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cis-Dichloridobis(methoxydiphenylphosphino)platinum(II)

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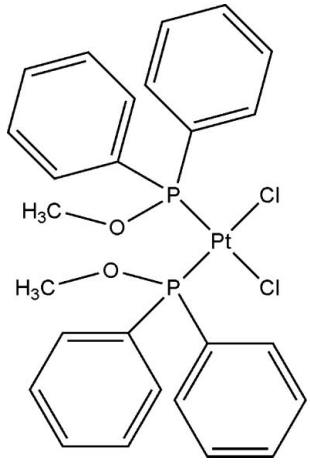
Key indicators: single-crystal X-ray study; T = 125 K; mean σ(C–C) = 0.006 Å; R factor = 0.041; wR factor = 0.062; data-to-parameter ratio = 19.5.

The title compound, $[PtCl_2(C_{13}H_{13}OP)_2]$, adopts a *cis*-square-planar geometry. Molecules are linked by C—H···Cl and C—H···π(arene) interactions.

Related literature

For related literature on $PtCl_2L_2$ complexes, see: Bao *et al.* (1987); Fun *et al.* (2006); Slawin *et al.* (2007).



Experimental

Crystal data

$[PtCl_2(C_{13}H_{13}OP)_2]$
M_r = 698.43
Monoclinic, $P2_1/n$
a = 12.4262 (6) Å
b = 13.6280 (7) Å
c = 15.0494 (8) Å
β = 93.5316 (11)°
V = 2543.7 (2) Å^3
Z = 4
Mo $K\alpha$ radiation
μ = 5.85 mm^{-1}
T = 125.1 K
0.25 × 0.15 × 0.12 mm

Data collection

Rigaku SCXmini diffractometer
Absorption correction: multi-scan (*ABSCOR*; Higashi, 1995)
T_{min} = 0.377, T_{max} = 0.495
26133 measured reflections
5827 independent reflections
4910 reflections with $F^2 > 2\sigma(F^2)$
R_{int} = 0.057

Refinement

$R[F^2 > 2\sigma(F^2)]$ = 0.041
$wR(F^2)$ = 0.062
S = 1.13
5827 reflections
299 parameters
H-atom parameters constrained
$\Delta\rho_{max}$ = 0.99 e Å^{-3}
$\Delta\rho_{min}$ = −1.02 e Å^{-3}

Table 1
Selected geometric parameters (Å, °).

Pt1—Cl1	2.3693 (12)	Pt1—P1	2.2272 (11)
Pt1—Cl2	2.3533 (12)	Pt1—P2	2.2279 (12)
Cl1—Pt1—Cl2	89.37 (4)	Cl1—Pt1—P2	175.95 (4)
P1—Pt1—P2	98.14 (4)	Cl2—Pt1—P1	168.82 (4)
Cl1—Pt1—P1	83.49 (4)	Cl2—Pt1—P2	89.56 (4)

Table 2
Hydrogen-bond geometry (Å, °).

*Cg*1 and *Cg*2 are the centroids of the C7–C12 and C20–C25 rings.

D—H···*A*	*D*—H	H···*A*	*D*···*A*	*D*—H···*A*
C10—H10···Cl1^{i}	0.95	2.72	3.642 (6)	165
C16—H16···Cl1^{ii}	0.95	2.72	3.518 (5)	143
C4—H4···*Cg*1^{iii}	0.95	2.88	3.692 (5)	145
C19—H19···*Cg*2^{iv}	0.95	2.83	3.641 (4)	144

Symmetry codes: (i) $x+\frac{1}{2}, -y+\frac{1}{2}, z+\frac{1}{2}$; (ii) $-x, -y, -z+2$; (iii) $-x+1, -y, -z+2$; (iv) $-x, -y+1, -z+2$.

Data collection: *SCXmini Software* (Rigaku/MSC, 2006); cell refinement: *PROCESS-AUTO* (Rigaku, 1998); data reduction: *PROCESS-AUTO*; program(s) used to solve structure: *SHELXS97* (Sheldrick, 1997); program(s) used to refine structure: *SHELXL97* (Sheldrick, 1997); molecular graphics: *CrystalStructure* (Rigaku/MSC, 2006); software used to prepare material for publication: *CrystalStructure*.

Supplementary data and figures for this paper are available from the IUCr electronic archives (Reference: GG2017).

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  doi:10.1107/S1600536807031005

supplementary materials

Acta Cryst. (2007). E**63**, m2018 [**doi:10.1107/S1600536807031005**]

cis-Dichloridobis(methoxydiphenylphosphino)platinum(II)

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Comment

The title complex (I) can be compared to similar platinum dichloride complexes containing trimethoxy phosphite; $[PtCl_2(P(OMe)_3)_2]$ (Bao *et al.*, 1987) and triphenyl phosphine $[PtCl_2(PPh_3)_2]$ (Fun *et al.*, 2006). The geometry at the platinum atom in the title compound (I) bears a closer resemblance to the triphenyl phosphine complex and can be compared with $[PtCl_2(P(OMe)_2Ph)_2]$ (Slawin *et al.*, 2007).

Experimental

0.8 g (2.14 mmol) of $PtCl_2$(COD) was dissolved in the minimum volume of dichloromethane in a round-bottomed flask. To this, 0.921 ml (4.28 mmol) of methyldiphenylphosphinite was added. The solution was then stirred for 0.5 h at room temperature. The product was precipitated *via* slow diffusion of hexane and was then filtered off and dried under vacuum, $[PtCl_2(P(OMe)Ph_2)_2]$ (1.93 mmol,*ca* 90%. ^{31}P-{^{1}H} NMR: δ 85.2 p.p.m. *J*{Pt—P} 4183 Hz.

Refinement

All H atoms were included in calculated positions (C—H distances are 0.96 Å for methyl H atoms, 0.97 Å for methylene H atoms and 0.98 Å for methine H atoms) and were refined as riding atoms with U_{iso}(H) = 1.2 U_{eq}(parent atom, methylene and methine H atoms) or U_{iso}(H) = 1.5 U_{eq}(parent atom, methyl H atoms).

Figures

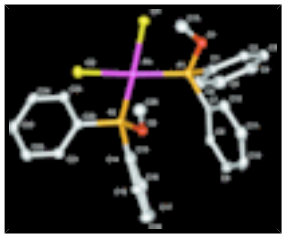


Fig. 1. The structure of (**1**) with displacement ellipsoids drawn at the 50% probability level, H atoms omitted for clarity.

cis-Dichloridobis(methoxydiphenylphosphino)platinum(II)

Crystal data

$[PtCl_2(C_{13}H_{13}OP)_2]$	F_{000} = 1360.00
M_r = 698.43	D_x = 1.824 Mg m^{-3}
Monoclinic, $P2_1/n$	Mo $K\alpha$ radiation λ = 0.71075 Å

Hall symbol: -P 2yn
a = 12.4262 (6) Å
b = 13.6280 (7) Å
c = 15.0494 (8) Å
β = 93.5316 (11)º
V = 2543.7 (2) Å^3
Z = 4

Cell parameters from 23439 reflections
θ = 3.1–27.6º
μ = 5.85 mm^{-1}
T = 125.1 K
Prism, colorless
0.25 × 0.15 × 0.12 mm

Data collection

Rigaku SCXmini diffractometer
Detector resolution: 6.85 pixels mm^{-1}
ω scans
Absorption correction: multi-scan (ABSCOR; Higashi, 1995)
T_{min} = 0.377, T_{max} = 0.495
26133 measured reflections
5827 independent reflections

4910 reflections with $F^2 > 2\sigma(F^2)$
R_{int} = 0.057
θ_{max} = 27.5º
h = −16→16
k = −17→17
l = −19→19

Refinement

Refinement on F^2
$R[F^2 > 2\sigma(F^2)]$ = 0.041
$wR(F^2)$ = 0.062
S = 1.13
5827 reflections
299 parameters

H-atom parameters constrained
$w = 1/[\sigma^2(F_o^2) + (0.0124P)^2 + 7.7753P]$ where $P = (F_o^2 + 2F_c^2)/3$
$(\Delta/\sigma)_{max}$ = 0.002
$\Delta\rho_{max}$ = 0.99 e Å^{-3}
$\Delta\rho_{min}$ = −1.02 e Å^{-3}
Extinction correction: none

Special details

Refinement. Refinement was performed using all reflections. The weighted *R*-factor (*wR*) and goodness of fit (S) are based on F^2. *R*-factor (gt) are based on F. The threshold expression of $F^2 > 2.0$ sigma(F^2) is used only for calculating *R*-factor (gt).

Fractional atomic coordinates and isotropic or equivalent isotropic displacement parameters (Å^2)

	x	*y*	*z*	U_{iso}*/U_{eq}
Pt(1)	0.075336 (15)	0.162861 (13)	0.837844 (12)	0.01364 (4)
Cl(1)	0.10233 (10)	0.03053 (9)	0.73956 (8)	0.0204 (2)
Cl(2)	−0.11089 (10)	0.12977 (9)	0.82742 (9)	0.0229 (2)
P(1)	0.25475 (9)	0.16303 (10)	0.85328 (8)	0.0146 (2)
P(2)	0.04528 (10)	0.29335 (9)	0.92198 (8)	0.0135 (2)
O(1)	0.3161 (2)	0.1781 (2)	0.7644 (2)	0.0205 (7)
O(2)	0.1320 (2)	0.3806 (2)	0.9213 (2)	0.0162 (7)
C(1)	0.3066 (3)	0.0446 (3)	0.8932 (3)	0.0165 (10)
C(2)	0.4104 (4)	0.0170 (3)	0.8755 (3)	0.0229 (11)

C(3)	0.4538 (4)	−0.0690 (3)	0.9111 (3)	0.0261 (12)
C(4)	0.3943 (4)	−0.1272 (3)	0.9644 (3)	0.0277 (12)
C(5)	0.2914 (4)	−0.0996 (3)	0.9842 (3)	0.0285 (12)
C(6)	0.2473 (4)	−0.0138 (3)	0.9477 (3)	0.0238 (11)
C(7)	0.3255 (3)	0.2451 (3)	0.9318 (3)	0.0161 (10)
C(8)	0.3143 (3)	0.2328 (3)	1.0229 (3)	0.0182 (10)
C(9)	0.3715 (4)	0.2924 (3)	1.0838 (3)	0.0267 (12)
C(10)	0.4417 (4)	0.3621 (3)	1.0537 (4)	0.0279 (13)
C(11)	0.4526 (4)	0.3749 (3)	0.9635 (3)	0.0273 (12)
C(12)	0.3945 (3)	0.3163 (3)	0.9024 (3)	0.0219 (11)
C(13)	0.2720 (4)	0.2348 (4)	0.6905 (3)	0.0297 (13)
C(14)	0.0499 (3)	0.2684 (3)	1.0394 (3)	0.0156 (10)
C(15)	0.0338 (3)	0.1735 (3)	1.0697 (3)	0.0221 (11)
C(16)	0.0487 (4)	0.1518 (4)	1.1591 (3)	0.0287 (12)
C(17)	0.0785 (4)	0.2256 (4)	1.2200 (3)	0.0271 (12)
C(18)	0.0940 (4)	0.3196 (4)	1.1909 (3)	0.0267 (12)
C(19)	0.0800 (3)	0.3427 (3)	1.1010 (3)	0.0193 (10)
C(20)	−0.0821 (3)	0.3548 (3)	0.8926 (3)	0.0167 (10)
C(21)	−0.1502 (4)	0.3860 (3)	0.9576 (3)	0.0201 (11)
C(22)	−0.2438 (4)	0.4369 (3)	0.9331 (3)	0.0264 (12)
C(23)	−0.2699 (4)	0.4580 (3)	0.8444 (3)	0.0251 (12)
C(24)	−0.2024 (4)	0.4278 (3)	0.7794 (3)	0.0246 (12)
C(25)	−0.1105 (4)	0.3757 (3)	0.8035 (3)	0.0206 (11)
C(26)	0.1466 (4)	0.4373 (3)	0.8418 (3)	0.0242 (11)
H(30)	0.2260	0.2868	0.7123	0.036*
H(2)	0.4519	0.0571	0.8389	0.028*
H(3)	0.5249	−0.0879	0.8987	0.031*
H(4)	0.4242	−0.1867	0.9877	0.033*
H(5)	0.2513	−0.1389	1.0225	0.034*
H(6)	0.1762	0.0049	0.9602	0.029*
H(31)	0.2291	0.1921	0.6497	0.036*
H(8)	0.2675	0.1836	1.0432	0.022*
H(9)	0.3625	0.2855	1.1458	0.032*
H(10)	0.4828	0.4014	1.0954	0.033*
H(11)	0.4998	0.4239	0.9435	0.033*
H(12)	0.4021	0.3249	0.8405	0.026*
H(33)	0.3308	0.2642	0.6591	0.036*
H(28)	0.2017	0.4061	0.8075	0.029*
H(15)	0.0125	0.1232	1.0285	0.026*
H(16)	0.0387	0.0866	1.1792	0.034*
H(17)	0.0881	0.2107	1.2816	0.033*
H(18)	0.1144	0.3695	1.2326	0.032*
H(19)	0.0906	0.4079	1.0813	0.023*
H(21)	−0.1321	0.3723	1.0186	0.024*
H(22)	−0.2902	0.4575	0.9774	0.032*
H(23)	−0.3341	0.4932	0.8279	0.030*
H(24)	−0.2197	0.4431	0.7187	0.029*
H(25)	−0.0656	0.3535	0.7587	0.025*
H(26)	0.1697	0.5039	0.8585	0.029*

H(27)	0.0784	0.4402	0.8057	0.029*

Atomic displacement parameters (Å^2)

	U^{11}	U^{22}	U^{33}	U^{12}	U^{13}	U^{23}
Pt(1)	0.01313 (9)	0.01225 (9)	0.01551 (9)	0.00037 (9)	0.00053 (6)	−0.00182 (9)
Cl(1)	0.0223 (6)	0.0175 (6)	0.0212 (6)	0.0008 (5)	0.0010 (5)	−0.0066 (4)
Cl(2)	0.0150 (6)	0.0211 (6)	0.0326 (7)	−0.0030 (4)	0.0014 (5)	−0.0064 (5)
P(1)	0.0142 (5)	0.0143 (5)	0.0155 (5)	0.0010 (5)	0.0013 (4)	−0.0010 (5)
P(2)	0.0130 (6)	0.0122 (6)	0.0155 (6)	0.0007 (4)	0.0014 (5)	0.0005 (4)
O(1)	0.0209 (18)	0.024 (2)	0.0172 (17)	0.0041 (15)	0.0050 (14)	0.0029 (14)
O(2)	0.0180 (17)	0.0141 (16)	0.0167 (17)	−0.0023 (14)	0.0024 (14)	0.0011 (13)
C(1)	0.018 (2)	0.015 (2)	0.016 (2)	0.005 (2)	−0.001 (2)	−0.0011 (19)
C(2)	0.023 (2)	0.026 (2)	0.020 (2)	0.005 (2)	−0.001 (2)	−0.006 (2)
C(3)	0.024 (2)	0.028 (3)	0.026 (3)	0.014 (2)	−0.003 (2)	−0.008 (2)
C(4)	0.036 (3)	0.019 (2)	0.027 (3)	0.010 (2)	−0.005 (2)	−0.004 (2)
C(5)	0.041 (3)	0.019 (2)	0.026 (3)	−0.001 (2)	0.002 (2)	0.003 (2)
C(6)	0.021 (2)	0.018 (2)	0.032 (3)	0.006 (2)	0.006 (2)	−0.001 (2)
C(7)	0.012 (2)	0.017 (2)	0.020 (2)	0.0057 (19)	−0.001 (2)	−0.002 (2)
C(8)	0.014 (2)	0.015 (2)	0.025 (2)	0.003 (2)	−0.002 (2)	0.001 (2)
C(9)	0.032 (3)	0.029 (3)	0.018 (2)	0.012 (2)	−0.007 (2)	−0.003 (2)
C(10)	0.021 (2)	0.019 (2)	0.042 (3)	0.004 (2)	−0.012 (2)	−0.015 (2)
C(11)	0.022 (2)	0.017 (2)	0.043 (3)	−0.002 (2)	0.001 (2)	−0.004 (2)
C(12)	0.020 (2)	0.017 (2)	0.029 (2)	0.003 (2)	0.003 (2)	0.001 (2)
C(13)	0.031 (3)	0.040 (3)	0.019 (2)	0.005 (2)	0.005 (2)	0.009 (2)
C(14)	0.013 (2)	0.016 (2)	0.019 (2)	0.0050 (19)	0.0029 (19)	0.0043 (19)
C(15)	0.020 (2)	0.020 (2)	0.027 (2)	−0.002 (2)	0.007 (2)	0.000 (2)
C(16)	0.032 (3)	0.020 (2)	0.035 (3)	−0.004 (2)	0.009 (2)	0.014 (2)
C(17)	0.028 (3)	0.037 (3)	0.017 (2)	0.004 (2)	0.003 (2)	0.010 (2)
C(18)	0.029 (2)	0.033 (3)	0.019 (2)	−0.002 (2)	0.002 (2)	−0.003 (2)
C(19)	0.025 (2)	0.016 (2)	0.017 (2)	0.002 (2)	0.003 (2)	0.001 (2)
C(20)	0.016 (2)	0.010 (2)	0.023 (2)	−0.0010 (19)	−0.001 (2)	−0.0001 (19)
C(21)	0.021 (2)	0.018 (2)	0.021 (2)	0.000 (2)	0.002 (2)	−0.001 (2)
C(22)	0.020 (2)	0.028 (3)	0.032 (3)	0.004 (2)	0.003 (2)	−0.007 (2)
C(23)	0.016 (2)	0.016 (2)	0.042 (3)	0.009 (2)	−0.008 (2)	−0.004 (2)
C(24)	0.025 (2)	0.023 (2)	0.024 (2)	−0.002 (2)	−0.011 (2)	0.000 (2)
C(25)	0.019 (2)	0.021 (2)	0.021 (2)	0.001 (2)	−0.001 (2)	0.000 (2)
C(26)	0.026 (2)	0.022 (2)	0.025 (2)	−0.006 (2)	0.004 (2)	0.004 (2)

Geometric parameters (Å, °)

Pt1—Cl1	2.3693 (12)	C(20)—C(25)	1.395 (6)
Pt1—Cl2	2.3533 (12)	C(21)—C(22)	1.385 (7)
Pt1—P1	2.2272 (11)	C(22)—C(23)	1.385 (7)
Pt1—P2	2.2279 (12)	C(23)—C(24)	1.389 (7)
P(1)—O(1)	1.593 (3)	C(24)—C(25)	1.375 (7)
P(1)—C(1)	1.826 (4)	C(2)—H(2)	0.950
P(1)—C(7)	1.815 (4)	C(3)—H(3)	0.950
P(2)—O(2)	1.605 (3)	C(4)—H(4)	0.950

P(2)—C(14)	1.797 (4)	C(5)—H(5)	0.950
P(2)—C(20)	1.821 (4)	C(6)—H(6)	0.950
O(1)—C(13)	1.434 (6)	C(8)—H(8)	0.950
O(2)—C(26)	1.444 (6)	C(9)—H(9)	0.950
C(1)—C(2)	1.385 (7)	C(10)—H(10)	0.950
C(1)—C(6)	1.388 (7)	C(11)—H(11)	0.950
C(2)—C(3)	1.384 (7)	C(12)—H(12)	0.950
C(3)—C(4)	1.375 (7)	C(13)—H(30)	0.980
C(4)—C(5)	1.383 (8)	C(13)—H(31)	0.980
C(5)—C(6)	1.390 (7)	C(13)—H(33)	0.980
C(7)—C(8)	1.396 (6)	C(15)—H(15)	0.950
C(7)—C(12)	1.386 (6)	C(16)—H(16)	0.950
C(8)—C(9)	1.387 (7)	C(17)—H(17)	0.950
C(9)—C(10)	1.385 (7)	C(18)—H(18)	0.950
C(10)—C(11)	1.383 (8)	C(19)—H(19)	0.950
C(11)—C(12)	1.387 (7)	C(21)—H(21)	0.950
C(14)—C(15)	1.390 (6)	C(22)—H(22)	0.950
C(14)—C(19)	1.407 (6)	C(23)—H(23)	0.950
C(15)—C(16)	1.379 (7)	C(24)—H(24)	0.950
C(16)—C(17)	1.395 (7)	C(25)—H(25)	0.950
C(17)—C(18)	1.372 (7)	C(26)—H(28)	0.980
C(18)—C(19)	1.389 (6)	C(26)—H(26)	0.980
C(20)—C(21)	1.398 (7)	C(26)—H(27)	0.980
Cl(1)···C(16)^{i}	3.518 (5)	H(31)···H(22)^{x}	3.295
O(2)···C(22)^{ii}	3.542 (6)	H(31)···H(26)^{iii}	2.863
C(2)···C(26)^{iii}	3.478 (7)	H(8)···H(3)^{iv}	2.974
C(3)···C(3)^{iv}	3.412 (7)	H(8)···H(24)^{vi}	3.152
C(4)···C(13)^{iii}	3.557 (7)	H(9)···Cl(2)^{vi}	2.968
C(5)···C(13)^{iii}	3.518 (7)	H(9)···C(25)^{vi}	3.236
C(13)···C(4)^{v}	3.557 (7)	H(9)···H(3)^{iv}	3.125
C(13)···C(5)^{v}	3.518 (7)	H(9)···H(23)^{ii}	3.066
C(16)···Cl(1)^{i}	3.518 (5)	H(9)···H(24)^{vi}	3.477
C(17)···C(23)^{vi}	3.589 (7)	H(9)···H(25)^{vi}	2.663
C(17)···C(24)^{vi}	3.504 (7)	H(10)···Cl(1)^{vi}	2.716
C(22)···O(2)^{ii}	3.542 (6)	H(10)···C(11)^{ix}	3.287
C(23)···C(17)^{vii}	3.589 (7)	H(10)···C(23)^{ii}	3.433
C(24)···C(17)^{vii}	3.504 (7)	H(10)···H(4)^{iv}	3.412
C(26)···C(2)^{v}	3.478 (7)	H(10)···H(31)^{vi}	3.369
Cl(1)···H(10)^{vii}	2.716	H(10)···H(11)^{ix}	2.463
Cl(1)···H(11)^{iii}	3.298	H(10)···H(22)^{xi}	3.508
Cl(1)···H(12)^{iii}	3.049	H(10)···H(22)^{ii}	3.210
Cl(1)···H(28)^{iii}	3.085	H(10)···H(23)^{ii}	2.660
Cl(1)···H(16)^{i}	2.716	H(11)···Cl(1)^{v}	3.298
Cl(1)···H(23)^{viii}	3.462	H(11)···C(10)^{ix}	3.005

Cl(1)···H(26)^{iii}	3.294	H(11)···C(11)^{ix}	3.118
Cl(2)···H(5)^{i}	2.941	H(11)···C(22)^{xi}	3.205
Cl(2)···H(9)^{vii}	2.968	H(11)···C(23)^{xi}	3.340
Cl(2)···H(16)^{i}	3.085	H(11)···H(4)^{iv}	3.506
Cl(2)···H(23)^{viii}	3.034	H(11)···H(10)^{ix}	2.463
Cl(2)···H(24)^{viii}	3.347	H(11)···H(11)^{ix}	2.682
O(1)···H(26)^{iii}	3.021	H(11)···H(17)^{x}	3.291
O(2)···H(21)^{ii}	3.488	H(11)···H(22)^{xi}	2.667
O(2)···H(22)^{ii}	3.270	H(11)···H(22)^{ii}	3.346
C(1)···H(28)^{iii}	3.556	H(11)···H(23)^{xi}	2.935
C(2)···H(3)^{iv}	3.577	H(12)···Cl(1)^{v}	3.049
C(2)···H(28)^{iii}	3.366	H(12)···C(16)^{x}	3.389
C(2)···H(27)^{iii}	2.931	H(12)···C(17)^{x}	3.010
C(3)···H(30)^{iii}	3.434	H(12)···H(16)^{x}	3.276
C(3)···H(3)^{iv}	3.570	H(12)···H(17)^{x}	2.572
C(3)···H(25)^{iii}	3.165	H(33)···C(4)^{v}	3.583
C(3)···H(27)^{iii}	3.265	H(33)···C(5)^{v}	3.163
C(4)···H(30)^{iii}	3.192	H(33)···C(6)^{v}	3.534
C(4)···H(2)^{iv}	3.554	H(33)···C(14)^{x}	3.385
C(4)···H(31)^{iii}	3.323	H(33)···C(15)^{x}	3.052
C(4)···H(33)^{iii}	3.583	H(33)···C(16)^{x}	2.940
C(5)···H(30)^{iii}	3.334	H(33)···C(17)^{x}	3.160
C(5)···H(31)^{iii}	3.482	H(33)···C(18)^{x}	3.468
C(5)···H(33)^{iii}	3.163	H(33)···C(19)^{x}	3.578
C(6)···H(33)^{iii}	3.534	H(33)···H(5)^{v}	3.148
C(6)···H(15)^{i}	3.594	H(33)···H(15)^{x}	3.444
C(7)···H(4)^{iv}	3.363	H(33)···H(16)^{x}	3.287
C(8)···H(3)^{iv}	2.999	H(33)···H(21)^{x}	2.874
C(8)···H(4)^{iv}	3.324	H(33)···H(26)^{iii}	3.557
C(9)···H(3)^{iv}	3.074	H(28)···Cl(1)^{v}	3.085
C(9)···H(4)^{iv}	3.166	H(28)···C(1)^{v}	3.556
C(9)···H(23)^{ii}	3.255	H(28)···C(2)^{v}	3.366
C(9)···H(25)^{vi}	3.353	H(28)···H(2)^{v}	3.494
C(10)···H(4)^{iv}	3.001	H(15)···C(6)^{i}	3.594
C(10)···H(11)^{ix}	3.005	H(15)···H(5)^{i}	3.327
C(10)···H(22)^{ii}	3.115	H(15)···H(6)^{i}	2.937
C(10)···H(23)^{ii}	3.024	H(15)···H(33)^{xii}	3.444
C(11)···H(4)^{iv}	3.054	H(15)···H(15)^{i}	3.476
C(11)···H(10)^{ix}	3.287	H(16)···Cl(1)^{i}	2.716
C(11)···H(11)^{ix}	3.118	H(16)···Cl(2)^{i}	3.085
C(11)···H(17)^{x}	3.502	H(16)···C(23)^{vi}	3.387

C(11)···H(22)^{xi}	3.382	H(16)···C(24)^{vi}	3.473
C(11)···H(22)^{ii}	3.209	H(16)···H(6)^{i}	3.521
C(12)···H(4)^{iv}	3.235	H(16)···H(12)^{xii}	3.276
C(12)···H(17)^{x}	3.125	H(16)···H(33)^{xii}	3.287
C(13)···H(21)^{x}	3.259	H(16)···H(23)^{vi}	2.873
C(13)···H(26)^{iii}	3.322	H(16)···H(24)^{vi}	3.051
C(14)···H(33)^{xii}	3.385	H(17)···C(11)^{xii}	3.502
C(15)···H(6)^{i}	3.575	H(17)···C(12)^{xii}	3.125
C(15)···H(33)^{xii}	3.052	H(17)···C(23)^{vi}	3.014
C(16)···H(12)^{xii}	3.389	H(17)···C(24)^{vi}	3.217
C(16)···H(33)^{xii}	2.940	H(17)···H(11)^{xii}	3.291
C(16)···H(23)^{vi}	3.468	H(17)···H(12)^{xii}	2.572
C(16)···H(24)^{vi}	3.231	H(17)···H(23)^{vi}	3.009
C(17)···H(12)^{xii}	3.010	H(17)···H(24)^{vi}	3.358
C(17)···H(33)^{xii}	3.160	H(18)···C(23)^{ii}	3.298
C(17)···H(23)^{vi}	3.534	H(18)···C(24)^{ii}	2.980
C(17)···H(24)^{vi}	3.403	H(18)···C(25)^{ii}	3.514
C(18)···H(2)^{xii}	3.374	H(18)···H(2)^{xii}	2.835
C(18)···H(33)^{xii}	3.468	H(18)···H(23)^{ii}	3.477
C(19)···H(33)^{xii}	3.578	H(18)···H(24)^{ii}	2.941
C(20)···H(19)^{ii}	3.259	H(18)···H(27)^{ii}	3.553
C(21)···H(31)^{xii}	3.503	H(19)···C(20)^{ii}	3.259
C(21)···H(19)^{ii}	2.971	H(19)···C(21)^{ii}	2.971
C(21)···H(26)^{ii}	3.170	H(19)···C(22)^{ii}	2.861
C(22)···H(11)^{xiii}	3.205	H(19)···C(23)^{ii}	3.040
C(22)···H(19)^{ii}	2.861	H(19)···C(24)^{ii}	3.313
C(22)···H(26)^{ii}	3.313	H(19)···C(25)^{ii}	3.422
C(23)···H(10)^{ii}	3.433	H(19)···H(21)^{ii}	3.405
C(23)···H(11)^{xiii}	3.340	H(19)···H(22)^{ii}	3.250
C(23)···H(16)^{vii}	3.387	H(19)···H(23)^{ii}	3.511
C(23)···H(17)^{vii}	3.014	H(19)···H(27)^{ii}	3.468
C(23)···H(18)^{ii}	3.298	H(21)···O(2)^{ii}	3.488
C(23)···H(19)^{ii}	3.040	H(21)···C(13)^{xii}	3.259
C(24)···H(3)^{v}	3.582	H(21)···C(26)^{ii}	3.351
C(24)···H(16)^{vii}	3.473	H(21)···H(5)^{i}	3.546
C(24)···H(17)^{vii}	3.217	H(21)···H(31)^{xii}	2.837
C(24)···H(18)^{ii}	2.980	H(21)···H(33)^{xii}	2.874
C(24)···H(19)^{ii}	3.313	H(21)···H(19)^{ii}	3.405
C(25)···H(3)^{v}	3.322	H(21)···H(26)^{ii}	2.568
C(25)···H(9)^{vii}	3.236	H(22)···O(2)^{ii}	3.270
C(25)···H(18)^{ii}	3.514	H(22)···C(10)^{ii}	3.115

C(25)···H(19)^{ii}	3.422	H(22)···C(11)^{xiii}	3.382
C(26)···H(2)^{v}	3.340	H(22)···C(11)^{ii}	3.209
C(26)···H(21)^{ii}	3.351	H(22)···C(26)^{ii}	3.471
C(26)···H(22)^{ii}	3.471	H(22)···H(31)^{xii}	3.295
H(30)···C(3)^{v}	3.434	H(22)···H(10)^{xiii}	3.508
H(30)···C(4)^{v}	3.192	H(22)···H(10)^{ii}	3.210
H(30)···C(5)^{v}	3.334	H(22)···H(11)^{xiii}	2.667
H(30)···H(4)^{v}	3.461	H(22)···H(11)^{ii}	3.346
H(2)···C(4)^{iv}	3.554	H(22)···H(19)^{ii}	3.250
H(2)···C(18)^{x}	3.374	H(22)···H(26)^{ii}	2.858
H(2)···C(26)^{iii}	3.340	H(23)···Cl(1)^{xiv}	3.462
H(2)···H(4)^{iv}	3.436	H(23)···Cl(2)^{xiv}	3.034
H(2)···H(28)^{iii}	3.494	H(23)···C(9)^{ii}	3.255
H(2)···H(18)^{x}	2.835	H(23)···C(10)^{ii}	3.024
H(2)···H(25)^{iii}	3.480	H(23)···C(16)^{vii}	3.468
H(2)···H(26)^{iii}	3.329	H(23)···C(17)^{vii}	3.534
H(2)···H(27)^{iii}	2.704	H(23)···H(9)^{ii}	3.066
H(3)···C(2)^{iv}	3.577	H(23)···H(10)^{ii}	2.660
H(3)···C(3)^{iv}	3.570	H(23)···H(11)^{xiii}	2.935
H(3)···C(8)^{iv}	2.999	H(23)···H(16)^{vii}	2.873
H(3)···C(9)^{iv}	3.074	H(23)···H(17)^{vii}	3.009
H(3)···C(24)^{iii}	3.582	H(23)···H(18)^{ii}	3.477
H(3)···C(25)^{iii}	3.322	H(23)···H(19)^{ii}	3.511
H(3)···H(8)^{iv}	2.974	H(24)···Cl(2)^{xiv}	3.347
H(3)···H(9)^{iv}	3.125	H(24)···C(16)^{vii}	3.231
H(3)···H(24)^{iii}	3.112	H(24)···C(17)^{vii}	3.403
H(3)···H(25)^{iii}	2.579	H(24)···H(3)^{v}	3.112
H(3)···H(27)^{iii}	3.281	H(24)···H(8)^{vii}	3.152
H(4)···C(7)^{iv}	3.363	H(24)···H(9)^{vii}	3.477
H(4)···C(8)^{iv}	3.324	H(24)···H(16)^{vii}	3.051
H(4)···C(9)^{iv}	3.166	H(24)···H(17)^{vii}	3.358
H(4)···C(10)^{iv}	3.001	H(24)···H(18)^{ii}	2.941
H(4)···C(11)^{iv}	3.054	H(25)···C(3)^{v}	3.165
H(4)···C(12)^{iv}	3.235	H(25)···C(9)^{vii}	3.353
H(4)···H(30)^{iii}	3.461	H(25)···H(2)^{v}	3.480
H(4)···H(2)^{iv}	3.436	H(25)···H(3)^{v}	2.579
H(4)···H(31)^{iii}	3.185	H(25)···H(9)^{vii}	2.663
H(4)···H(10)^{iv}	3.412	H(26)···Cl(1)^{v}	3.294
H(4)···H(11)^{iv}	3.506	H(26)···O(1)^{v}	3.021
H(5)···Cl(2)^{i}	2.941	H(26)···C(13)^{v}	3.322
H(5)···H(31)^{iii}	3.486	H(26)···C(21)^{ii}	3.170

H(5)···H(33)^{iii}	3.148	H(26)···C(22)^{ii}	3.313
H(5)···H(15)^{i}	3.327	H(26)···H(2)^{v}	3.329
H(5)···H(21)^{i}	3.546	H(26)···H(31)^{v}	2.863
H(6)···C(15)^{i}	3.575	H(26)···H(33)^{v}	3.557
H(6)···H(15)^{i}	2.937	H(26)···H(21)^{ii}	2.568
H(6)···H(16)^{i}	3.521	H(26)···H(22)^{ii}	2.858
H(31)···C(4)^{v}	3.323	H(27)···C(2)^{v}	2.931
H(31)···C(5)^{v}	3.482	H(27)···C(3)^{v}	3.265
H(31)···C(21)^{x}	3.503	H(27)···H(2)^{v}	2.704
H(31)···H(4)^{v}	3.185	H(27)···H(3)^{v}	3.281
H(31)···H(5)^{v}	3.486	H(27)···H(18)^{ii}	3.553
H(31)···H(10)^{vii}	3.369	H(27)···H(19)^{ii}	3.468
H(31)···H(21)^{x}	2.837		
Cl1—Pt1—Cl2	89.37 (4)	C(1)—C(2)—H(2)	120.0
P1—Pt1—P2	98.14 (4)	C(3)—C(2)—H(2)	120.0
Cl1—Pt1—P1	83.49 (4)	C(2)—C(3)—H(3)	119.9
Cl1—Pt1—P2	175.95 (4)	C(4)—C(3)—H(3)	119.9
Cl2—Pt1—P1	168.82 (4)	C(3)—C(4)—H(4)	119.8
Cl2—Pt1—P2	89.56 (4)	C(5)—C(4)—H(4)	119.8
Pt(1)—P(1)—O(1)	116.11 (12)	C(4)—C(5)—H(5)	120.3
Pt(1)—P(1)—C(1)	111.37 (16)	C(6)—C(5)—H(5)	120.3
Pt(1)—P(1)—C(7)	120.68 (16)	C(1)—C(6)—H(6)	119.8
O(1)—P(1)—C(1)	102.3 (2)	C(5)—C(6)—H(6)	119.8
O(1)—P(1)—C(7)	103.3 (2)	C(7)—C(8)—H(8)	120.0
C(1)—P(1)—C(7)	100.6 (2)	C(9)—C(8)—H(8)	120.0
Pt(1)—P(2)—O(2)	116.82 (13)	C(8)—C(9)—H(9)	120.3
Pt(1)—P(2)—C(14)	114.29 (15)	C(10)—C(9)—H(9)	120.3
Pt(1)—P(2)—C(20)	113.76 (15)	C(9)—C(10)—H(10)	119.7
O(2)—P(2)—C(14)	99.56 (19)	C(11)—C(10)—H(10)	119.7
O(2)—P(2)—C(20)	103.39 (19)	C(10)—C(11)—H(11)	120.0
C(14)—P(2)—C(20)	107.5 (2)	C(12)—C(11)—H(11)	120.0
P(1)—O(1)—C(13)	122.7 (3)	C(7)—C(12)—H(12)	120.0
P(2)—O(2)—C(26)	121.4 (2)	C(11)—C(12)—H(12)	120.0
P(1)—C(1)—C(2)	119.4 (3)	O(1)—C(13)—H(30)	109.5
P(1)—C(1)—C(6)	120.8 (3)	O(1)—C(13)—H(31)	109.5
C(2)—C(1)—C(6)	119.5 (4)	O(1)—C(13)—H(33)	109.5
C(1)—C(2)—C(3)	120.0 (4)	H(30)—C(13)—H(31)	109.5
C(2)—C(3)—C(4)	120.3 (5)	H(30)—C(13)—H(33)	109.5
C(3)—C(4)—C(5)	120.4 (4)	H(31)—C(13)—H(33)	109.5
C(4)—C(5)—C(6)	119.4 (5)	C(14)—C(15)—H(15)	119.8
C(1)—C(6)—C(5)	120.4 (4)	C(16)—C(15)—H(15)	119.8
P(1)—C(7)—C(8)	119.5 (3)	C(15)—C(16)—H(16)	120.0
P(1)—C(7)—C(12)	120.5 (3)	C(17)—C(16)—H(16)	120.0
C(8)—C(7)—C(12)	119.9 (4)	C(16)—C(17)—H(17)	120.0
C(7)—C(8)—C(9)	120.1 (4)	C(18)—C(17)—H(17)	120.0
C(8)—C(9)—C(10)	119.5 (4)	C(17)—C(18)—H(18)	119.7

C(9)—C(10)—C(11)	120.7 (4)	C(19)—C(18)—H(18)	119.6
C(10)—C(11)—C(12)	120.0 (4)	C(14)—C(19)—H(19)	120.3
C(7)—C(12)—C(11)	119.9 (4)	C(18)—C(19)—H(19)	120.3
P(2)—C(14)—C(15)	120.1 (3)	C(20)—C(21)—H(21)	120.0
P(2)—C(14)—C(19)	120.2 (3)	C(22)—C(21)—H(21)	120.0
C(15)—C(14)—C(19)	119.4 (4)	C(21)—C(22)—H(22)	119.9
C(14)—C(15)—C(16)	120.4 (4)	C(23)—C(22)—H(22)	119.9
C(15)—C(16)—C(17)	120.1 (4)	C(22)—C(23)—H(23)	120.0
C(16)—C(17)—C(18)	120.0 (4)	C(24)—C(23)—H(23)	120.0
C(17)—C(18)—C(19)	120.7 (4)	C(23)—C(24)—H(24)	120.1
C(14)—C(19)—C(18)	119.4 (4)	C(25)—C(24)—H(24)	120.1
P(2)—C(20)—C(21)	121.6 (3)	C(20)—C(25)—H(25)	119.5
P(2)—C(20)—C(25)	119.5 (3)	C(24)—C(25)—H(25)	119.5
C(21)—C(20)—C(25)	118.8 (4)	O(2)—C(26)—H(28)	109.5
C(20)—C(21)—C(22)	120.1 (4)	O(2)—C(26)—H(26)	109.5
C(21)—C(22)—C(23)	120.2 (5)	O(2)—C(26)—H(27)	109.5
C(22)—C(23)—C(24)	120.1 (4)	H(28)—C(26)—H(26)	109.5
C(23)—C(24)—C(25)	119.7 (4)	H(28)—C(26)—H(27)	109.5
C(20)—C(25)—C(24)	121.0 (4)	H(26)—C(26)—H(27)	109.5
Cl(1)—Pt(1)—P(1)—O(1)	58.22 (15)	O(2)—P(2)—C(20)—C(25)	80.4 (3)
Cl(1)—Pt(1)—P(1)—C(1)	−58.24 (16)	C(20)—P(2)—O(2)—C(26)	−60.0 (3)
Cl(1)—Pt(1)—P(1)—C(7)	−175.70 (19)	C(14)—P(2)—C(20)—C(21)	8.2 (4)
Cl(2)—Pt(1)—P(1)—O(1)	108.8 (2)	C(14)—P(2)—C(20)—C(25)	−174.9 (3)
Cl(2)—Pt(1)—P(1)—C(1)	−7.6 (3)	C(20)—P(2)—C(14)—C(15)	105.2 (4)
Cl(2)—Pt(1)—P(1)—C(7)	−125.1 (2)	C(20)—P(2)—C(14)—C(19)	−80.9 (4)
Cl(2)—Pt(1)—P(2)—O(2)	−154.11 (14)	P(1)—C(1)—C(2)—C(3)	175.0 (3)
Cl(2)—Pt(1)—P(2)—C(14)	90.27 (17)	P(1)—C(1)—C(6)—C(5)	−174.2 (3)
Cl(2)—Pt(1)—P(2)—C(20)	−33.70 (17)	C(2)—C(1)—C(6)—C(5)	−0.2 (6)
P(1)—Pt(1)—P(2)—O(2)	34.03 (14)	C(6)—C(1)—C(2)—C(3)	0.9 (7)
P(1)—Pt(1)—P(2)—C(14)	−81.59 (17)	C(1)—C(2)—C(3)—C(4)	−0.3 (6)
P(1)—Pt(1)—P(2)—C(20)	154.44 (17)	C(2)—C(3)—C(4)—C(5)	−1.2 (8)
P(2)—Pt(1)—P(1)—O(1)	−118.04 (15)	C(3)—C(4)—C(5)—C(6)	1.9 (7)
P(2)—Pt(1)—P(1)—C(1)	125.50 (16)	C(4)—C(5)—C(6)—C(1)	−1.2 (7)
P(2)—Pt(1)—P(1)—C(7)	8.04 (19)	P(1)—C(7)—C(8)—C(9)	177.3 (3)
Pt(1)—P(1)—O(1)—C(13)	30.6 (3)	P(1)—C(7)—C(12)—C(11)	−176.5 (3)
Pt(1)—P(1)—C(1)—C(2)	155.6 (3)	C(8)—C(7)—C(12)—C(11)	0.2 (5)
Pt(1)—P(1)—C(1)—C(6)	−30.4 (4)	C(12)—C(7)—C(8)—C(9)	0.6 (7)
Pt(1)—P(1)—C(7)—C(8)	65.7 (4)	C(7)—C(8)—C(9)—C(10)	−1.8 (7)
Pt(1)—P(1)—C(7)—C(12)	−117.6 (3)	C(8)—C(9)—C(10)—C(11)	2.2 (7)
O(1)—P(1)—C(1)—C(2)	31.0 (4)	C(9)—C(10)—C(11)—C(12)	−1.4 (7)
O(1)—P(1)—C(1)—C(6)	−155.0 (3)	C(10)—C(11)—C(12)—C(7)	0.2 (5)
C(1)—P(1)—O(1)—C(13)	152.1 (3)	P(2)—C(14)—C(15)—C(16)	173.0 (3)
O(1)—P(1)—C(7)—C(8)	−162.6 (3)	P(2)—C(14)—C(19)—C(18)	−173.4 (3)
O(1)—P(1)—C(7)—C(12)	14.1 (4)	C(15)—C(14)—C(19)—C(18)	0.6 (7)
C(7)—P(1)—O(1)—C(13)	−103.8 (3)	C(19)—C(14)—C(15)—C(16)	−1.0 (7)
C(1)—P(1)—C(7)—C(8)	−57.1 (4)	C(14)—C(15)—C(16)—C(17)	1.0 (7)
C(1)—P(1)—C(7)—C(12)	119.6 (4)	C(15)—C(16)—C(17)—C(18)	−0.6 (7)
C(7)—P(1)—C(1)—C(2)	−75.3 (4)	C(16)—C(17)—C(18)—C(19)	0.2 (6)
C(7)—P(1)—C(1)—C(6)	98.7 (4)	C(17)—C(18)—C(19)—C(14)	−0.2 (5)

Pt(1)—P(2)—O(2)—C(26)	65.8 (3)	P(2)—C(20)—C(21)—C(22)	176.7 (3)
Pt(1)—P(2)—C(14)—C(15)	−22.1 (4)	P(2)—C(20)—C(25)—C(24)	−175.6 (3)
Pt(1)—P(2)—C(14)—C(19)	151.8 (3)	C(21)—C(20)—C(25)—C(24)	1.4 (7)
Pt(1)—P(2)—C(20)—C(21)	135.8 (3)	C(25)—C(20)—C(21)—C(22)	−0.2 (5)
Pt(1)—P(2)—C(20)—C(25)	−47.3 (4)	C(20)—C(21)—C(22)—C(23)	−0.6 (7)
O(2)—P(2)—C(14)—C(15)	−147.4 (3)	C(21)—C(22)—C(23)—C(24)	0.2 (6)
O(2)—P(2)—C(14)—C(19)	26.5 (4)	C(22)—C(23)—C(24)—C(25)	1.0 (7)
C(14)—P(2)—O(2)—C(26)	−170.7 (3)	C(23)—C(24)—C(25)—C(20)	−1.8 (7)
O(2)—P(2)—C(20)—C(21)	−96.5 (4)		

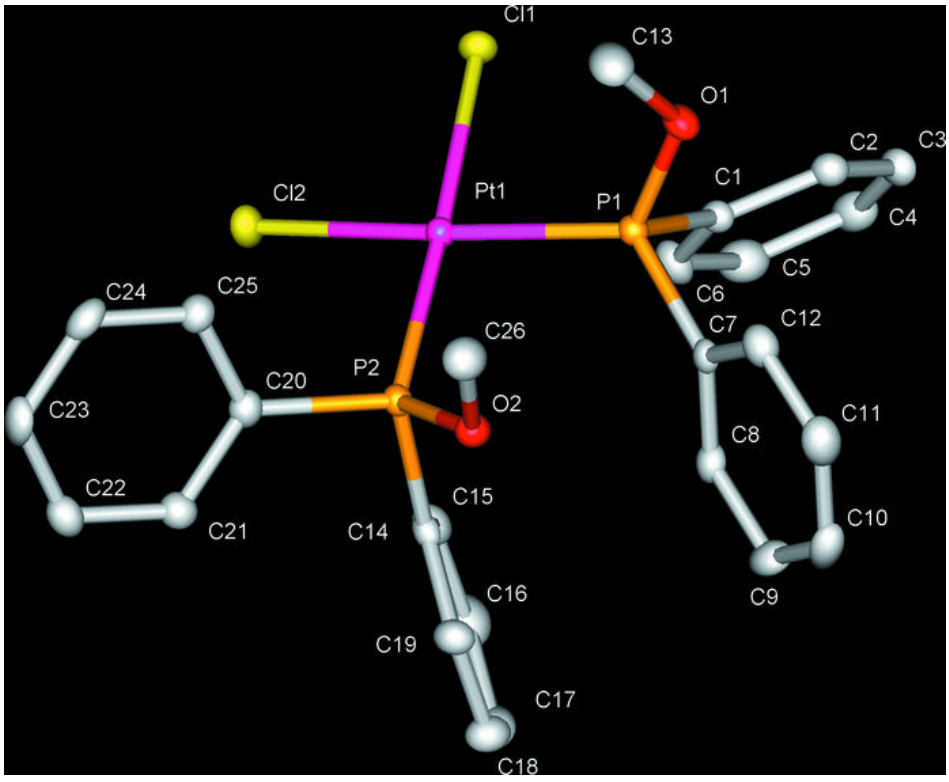
Symmetry codes: (i) −*x*, −*y*, −*z*+2; (ii) −*x*, −*y*+1, −*z*+2; (iii) −*x*+1/2, *y*−1/2, −*z*+3/2; (iv) −*x*+1, −*y*, −*z*+2; (v) −*x*+1/2, *y*+1/2, −*z*+3/2; (vi) *x*+1/2, −*y*+1/2, *z*+1/2; (vii) *x*−1/2, −*y*+1/2, *z*−1/2; (viii) −*x*−1/2, *y*−1/2, −*z*+3/2; (ix) −*x*+1, −*y*+1, −*z*+2; (x) *x*+1/2, −*y*+1/2, *z*−1/2; (xi) *x*+1, *y*, *z*; (xii) *x*−1/2, −*y*+1/2, *z*+1/2; (xiii) *x*−1, *y*, *z*; (xiv) −*x*−1/2, *y*+1/2, −*z*+3/2.

Hydrogen-bond geometry (Å, °)

D—H···*A*	*D*—H	H···*A*	*D*···*A*	*D*—H···*A*
C10—H10···Cl1^{vi}	0.95	2.72	3.642 (6)	165
C16—H16···Cl1^{i}	0.95	2.72	3.518 (5)	143
C4—H4···Cg1^{iv}	0.95	2.88	3.692 (5)	145
C19—H19···Cg2^{ii}	0.95	2.83	3.641 (4)	144

Symmetry codes: (vi) *x*+1/2, −*y*+1/2, *z*+1/2; (i) −*x*, −*y*, −*z*+2; (iv) −*x*+1, −*y*, −*z*+2; (ii) −*x*, −*y*+1, −*z*+2.

Fig. 1


Cl1
C13
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C2
C3
Cl2
Pt1
P1
C1
C4
C5
C24
C25
C6
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C26
P2
C20
O2
C23
C11
C8
C22
C15
C10
C21
C14
C16
C9
C19
C17
C18