JOM 23449

Synthesis and molecular structures of $S_2Fe_2(CO)_6$ heterometallic derivatives, containing $(Ph_3P)_2Pt$ or CpRe(CO) fragments

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(Received November 11, 1992)

Abstract

The heterometallic cluster $(Ph_3P)_2Pt(\mu_3\text{-}S)_2Fe_2(CO)_6$ (**II**) has been synthesized by transmetallation of $S_2Fe_3(CO)_9$ under the action of $(Ph_3P)_2PtCl_2$. X-ray studies indicate that **II** contains a short Fe–Fe bond (mean 2.496(7) Å for 4 independent molecules), but that there are no bonds between Fe and Pt. It is concluded that transmetallation takes place via a process of coordination of $(Ph_3P)_2PtCl_2$ with a lone pair of the μ_3-S bridge in $S_2Fe_3(CO)_9$; this is because of the absence of any analogous reaction of $(PhN)_2Fe_3(CO)_9$.

The trinuclear cluster $CpRe(\mu\text{-}CO)(\mu_3\text{-}S)_2Fe_2(CO)_6$ (**III**) has been obtained by the interaction of $CpRe(CO)_2(THF)$ with $S_2Fe_2(CO)_6$. According to X-ray studies this cluster contains short Re–Fe bonds (mean 2.712(2) Å), but does not contain an Fe–Fe bond. It was concluded that the distinctive features of the metal-core character of $LM(\mu_3\text{-}S)_2Fe_2(CO)_6$ clusters depend on the electron deficit of the LM fragments.

1. Introduction

The binuclear complex $S_2Fe_2(CO)_6$ (**I**), containing S–S and Fe–Fe bonds (2.007 and 2.552 Å, respectively) [1] has been used by us [2] and by other authors [3] for the planned synthesis of $LM(\mu_3\text{-}S)_2Fe_2(CO)_6$ clusters. Here we report the synthesis and some of the features of the molecular structures of this type of cluster, where LM = $(Ph_3P)_2Pt$ or CpRe(CO).

2. Results and discussion

The process of transmetallation of $S_2Fe_3(CO)_9$ under the action of $(Ph_3P)_2PtCl_2$ involves exchange of acidic ligands between Pt^{II} and terminal Fe^{II} ions with the formation of the cluster of $(Ph_3P)_2Pt(\mu_3\text{-}S)_2Fe_2(CO)_6$ (**II**). **II** had been previously obtained by reaction of $S_2Fe_2(CO)_6^{2-}$ with $(Ph_3P)_2PtCl_2$ [4] and

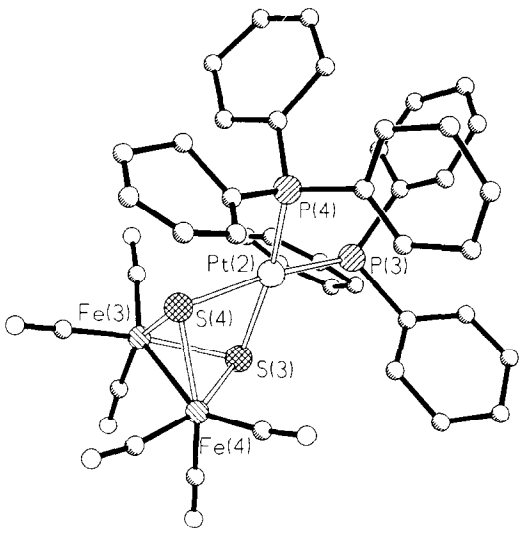

Fig. 1. The structure of the cluster $(Ph_3P)_2Pt(\mu_3\text{-}S)_2Fe_2(CO)_6$ (**II**) (one from 4 independent molecules).

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0022-328X/93/$6.00

TABLE 1. Bond lengths (Å) for the cluster $(Ph_3P)_2Pt(\mu_3\text{-}S)_2Fe_2(CO)_6$ (II)

Pt(1)–S(1)	2.315(9)	Fe(1)–S(2)	2.30(1)
Pt(1)–S(2)	2.32(1)	Fe(2)–S(1)	2.29(1)
Pt(1)–P(1)	2.302(9)	Fe(2)–S(2)	2.28(1)
Pt(1)–P(2)	2.275(9)	Fe(3)–Fe(4)	2.499(8)
Pt(2)–S(3)	2.37(1)	Fe(3)–S(3)	2.28(1)
Pt(2)–S(4)	2.322(9)	Fe(3)–S(4)	2.24(1)
Pt(2)–P(3)	2.323(9)	Fe(4)–S(3)	2.29(1)
Pt(2)–P(4)	2.307(9)	Fe(4)–S(4)	2.28(1)
Pt(3)–S(5)	2.32(1)	Fe(5)–Fe(6)	2.506(8)
Pt(3)–S(6)	2.310(9)	Fe(5)–S(5)	2.30(1)
Pt(3)–P(5)	2.32(1)	Fe(5)–S(6)	2.27(1)
Pt(3)–P(6)	2.27(1)	Fe(6)–S(5)	2.32(1)
Pt(4)–S(7)	2.374(9)	Fe(6)–S(6)	2.28(1)
Pt(4)–S(8)	2.326(9)	Fe(7)–Fe(8)	2.494(7)
Pt(4)–P(7)	2.25(1)	Fe(7)–S(7)	2.30(1)
Pt(4)–P(8)	2.282(9)	Fe(7)–S(8)	2.31(1)
Fe(1)–Fe(2)	2.484(7)	Fe(8)–S(7)	2.31(1)
Fe(1)–S(1)	2.29(1)	Fe(8)–S(8)	2.27(1)

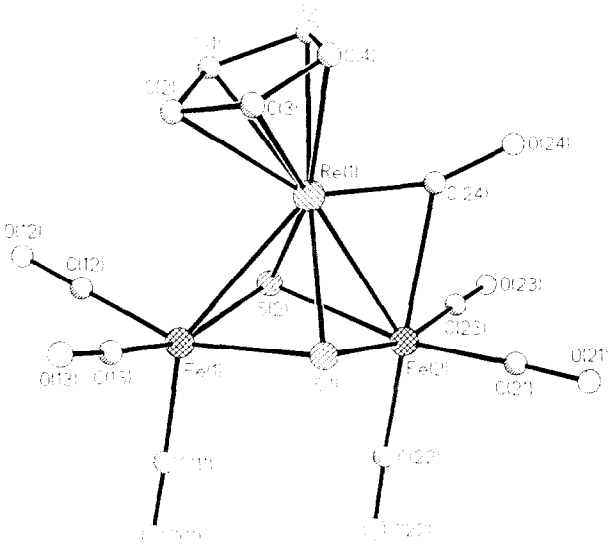


Fig. 2. The structure of the cluster $CpRe(\mu\text{-}CO)(\mu_3\text{-}S)_2Fe_2(CO)_6$ (III) (one from 2 independent molecules).

TABLE 2. Bond angles (°) for the cluster $(Ph_3P)_2Pt(\mu_3\text{-}S)_2Fe_2(CO)_6$ (II)

S(1)–Pt(1)–S(2)	75.5(3)	Fe(6)–Fe(5)–S(5)	57.6(3)
S(1)–Pt(1)–P(1)	166.8(3)	Fe(6)–Fe(5)–S(6)	56.8(3)
S(2)–Pt(1)–P(1)	91.3(3)	S(5)–Fe(5)–S(6)	76.2(4)
S(1)–Pt(1)–P(2)	95.7(3)	Fe(5)–Fe(6)–S(5)	56.7(3)
S(2)–Pt(1)–P(2)	171.2(3)	Fe(5)–Fe(6)–S(6)	56.4(3)
P(1)–Pt(1)–P(2)	97.5(3)	S(5)–Fe(6)–S(6)	75.6(4)
S(3)–Pt(2)–S(4)	75.5(3)	Fe(8)–Fe(7)–S(7)	57.4(3)
S(3)–Pt(2)–P(3)	91.(93)	Fe(8)–Fe(7)–S(8)	56.2(3)
S(4)–Pt(2)–P(3)	147.3(3)	S(7)–Fe(7)–S8	78.6(4)
S(3)–Pt(2)–P(4)	169.5(3)	Fe(7)–Fe(8)–S(7)	57.0(3)
S(4)–Pt(2)–P(4)	93.9(3)	Fe(7)–Fe(8)–S(8)	57.7(3)
P(3)–Pt(2)–P(4)	98.6(3)	S(7)–Fe(8)–S(8)	79.1(4)
S(5)–Pt(3)–S(6)	75.1(3)	Pt(1)–S(1)–Fe(1)	92.2(3)
S(5)–Pt(3)–P(5)	90.7(4)	Pt(1)–S(1)–Fe(2)	95.8(4)
S(6)–Pt(3)–P(5)	165.8(4)	Fe(1)–S(1)–Fe(2)	65.8(3)
S(5)–Pt(3)–P(6)	169.0(3)	Pt(1)–S(2)–Fe(1)	91.8(4)
S(6)–Pt(3)–P(6)	94.8(3)	Pt(1)–S(2)–Fe(2)	95.6(4)
P(5)–Pt(3)–P(6)	99.3(4)	Fe(1)–S(2)–Fe(2)	65.7(3)
S(7)–Pt(4)–S(8)	76.7(3)	Pt(2)–S(3)–Fe(3)	91.1(4)
S(7)–Pt(4)–P(7)	170.8(3)	Pt(2)–S(3)–Fe(4)	92.2(4)
S(8)–Pt(4)–P(7)	94.2(3)	Fe(3)–S(3)–Fe(4)	66.2(3)
S(7)–Pt(4)–P(8)	92.1(3)	Pt(2)–S(4)–Fe(3)	93.4(4)
S(8)–Pt(4)–P(8)	168.6(4)	Pt(2)–S(4)–Fe(4)	93.8(3)
P(7)–Pt(4)–P(8)	97.1(4)	Fe(3)–S(4)–Fe(4)	67.1(3)
Fe(2)–Fe(1)–S(1)	57.0(3)	Pt(3)–S(5)–Fe(5)	93.7(4)
Fe(2)–Fe(1)–S(2)	56.9(3)	Pt(3)–S(5)–Fe(6)	93.9(4)
S(1)–Fe(1)–S(2)	76.4(4)	Fe(5)–S(5)–Fe(6)	65.7(3)
Fe(1)–Fe(2)–S(1)	57.2(3)	Pt(3)–S(6)–Fe(5)	94.6(4)
Fe(1)–Fe(2)–S(2)	57.5(3)	Pt(3)–S(6)–Fe(6)	95.2(4)
S(1)–Fe(2)–S(2)	76.8(4)	Fe(5)–S(6)–Fe(6)	66.8(3)
Fe(4)–Fe(3)–S(3)	57.1(3)	Pt(4)–S(7)–Fe(7)	92.3(4)
Fe(4)–Fe(3)–S(4)	57.2(3)	Pt(4)–S(7)–Fe(8)	90.3(3)
S(3)–Fe(3)–S(4)	78.8(4)	Fe(7)–S(7)–Fe(8)	65.6(3)
Fe(3)–Fe(4)–S(3)	56.7(3)	Pt(4)–S(8)–Fe(7)	93.3(4)
Fe(3)–Fe(4)–S(4)	55.8(3)	Pt(4)–S(8)–Fe(8)	92.5(4)
S(3)–Fe(4)–S(4)	77.8(4)	Fe(7)–S(8)–Fe(8)	66.1(3)

TABLE 3. Bond lengths (Å) for the cluster $CpRe(\mu\text{-}CO)(\mu_3\text{-}S)_2Fe_2(CO)_6$ (III)

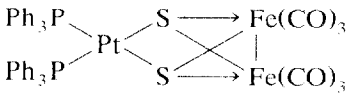
Re(1)–Fe(1)	2.736(2)	Re(1)–Fe(2)	2.695(2)
Re(1)–S(1)	2.340(3)	Re(1)–S(2)	2.353(3)
Re(1)–C(1)	2.292(16)	Re(1)–C(2)	2.326(14)
Re(1)–C(3)	2.286(13)	Re(1)–C(4)	2.218(13)
Re(1)–C(5)	2.277(13)	Re(1)–C(24)	1.830(14)
Re(2)–Fe(3)	2.727(2)	Re(2)–Fe(4)	2.695(2)
Re(2)–S(3)	2.343(3)	Re(2)–S(4)	2.340(3)
Re(2)–C(6)	2.305(11)	Re(2)–C(7)	2.289(15)
Re(2)–C(8)	2.224(11)	Re(2)–C(9)	2.306(12)
Re(2)–C(10)	2.265(12)	Re(2)–C(44)	1.909(14)
Fe(1)–S(1)	2.275(4)	Fe(1)–S(2)	2.276(3)
Fe(1)–C(11)	1.810(13)	Fe(1)–C(12)	1.797(14)
Fe(1)–C(13)	1.805(11)	Fe(2)–S(1)	2.277(3)
Fe(2)–S(2)	2.289(4)	Fe(2)–C(21)	1.805(14)
Fe(2)–C(22)	1.795(13)	Fe(2)–C(23)	1.820(12)
Fe(2)–C(24)	2.383(16)	Fe(3)–S(3)	2.265(3)
Fe(3)–S(4)	2.274(4)	Fe(3)–C(31)	1.817(13)
Fe(3)–C(32)	1.795(15)	Fe(3)–C(33)	1.815(12)
Fe(4)–S(3)	2.285(4)	Fe(4)–S(4)	2.274(3)
Fe(4)–C(41)	1.797(13)	Fe(4)–C(42)	1.812(15)
Fe(4)–C(43)	1.814(12)	Fe(4)–C(44)	2.452(14)
O(11)–C(11)	1.141(16)	O(12)–C(12)	1.138(18)
O(13)–C(13)	1.136(14)	O(21)–C(21)	1.133(18)
O(22)–C(22)	1.137(16)	O(23)–C(23)	1.130(15)
O(24)–C(24)	1.281(16)	O(31)–C(31)	1.134(16)
O(32)–C(32)	1.142(18)	O(33)–C(33)	1.124(15)
O(41)–C(41)	1.134(16)	O(42)–C(42)	1.128(19)
O(43)–C(43)	1.141(14)	O(44)–C(44)	1.196(17)
C(1)–C(2)	1.453(20)	C(1)–C(5)	1.463(19)
C(2)–C(3)	1.457(22)	C(3)–C(4)	1.358(15)
C(4)–C(5)	1.496(23)	C(6)–C(7)	1.433(20)
C(6)–C(10)	1.439(23)	C(7)–C(8)	1.399(21)
C(8)–C(9)	1.497(22)	C(9)–C(10)	1.447(19)

TABLE 4. Bond angles (°) for the cluster $CpRe(\mu\text{-}CO)(\mu_3\text{-}S)_2Fe_2(CO)_6$ (III)

Fe(1)–Re(1)–Fe(2)	75.3(1)	Fe(1)–Re(1)–S(1)	52.5(1)	S(1)–Fe(2)–C(22)	95.8(4)	S(2)–Fe(2)–C(22)	96.5(5)
Fe(2)–Re(1)–S(1)	53.2(1)	Fe(1)–Re(1)–S(2)	52.5(1)	C(21)–Fe(2)–C(22)	97.0(6)	Re(1)–Fe(2)–C(23)	111.8(5)
Fe(2)–Re(1)–S(2)	53.4(1)	S(1)–Re(1)–S(2)	80.7(1)	S(1)–Fe(2)–C(23)	167.1(5)	S(2)–Fe(2)–C(23)	90.5(5)
Fe(1)–Re(1)–C(1)	99.8(3)	Fe(2)–Re(1)–C(1)	149.7(4)	C(21)–Fe(2)–C(23)	93.9(6)	C(22)–Fe(2)–C(23)	96.2(6)
S(1)–Re(1)–C(1)	144.8(3)	S(2)–Re(1)–C(1)	99.5(4)	Re(1)–Fe(2)–C(24)	41.7(3)	S(1)–Fe(2)–C(24)	83.6(3)
Fe(1)–Re(1)–C(2)	81.1(3)	Fe(2)–Re(1)–C(2)	156.4(3)	S(2)–Fe(2)–C(24)	84.9(4)	C(21)–Fe(2)–C(24)	81.5(6)
S(1)–Re(1)–C(2)	110.3(4)	S(2)–Re(1)–C(2)	111.7(4)	C(22)–Fe(2)–C(24)	178.4(7)	C(23)–Fe(2)–C(24)	84.5(5)
C(1)–Re(1)–C(2)	36.7(5)	Fe(1)–Re(1)–C(3)	101.2(3)	Re(2)–Fe(3)–S(3)	55.0(1)	Re(2)–Fe(3)–S(4)	54.9(1)
Fe(2)–Re(1)–C(3)	148.5(4)	S(1)–Re(1)–C(3)	99.3(4)	S(3)–Fe(3)–S(4)	83.9(1)	Re(2)–Fe(3)–C(31)	146.9(4)
S(2)–Re(1)–C(3)	146.7(3)	C(1)–Re(1)–C(3)	61.6(5)	S(3)–Fe(3)–C(31)	103.4(4)	S(4)–Fe(3)–C(31)	102.3(4)
C(2)–Re(1)–C(3)	36.8(5)	Fe(1)–Re(1)–C(4)	135.9(3)	Re(2)–Fe(3)–C(32)	103.9(4)	S(3)–Fe(3)–C(32)	87.0(4)
Fe(2)–Re(1)–C(4)	141.8(4)	S(1)–Re(1)–C(4)	121.6(4)	S(4)–Fe(3)–C(32)	158.2(4)	C(31)–Fe(3)–C(32)	99.0(6)
S(2)–Re(1)–C(4)	157.2(4)	C(1)–Re(1)–C(4)	60.2(5)	Re(2)–Fe(3)–C(33)	103.6(4)	S(3)–Fe(3)–C(33)	157.7(4)
C(2)–Re(1)–C(4)	59.2(5)	C(3)–Re(1)–C(4)	35.1(4)	S(4)–Fe(3)–C(33)	88.3(5)	C(31)–Fe(3)–C(33)	98.7(5)
Fe(1)–Re(1)–C(5)	137.1(4)	Fe(2)–Re(1)–C(5)	138.3(3)	C(32)–Fe(3)–C(33)	92.8(6)	Re(2)–Fe(4)–S(3)	55.4(1)
S(1)–Re(1)–C(5)	160.5(4)	S(2)–Re(1)–C(5)	118.7(4)	Re(2)–Fe(4)–S(4)	55.4(1)	S(3)–Fe(4)–S(4)	83.4(1)
C(1)–Re(1)–C(5)	37.3(5)	C(2)–Re(1)–C(5)	63.0(5)	Re(2)–Fe(4)–C(41)	138.4(4)	S(3)–Fe(4)–C(41)	95.8(5)
C(3)–Re(1)–C(5)	64.0(5)	C(4)–Re(1)–C(5)	38.9(6)	S(4)–Fe(4)–C(41)	95.9(4)	Re(2)–Fe(4)–C(42)	112.2(4)
Fe(1)–Re(1)–C(24)	135.3(5)	Fe(2)–Re(1)–C(24)	60.0(5)	S(3)–Fe(4)–C(42)	167.6(4)	S(4)–Fe(4)–C(42)	89.8(4)
S(1)–Re(1)–C(24)	95.6(6)	S(2)–Re(1)–C(24)	97.2(5)	C(41)–Fe(4)–C(42)	95.2(6)	Re(2)–Fe(4)–C(43)	110.9(4)
C(1)–Re(1)–C(24)	119.0(6)	C(2)–Re(1)–C(24)	143.5(6)	S(3)–Fe(4)–C(43)	90.3(4)	S(4)–Fe(4)–C(43)	166.1(4)
C(3)–Re(1)–C(24)	115.8(6)	C(4)–Re(1)–C(24)	85.6(6)	C(41)–Fe(4)–C(43)	97.1(5)	C(42)–Fe(4)–C(43)	94.0(6)
C(5)–Re(1)–C(24)	83.9(6)	Fe(3)–Re(2)–Fe(4)	75.2(1)	Re(2)–Fe(4)–C(44)	43.2(3)	S(3)–Fe(4)–C(44)	86.0(4)
Fe(3)–Re(2)–S(3)	52.4(1)	Fe(4)–Re(2)–S(3)	53.4(1)	S(4)–Fe(4)–C(44)	84.6(3)	C(41)–Fe(4)–C(44)	178.1(5)
Fe(3)–Re(2)–S(4)	52.6(1)	Fe(4)–Re(2)–S(4)	53.1(1)	C(42)–Fe(4)–C(44)	83.0(6)	C(43)–Fe(4)–C(44)	82.6(5)
S(3)–Re(2)–S(4)	80.7(1)	Fe(3)–Re(2)–C(6)	80.8(3)	Re(1)–S(1)–Fe(1)	72.7(1)	Re(1)–S(1)–Fe(2)	71.4(1)
Fe(4)–Re(2)–C(6)	156.0(3)	S(3)–Re(2)–C(6)	110.4(4)	Fe(1)–S(1)–Fe(2)	93.6(1)	Re(1)–S(2)–Fe(1)	72.5(1)
S(4)–Re(2)–C(6)	111.3(3)	Fe(3)–Re(2)–C(7)	99.6(4)	Re(1)–S(2)–Fe(2)	71.0(1)	Fe(1)–S(2)–Fe(2)	93.3(1)
Fe(4)–Re(2)–C(7)	148.7(4)	S(3)–Re(2)–C(7)	98.6(4)	Re(2)–S(3)–Fe(3)	72.6(1)	Re(2)–S(3)–Fe(4)	71.2(1)
S(4)–Re(2)–C(7)	145.4(4)	C(6)–Re(2)–C(7)	36.3(5)	Fe(3)–S(3)–Fe(4)	93.4(1)	Re(2)–S(4)–Fe(3)	72.4(1)
Fe(3)–Re(2)–C(8)	135.4(3)	Fe(4)–Re(2)–C(8)	142.2(3)	Re(2)–S(4)–Fe(4)	71.5(1)	Fe(3)–S(4)–Fe(4)	93.4(1)
S(3)–Re(2)–C(8)	121.4(4)	S(4)–Re(2)–C(8)	157.4(4)	Re(1)–C(1)–C(2)	72.9(9)	Re(1)–C(1)–C(5)	70.8(9)
C(6)–Re(2)–C(8)	59.3(4)	C(7)–Re(2)–C(8)	36.1(5)	C(2)–C(1)–C(5)	111.3(14)	Re(1)–C(2)–C(1)	70.4(8)
Fe(3)–Re(2)–C(9)	136.6(3)	Fe(4)–Re(2)–C(9)	139.2(4)	Re(1)–C(2)–C(3)	70.1(8)	C(1)–C(2)–C(3)	107.4(11)
S(3)–Re(2)–C(9)	159.9(4)	S(4)–Re(2)–C(9)	119.2(4)	Re(1)–C(3)–C(2)	73.1(8)	Re(1)–C(3)–C(4)	69.7(7)
C(6)–Re(2)–C(9)	62.3(5)	C(7)–Re(2)–C(9)	64.0(6)	C(2)–C(3)–C(4)	105.8(12)	Re(1)–C(4)–C(3)	75.2(7)
C(8)–Re(2)–C(9)	38.5(5)	Fe(3)–Re(2)–C(10)	99.7(3)	Re(1)–C(4)–C(5)	72.7(7)	C(3)–C(4)–C(5)	115.8(12)
Fe(4)–Re(2)–C(10)	149.2(4)	S(3)–Re(2)–C(10)	144.9(4)	Re(1)–C(5)–C(1)	71.9(8)	Re(1)–C(5)–C(4)	68.4(7)
Fe(4)–Re(2)–C(44)	61.6(4)	S(3)–Re(2)–C(44)	98.5(4)	C(1)–C(5)–C(4)	99.7(11)	Re(2)–C(6)–C(7)	71.2(7)
S(4)–Re(2)–C(44)	96.5(4)	C(6)–Re(2)–C(44)	142.3(5)	Re(2)–C(6)–C(10)	70.2(7)	C(7)–C(6)–C(10)	109.1(12)
C(7)–Re(2)–C(44)	117.6(5)	C(8)–Re(2)–C(44)	85.3(5)	Re(2)–C(7)–C(6)	72.4(8)	Re(2)–C(7)–C(8)	69.4(8)
C(9)–Re(2)–C(44)	82.3(5)	C(10)–Re(2)–C(44)	116.2(5)	C(8)–C(9)–C(10)	100.2(13)	Re(2)–C(10)–C(6)	73.2(7)
Re(1)–Fe(1)–S(1)	54.8(1)	Re(1)–Fe(1)–S(2)	55.1(1)	Re(2)–C(10)–C(9)	73.1(7)	C(6)–C(10)–C(9)	111.4(13)
S(1)–Fe(1)–S(2)	83.8(1)	Re(1)–Fe(1)–C(11)	145.0(4)	Fe(1)–C(11)–O(11)	177.9(11)	Fe(1)–C(12)–O(12)	180.0(16)
S(1)–Fe(1)–C(11)	101.4(5)	S(2)–Fe(1)–C(11)	101.6(4)	Fe(1)–C(13)–O(13)	177.3(12)	Fe(2)–C(21)–O(21)	178.1(10)
Re(1)–Fe(1)–C(12)	105.1(4)	S(1)–Fe(1)–C(12)	158.9(4)	Fe(2)–C(22)–O(22)	177.4(12)	Fe(2)–C(23)–O(23)	178.3(14)
S(2)–Fe(1)–C(12)	88.7(4)	C(11)–Fe(1)–C(12)	99.4(6)	Re(1)–C(24)–Fe(2)	78.3(5)	Re(1)–C(24)–O(24)	160.2(14)
Re(1)–Fe(1)–C(13)	104.8(4)	S(1)–Fe(1)–C(13)	88.6(4)	Fe(2)–C(24)–O(24)	120.8(11)	Fe(3)–C(31)–O(31)	178.9(11)
S(2)–Fe(1)–C(13)	159.0(4)	C(11)–Fe(1)–C(13)	99.1(5)	Fe(3)–C(32)–O(32)	176.5(13)	Fe(3)–C(33)–O(33)	177.9(12)
C(12)–Fe(1)–C(13)	91.5(6)	Re(1)–Fe(2)–S(1)	55.4(1)	Fe(4)–C(41)–O(41)	179.8(15)	Fe(4)–C(42)–O(42)	176.6(12)
Re(1)–Fe(2)–S(2)	55.6(1)	S(1)–Fe(2)–S(2)	83.5(1)	Fe(4)–C(43)–O(43)	179.0(9)	Re(2)–C(44)–Fe(4)	75.2(5)
Re(1)–Fe(2)–C(21)	109.8(4)	S(1)–Fe(2)–C(21)	89.3(4)	Re(2)–C(44)–O(44)	162.6(11)	Fe(4)–C(44)–O(44)	122.1(9)
S(2)–Fe(2)–C(21)	165.3(4)	Re(1)–Fe(2)–C(22)	138.9(4)				

also by interaction of $S_2Fe_2(CO)_6$ (**I**) with $(Ph_3P)_2Pt(C_2H_4)$ [5] or with $(Ph_3P)_4Pt$ (in the presence of methyl iodide, which scavenges the triphenylphosphine eliminated) [3]:

$$\left.\begin{array}{l} S_2Fe_3(CO)_9 + (Ph_3P)_2PtCl_2 \\ S_2Fe_2(CO)_6^{2-} + (Ph_3P)_2PtCl_2 \\ S_2Fe_2(CO)_6 + (Ph_3P)_2Pt(C_2H_4) \\ S_2Fe_2(CO)_6 + (Ph_3P)_4Pt + MeI \end{array}\right\} \longrightarrow$$



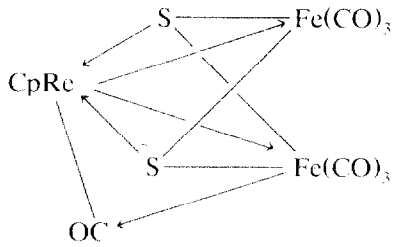
(**II**)

The structure of **II** was solved by X-ray analysis (Fig. 1, Tables 1 and 2). It was found to be similar to the Pd-containing cluster [2]. Pt^{II} and Pd^{II} ions have a typical square-planar ligand environment with practically the same M–S bond lengths (Pt–$S_{av.}$ 2.33(1), Pd–$S_{av.}$ 2.32(1) Å [2]), although Pt–P bonds (mean 2.29(1) Å) are slightly shorter than Pd–P bonds (mean 2.33(1) Å [2]). Geometry of the $S_2Fe_2(CO)_6$ fragment is practically the same in both clusters (in **II**, Fe–$Fe_{av.}$ and Fe–$S_{av.}$ bond lengths are 2.496(7) and 2.29(1) Å respectively for 4 independent molecules in the cell). Pt···Fe distances are more than 3.3 Å and are evidently nonbonding. The transmetallation reaction gives along with **II** a more soluble black-brown crystalline product, probably $(Ph_3P)(CO)PtS_2Fe_2(CO)_6$. Its IR spectrum, in comparison with that of **II** has less intense bands of phenyl groups in the region of 680 and 730 cm^{-1}, and also a supplementary ν(CO) band at 2055 cm^{-1}. However, the yield of this substance was not sufficient for elemental analysis.

It is possible that transmetallation of $S_2Fe_3(CO)_9$ begins with coordination of $(Ph_3P)_2PtCl_2$ to the μ_3-S bridge, by analogy with $W(CO)_5$ fragment coordination to the bridge atom in the $(CO)_4W(\mu_3\text{-}S)_2Fe_2(CO)_6$ cluster [2]. The absence of reaction between $(Ph_3P)_2PtCl_2$ and $(\mu_3\text{-}NPh)_2Fe_3(CO)_9$ [6] even in boiling toluene or in THF under UV-irradiation could be explained by the impossibility of $(Ph_3P)_2PtCl_2$ coordination with phenylnitrene bridges, as they have no lone pairs. The absence of direct Pt–Fe bonds in **II** is in accordance with the stable 16e configuration of Pt^{II} in the square-planar ligand environment. It means that the $S_2Fe_2(CO)_6$ fragment plays the role of a 2e donor with retention of the Fe–Fe bond.

Another situation arises in the reaction of $S_2Fe_2(CO)_6$ (**I**) with $CpRe(CO)_2(THF)$ (generated under UV light) which gives the $CpRe(\mu\text{-}CO)(\mu_3\text{-}S)_2Fe_2(CO)_6$ (**III**) cluster (Fig. 2, Tables 3 and 4):

$$CpRe(CO)_3 \xrightarrow[h\nu,7\ h]{THF} CpRe(CO)_2(thf) \xrightarrow[THF,20°C]{S_2Fe_2(CO)_6}$$



(**III**)

At the elimination of the CO and tetrahydrofuran molecules the 4e deficient CpRe(CO) fragment formally arises. This deficit is compensated by coordination of I as a 4e donor with breaking of the Fe–Fe bond and with formation of two Re–S (mean 2.344(3) Å) and two Re–Fe bonds (mean 2.712(2) Å). In addition the semibridge carbonyl group appears between the Re atom and one of the Fe atoms, showing a band at 1840 cm^{-1} in IR spectrum. The Fe_2S_2 cycle is nearly planar having a dihedral angle of 153.3° between Fe_2S planes. This angle is close to 156° for the previously studied $Me_5C_5Co(\mu_3\text{-}S)_2Fe_2(CO)_6$ cluster, whose MO calculation corresponds to formation of S → Co and Co → Fe bonds [3]. Probably the same type of bonding occurs for **III** with formation of S → Re and Re → Fe bonds being supplemented by dative Fe–CO_{bridge} interaction. This new type of coordination of $S_2Fe_2(CO)_6$ (as a formal 6e donor) contrasts to the earlier observed type in the $CpV(O)(\mu_3\text{-}S)_2Fe_2(CO)_6$ cluster, which retains as a Fe–Fe bond and contains two Fe → V bonds [2].

TABLE 5. Crystallographic data for the clusters $(Ph_3P)_2Pt(\mu_3\text{-}S)_2Fe_2(CO)_6$ (**II**) and $CpRe(\mu\text{-}CO)(\mu_3\text{-}S)_2Fe_2(CO)_4$ (**III**)

	II	**III**
Crystal system	monoclinic	triclinic
Space group	$P2_1/c$	$P\bar{1}$
a (Å)	24.885(9)	9.272(2)
b (Å)	19.770(8)	9.452(3)
c (Å)	34.085(12)	19.936(7)
α (°)		80.45(2)
β (°)	90.55(1)	89.63(3)
γ (°)		74.43(2)
V (Å^3)	16768(18)	1658.4(1.2)
Z	16	4
Number of reflections measured	10897	6895
Number of independent reflections with		
$I > 6\sigma(I)$	8564	
$I > 2\sigma(I)$		4525
R	0.080	0.043
R_w	0.077	0.043

3. Experimental details

All operations connected with syntheses of both initial and final products were performed in a flow of pure dry argon in absolute solvents. The initial complexes $(NPh)_2Fe_3(CO)_9$ [6], $S_2Fe_2(CO)_6$, $S_2Fe_3(CO)_9$ [7] and $CpRe(CO)_3$ [8] were synthesized by published procedures. The IR spectra were recorded in KBr

TABLE 6. Atomic coordinates ($\times 10^4$) for the cluster $(Ph_3P)_2Pt(\mu_3\text{-}S)_2Fe_2(CO)_6$ (II)

Atom	x	y	z	Atom	x	y	z
Pt(1)	1896(1)	3151(1)	4912(1)	C(13)	788(17)	1342(16)	4482(9)
Pt(2)	5505(1)	1866(1)	2656(1)	C(21)	1094(12)	2615(16)	5763(9)
Pt(3)	−3056(1)	1850(1)	5066(1)	C(22)	142(14)	2549(18)	5336(10)
Pt(4)	593(1)	510(1)	2449(1)	C(23)	713(12)	1425(16)	5375(9)
Fe(1)	892(2)	2221(3)	4558(1)	C(31)	6653(17)	335(21)	3347(14)
Fe(2)	822(2)	2301(3)	5283(1)	C(32)	6077(14)	1369(15)	3581(11)
Fe(3)	6487(2)	1168(3)	3186(2)	C(33)	7098(17)	1596(16)	3359(10)
Fe(4)	6635(2)	998(3)	2468(2)	C(41)	6458(14)	1135(22)	1984(13)
Fe(5)	−4104(2)	2765(3)	4727(2)	C(42)	7340(14)	1182(17)	2420(15)
Fe(6)	−4149(2)	2609(3)	5456(2)	C(43)	6763(15)	135(19)	2454(12)
Fe(7)	1650(2)	1325(3)	2058(2)	C(51)	−3754(14)	2796(17)	4310(12)
Fe(8)	1650(2)	1359(3)	2790(2)	C(52)	−4321(15)	3609(16)	4758(12)
S(1)	968(3)	3222(5)	4893(3)	C(53)	−4719(14)	2434(26)	4613(10)
S(2)	1607(3)	2040(5)	4977(3)	C(61)	−4809(15)	2398(19)	5472(9)
S(3)	5838(4)	760(5)	2771(3)	C(62)	−4261(16)	3405(20)	5611(11)
S(4)	6424(3)	2011(4)	2747(3)	C(63)	−3940(22)	2207(24)	5886(13)
S(5)	−3376(4)	2945(5)	5134(3)	C(71)	2325(16)	1120(25)	1969(12)
S(6)	−3980(4)	1751(5)	5028(3)	C(72)	1370(18)	1003(19)	1633(10)
S(7)	909(3)	1641(5)	2411(3)	C(73)	1752(18)	2138(22)	2000(18)
S(8)	1523(3)	386(5)	2448(3)	C(81)	1773(12)	2287(18)	2904(9)
P(1)	2782(4)	2820(5)	2954(3)	C(82)	1364(13)	1137(18)	3251(10)
P(2)	2044(4)	4279(5)	4834(3)	C(83)	2349(13)	1059(22)	2895(13)
P(3)	4627(4)	1476(5)	2606(3)	C(101)	2980(12)	2278(15)	4563(9)
P(4)	5343(4)	3003(4)	2563(2)	C(102)	3538(16)	2161(20)	4469(12)
P(5)	−2177(4)	2230(5)	5131(3)	C(103)	3704(15)	1817(21)	4160(12)
P(6)	−2901(4)	718(5)	5039(3)	C(104)	3299(15)	1506(19)	3889(11)
P(7)	433(4)	−609(5)	2484(3)	C(105)	2764(14)	1623(18)	3990(10)
P(8)	−282(3)	851(5)	2418(3)	C(106)	2589(13)	2017(17)	4297(10)
O(11)	1418(10)	2502(16)	3838(6)	C(107)	2863(13)	2291(17)	5428(9)
O(12)	−201(10)	2609(21)	4379(8)	C(108)	2547(12)	2473(16)	5707(9)
O(13)	689(12)	808(12)	4436(8)	C(109)	2656(16)	2148(21)	6069(12)
O(21)	1271(12)	2692(16)	6058(7)	C(110)	3013(17)	1613(22)	6121(12)
O(22)	−311(9)	2712(10)	5348(6)	C(111)	3280(17)	1397(22)	5754(14)
O(23)	604(10)	881(15)	5432(8)	C(112)	3200(15)	1771(20)	5415(11)
O(31)	6776(18)	−239(19)	3424(12)	C(113)	3318(15)	3403(19)	5046(11)
O(32)	5827(12)	1471(18)	3860(7)	C(114)	3541(15)	3760(19)	4654(11)
O(33)	7476(10)	1861(16)	3446(8)	C(115)	3957(18)	4243(23)	4689(13)
O(41)	6332(11)	1339(17)	1666(7)	C(116)	4239(19)	4266(26)	5134(15)
O(42)	7764(10)	1376(15)	2420(10)	C(117)	4045(18)	3909(24)	5442(13)
O(43)	6867(14)	−403(16)	2423(13)	C(118)	3590(17)	3455(22)	5385(12)
O(51)	−3585(10)	2845(15)	3987(8)	C(201)	2443(15)	4497(22)	4364(11)
O(52)	−4442(12)	4162(14)	4753(12)	C(202)	2618(19)	5264(26)	4328(14)
O(53)	−5128(11)	2176(21)	4475(10)	C(203)	2870(19)	5184(26)	3880(15)
O(61)	−5273(11)	2236(15)	5444(8)	C(204)	2873(20)	4640(30)	3659(15)
O(42)	−4318(14)	3954(17)	5750(10)	C(205)	2652(21)	4053(29)	3739(16)
O(63)	−3801(12)	1929(20)	6180(8)	C(206)	2393(16)	3952(21)	4116(12)
O(71)	2755(10)	918(22)	1907(8)	C(207)	1455(14)	4769(19)	4783(11)
O(72)	1210(11)	838(16)	1323(9)	C(208)	1156(18)	4732(23)	4375(13)
O(73)	1846(11)	2689(14)	1919(8)	C(209)	672(20)	5103(26)	4336(14)
O(81)	1862(12)	2802(13)	2960(8)	C(210)	494(15)	5512(20)	4659(12)
O(82)	1132(9)	1013(12)	3520(7)	C(211)	690(21)	5425(26)	5082(15)
O(83)	2770(10)	922(15)	2937(9)	C(212)	1225(17)	5097(22)	5040(12)
C(11)	1202(16)	2410(16)	4142(12)	C(213)	2377(11)	4677(15)	5242(8)
C(12)	227(14)	2394(27)	4471(13)	C(214)	2223(15)	4425(21)	5618(12)

TABLE 6. (continued)

Atom	x	y	z	Atom	x	y	z
C(215)	2514(25)	4747(32)	5977(17)	C(517)	−1324(17)	3312(23)	4321(14)
C(216)	2909(17)	5213(23)	5964(13)	C(518)	−1421(16)	3002(21)	4663(12)
C(217)	3040(21)	5383(27)	5616(17)	C(601)	−3483(13)	163(17)	4963(10)
C(218)	2845(16)	5039(21)	5217(12)	C(602)	−3735(15)	−255(19)	5174(11)
C(301)	4560(14)	981(18)	2146(10)	C(603)	−4206(12)	575(15)	5095(9)
C(302)	4984(15)	795(19)	1942(11)	C(604)	−4509(20)	−508(26)	4834(15)
C(303)	4937(17)	416(21)	1568(12)	C(605)	−4256(14)	3(18)	4487(10)
C(304)	4423(19)	288(23)	1401(13)	C(606)	−3760(17)	355(21)	4554(12)
C(305)	3965(23)	472(29)	1634(18)	C(607)	−2636(13)	428(16)	5497(9)
C(306)	4015(18)	785(23)	2000(14)	C(608)	−2149(13)	106(17)	5516(10)
C(307)	4510(12)	893(16)	3044(9)	C(609)	−1917(17)	−6(22)	5943(13)
C(308)	4716(13)	1102(18)	3372(10)	C(610)	−2260(18)	140(22)	6248(12)
C(309)	4641(14)	710(19)	3728(10)	C(611)	−2742(16)	429(21)	6233(11)
C(310)	4338(16)	119(22)	3666(12)	C(612)	−2928(14)	637(18)	5818(10)
C(311)	4094(15)	−86(20)	3302(12)	C(613)	−2447(12)	393(16)	4642(9)
C(312)	4180(13)	352(17)	2969(10)	C(614)	−2329(14)	−294(18)	4638(10)
C(313)	4027(13)	2060(18)	2591(11)	C(615)	−2018(17)	−506(22)	4305(13)
C(314)	3858(21)	2354(26)	2296(15)	C(616)	−1832(21)	−156(29)	4015(16)
C(315)	3431(19)	2818(23)	2304(13)	C(617)	−2004(19)	569(27)	4015(14)
C(316)	3169(16)	2902(21)	2603(13)	C(618)	−2325(14)	808(19)	4329(11)
C(317)	3349(17)	2523(23)	2952(13)	C(701)	36(12)	−890(17)	2902(9)
C(318)	3802(14)	2139(18)	2960(10)	C(702)	−177(16)	−1567(21)	2921(12)
C(401)	5045(13)	3223(20)	2099(10)	C(703)	−480(15)	−1750(20)	3249(11)
C(402)	4983(14)	2698(19)	1824(11)	C(704)	−556(16)	−1277(23)	3541(12)
C(403)	4751(21)	2863(28)	1418(16)	C(705)	−330(17)	−625(23)	3567(12)
C(404)	4595(17)	3534(25)	1374(13)	C(706)	−26(17)	−397(23)	3202(13)
C(405)	4631(18)	4110(25)	1671(14)	C(707)	133(17)	−924(21)	2004(12)
C(406)	4850(16)	3897(21)	2050(12)	C(708)	431(18)	−665(24)	1673(14)
C(407)	5954(15)	3354(20)	2534(11)	C(709)	141(20)	−874(25)	1312(14)
C(408)	6103(19)	3909(24)	2812(13)	C(710)	−317(18)	−1303(22)	1294(13)
C(409)	6666(23)	4146(28)	2828(16)	C(711)	−582(17)	−1512(22)	1643(13)
C(410)	6922(22)	4056(28)	2539(18)	C(712)	−377(16)	−1331(21)	2016(12)
C(411)	6783(21)	3825(26)	2196(16)	C(713)	1041(15)	−1086(19)	2560(11)
C(412)	6277(20)	3426(25)	2210(14)	C(714)	1230(15)	−1621(19)	2244(11)
C(413)	4946(16)	3300(22)	2968(12)	C(715)	1703(14)	−1995(17)	2311(10)
C(414)	4479(14)	3768(18)	2873(10)	C(716)	1946(18)	−1891(26)	2762(14)
C(415)	4194(25)	3934(33)	3243(21)	C(717)	1786(18)	−1472(25)	2950(13)
C(416)	4358(24)	3759(30)	3598(18)	C(718)	1306(16)	−1078(20)	2931(11)
C(417)	4814(25)	3357(32)	3726(18)	C(801)	−343(13)	1437(17)	2014(9)
C(418)	5144(22)	3142(29)	3335(17)	C(802)	−702(14)	1970(19)	2034(10)
C(501)	−2164(16)	2748(20)	5597(11)	C(803)	−799(16)	2381(21)	1639(12)
C(502)	−1763(16)	3235(22)	5618(11)	C(804)	−476(15)	2246(20)	1320(11)
C(503)	−1733(19)	3566(25)	6037(15)	C(805)	−109(16)	1644(21)	1302(12)
C(504)	−2057(23)	3364(29)	6298(16)	C(806)	−39(12)	1342(16)	1682(10)
C(505)	−2416(20)	2872(26)	6238(15)	C(807)	−505(12)	1249(16)	2844(9)
C(506)	−2484(14)	2566(18)	5889(11)	C(808)	−1048(14)	1410(18)	2948(11)
C(507)	−1582(17)	1663(22)	5235(14)	C(809)	−1171(15)	1743(20)	3286(12)
C(508)	−1426(23)	1577(28)	5575(17)	C(810)	−786(19)	2025(24)	3513(13)
C(509)	−862(22)	1016(29)	5550(17)	C(811)	−233(19)	1941(26)	3428(14)
C(510)	−786(17)	840(23)	5193(15)	C(812)	−86(14)	1558(19)	3129(11)
C(511)	−882(39)	985(50)	4741(29)	C(813)	−847(14)	338(18)	2308(10)
C(512)	−1375(21)	1396(26)	4869(16)	C(814)	−1090(18)	−100(23)	2623(13)
C(513)	−1997(16)	2743(20)	4697(11)	C(815)	−1537(13)	−520(18)	2581(10)
C(514)	−2375(16)	2877(20)	4435(12)	C(816)	−1725(18)	−497(24)	2205(14)
C(515)	−2246(19)	3219(25)	4046(13)	C(817)	−1527(19)	−198(25)	1885(14)
C(516)	−1692(21)	3453(25)	4023(14)	C(818)	−1052(13)	313(17)	1931(10)

pellets with a Specord 75 IR instrument. The X-ray diffraction data for **II** (at 20°C) and **III** (at −100°C) were collected with Syntex $P2_1$ and Siemens P3/PC automatic diffractometers, respectively (λ(Mo-Kα), θ–2θ scan, $2\theta_{max}$ 60°). Crystallographic data are listed in Table 5. The structures were solved by the direct method and refined in full-matrix anisotropic approximation for all non-hydrogen atoms. Atomic coordinates are listed in Tables 6 and 7. All calculations were performed with the Siemens SHELXTL PLUS program package (PC version).

TABLE 7. Atomic coordinates ($\times 10^4$) and equivalent isotropic displacement coefficients ($Å^2 \times 10^3$) for the cluster $CpRe(\mu\text{-}CO)(\mu_3\text{-}S)_2Fe_2(CO)_6$ (**III**)

Atom	x	y	z	U_{eq} [a]
Re(1)	−2679(1)	10737(1)	9201(1)	19(1)
Re(2)	−2295(1)	9223(1)	4302(1)	19(1)
Fe(1)	−3086(2)	12398(2)	7921(1)	20(1)
Fe(2)	−2130(2)	8714(2)	8359(1)	19(1)
Fe(3)	−1929(2)	7639(2)	3258(1)	20(1)
Fe(4)	−2847(2)	11303(2)	3165(1)	17(1)
S(1)	−4261(3)	10616(3)	8314(1)	19(1)
S(2)	−974(3)	10582(3)	8319(1)	19(1)
S(3)	−4013(3)	9445(3)	3408(1)	19(1)
S(4)	−727(3)	9388(3)	3385(1)	19(1)
O(11)	−3055(10)	12326(11)	6446(4)	35(4)
O(12)	−1408(11)	14614(10)	7951(5)	38(4)
O(13)	−5942(11)	14672(10)	7965(5)	39(4)
O(21)	−3929(12)	6589(10)	8717(6)	46(4)
O(22)	−2157(11)	8618(11)	6897(5)	40(4)
O(23)	746(12)	6426(11)	8710(6)	50(4)
O(24)	−1811(12)	7531(9)	9983(4)	40(4)
O(31)	−1948(11)	7710(10)	1773(5)	36(4)
O(32)	−3694(11)	5507(10)	3668(5)	39(4)
O(33)	913(12)	5349(10)	3645(5)	42(4)
O(41)	−2915(11)	11426(11)	1686(5)	39(4)
O(42)	−1011(12)	13409(10)	3124(6)	45(4)
O(43)	−5738(11)	13549(10)	3225(5)	38(4)
O(44)	−3034(11)	12392(10)	4634(5)	37(4)
C(1)	−1864(17)	12303(15)	9776(7)	35(6)
C(2)	−3356(17)	13103(15)	9493(7)	36(6)
C(3)	−4380(16)	12258(13)	9785(6)	29(5)
C(4)	−3528(16)	11075(13)	10221(6)	31(5)
C(5)	−1885(19)	10950(16)	10249(6)	38(6)
C(6)	−1701(16)	6845(13)	4925(6)	30(5)
C(7)	−3156(19)	7645(15)	5102(7)	42(6)
C(8)	−2910(16)	8826(12)	5384(5)	26(5)
C(9)	−1312(17)	8879(15)	5395(5)	38(6)
C(10)	−622(17)	7601(14)	5081(6)	35(5)
C(11)	−3056(14)	12326(14)	7019(6)	26(5)
C(22)	−2120(15)	8671(13)	7462(6)	28(5)
C(23)	−344(16)	7319(13)	8575(7)	31(5)
C(24)	−2201(18)	8745(16)	9552(8)	51(7)
C(31)	−1942(14)	7697(13)	2343(7)	23(5)
C(32)	−3014(16)	6332(13)	3488(7)	29(5)
C(33)	−168(16)	6225(14)	3484(6)	28(5)
C(41)	−2891(16)	11379(13)	2258(6)	28(5)
C(42)	−1740(15)	12620(14)	3155(7)	28(5)
C(43)	−4616(15)	12688(12)	3205(6)	24(5)
C(44)	−2758(15)	11271(14)	4396(7)	34(5)

[a] Equivalent isotropic U defined as one third of the trace of the orthogonalized U_{ij} tensor.

3.1. $(Ph_3P)_2Pt(\mu_3\text{-}S)_2Fe_2(CO)_6$ (II)

A solution of 0.32 g (0.40 mmol) of $(Ph_3P)_2PtCl_2$ in 20 ml CH_2Cl_2 and 15 ml toluene was doubly concentrated *in vacuo*, until precipitation began. 0.20 g (0.40 mmol) of $S_2Fe_3(CO)_9$ was then added and the mixture was heated at 95°C for 10 h. The solution was filtered and the black solid deposited on the flask and chromatographed on SiO_2. The unreacted $S_2Fe_3(CO)_9$ and the brown band (A) were eluted by benzene/heptane 1:3 mixture. The orange band (B) was then eluted by benzene. The solution of (B) gave on cooling thin orange needles **II** insoluble in heptane. Single crystals for X-ray structural analysis were obtained by crystallization from CH_2Cl_2/ether/heptane mixture. Yield 0.05 g (11.5%). IR spectra (ν, cm^{-1}): 510s, 530w, 560s, 605m, 680w, 730m, 990vw, 1050vw, 1080m, 1145vw, 1170vw, 1420m, 1465w, 1935vs, 1960vs, 1990vs, 2030vs.

The solution of (A) was concentrated *in vacuo* and after cooling black crystalline needles were formed. These are easily soluble even in pentane but the quantity of crystals was not sufficient for elemental analysis. IR spectra (ν, cm^{-1}): 505s, 560w, 680s, 733m, 990m, 1075m, 1150vw, 1175vw, 1420m, 1469m, 1940–2020vs multiplet, 2055vs.

3.2. $CpRe(\mu\text{-}CO)(\mu_3\text{-}S)_2Fe_2(CO)_6$ (III)

The colourless solution of 0.46 g (1.37 mmol) of $CpRe(CO)_3$ in 25 ml of THF was irradiated by UV light (PRK-4 lamp) in a quartz Schlenk vessel at room temperature for 7 h. 0.24 g (0.70 mmol) of $S_2Fe_2(CO)_6$ was added to the yellow solution of $CpRe(CO)_2(THF)$ and the mixture was stirred at 20°C without UV-irradiation. After 12 h $S_2Fe_2(CO)_6$ disappeared (TLC data) and the solution was a brown colour. The mixture was evaporated to dryness *in vacuo* and the precipitate was extracted by hexane. The solution was concentrated and after cooling black-brown rhombic crystals of **III** were formed (yield 0.18 g, 41.2%). IR spectra (ν, cm^{-1}): 425m, 455s, 480vw, 492vw, 540vs, 590vs, 825m, 835vw, 1005w, 1050w, 1400w, 1840vs, 1952–2068vs multiplet, 3080 wbr.

Acknowledgments

The authors are indebted to Dr. N.Yu. Kozitsyna and Mr. Yu.V. Torubaev for syntheses of $(Ph_3P)_2PtCl_2$ and $(PhN)_2Fe_3(CO)_9$, respectively.

References

1 C.H. Wei and L.F. Dahl, *Inorg. Chem.*, 4 (1965) 1.
2 A.A. Pasynskii, B.I. Kolobkov, I.L. Eremenko, S.E. Nefedov, S.B. Katser and M.A. Porai-Koshits, *Zhur. Neorg. Khim.*, *36* (1992) 563.
3 M. Cowie, R.L. De Kock, T.R. Wagenmaker, D. Seyferth, R.S. Henderson and M.K. Gallagher, *Organometallics*, *8* (1989) 119.
4 D. Seyferth, R.S. Henderson and L.-C. Song, *Organometallics*, *1* (1982) 125.
5 D.A. Lesch and T.B. Rauchfuss, *J. Organomet. Chem.*, *199* (1980) C6.
6 M.I. Bruce, M.G. Humphrey, O. bin Shawkataly, M.R. Snow and R.T. Tiekink, *J. Organomet. Chem.*, *336* (1987) 199.
7 H. Hieber and J. Gruber, *Z. Anorg. Allg. Chem.*, *296* (1958) 91.
8 M.L.H. Green and G. Wilkinson, *J. Chem. Soc.*, (1958) 4314.