](ClO$_4$)$_2$	6	1875	178	1.747	1.128	[18]
[Fe(NO)(diars)$_2$(NCS)]$^{2+}$	6	1885	180			
[Ru(HEDTA)NO]	6	1890	172.3	1.756	1.156	[19]

[Fe('pyS$_4$')NO]PF$_6$	6	1893	179.5	1.634	1.141	[8]
[Fe(TpivPP)(NO$_2$)NO]	6	1893	180	1.668	1.132	[20]
Na$_2$[Os(CN)$_5$NO]·2H$_2$O	6	1897	175.5	1.774	1.14	[21]
[Ru(NH$_3$)$_5$NO]Cl$_3$	6	1903	172.8	1.77	1.172	[22]
[Fe(cyclam-ac)NO](PF$_6$)$_2$	6	1904	175.5	1.663	1.132	[5]
trans-[RuCl(py)$_4$NO](ClO$_4$)$_2$	6	1910	172.9	1.766	1.123	[23]
[Fe(PaPy$_3$)NO](ClO$_4$)$_2$	6	1919	173.1	1.677	1.139	[4]
[Fe(NO)(pyN$_4$)]$^{3+}$	6	1926	180			
Na$_2$[Ru(CN)$_5$NO]·2H$_2$O	6	1926	173.9	1.776	1.127	[24]
trans-[Ru(NH$_3$)$_4$(nic)NO]$_2$(SiF$_6$)$_3$	6	1940	177	1.71	1.17	[25]
Na$_2$[Fe(CN)$_5$NO]·2H$_2$O	6	1945	176.03	1.6656	1.1331	[26]
[Ru(dpk)(trpy)NO](ClO$_4$)$_3$	6	1949	173.1	1.764	1.126	[16]
K[IrCl$_5$NO]	6	1952	174.3	1.76	1.124	[27]
[Ru(bpy)(tpm)NO](ClO$_4$)$_3$	6	1959	179.1	1.774	1.093	[28]

x = number of {Fe(NO)$_n$}^{x} valence electrons; pybuS$_4$ = 2,6-bis(3,5-di(tBu)-2-mercapto-phenylthio)methylene-pyridine(2-); PPh$_3$ = triphenylphosphine; salen = 2,2'-Ethylenebis(nitrilomethylidene)diphenol; diars = 1,2-Bis(dimethylarsino)benzene; Cyclam = 1,4,8,11-tetraazacyclotetradecane; oep = octaethylporphyrin; l-MeIm = 1-methylimidazole; nic = nicotinamide; Phpy = 2-phenylpyridine; dpk = 2,2'-dipyridylketone; trpy = 2,2′:6′,2′′-terpyridine; HEDTA = ethylenediaminetetraacetic acid, monoprotonated; tpm = trispyrazolylmethane.

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