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# *catena*-Poly[[chloridocadmium(II)]bis{$\mu$-1-[(2-ethyl-1*H*-imidazol-1-yl)methyl]-1*H*-benzotriazole}[chloridocadmium(II)]di-$\mu$-chlorido]

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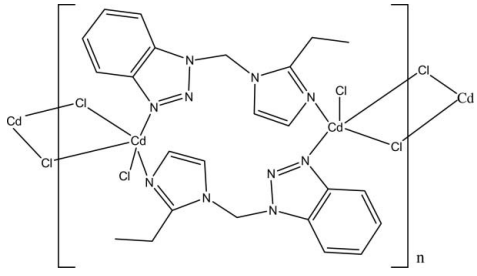
Key indicators: single-crystal X-ray study; $T$ = 293 K; mean $\sigma$(C–C) = 0.006 Å; $R$ factor = 0.035; $wR$ factor = 0.069; data-to-parameter ratio = 16.3.

In the polymeric title complex, $[CdCl_2(C_{12}H_{13}N_5)]_n$, the $Cd^{II}$ atom is five-coordinated by two N atoms from two bridging 1-[(2-ethyl-1*H*-imidazol-1-yl)methyl]-1*H*-benzotriazole (bmei) ligands, two bridging Cl atoms and one terminal Cl atom in a distorted trigonal–bipyramidal geometry. The $Cd^{II}$ atoms are connected alternately by the Cl atoms and bmei ligands, leading to a zigzag chain extending parallel to [011]. $\pi$–$\pi$ interactions, with a centroid–centroid distance of 3.3016 (3) Å, help to stabilize the crystal packing.

## Related literature

For similar compounds with symmetric or asymmetric *N*-heterocyclic ligands, see: Li *et al.* (2011); Hu *et al.* (2009); Meng *et al.* (2009); Huang *et al.* (2006).



## Experimental

### Crystal data

$[CdCl_2(C_{12}H_{13}N_5)]$
$M_r$ = 410.57
Triclinic, $P\overline{1}$
$a$ = 7.6055 (6) Å
$b$ = 9.7027 (11) Å
$c$ = 10.3144 (10) Å
$\alpha$ = 74.431 (9)°
$\beta$ = 81.609 (7)°
$\gamma$ = 87.720 (8)°
$V$ = 725.36 (12) Å$^3$
$Z$ = 2
Mo $K\alpha$ radiation
$\mu$ = 1.87 mm$^{-1}$
$T$ = 293 K
0.20 × 0.20 × 0.18 mm

### Data collection

Oxford Diffraction Xcalibur Eos Gemini diffractometer
Absorption correction: multi-scan (*CrysAlis PRO*; Oxford Diffraction, 2010)
$T_{min}$ = 0.993, $T_{max}$ = 1.000
6082 measured reflections
2963 independent reflections
2534 reflections with $I > 2\sigma(I)$
$R_{int}$ = 0.027

### Refinement

$R[F^2 > 2\sigma(F^2)]$ = 0.035
$wR(F^2)$ = 0.069
$S$ = 1.02
2963 reflections
182 parameters
H-atom parameters constrained
$\Delta\rho_{max}$ = 0.47 e Å$^{-3}$
$\Delta\rho_{min}$ = −0.50 e Å$^{-3}$

Data collection: *CrysAlis PRO* (Oxford Diffraction, 2010); cell refinement: *CrysAlis PRO*; data reduction: *CrysAlis PRO*; program(s) used to solve structure: *SHELXS97* (Sheldrick, 2008); program(s) used to refine structure: *SHELXL97* (Sheldrick, 2008); molecular graphics: *OLEX2* (Dolomanov *et al.*, 2009); software used to prepare material for publication: *publCIF* (Westrip, 2010).

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Supplementary data and figures for this paper are available from the IUCr electronic archives (Reference: WM2490).

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# supplementary materials

*Acta Cryst.* (2011). E**67**, m846 [ **doi:10.1107/S1600536811019908** ]

# *catena*-Poly[[chloridocadmium(II)]bis{$\mu$-1-[(2-ethyl-1*H*-imidazol-1-yl)methyl]-1*H*-benzotriazole}[chloridocadmium(II)]di-$\mu$-chlorido]

**X. Wang, X.-J. Shi, H.-X. Yang, H. Feng and P. Liu**

## Comment

In coordination and supramolecular chemistry many symmetric imidazole and benzotriazole ligands have been applied (Li *et al.*, 2011; Hu *et al.*, 2009). However, studies involving asymmetric imidazole and benzotriazole ligands are rather rare (Meng *et al.*, 2009; Huang *et al.*, 2006). We were thus engaged in the synthesis of asymmetric N-heterocyclic ligands and synthesized the compound 1-[(1*H*-benzotriazol-1-yl)methyl]-1*H*-1,3-(2-ethyl-imidazol) (bmei). In this work, we selected this compound as a ligand for generation of the new complex $[Cd(C_{12}H_{13}N_5)Cl_2]_n$, (I), that is reported here.

In the complex (I) the $Cd^{II}$ atom is five-coordinated by two N atoms from two bridging bmei ligands, two bridging Cl atoms and one terminal Cl atom in a distorted trigonal-bipyramidal geometry (Fig. 1). The two $Cd^{II}$ ions are connected by a pair of bridging Cl atoms, yielding a centrosymmetric $Cd_2Cl_2$ binuclear unit with a Cd···Cd distance of 3.9657 (6) Å. The dimers are further linked by bmei ligands to give a zigzag chain extending parallel to [011] (Fig. 2). The distance between two Cd atoms bridged by the bmei ligand is 9.0727 (12) Å. In addition, the benzotriazole rings between adjacent chains are stacked in a face-to-face orientation with a centroid—centroid distance of 3.3016 (3) Å, so the crystal structure involves also π—π interactions.

## Experimental

The ligand 1-[(1*H*-benzotriazol-1-yl)methyl]-1*H*-1,3-(2-ethyl-imidazol) (0.04 mmol, 0.0096 g) in methanol (6 ml) was added dropwise to a methanol solution (5 ml) of $CdCl_2$ (0.04 mmol, 0.0074 g) in methanol. The resulting solution was allowed to stand at room temperature. After one week good quality colourless crystals were obtained and dried in air.

## Refinement

H atoms were placed geometrically and refined as riding atoms with C-H = 0.93 Å and $U_{iso}(H) = 1.2U_{eq}(C)$.

## Figures

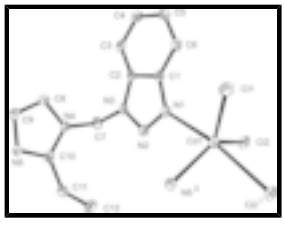

Fig. 1. A fragment of the title complex, showing the coordination of the $Cd^{II}$ atom with atom labelling of the non-H atoms and with 30% probability ellipsolids. [Symmetry codes: (i) -*x* + 1,-*y* + 1,-*z* + 1; (ii) -*x* + 1, -*y* + 2, -*z*.]

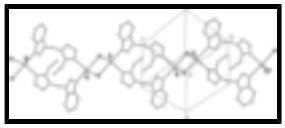

Fig. 2. View of the zigzag chain structure of the title complex.

**_catena_-Poly[[chloridocadmium(II)]bis{μ-1-[(2-ethyl-1_H_- imidazol-1-yl)methyl]-1_H_-benzotriazole}[chloridocadmium(II)]di- μ-chlorido]**

*Crystal data*

| | |
|---|---|
| $[CdCl_2(C_{12}H_{13}N_5)]$ | $Z = 2$ |
| $M_r = 410.57$ | $F(000) = 404$ |
| Triclinic, $P\overline{1}$ | $D_x = 1.880$ Mg m$^{-3}$ |
| $a = 7.6055$ (6) Å | Mo $K\alpha$ radiation, $\lambda = 0.7107$ Å |
| $b = 9.7027$ (11) Å | Cell parameters from 2806 reflections |
| $c = 10.3144$ (10) Å | $\theta = 3.2$–$26.3°$ |
| $\alpha = 74.431$ (9)° | $\mu = 1.87$ mm$^{-1}$ |
| $\beta = 81.609$ (7)° | $T = 293$ K |
| $\gamma = 87.720$ (8)° | Prismatic, colorless |
| $V = 725.36$ (12) Å$^3$ | 0.20 × 0.20 × 0.18 mm |

*Data collection*

| | |
|---|---|
| Oxford Diffraction Xcalibur Eos Gemini diffractometer | 2963 independent reflections |
| Radiation source: Enhance (Mo) X-ray Source | 2534 reflections with $I > 2\sigma(I)$ |
| graphite | $R_{int} = 0.027$ |
| Detector resolution: 16.2312 pixels mm$^{-1}$ | $\theta_{max} = 26.3°$, $\theta_{min} = 3.2°$ |
| ω scans | $h = -9 \rightarrow 9$ |
| Absorption correction: multi-scan (*CrysAlis PRO*; Oxford Diffraction, 2010) | $k = -12 \rightarrow 11$ |
| $T_{min} = 0.993$, $T_{max} = 1.000$ | $l = -12 \rightarrow 11$ |
| 6082 measured reflections | |

*Refinement*

| | |
|---|---|
| Refinement on $F^2$ | Primary atom site location: structure-invariant direct methods |
| Least-squares matrix: full | Secondary atom site location: difference Fourier map |
| $R[F^2 > 2\sigma(F^2)] = 0.035$ | Hydrogen site location: inferred from neighbouring sites |
| $wR(F^2) = 0.069$ | H-atom parameters constrained |
| $S = 1.02$ | $w = 1/[\sigma^2(F_o^2) + (0.0217P)^2]$ where $P = (F_o^2 + 2F_c^2)/3$ |
| 2963 reflections | $(\Delta/\sigma)_{max} = 0.001$ |
| 182 parameters | $\Delta\rho_{max} = 0.47$ e Å$^{-3}$ |
| 0 restraints | $\Delta\rho_{min} = -0.50$ e Å$^{-3}$ |

*Special details*

**Geometry**. All e.s.d.'s (except the e.s.d. in the dihedral angle between two l.s. planes) are estimated using the full covariance matrix. The cell e.s.d.'s are taken into account individually in the estimation of e.s.d.'s in distances, angles and torsion angles; correlations between e.s.d.'s in cell parameters are only used when they are defined by crystal symmetry. An approximate (isotropic) treatment of cell e.s.d.'s is used for estimating e.s.d.'s involving l.s. planes.

**Refinement**. Refinement of $F^2$ against ALL reflections. The weighted *R*-factor *wR* and goodness of fit *S* are based on $F^2$, conventional *R*-factors *R* are based on *F*, with *F* set to zero for negative $F^2$. The threshold expression of $F^2 > \sigma(F^2)$ is used only for calculating *R*-factors(gt) *etc*. and is not relevant to the choice of reflections for refinement. *R*-factors based on $F^2$ are statistically about twice as large as those based on *F*, and *R*- factors based on ALL data will be even larger.

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

| | *x* | *y* | *z* | $U_{iso}$*/$U_{eq}$ |
|---|---|---|---|---|
| Cd1 | 0.37119 (4) | 0.60250 (3) | 0.34830 (3) | 0.02594 (10) |
| Cl1 | 0.10727 (13) | 0.49171 (10) | 0.30891 (11) | 0.0366 (3) |
| Cl2 | 0.41293 (13) | 0.62093 (9) | 0.58398 (10) | 0.0321 (2) |
| N1 | 0.2477 (4) | 0.8391 (3) | 0.3168 (3) | 0.0266 (7) |
| N2 | 0.3564 (4) | 0.9476 (3) | 0.2763 (3) | 0.0270 (7) |
| N3 | 0.2578 (4) | 1.0677 (3) | 0.2711 (3) | 0.0240 (7) |
| N4 | 0.3531 (4) | 1.2614 (3) | 0.0745 (3) | 0.0268 (7) |
| N5 | 0.4535 (4) | 1.3280 (3) | −0.1440 (3) | 0.0302 (8) |
| C1 | 0.0746 (5) | 0.8865 (4) | 0.3398 (4) | 0.0241 (8) |
| C2 | 0.0805 (5) | 1.0354 (4) | 0.3106 (4) | 0.0223 (8) |
| C3 | −0.0701 (5) | 1.1177 (4) | 0.3322 (4) | 0.0267 (8) |
| H3 | −0.0656 | 1.2167 | 0.3151 | 0.032* |
| C4 | −0.2255 (5) | 1.0418 (4) | 0.3806 (4) | 0.0303 (9) |
| H4 | −0.3299 | 1.0915 | 0.3969 | 0.036* |
| C5 | −0.2333 (5) | 0.8923 (4) | 0.4064 (4) | 0.0322 (9) |
| H5 | −0.3426 | 0.8466 | 0.4374 | 0.039* |
| C6 | −0.0851 (5) | 0.8122 (4) | 0.3874 (4) | 0.0281 (9) |
| H6 | −0.0904 | 0.7132 | 0.4052 | 0.034* |
| C7 | 0.3445 (5) | 1.2069 (4) | 0.2205 (4) | 0.0294 (9) |
| H7B | 0.2797 | 1.2742 | 0.2643 | 0.035* |
| H7A | 0.4640 | 1.1987 | 0.2442 | 0.035* |
| C8 | 0.2094 (5) | 1.3085 (4) | 0.0082 (4) | 0.0345 (10) |
| H8 | 0.0919 | 1.3119 | 0.0479 | 0.041* |
| C9 | 0.2719 (5) | 1.3492 (4) | −0.1261 (4) | 0.0382 (10) |
| H9 | 0.2035 | 1.3856 | −0.1954 | 0.046* |
| C10 | 0.4998 (5) | 1.2744 (4) | −0.0210 (4) | 0.0266 (8) |
| C11 | 0.6844 (5) | 1.2391 (4) | 0.0090 (4) | 0.0365 (10) |
| H11B | 0.7009 | 1.2715 | 0.0876 | 0.044* |
| H11A | 0.7665 | 1.2922 | −0.0674 | 0.044* |
| C12 | 0.7329 (6) | 1.0793 (4) | 0.0370 (4) | 0.0457 (11) |
| H12A | 0.7140 | 1.0451 | −0.0389 | 0.069* |
| H12B | 0.6593 | 1.0264 | 0.1173 | 0.069* |
| H12C | 0.8555 | 1.0668 | 0.0502 | 0.069* |

*Atomic displacement parameters (Å$^2$)*

| | $U^{11}$ | $U^{22}$ | $U^{33}$ | $U^{12}$ | $U^{13}$ | $U^{23}$ |
|---|---|---|---|---|---|---|
| Cd1 | 0.02975 (16) | 0.02168 (16) | 0.02519 (18) | 0.00200 (11) | −0.00631 (12) | −0.00314 (12) |
| Cl1 | 0.0331 (5) | 0.0287 (5) | 0.0511 (7) | −0.0001 (4) | −0.0110 (5) | −0.0133 (5) |
| Cl2 | 0.0412 (6) | 0.0275 (5) | 0.0290 (6) | 0.0108 (4) | −0.0100 (4) | −0.0087 (4) |
| N1 | 0.0333 (18) | 0.0213 (16) | 0.0227 (19) | 0.0029 (14) | −0.0050 (14) | −0.0014 (13) |
| N2 | 0.0319 (18) | 0.0236 (16) | 0.0238 (19) | 0.0048 (14) | −0.0044 (14) | −0.0038 (13) |
| N3 | 0.0314 (18) | 0.0182 (15) | 0.0197 (18) | 0.0015 (13) | −0.0017 (14) | −0.0017 (13) |
| N4 | 0.0287 (17) | 0.0235 (16) | 0.0251 (19) | 0.0018 (13) | −0.0074 (14) | 0.0005 (13) |
| N5 | 0.0283 (18) | 0.0332 (18) | 0.0240 (19) | 0.0025 (14) | −0.0036 (14) | 0.0009 (14) |
| C1 | 0.031 (2) | 0.0235 (19) | 0.017 (2) | 0.0042 (16) | −0.0018 (16) | −0.0045 (15) |
| C2 | 0.0267 (19) | 0.0219 (19) | 0.017 (2) | 0.0004 (15) | −0.0028 (15) | −0.0036 (15) |
| C3 | 0.037 (2) | 0.0228 (19) | 0.021 (2) | 0.0059 (17) | −0.0074 (17) | −0.0064 (16) |
| C4 | 0.027 (2) | 0.036 (2) | 0.028 (2) | 0.0062 (17) | −0.0050 (17) | −0.0095 (18) |
| C5 | 0.029 (2) | 0.036 (2) | 0.029 (2) | −0.0055 (18) | −0.0010 (18) | −0.0051 (18) |
| C6 | 0.035 (2) | 0.0225 (19) | 0.025 (2) | −0.0036 (17) | −0.0068 (17) | −0.0011 (16) |
| C7 | 0.040 (2) | 0.025 (2) | 0.023 (2) | −0.0029 (17) | −0.0034 (18) | −0.0063 (17) |
| C8 | 0.027 (2) | 0.036 (2) | 0.035 (3) | 0.0032 (18) | −0.0033 (18) | −0.0013 (19) |
| C9 | 0.030 (2) | 0.045 (2) | 0.032 (3) | 0.0039 (19) | −0.0086 (19) | 0.004 (2) |
| C10 | 0.030 (2) | 0.0191 (18) | 0.028 (2) | 0.0003 (16) | −0.0031 (17) | −0.0019 (16) |
| C11 | 0.029 (2) | 0.047 (3) | 0.029 (2) | −0.0005 (19) | −0.0057 (18) | −0.002 (2) |
| C12 | 0.046 (3) | 0.056 (3) | 0.034 (3) | 0.021 (2) | −0.012 (2) | −0.009 (2) |

*Geometric parameters (Å, °)*

| | | | |
|---|---|---|---|
| Cd1—Cl1 | 2.4482 (10) | C3—H3 | 0.9300 |
| Cd1—Cl2$^{i}$ | 2.6687 (10) | C3—C4 | 1.374 (5) |
| Cd1—Cl2 | 2.5505 (10) | C4—H4 | 0.9300 |
| Cd1—N1 | 2.403 (3) | C4—C5 | 1.405 (5) |
| Cd1—N5$^{ii}$ | 2.272 (3) | C5—H5 | 0.9300 |
| Cl2—Cd1$^{i}$ | 2.6686 (10) | C5—C6 | 1.363 (5) |
| N1—N2 | 1.303 (4) | C6—H6 | 0.9300 |
| N1—C1 | 1.386 (5) | C7—H7B | 0.9700 |
| N2—N3 | 1.353 (4) | C7—H7A | 0.9700 |
| N3—C2 | 1.374 (4) | C8—H8 | 0.9300 |
| N3—C7 | 1.457 (4) | C8—C9 | 1.353 (5) |
| N4—C7 | 1.449 (5) | C9—H9 | 0.9300 |
| N4—C8 | 1.371 (5) | C10—C11 | 1.488 (5) |
| N4—C10 | 1.362 (5) | C11—H11B | 0.9700 |
| N5—Cd1$^{ii}$ | 2.272 (3) | C11—H11A | 0.9700 |
| N5—C9 | 1.381 (5) | C11—C12 | 1.539 (5) |
| N5—C10 | 1.329 (5) | C12—H12A | 0.9600 |
| C1—C2 | 1.395 (5) | C12—H12B | 0.9600 |
| C1—C6 | 1.394 (5) | C12—H12C | 0.9600 |
| C2—C3 | 1.396 (5) | | |
| Cd1—Cl2—Cd1$^{i}$ | 98.87 (3) | C3—C4—H4 | 118.6 |

| | | | |
|---|---|---|---|
| Cl1—Cd1—Cl2$^{i}$ | 102.49 (3) | C3—C4—C5 | 122.8 (4) |
| Cl1—Cd1—Cl2 | 121.87 (4) | C4—C3—C2 | 115.1 (3) |
| Cl2—Cd1—Cl2$^{i}$ | 81.13 (3) | C4—C3—H3 | 122.5 |
| N1—Cd1—Cl1 | 95.86 (8) | C4—C5—H5 | 119.1 |
| N1—Cd1—Cl2 | 85.51 (8) | C5—C4—H4 | 118.6 |
| N1—Cd1—Cl2$^{i}$ | 161.13 (8) | C5—C6—C1 | 116.5 (3) |
| N1—N2—N3 | 107.5 (3) | C5—C6—H6 | 121.7 |
| N1—C1—C2 | 107.3 (3) | C6—C1—C2 | 121.3 (3) |
| N1—C1—C6 | 131.4 (3) | C6—C5—C4 | 121.8 (4) |
| N2—N1—Cd1 | 118.2 (2) | C6—C5—H5 | 119.1 |
| N2—N1—C1 | 110.0 (3) | H7B—C7—H7A | 107.9 |
| N2—N3—C2 | 111.1 (3) | C8—N4—C7 | 124.7 (3) |
| N2—N3—C7 | 119.4 (3) | C8—C9—N5 | 109.1 (4) |
| N3—C2—C1 | 104.2 (3) | C8—C9—H9 | 125.4 |
| N3—C2—C3 | 133.2 (3) | C9—N5—Cd1$^{ii}$ | 123.7 (3) |
| N3—C7—H7B | 109.2 | C9—C8—N4 | 106.6 (4) |
| N3—C7—H7A | 109.2 | C9—C8—H8 | 126.7 |
| N4—C7—N3 | 112.0 (3) | C10—N4—C7 | 127.5 (3) |
| N4—C7—H7B | 109.2 | C10—N4—C8 | 107.9 (3) |
| N4—C7—H7A | 109.2 | C10—N5—Cd1$^{ii}$ | 129.2 (3) |
| N4—C8—H8 | 126.7 | C10—N5—C9 | 106.8 (3) |
| N4—C10—C11 | 124.9 (4) | C10—C11—H11B | 108.5 |
| N5$^{ii}$—Cd1—Cl1 | 106.55 (8) | C10—C11—H11A | 108.5 |
| N5$^{ii}$—Cd1—Cl2$^{i}$ | 88.42 (8) | C10—C11—C12 | 115.0 (3) |
| N5$^{ii}$—Cd1—Cl2 | 131.58 (8) | C11—C12—H12A | 109.5 |
| N5$^{ii}$—Cd1—N1 | 90.57 (11) | C11—C12—H12B | 109.5 |
| N5—C9—H9 | 125.4 | C11—C12—H12C | 109.5 |
| N5—C10—N4 | 109.5 (3) | H11B—C11—H11A | 107.5 |
| N5—C10—C11 | 125.5 (4) | C12—C11—H11B | 108.5 |
| C1—N1—Cd1 | 131.7 (2) | C12—C11—H11A | 108.5 |
| C1—C2—C3 | 122.5 (3) | H12A—C12—H12B | 109.5 |
| C1—C6—H6 | 121.7 | H12A—C12—H12C | 109.5 |
| C2—N3—C7 | 129.5 (3) | H12B—C12—H12C | 109.5 |
| C2—C3—H3 | 122.5 | | |
| Cd1—N1—N2—N3 | −177.7 (2) | N4—C10—C11—C12 | 81.6 (5) |
| Cd1—N1—C1—C2 | 176.9 (2) | N5$^{ii}$—Cd1—Cl2—Cd1$^{i}$ | −79.87 (11) |
| Cd1—N1—C1—C6 | −0.9 (6) | N5$^{ii}$—Cd1—N1—N2 | −47.0 (3) |
| Cd1$^{ii}$—N5—C9—C8 | −174.2 (2) | N5$^{ii}$—Cd1—N1—C1 | 136.3 (3) |
| Cd1$^{ii}$—N5—C10—N4 | 173.7 (2) | N5—C10—C11—C12 | −100.9 (4) |
| Cd1$^{ii}$—N5—C10—C11 | −4.0 (5) | C1—N1—N2—N3 | −0.3 (4) |
| Cl1—Cd1—Cl2—Cd1$^{i}$ | 99.25 (4) | C1—C2—C3—C4 | −1.8 (5) |
| Cl1—Cd1—N1—N2 | −153.7 (2) | C2—N3—C7—N4 | −87.5 (4) |
| Cl1—Cd1—N1—C1 | 29.6 (3) | C2—C1—C6—C5 | −1.4 (5) |
| Cl2$^{i}$—Cd1—Cl2—Cd1$^{i}$ | 0.000 (2) | C2—C3—C4—C5 | −0.1 (6) |
| Cl2$^{i}$—Cd1—N1—N2 | 39.8 (4) | C3—C4—C5—C6 | 1.3 (6) |

| | | | |
|---|---|---|---|
| Cl2—Cd1—N1—N2 | 84.7 (2) | C4—C5—C6—C1 | −0.5 (6) |
| Cl2—Cd1—N1—C1 | −92.0 (3) | C6—C1—C2—N3 | 178.3 (3) |
| Cl2$^{i}$—Cd1—N1—C1 | −136.9 (3) | C6—C1—C2—C3 | 2.7 (6) |
| N1—Cd1—Cl2—Cd1$^{i}$ | −166.64 (8) | C7—N3—C2—C1 | 175.8 (3) |
| N1—N2—N3—C2 | 0.5 (4) | C7—N3—C2—C3 | −9.3 (6) |
| N1—N2—N3—C7 | −176.2 (3) | C7—N4—C8—C9 | −179.5 (3) |
| N1—C1—C2—N3 | 0.3 (4) | C7—N4—C10—N5 | 179.6 (3) |
| N1—C1—C2—C3 | −175.3 (3) | C7—N4—C10—C11 | −2.6 (6) |
| N1—C1—C6—C5 | 176.1 (4) | C8—N4—C7—N3 | 70.3 (4) |
| N2—N1—C1—C2 | 0.0 (4) | C8—N4—C10—N5 | 0.1 (4) |
| N2—N1—C1—C6 | −177.7 (4) | C8—N4—C10—C11 | 177.9 (3) |
| N2—N3—C2—C1 | −0.5 (4) | C9—N5—C10—N4 | −0.2 (4) |
| N2—N3—C2—C3 | 174.4 (4) | C9—N5—C10—C11 | −178.0 (3) |
| N2—N3—C7—N4 | 88.6 (4) | C10—N4—C7—N3 | −109.1 (4) |
| N3—C2—C3—C4 | −176.0 (4) | C10—N4—C8—C9 | 0.0 (4) |
| N4—C8—C9—N5 | −0.1 (4) | C10—N5—C9—C8 | 0.2 (4) |

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

**Fig. 1**

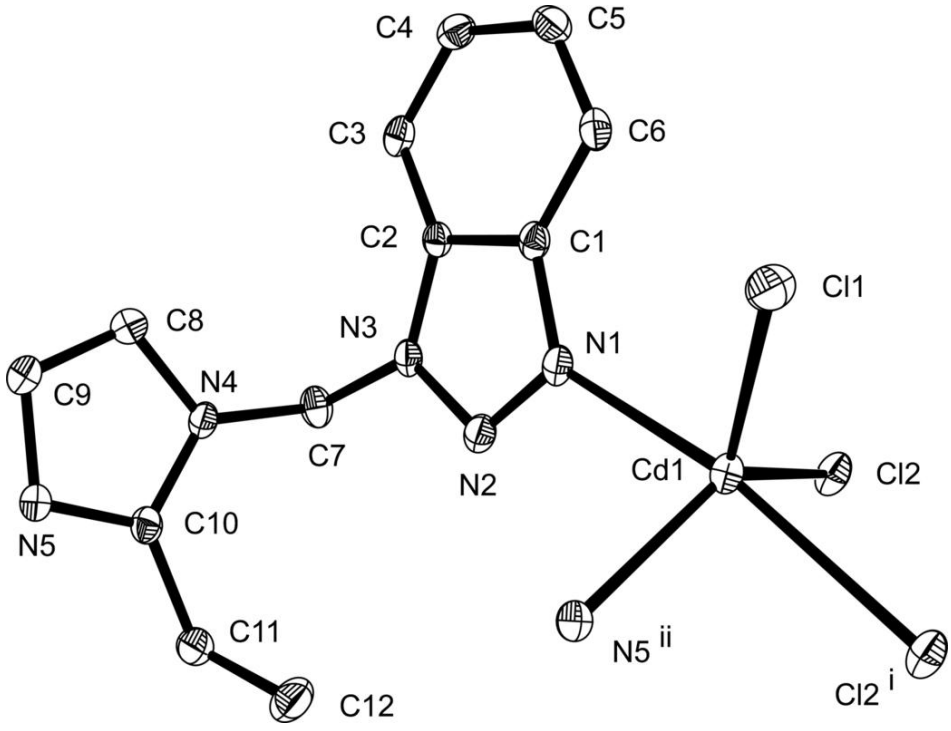
C4
C5
C3
C6
C2
C1
Cl1
C8
N3
N1
C9
N4
C7
N2
Cd1
Cl2
N5
C10
C11
N5 ii
C12
Cl2 i

**Fig. 2**