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# [*N*,*N*-Bis(diphenylphosphino)propylamine-$\kappa^2P,P'$]dichloridoplatinum(II)

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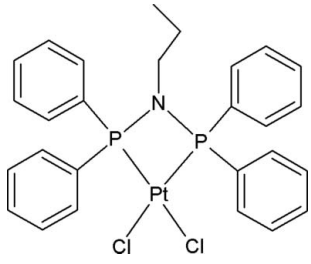
Key indicators: single-crystal X-ray study; $T$ = 101 K; mean $\sigma$(C–C) = 0.004 Å; $R$ factor = 0.022; $wR$ factor = 0.053; data-to-parameter ratio = 21.1.

The Pt(II) atom in the title compound, $[PtCl_2(C_{27}H_{27}NP_2)]$, has a highly distorted square-planar geometry, as evidenced by the P—Pt—P bite angle [72.4 (1)°]. The strain in the complex is further illustrated by the distorted tetrahedral angles of the P atoms, which range between 93.5 (1) and 122.2 (1)°. It is of interest to note that the N atom has to adopt an almost planar geometry with the two P atoms and the C atom attached to it [it is displaced by 0.093 (2) Å from the $CP_2$ plane] in order to accommodate the steric bulk of the phenyl groups and the alkyl group of the ligand coordinated to the $Pt^{II}$ centre. The molecules pack in horizontal rows across the *bc* plane. C—H···Cl hydrogen bonds stabilize the crystal packing.

## Related literature

For related platinum(II) complexes, see: Browning *et al.* (1992); Calabrò *et al.* (2004); Fei *et al.* (2006).




## Experimental

### Crystal data

$[PtCl_2(C_{27}H_{27}NP_2)]$
$M_r$ = 693.43
Monoclinic, $P2_1/n$
$a$ = 10.6301 (4) Å
$b$ = 18.8117 (7) Å
$c$ = 12.7653 (5) Å
$\beta$ = 97.326 (1)°
$V$ = 2531.84 (17) Å$^3$
$Z$ = 4
Mo $K\alpha$ radiation
$\mu$ = 5.90 mm$^{-1}$
$T$ = 101 K
0.38 × 0.10 × 0.02 mm

### Data collection

Bruker X8 APEXII Kappa CCD diffractometer
Absorption correction: multi-scan (*SADABS*; Bruker, 2001)
$T_{min}$ = 0.213, $T_{max}$ = 0.891
50743 measured reflections
6276 independent reflections
5347 reflections with $I > 2\sigma(I)$
$R_{int}$ = 0.052

### Refinement

$R[F^2 > 2\sigma(F^2)]$ = 0.022
$wR(F^2)$ = 0.053
$S$ = 1.04
6276 reflections
298 parameters
H-atom parameters constrained
$\Delta\rho_{max}$ = 1.55 e Å$^{-3}$
$\Delta\rho_{min}$ = −0.63 e Å$^{-3}$

**Table 1**
Selected bond lengths (Å).

| | | | |
|---|---|---|---|
| Pt—P1 | 2.1932 (7) | Pt—Cl1 | 2.3461 (7) |
| Pt—P2 | 2.2121 (7) | Pt—Cl2 | 2.3528 (7) |

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

| $D$—H···$A$ | $D$—H | H···$A$ | $D$···$A$ | $D$—H···$A$ |
|---|---|---|---|---|
| C1—H1$A$···Cl1$^{i}$ | 0.99 | 2.64 | 3.512 (3) | 147 |

Symmetry code: (i) $x+\frac{1}{2}, -y+\frac{1}{2}, z-\frac{1}{2}$.

Data collection: *APEX2* (Bruker, 2007); cell refinement: *SAINT-Plus* (Bruker, 2007); data reduction: *SAINT-Plus*; program(s) used to solve structure: *SIR97* (Altomare *et al.*, 1999); program(s) used to refine structure: *SHELXL97* (Sheldrick, 2008); molecular graphics: *DIAMOND* (Brandenburg & Putz, 1999); software used to prepare material for publication: *WinGX* (Farrugia, 1999).

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Supplementary data and figures for this paper are available from the IUCr electronic archives (Reference: HY2248).

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# supporting information

*Acta Cryst.* (2010). E**66**, m51–m52 [doi:10.1107/S160053680905301X]

## [*N*,*N*-Bis(diphenylphosphino)propylamine-$\kappa^2P,P'$]dichloridoplatinum(II)

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### S1. Comment

In the title compound (Fig. 1 and Table 1), all bond distances and angles are considered to be normal and fall within range reported for similar complexes (Browning *et al.*, 1992; Fei *et al.*, 2006; Calabrò *et al.*, 2004). The square-planar geometry of the complex is highly distorted with a P1—Pt—P2 bite angle of 72.40 (3)° and a Cl1—Pt—Cl2 angle of 92.7 (1). The reported P1—Pt—P2 small bite angle forces the P1—N1—P2 angle to 100.1 (1)° which illustrates the distorted geometry from the ideal tetrahedral geometry of the N atom. The distance between the N1 atom and the plane created by C1, P1 and P2 is 0.093 (2) Å. The P atoms are also severely distorted from the expected tetrahedral configuration with Pt—P1—N1 and Pt—P2—N1 angles being 94.0 (1) and 93.5 (1)°, respectively. The molecules of the title compound pack horizontal rows in the unit cell across the *bc* plane (Fig. 2). Intermolecular hydrogen bond exists between C1—H1A and Cl1(1/2+x, 1/2-y, -1/2+z) (Table 2).

### S2. Experimental

$Pt(cod)Cl_2$ (50 mg, 0.13 mmol) (cod = 1,5-cyclooctadiene) was dissolved in dichloromethane (15 ml). Bis(diphenylphosphino)propylamine (57.1 mg, 0.13 mmol) was also dissolved in dichloromethane (10 ml) and was added dropwise to the $Pt(cod)Cl_2$ solution. The solution was stirred for 2 h at room temperature. The reaction mixture was layered with methanol (10 ml). Colourless single crystals suitable for X-ray crystallography was obtained after 1 d (yield 0.066 g, 73.4%).

### S3. Refinement

H atoms were positioned geometrically and refined as riding atoms, with C—H = 0.95 (aromatic), 0.99 ($CH_2$) and 0.98 ($CH_3$) Å and with $U_{iso}$(H) = 1.2(1.5 for methyl)$U_{eq}$(C). The highest residual electron density was found 0.84Å from Pt and the deepest hole 0.68Å from Pt.

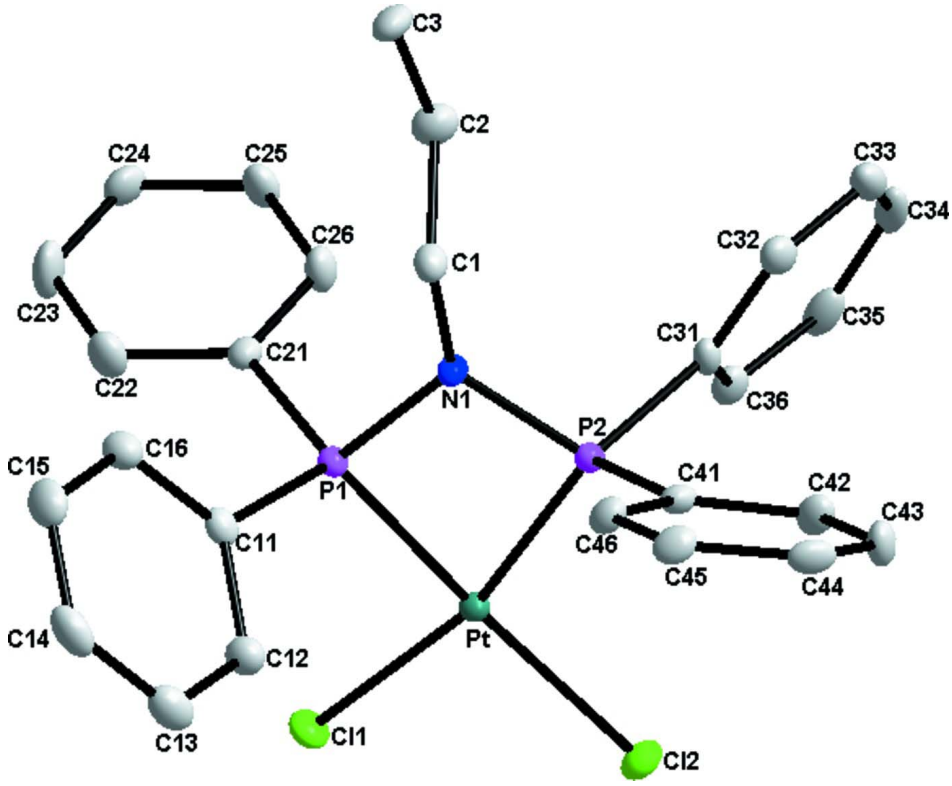


**Figure 1**

Molecular structure of the title compound. Displacement ellipsoids are drawn at the 50% probability level. H atoms were omitted for clarity.

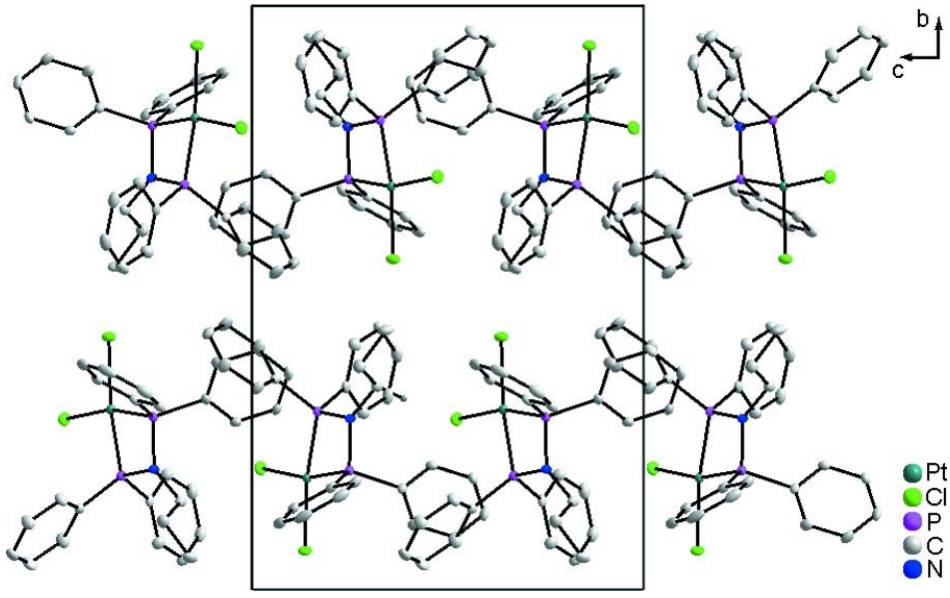


**Figure 2**

Perspective view of the unit cell of the title compound along the *a* axis.

**[*N*,*N*-Bis(diphenylphosphino)propylamine- $\kappa^2P,P'$]dichloridoplatinum(II)**

*Crystal data*

$[PtCl_2(C_{27}H_{27}NP_2)]$
$M_r = 693.43$
Monoclinic, $P2_1/n$
Hall symbol: -P 2yn
$a = 10.6301$ (4) Å
$b = 18.8117$ (7) Å
$c = 12.7653$ (5) Å
$\beta = 97.326$ (1)°
$V = 2531.84$ (17) Å$^3$
$Z = 4$
$F(000) = 1352$
$D_x = 1.819$ Mg m$^{-3}$
Mo $K\alpha$ radiation, $\lambda = 0.71073$ Å
Cell parameters from 6904 reflections
$\theta = 2.6$–$28.2°$
$\mu = 5.90$ mm$^{-1}$
$T = 101$ K
Plate, colourless
0.38 × 0.10 × 0.02 mm

*Data collection*

Bruker X8 APEXII Kappa CCD diffractometer
$\omega$ and $\varphi$ scans
Absorption correction: multi-scan (*SADABS*; Bruker, 2001)
$T_{min} = 0.213$, $T_{max} = 0.891$
50743 measured reflections
6276 independent reflections
5347 reflections with $I > 2\sigma(I)$
$R_{int} = 0.052$
$\theta_{max} = 28.3°$, $\theta_{min} = 2.2°$
$h = -14 \rightarrow 14$
$k = -25 \rightarrow 25$
$l = -17 \rightarrow 17$

*Refinement*

Refinement on $F^2$
Least-squares matrix: full
$R[F^2 > 2\sigma(F^2)] = 0.022$
$wR(F^2) = 0.053$
$S = 1.04$
6276 reflections
298 parameters
0 restraints
H-atom parameters constrained
$w = 1/[\sigma^2(F_o^2) + (0.0238P)^2 + 1.2293P]$ where $P = (F_o^2 + 2F_c^2)/3$
$(\Delta/\sigma)_{max} = 0.002$
$\Delta\rho_{max} = 1.55$ e Å$^{-3}$
$\Delta\rho_{min} = -0.63$ e Å$^{-3}$

*Special details*

**Experimental**. The intensity data was collected on a Bruker X8 Apex II 4 K Kappa CCD diffractometer using an exposure time of 20 s/frame. A total of 1264 frames were collected with a frame width of 0.5° covering up to $\theta = 28.23°$ with 99.6% completeness accomplished.

*Fractional atomic coordinates and isotropic or equivalent isotropic displacement parameters (Å²)*

| | *x* | *y* | *z* | $U_{iso}$*/$U_{eq}$ |
|---|---|---|---|---|
| N1 | 0.3830 (2) | 0.20629 (12) | 0.24699 (19) | 0.0122 (5) |
| P1 | 0.27187 (7) | 0.19470 (4) | 0.33006 (6) | 0.01071 (15) |
| P2 | 0.39535 (7) | 0.29612 (4) | 0.24933 (6) | 0.01051 (15) |
| Cl1 | 0.10041 (7) | 0.29205 (4) | 0.47535 (6) | 0.01820 (15) |
| Cl2 | 0.23004 (7) | 0.43335 (4) | 0.36231 (6) | 0.01938 (16) |
| Pt | 0.250086 (9) | 0.308869 (5) | 0.357534 (8) | 0.00997 (4) |
| C1 | 0.4307 (3) | 0.15118 (15) | 0.1788 (2) | 0.0152 (6) |
| H1A | 0.4419 | 0.1731 | 0.11 | 0.018* |
| H1B | 0.3654 | 0.1136 | 0.1651 | 0.018* |
| C2 | 0.5540 (3) | 0.11697 (16) | 0.2238 (2) | 0.0209 (7) |
| H2A | 0.5478 | 0.0999 | 0.2963 | 0.025* |
| H2B | 0.6232 | 0.1525 | 0.2276 | 0.025* |

| | | | | |
|---|---|---|---|---|
| C3 | 0.5846 (3) | 0.05447 (15) | 0.1546 (2) | 0.0205 (7) |
| H3A | 0.6649 | 0.0327 | 0.1847 | 0.031* |
| H3B | 0.5918 | 0.0715 | 0.0831 | 0.031* |
| H3C | 0.5165 | 0.0191 | 0.1518 | 0.031* |
| C11 | 0.1349 (3) | 0.15250 (15) | 0.2579 (2) | 0.0129 (6) |
| C12 | 0.1292 (3) | 0.07992 (16) | 0.2354 (2) | 0.0178 (6) |
| H12 | 0.1963 | 0.0495 | 0.2638 | 0.021* |
| C13 | 0.0254 (3) | 0.05216 (17) | 0.1714 (2) | 0.0208 (7) |
| H13 | 0.0215 | 0.0026 | 0.1569 | 0.025* |
| C14 | −0.0725 (3) | 0.09605 (17) | 0.1286 (2) | 0.0210 (7) |
| H14 | −0.1427 | 0.0767 | 0.0842 | 0.025* |
| C15 | −0.0678 (3) | 0.16837 (18) | 0.1507 (2) | 0.0204 (7) |
| H15 | −0.1352 | 0.1985 | 0.1219 | 0.025* |
| C16 | 0.0354 (3) | 0.19657 (16) | 0.2150 (2) | 0.0174 (6) |
| H16 | 0.0385 | 0.2461 | 0.2299 | 0.021* |
| C21 | 0.3394 (3) | 0.13850 (15) | 0.4372 (2) | 0.0123 (6) |
| C22 | 0.4622 (3) | 0.15416 (16) | 0.4831 (2) | 0.0189 (6) |
| H22 | 0.5072 | 0.1921 | 0.4557 | 0.023* |
| C23 | 0.5195 (3) | 0.11521 (16) | 0.5679 (2) | 0.0192 (7) |
| H23 | 0.6035 | 0.1264 | 0.5981 | 0.023* |
| C24 | 0.4550 (3) | 0.06004 (16) | 0.6087 (2) | 0.0189 (6) |
| H24 | 0.4945 | 0.033 | 0.6667 | 0.023* |
| C25 | 0.3330 (3) | 0.04456 (17) | 0.5647 (3) | 0.0255 (7) |
| H25 | 0.2885 | 0.0066 | 0.5925 | 0.031* |
| C26 | 0.2738 (3) | 0.08392 (16) | 0.4798 (2) | 0.0206 (7) |
| H26 | 0.1889 | 0.0735 | 0.4511 | 0.025* |
| C31 | 0.5551 (3) | 0.32517 (15) | 0.2956 (2) | 0.0134 (6) |
| C32 | 0.6533 (3) | 0.31537 (15) | 0.2338 (2) | 0.0174 (6) |
| H32 | 0.6376 | 0.2925 | 0.1671 | 0.021* |
| C33 | 0.7734 (3) | 0.33934 (17) | 0.2709 (3) | 0.0226 (7) |
| H33 | 0.8413 | 0.3316 | 0.2305 | 0.027* |
| C34 | 0.7957 (3) | 0.37464 (17) | 0.3668 (3) | 0.0250 (8) |
| H34 | 0.8786 | 0.3912 | 0.3914 | 0.03* |
| C35 | 0.6988 (3) | 0.38594 (16) | 0.4269 (3) | 0.0205 (7) |
| H35 | 0.7146 | 0.4109 | 0.4919 | 0.025* |
| C36 | 0.5776 (3) | 0.36064 (15) | 0.3920 (2) | 0.0157 (6) |
| H36 | 0.5107 | 0.3675 | 0.4337 | 0.019* |
| C41 | 0.3704 (3) | 0.32672 (15) | 0.1144 (2) | 0.0124 (6) |
| C42 | 0.2932 (3) | 0.28739 (15) | 0.0390 (2) | 0.0152 (6) |
| H42 | 0.253 | 0.2453 | 0.0593 | 0.018* |
| C43 | 0.2749 (3) | 0.30953 (15) | −0.0655 (2) | 0.0158 (6) |
| H43 | 0.2215 | 0.283 | −0.1167 | 0.019* |
| C44 | 0.3346 (3) | 0.37023 (16) | −0.0948 (2) | 0.0169 (6) |
| H44 | 0.3245 | 0.3846 | −0.1667 | 0.02* |
| C45 | 0.4088 (3) | 0.41015 (16) | −0.0201 (2) | 0.0182 (6) |
| H45 | 0.4477 | 0.4525 | −0.0406 | 0.022* |
| C46 | 0.4272 (3) | 0.38889 (15) | 0.0847 (2) | 0.0169 (6) |
| H46 | 0.4782 | 0.4166 | 0.136 | 0.02* |

*Atomic displacement parameters (Å²)*

| | $U^{11}$ | $U^{22}$ | $U^{33}$ | $U^{12}$ | $U^{13}$ | $U^{23}$ |
|---|---|---|---|---|---|---|
| N1 | 0.0146 (12) | 0.0097 (12) | 0.0134 (12) | 0.0010 (9) | 0.0058 (10) | 0.0007 (9) |
| P1 | 0.0109 (3) | 0.0113 (4) | 0.0104 (3) | 0.0002 (3) | 0.0030 (3) | 0.0000 (3) |
| P2 | 0.0100 (3) | 0.0112 (4) | 0.0104 (4) | 0.0005 (3) | 0.0014 (3) | 0.0010 (3) |
| Cl1 | 0.0176 (4) | 0.0213 (4) | 0.0176 (4) | 0.0008 (3) | 0.0093 (3) | −0.0008 (3) |
| Cl2 | 0.0240 (4) | 0.0116 (3) | 0.0225 (4) | 0.0025 (3) | 0.0025 (3) | 0.0003 (3) |
| Pt | 0.01023 (6) | 0.01022 (6) | 0.00961 (6) | 0.00052 (4) | 0.00187 (4) | −0.00044 (4) |
| C1 | 0.0176 (15) | 0.0141 (15) | 0.0151 (15) | −0.0014 (12) | 0.0065 (12) | −0.0006 (11) |
| C2 | 0.0232 (17) | 0.0208 (17) | 0.0182 (16) | 0.0031 (13) | 0.0009 (13) | 0.0009 (13) |
| C3 | 0.0251 (17) | 0.0124 (15) | 0.0257 (17) | 0.0050 (13) | 0.0099 (14) | 0.0021 (13) |
| C11 | 0.0131 (14) | 0.0176 (15) | 0.0084 (14) | −0.0023 (11) | 0.0034 (11) | 0.0003 (11) |
| C12 | 0.0166 (15) | 0.0183 (16) | 0.0192 (16) | 0.0002 (12) | 0.0044 (12) | −0.0024 (12) |
| C13 | 0.0231 (16) | 0.0186 (16) | 0.0215 (17) | −0.0059 (13) | 0.0056 (13) | −0.0064 (13) |
| C14 | 0.0156 (15) | 0.0328 (19) | 0.0146 (16) | −0.0079 (13) | 0.0022 (12) | −0.0028 (13) |
| C15 | 0.0168 (15) | 0.0304 (18) | 0.0140 (15) | −0.0009 (13) | 0.0014 (12) | 0.0030 (13) |
| C16 | 0.0158 (15) | 0.0174 (16) | 0.0191 (16) | −0.0006 (12) | 0.0022 (12) | −0.0012 (12) |
| C21 | 0.0148 (14) | 0.0111 (14) | 0.0117 (14) | 0.0015 (11) | 0.0039 (11) | −0.0004 (11) |
| C22 | 0.0185 (16) | 0.0192 (16) | 0.0189 (16) | −0.0045 (13) | 0.0023 (13) | 0.0066 (13) |
| C23 | 0.0131 (15) | 0.0239 (17) | 0.0201 (16) | −0.0035 (12) | −0.0002 (12) | 0.0047 (13) |
| C24 | 0.0231 (16) | 0.0166 (16) | 0.0169 (16) | 0.0041 (13) | 0.0020 (13) | 0.0056 (12) |
| C25 | 0.0296 (18) | 0.0218 (17) | 0.0246 (18) | −0.0095 (14) | 0.0019 (14) | 0.0101 (14) |
| C26 | 0.0158 (15) | 0.0250 (17) | 0.0203 (16) | −0.0040 (13) | −0.0004 (12) | 0.0032 (13) |
| C31 | 0.0120 (14) | 0.0131 (14) | 0.0149 (15) | −0.0023 (11) | 0.0006 (11) | 0.0045 (11) |
| C32 | 0.0177 (15) | 0.0172 (16) | 0.0175 (16) | 0.0015 (12) | 0.0026 (12) | 0.0065 (12) |
| C33 | 0.0148 (15) | 0.0212 (17) | 0.0321 (19) | 0.0021 (13) | 0.0043 (14) | 0.0129 (14) |
| C34 | 0.0143 (15) | 0.0197 (17) | 0.038 (2) | −0.0043 (13) | −0.0084 (14) | 0.0147 (14) |
| C35 | 0.0249 (17) | 0.0144 (15) | 0.0191 (16) | −0.0019 (13) | −0.0096 (13) | 0.0035 (12) |
| C36 | 0.0176 (15) | 0.0145 (15) | 0.0140 (15) | 0.0002 (12) | −0.0016 (12) | 0.0043 (11) |
| C41 | 0.0129 (14) | 0.0129 (14) | 0.0114 (14) | 0.0033 (11) | 0.0020 (11) | 0.0011 (11) |
| C42 | 0.0176 (15) | 0.0114 (14) | 0.0160 (15) | 0.0007 (11) | 0.0003 (12) | −0.0003 (11) |
| C43 | 0.0207 (16) | 0.0157 (15) | 0.0106 (14) | 0.0026 (12) | 0.0001 (12) | −0.0038 (11) |
| C44 | 0.0183 (15) | 0.0221 (16) | 0.0099 (14) | 0.0077 (12) | 0.0002 (12) | 0.0024 (12) |
| C45 | 0.0177 (15) | 0.0178 (16) | 0.0189 (16) | −0.0050 (12) | 0.0015 (12) | 0.0069 (12) |
| C46 | 0.0159 (15) | 0.0153 (15) | 0.0179 (16) | −0.0017 (12) | −0.0039 (12) | 0.0011 (12) |

*Geometric parameters (Å, º)*

| | | | |
|---|---|---|---|
| N1—C1 | 1.484 (3) | C21—C22 | 1.393 (4) |
| N1—P2 | 1.695 (2) | C22—C23 | 1.383 (4) |
| N1—P1 | 1.699 (2) | C22—H22 | 0.95 |
| P1—C21 | 1.804 (3) | C23—C24 | 1.383 (4) |
| P1—C11 | 1.804 (3) | C23—H23 | 0.95 |
| Pt—P1 | 2.1932 (7) | C24—C25 | 1.378 (4) |
| P1—P2 | 2.6019 (10) | C24—H24 | 0.95 |
| P2—C41 | 1.804 (3) | C25—C26 | 1.394 (4) |
| P2—C31 | 1.810 (3) | C25—H25 | 0.95 |

| | | | |
|---|---|---|---|
| Pt—P2 | 2.2121 (7) | C26—H26 | 0.95 |
| Pt—Cl1 | 2.3461 (7) | C31—C36 | 1.394 (4) |
| Pt—Cl2 | 2.3528 (7) | C31—C32 | 1.399 (4) |
| C1—C2 | 1.507 (4) | C32—C33 | 1.379 (4) |
| C1—H1A | 0.99 | C32—H32 | 0.95 |
| C1—H1B | 0.99 | C33—C34 | 1.387 (5) |
| C2—C3 | 1.530 (4) | C33—H33 | 0.95 |
| C2—H2A | 0.99 | C34—C35 | 1.377 (5) |
| C2—H2B | 0.99 | C34—H34 | 0.95 |
| C3—H3A | 0.98 | C35—C36 | 1.392 (4) |
| C3—H3B | 0.98 | C35—H35 | 0.95 |
| C3—H3C | 0.98 | C36—H36 | 0.95 |
| C11—C12 | 1.395 (4) | C41—C46 | 1.391 (4) |
| C11—C16 | 1.400 (4) | C41—C42 | 1.394 (4) |
| C12—C13 | 1.388 (4) | C42—C43 | 1.388 (4) |
| C12—H12 | 0.95 | C42—H42 | 0.95 |
| C13—C14 | 1.385 (4) | C43—C44 | 1.381 (4) |
| C13—H13 | 0.95 | C43—H43 | 0.95 |
| C14—C15 | 1.389 (4) | C44—C45 | 1.380 (4) |
| C14—H14 | 0.95 | C44—H44 | 0.95 |
| C15—C16 | 1.389 (4) | C45—C46 | 1.386 (4) |
| C15—H15 | 0.95 | C45—H45 | 0.95 |
| C16—H16 | 0.95 | C46—H46 | 0.95 |
| C21—C26 | 1.390 (4) | | |

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| C1—N1—P2 | 132.48 (19) | C14—C15—H15 | 120 |
| C1—N1—P1 | 126.38 (19) | C15—C16—C11 | 120.4 (3) |
| P2—N1—P1 | 100.11 (12) | C15—C16—H16 | 119.8 |
| N1—P1—C21 | 107.92 (12) | C11—C16—H16 | 119.8 |
| N1—P1—C11 | 108.52 (12) | C26—C21—C22 | 118.8 (3) |
| C21—P1—C11 | 110.26 (14) | C26—C21—P1 | 124.0 (2) |
| N1—P1—Pt | 94.02 (8) | C22—C21—P1 | 117.1 (2) |
| C21—P1—Pt | 119.51 (10) | C23—C22—C21 | 120.9 (3) |
| C11—P1—Pt | 114.70 (10) | C23—C22—H22 | 119.6 |
| C21—P1—P2 | 123.93 (10) | C21—C22—H22 | 119.6 |
| C11—P1—P2 | 122.36 (10) | C22—C23—C24 | 120.2 (3) |
| Pt—P1—P2 | 54.13 (2) | C22—C23—H23 | 119.9 |
| N1—P2—C41 | 107.43 (13) | C24—C23—H23 | 119.9 |
| N1—P2—C31 | 111.98 (13) | C25—C24—C23 | 119.4 (3) |
| C41—P2—C31 | 103.49 (13) | C25—C24—H24 | 120.3 |
| N1—P2—Pt | 93.46 (8) | C23—C24—H24 | 120.3 |
| C41—P2—Pt | 122.17 (9) | C24—C25—C26 | 120.9 (3) |
| C31—P2—Pt | 117.65 (10) | C24—C25—H25 | 119.6 |
| C41—P2—P1 | 126.30 (10) | C26—C25—H25 | 119.6 |
| C31—P2—P1 | 126.28 (10) | C21—C26—C25 | 119.8 (3) |
| Pt—P2—P1 | 53.46 (2) | C21—C26—H26 | 120.1 |
| P1—Pt—P2 | 72.40 (3) | C25—C26—H26 | 120.1 |
| P1—Pt—Cl1 | 93.70 (3) | C36—C31—C32 | 120.3 (3) |

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| P2—Pt—Cl1 | 165.96 (3) | C36—C31—P2 | 118.8 (2) |
| P1—Pt—Cl2 | 172.11 (3) | C32—C31—P2 | 120.9 (2) |
| P2—Pt—Cl2 | 101.35 (3) | C33—C32—C31 | 119.2 (3) |
| Cl1—Pt—Cl2 | 92.67 (3) | C33—C32—H32 | 120.4 |
| N1—C1—C2 | 114.9 (2) | C31—C32—H32 | 120.4 |
| N1—C1—H1A | 108.6 | C32—C33—C34 | 120.4 (3) |
| C2—C1—H1A | 108.6 | C32—C33—H33 | 119.8 |
| N1—C1—H1B | 108.6 | C34—C33—H33 | 119.8 |
| C2—C1—H1B | 108.6 | C35—C34—C33 | 120.7 (3) |
| H1A—C1—H1B | 107.5 | C35—C34—H34 | 119.7 |
| C1—C2—C3 | 110.3 (3) | C33—C34—H34 | 119.7 |
| C1—C2—H2A | 109.6 | C34—C35—C36 | 119.8 (3) |
| C3—C2—H2A | 109.6 | C34—C35—H35 | 120.1 |
| C1—C2—H2B | 109.6 | C36—C35—H35 | 120.1 |
| C3—C2—H2B | 109.6 | C35—C36—C31 | 119.6 (3) |
| H2A—C2—H2B | 108.1 | C35—C36—H36 | 120.2 |
| C2—C3—H3A | 109.5 | C31—C36—H36 | 120.2 |
| C2—C3—H3B | 109.5 | C46—C41—C42 | 119.8 (3) |
| H3A—C3—H3B | 109.5 | C46—C41—P2 | 120.8 (2) |
| C2—C3—H3C | 109.5 | C42—C41—P2 | 119.4 (2) |
| H3A—C3—H3C | 109.5 | C43—C42—C41 | 120.1 (3) |
| H3B—C3—H3C | 109.5 | C43—C42—H42 | 119.9 |
| C12—C11—C16 | 119.2 (3) | C41—C42—H42 | 119.9 |
| C12—C11—P1 | 123.2 (2) | C44—C43—C42 | 119.7 (3) |
| C16—C11—P1 | 117.4 (2) | C44—C43—H43 | 120.1 |
| C13—C12—C11 | 120.0 (3) | C42—C43—H43 | 120.1 |
| C13—C12—H12 | 120 | C45—C44—C43 | 120.3 (3) |
| C11—C12—H12 | 120 | C45—C44—H44 | 119.8 |
| C14—C13—C12 | 120.6 (3) | C43—C44—H44 | 119.8 |
| C14—C13—H13 | 119.7 | C44—C45—C46 | 120.5 (3) |
| C12—C13—H13 | 119.7 | C44—C45—H45 | 119.7 |
| C13—C14—C15 | 119.8 (3) | C46—C45—H45 | 119.7 |
| C13—C14—H14 | 120.1 | C45—C46—C41 | 119.5 (3) |
| C15—C14—H14 | 120.1 | C45—C46—H46 | 120.2 |
| C16—C15—C14 | 120.0 (3) | C41—C46—H46 | 120.2 |
| C16—C15—H15 | 120 | | |

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| C1—N1—P1—C21 | 68.6 (3) | C16—C11—C12—C13 | −0.3 (4) |
| P2—N1—P1—C21 | −121.87 (13) | P1—C11—C12—C13 | −174.2 (2) |
| C1—N1—P1—C11 | −50.9 (3) | C11—C12—C13—C14 | 0.7 (4) |
| P2—N1—P1—C11 | 118.66 (14) | C12—C13—C14—C15 | −0.8 (5) |
| C1—N1—P1—Pt | −168.6 (2) | C13—C14—C15—C16 | 0.5 (4) |
| P2—N1—P1—Pt | 0.93 (11) | C14—C15—C16—C11 | −0.1 (4) |
| C1—N1—P1—P2 | −169.5 (3) | C12—C11—C16—C15 | 0.0 (4) |
| C1—N1—P2—C41 | 42.3 (3) | P1—C11—C16—C15 | 174.3 (2) |
| P1—N1—P2—C41 | −126.24 (13) | N1—P1—C21—C26 | −138.4 (3) |
| C1—N1—P2—C31 | −70.6 (3) | C11—P1—C21—C26 | −20.0 (3) |
| P1—N1—P2—C31 | 120.79 (14) | Pt—P1—C21—C26 | 116.1 (2) |

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| C1—N1—P2—Pt | 167.6 (2) | P2—P1—C21—C26 | −179.4 (2) |
| P1—N1—P2—Pt | −0.92 (11) | N1—P1—C21—C22 | 45.4 (3) |
| C1—N1—P2—P1 | 168.6 (3) | C11—P1—C21—C22 | 163.8 (2) |
| C21—P1—P2—N1 | 76.89 (17) | Pt—P1—C21—C22 | −60.1 (2) |
| C11—P1—P2—N1 | −80.10 (17) | P2—P1—C21—C22 | 4.4 (3) |
| Pt—P1—P2—N1 | −178.85 (13) | C26—C21—C22—C23 | 1.5 (5) |
| N1—P1—P2—C41 | 72.71 (17) | P1—C21—C22—C23 | 177.9 (2) |
| C21—P1—P2—C41 | 149.61 (16) | C21—C22—C23—C24 | −0.3 (5) |
| C11—P1—P2—C41 | −7.38 (17) | C22—C23—C24—C25 | −0.4 (5) |
| Pt—P1—P2—C41 | −106.14 (12) | C23—C24—C25—C26 | −0.2 (5) |
| N1—P1—P2—C31 | −81.22 (18) | C22—C21—C26—C25 | −2.1 (5) |
| C21—P1—P2—C31 | −4.33 (17) | P1—C21—C26—C25 | −178.2 (2) |
| C11—P1—P2—C31 | −161.32 (16) | C24—C25—C26—C21 | 1.5 (5) |
| Pt—P1—P2—C31 | 99.93 (12) | N1—P2—C31—C36 | −113.0 (2) |
| N1—P1—P2—Pt | 178.85 (13) | C41—P2—C31—C36 | 131.6 (2) |
| C21—P1—P2—Pt | −104.26 (11) | Pt—P2—C31—C36 | −6.4 (3) |
| C11—P1—P2—Pt | 98.75 (11) | P1—P2—C31—C36 | −69.7 (3) |
| N1—P1—Pt—P2 | −0.74 (9) | N1—P2—C31—C32 | 70.1 (3) |
| C21—P1—Pt—P2 | 112.48 (11) | C41—P2—C31—C32 | −45.3 (3) |
| C11—P1—Pt—P2 | −113.24 (10) | Pt—P2—C31—C32 | 176.61 (19) |
| N1—P1—Pt—Cl1 | −178.70 (9) | P1—P2—C31—C32 | 113.3 (2) |
| C21—P1—Pt—Cl1 | −65.49 (11) | C36—C31—C32—C33 | 1.9 (4) |
| C11—P1—Pt—Cl1 | 68.80 (10) | P2—C31—C32—C33 | 178.9 (2) |
| P2—P1—Pt—Cl1 | −177.96 (3) | C31—C32—C33—C34 | −1.9 (4) |
| N1—P2—Pt—P1 | 0.74 (9) | C32—C33—C34—C35 | 0.4 (5) |
| C41—P2—Pt—P1 | 113.85 (12) | C33—C34—C35—C36 | 1.1 (4) |
| C31—P2—Pt—P1 | −116.32 (11) | C34—C35—C36—C31 | −1.1 (4) |
| N1—P2—Pt—Cl1 | 9.15 (15) | C32—C31—C36—C35 | −0.4 (4) |
| C41—P2—Pt—Cl1 | 122.27 (15) | P2—C31—C36—C35 | −177.4 (2) |
| C31—P2—Pt—Cl1 | −107.90 (14) | N1—P2—C41—C46 | −150.9 (2) |
| P1—P2—Pt—Cl1 | 8.41 (11) | C31—P2—C41—C46 | −32.3 (3) |
| N1—P2—Pt—Cl2 | −174.28 (9) | Pt—P2—C41—C46 | 103.3 (2) |
| C41—P2—Pt—Cl2 | −61.16 (12) | P1—P2—C41—C46 | 169.10 (19) |
| C31—P2—Pt—Cl2 | 68.67 (11) | N1—P2—C41—C42 | 29.1 (3) |
| P1—P2—Pt—Cl2 | −175.02 (3) | C31—P2—C41—C42 | 147.7 (2) |
| P2—N1—C1—C2 | 96.3 (3) | Pt—P2—C41—C42 | −76.7 (2) |
| P1—N1—C1—C2 | −97.7 (3) | P1—P2—C41—C42 | −10.9 (3) |
| N1—C1—C2—C3 | 172.2 (2) | C46—C41—C42—C43 | 1.1 (4) |
| N1—P1—C11—C12 | 78.3 (3) | P2—C41—C42—C43 | −178.8 (2) |
| C21—P1—C11—C12 | −39.7 (3) | C41—C42—C43—C44 | 0.7 (4) |
| Pt—P1—C11—C12 | −178.1 (2) | C42—C43—C44—C45 | −2.1 (4) |
| P2—P1—C11—C12 | 120.1 (2) | C43—C44—C45—C46 | 1.7 (5) |
| N1—P1—C11—C16 | −95.8 (2) | C44—C45—C46—C41 | 0.2 (5) |
| C21—P1—C11—C16 | 146.2 (2) | C42—C41—C46—C45 | −1.6 (4) |
| Pt—P1—C11—C16 | 7.9 (3) | P2—C41—C46—C45 | 178.4 (2) |
| P2—P1—C11—C16 | −54.0 (3) | | |

*Hydrogen-bond geometry (Å, º)*

| *D*—H···*A* | *D*—H | H···*A* | *D*···*A* | *D*—H···*A* |
|---|---|---|---|---|
| C1—H1*A*···Cl1$^{i}$ | 0.99 | 2.64 | 3.512 (3) | 147 |

Symmetry code: (i) *x*+1/2, −*y*+1/2, *z*−1/2.