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Bis[μ-2-(trimethylsilylamido)-6-(trimethylsilylamino)pyridine-$\kappa^3N^1,N^2:N^2$]bis[(diethyl ether-κO)lithium(I)]

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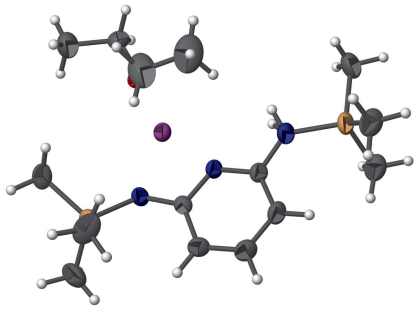
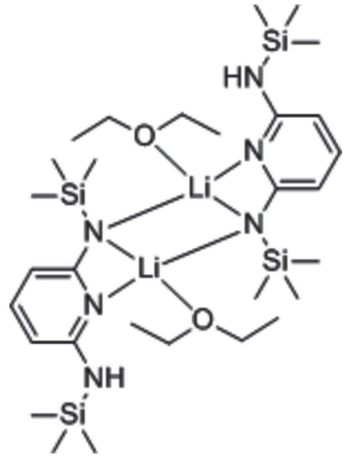
Structural data: full structural data are available from iucrdata.iucr.org

The title complex, $[Li_2(C_{11}H_{22}N_3Si_2)_2(C_4H_{10}O)_2]$, crystallizes in the $P\overline{1}$ space group with one molecule of a centrosymmetric dimeric complex in the unit cell. The lithium cation is coordinated in a bidentate fashion by the pyridyl N atom and a silylamido N atom of one 2,6-bis(trimethylsilylamido)pyridine ligand and by a monodentate, bridging silylamido N atom of another. A diethyl ether molecule completes the tetrahedral coordination environment for each lithium atom. Neither intra- nor intermolecular hydrogen bonding nor π–π stacking are observed in the crystal, likely indicating that weak electrostatic interactions are the dominant feature leading to the supramolecular structure.

3D view



Chemical scheme



Structure description

The title complex (Fig. 1) represents the first dinuclear lithium cluster reported with the 2,6-bis(trimethylsilylamido)pyridine ligand. This ligand is known to support clusters of differing nuclearities including a related tetralithium complex containing tetrahydrofuran (THF) ligands (Glatz & Kempe, 2008*a*), a hexalithium complex with benzonitrile ligands (Skvortsov *et al.*, 2013), as well as a mononuclear complex (Rave *et al.*, 2016). However, the ether-containing complex has not been investigated.

In the asymmetric unit, the lithium cation is coordinated by a bidentate 2,6-bis(trimethylsilylamido)pyridine ligand *via* the pyridiyl nitrogen (N1) with a bond length of 2.082 (5) Å and two bridging silylamido N atoms (N2 and N2′) with bond lengths of 2.098 (5) Å and 2.088 (5) Å, respectively. The related THF complex has Li—N distances that range from 2.054 Å to 2.178 Å, while in this structure they range from 2.082 Å to 2.098 Å. The Li—O bond distances are 1.931 and 1.915 (5) Å for the THF and the title

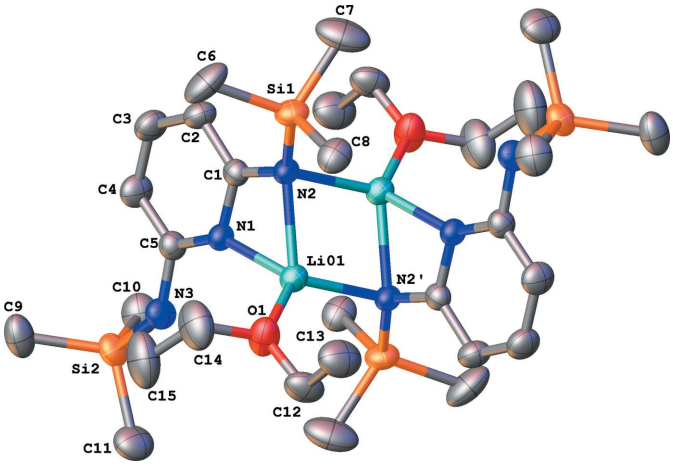


Figure 1
A view of the molecular structure of the title compound, omitting H atoms for clarity. Displacement ellipsoids are drawn at the 50% probability level. Only atoms in the asymmetric unit and symmetry-related N2′ atom are labelled (symmetry code for N2′: $-x, 1-y, 1-z$).

ether complex, respectively. The 2,6-bis(trimethylsilylamido)-pyridine ligand has been shown to support Co^{II} clusters (Glatz & Kempe, 2008*b*) and Cu^{I} clusters (Glatz & Kempe, 2008*c*), while two dinuclear chromium complexes with the triisopropyl congener have been reported (Huang *et al.*, 2012), indicating this lithium complex may find utility as a synthon for transition metal clusters.

Synthesis and crystallization

2,6-bis(trimethylsilylamido)pyridine was synthesized according to a previous report (Danièle *et al.*, 2001). The title complex was synthesized under an inert atmosphere by the addition of 4.27 mL of 2.45 *M* *n*-BuLi in cyclohexane (10.5 mmol) to 0.513 g of 2,6-diaminopyridine (4.70 mmol) in tetrahydrofuran at −30°C. The reaction was stirred overnight at room temperature. To the resulting slurry, chlorotrimethylsilane was added dropwise (1.02 g, 9.39 mmol) over a period of five minutes and the reaction was stirred for an additional 24 h. The reaction was filtered over a fritted filter to remove lithium chloride and the solvent was removed under reduced pressure yielding a yellow oil. Approximately 3 mL of hexanes was added to the residue and it was then filtered over celite to remove any residual lithium chloride. The solvent was again removed under reduced pressure. The residue was taken up in a small volume of diethyl ether and the solution was placed in a freezer at −30°C. Single crystals of the title complex formed over two days.

Refinement

Crystal data, data collection and structure refinement details are summarized in Table 1. The H atom bound to N3 is disordered over two sites, H3*A* and H3*B*, with occupancies 0.46 (6) and 0.54 (6). The two disordered H atoms were located as residual electron density peaks, and were refined freely. However, the N3—H3*A* and N3—H3*B* distances were restrained to be equal with a standard deviation of 0.02 Å.

Table 1
Experimental details.

Crystal data	
Chemical formula	$[Li_2(C_{11}H_{22}N_3Si_2)_2(C_4H_{10}O)_2]$
M_r	667.11
Crystal system, space group	Triclinic, $P\overline{1}$
Temperature (K)	173
a, b, c (Å)	9.870 (7), 10.624 (8), 11.319 (7)
α, β, γ (°)	74.34 (2), 81.35 (2), 68.246 (19)
V (Å^3)	1059.7 (13)
Z	1
Radiation type	Mo $K\alpha$
μ (mm^{-1})	0.17
Crystal size (mm)	0.3 × 0.27 × 0.22
Data collection	
Diffractometer	Rigaku XtaLAB mini
Absorption correction	Multi-scan (*REQAB*; Rigaku, 1998)
T_{min}, T_{max}	0.849, 1.000
No. of measured, independent and observed [$I > 2\sigma(I)$] reflections	11265, 4805, 2876
R_{int}	0.056
(sin $\theta/\lambda)_{max}$ (Å^{-1})	0.649
Refinement	
$R[F^2 > 2\sigma(F^2)]$, $wR(F^2)$, S	0.059, 0.158, 1.03
No. of reflections	4805
No. of parameters	209
No. of restraints	1
H-atom treatment	H atoms treated by a mixture of independent and constrained refinement
$\Delta\rho_{max}$, $\Delta\rho_{min}$ (e Å^{-3})	0.31, −0.25

Computer programs: *CrystalClear* (Rigaku, 2009), *SHELXT* (Sheldrick, 2015*a*), *SHELXL2014* (Sheldrick, 2015*b*) and *OLEX2* (Dolomanov *et al.*, 2009).

Acknowledgements

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full crystallographic data

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Crystal data

$[Li_2(C_{11}H_{22}N_3Si_2)_2(C_4H_{10}O)_2]$
M_r = 667.11
Triclinic, $P\overline{1}$
a = 9.870 (7) Å
b = 10.624 (8) Å
c = 11.319 (7) Å
α = 74.34 (2)°
β = 81.35 (2)°
γ = 68.246 (19)°
V = 1059.7 (13) Å^3
Z = 1
$F(000)$ = 364
D_x = 1.045 Mg m^{-3}
Mo $K\alpha$ radiation, λ = 0.71073 Å
Cell parameters from 2530 reflections
θ = 2.1–27.5°
μ = 0.17 mm^{-1}
T = 173 K
Prism, colourless
0.3 × 0.27 × 0.22 mm

Data collection

Rigaku XtaLAB mini diffractometer
Radiation source: Sealed Tube
Graphite Monochromator monochromator
Detector resolution: 13.6612 pixels mm^{-1}
profile data from ω–scans
Absorption correction: multi-scan (*REQAB*; Rigaku, 1998)
T_{min} = 0.849, T_{max} = 1.000
11265 measured reflections
4805 independent reflections
2876 reflections with $I > 2\sigma(I)$
R_{int} = 0.056
θ_{max} = 27.5°, θ_{min} = 2.2°
h = −12→12
k = −13→13
l = −14→14

Refinement

Refinement on F^2
Least-squares matrix: full
$R[F^2 > 2\sigma(F^2)]$ = 0.059
$wR(F^2)$ = 0.158
S = 1.03
4805 reflections
209 parameters
1 restraint
Primary atom site location: structure-invariant direct methods
Secondary atom site location: difference Fourier map
Hydrogen site location: mixed
H atoms treated by a mixture of independent and constrained refinement
$w = 1/[\sigma^2(F_o^2) + (0.0485P)^2 + 0.4277P]$ where $P = (F_o^2 + 2F_c^2)/3$
$(\Delta/\sigma)_{max} < 0.001$
$\Delta\rho_{max}$ = 0.31 e Å^{-3}
$\Delta\rho_{min}$ = −0.25 e Å^{-3}

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

	x	*y*	*z*	U_{iso}*/U_{eq}	Occ. (<1)
Si1	0.19374 (10)	0.19834 (8)	0.62211 (7)	0.0376 (2)	

Si2	0.31366 (9)	0.81456 (9)	0.10132 (7)	0.0383 (2)	
N1	0.2124 (2)	0.5214 (2)	0.36674 (19)	0.0290 (5)	
N2	0.1464 (2)	0.3537 (2)	0.5147 (2)	0.0306 (5)	
N3	0.2656 (3)	0.7063 (3)	0.2323 (2)	0.0395 (6)	
H3A	0.188 (4)	0.7368 (18)	0.2637 (18)	0.059*	0.46 (6)
H3B	0.2474 (11)	0.741 (2)	0.289 (3)	0.059*	0.54 (6)
O1	0.1403 (2)	0.6227 (2)	0.6407 (2)	0.0499 (6)	
C1	0.2251 (3)	0.3830 (3)	0.4077 (2)	0.0295 (6)	
C2	0.3140 (3)	0.2865 (3)	0.3370 (3)	0.0398 (7)	
H2	0.3246	0.1907	0.3636	0.048*	
C3	0.3847 (3)	0.3348 (3)	0.2288 (3)	0.0445 (8)	
H3	0.4437	0.2712	0.1808	0.053*	
C4	0.3711 (3)	0.4743 (3)	0.1891 (3)	0.0427 (7)	
H4	0.4198	0.5071	0.1150	0.051*	
C5	0.2837 (3)	0.5645 (3)	0.2617 (2)	0.0329 (6)	
C6	0.3966 (4)	0.1089 (4)	0.6330 (3)	0.0642 (11)	
H6A	0.4377	0.0691	0.5613	0.096*	
H6B	0.4168	0.0343	0.7081	0.096*	
H6C	0.4413	0.1766	0.6353	0.096*	
C7	0.1174 (5)	0.0721 (4)	0.5936 (4)	0.0763 (13)	
H7A	0.0132	0.1193	0.5789	0.114*	
H7B	0.1298	−0.0063	0.6655	0.114*	
H7C	0.1692	0.0376	0.5215	0.114*	
C8	0.1201 (4)	0.2353 (3)	0.7762 (3)	0.0473 (8)	
H8A	0.1724	0.2868	0.7991	0.071*	
H8B	0.1334	0.1472	0.8376	0.071*	
H8C	0.0157	0.2912	0.7726	0.071*	
C9	0.5159 (4)	0.7672 (4)	0.0779 (3)	0.0566 (9)	
H9A	0.5558	0.7663	0.1524	0.085*	
H9B	0.5394	0.8357	0.0087	0.085*	
H9C	0.5589	0.6745	0.0602	0.085*	
C10	0.2377 (4)	0.8064 (4)	−0.0372 (3)	0.0568 (9)	
H10A	0.2791	0.7111	−0.0491	0.085*	
H10B	0.2631	0.8702	−0.1098	0.085*	
H10C	0.1312	0.8336	−0.0252	0.085*	
C11	0.2294 (4)	0.9911 (3)	0.1338 (3)	0.0595 (10)	
H11A	0.1238	1.0126	0.1505	0.089*	
H11B	0.2475	1.0604	0.0625	0.089*	
H11C	0.2724	0.9930	0.2056	0.089*	
C12	0.0508 (4)	0.7007 (3)	0.7268 (3)	0.0502 (8)	
H12A	−0.0435	0.7623	0.6907	0.060*	
H12B	0.0997	0.7605	0.7423	0.060*	
C13	0.0218 (5)	0.6083 (4)	0.8471 (3)	0.0668 (11)	
H13A	−0.0290	0.5506	0.8327	0.100*	
H13B	−0.0392	0.6661	0.9030	0.100*	
H13C	0.1147	0.5481	0.8840	0.100*	
C14	0.2957 (4)	0.5744 (5)	0.6535 (4)	0.0722 (12)	
H14A	0.3395	0.4776	0.6429	0.087*	

H14B	0.3137	0.5735	0.7375	0.087*
C15	0.3672 (4)	0.6613 (5)	0.5643 (4)	0.0848 (14)
H15A	0.3400	0.6720	0.4814	0.127*
H15B	0.4734	0.6169	0.5688	0.127*
H15C	0.3362	0.7531	0.5830	0.127*
Li01	0.0751 (5)	0.5642 (5)	0.5205 (4)	0.0323 (10)

Atomic displacement parameters (Å²)

	U^{11}	U^{22}	U^{33}	U^{12}	U^{13}	U^{23}
Si1	0.0462 (5)	0.0251 (4)	0.0351 (5)	−0.0071 (4)	−0.0058 (4)	−0.0020 (3)
Si2	0.0425 (5)	0.0441 (5)	0.0297 (4)	−0.0232 (4)	0.0014 (3)	−0.0010 (3)
N1	0.0288 (12)	0.0289 (12)	0.0266 (11)	−0.0090 (10)	0.0015 (9)	−0.0052 (9)
N2	0.0292 (12)	0.0262 (11)	0.0327 (12)	−0.0082 (10)	0.0026 (9)	−0.0054 (9)
N3	0.0454 (16)	0.0401 (14)	0.0325 (14)	−0.0194 (12)	0.0085 (11)	−0.0073 (11)
O1	0.0404 (13)	0.0712 (16)	0.0445 (13)	−0.0194 (12)	−0.0006 (10)	−0.0247 (11)
C1	0.0275 (14)	0.0297 (14)	0.0313 (14)	−0.0101 (12)	−0.0048 (11)	−0.0051 (11)
C2	0.0427 (18)	0.0325 (15)	0.0419 (17)	−0.0082 (14)	−0.0003 (13)	−0.0129 (13)
C3	0.0457 (19)	0.0435 (18)	0.0420 (18)	−0.0111 (15)	0.0069 (14)	−0.0174 (14)
C4	0.0483 (19)	0.0456 (18)	0.0308 (16)	−0.0165 (15)	0.0085 (13)	−0.0090 (13)
C5	0.0338 (15)	0.0353 (15)	0.0301 (15)	−0.0139 (13)	0.0008 (12)	−0.0071 (12)
C6	0.055 (2)	0.057 (2)	0.051 (2)	0.0174 (18)	−0.0075 (17)	−0.0142 (17)
C7	0.128 (4)	0.046 (2)	0.061 (3)	−0.044 (2)	−0.021 (2)	0.0045 (18)
C8	0.0471 (19)	0.0438 (18)	0.0389 (18)	−0.0091 (16)	−0.0033 (14)	0.0004 (14)
C9	0.051 (2)	0.084 (3)	0.046 (2)	−0.039 (2)	0.0071 (16)	−0.0165 (18)
C10	0.058 (2)	0.068 (2)	0.0427 (19)	−0.0237 (19)	−0.0082 (16)	−0.0055 (17)
C11	0.075 (3)	0.0451 (19)	0.054 (2)	−0.0274 (19)	0.0074 (18)	−0.0002 (16)
C12	0.072 (2)	0.0484 (19)	0.0408 (18)	−0.0289 (18)	0.0018 (16)	−0.0183 (15)
C13	0.087 (3)	0.058 (2)	0.053 (2)	−0.032 (2)	0.012 (2)	−0.0085 (18)
C14	0.052 (2)	0.088 (3)	0.072 (3)	−0.029 (2)	−0.023 (2)	0.006 (2)
C15	0.055 (2)	0.129 (4)	0.074 (3)	−0.046 (3)	−0.009 (2)	−0.007 (3)
Li01	0.033 (3)	0.031 (2)	0.030 (2)	−0.009 (2)	−0.0003 (19)	−0.0059 (19)

Geometric parameters (Å, º)

Si1—N2	1.713 (2)	C7—H7A	0.9800
Si1—C6	1.878 (4)	C7—H7B	0.9800
Si1—C7	1.878 (4)	C7—H7C	0.9800
Si1—C8	1.871 (3)	C8—H8A	0.9800
Si1—Li01^{i}	3.184 (5)	C8—H8B	0.9800
Si2—N3	1.737 (3)	C8—H8C	0.9800
Si2—C9	1.865 (4)	C9—H9A	0.9800
Si2—C10	1.871 (4)	C9—H9B	0.9800
Si2—C11	1.862 (4)	C9—H9C	0.9800
N1—C1	1.381 (3)	C10—H10A	0.9800
N1—C5	1.346 (3)	C10—H10B	0.9800
N1—Li01	2.082 (5)	C10—H10C	0.9800
N2—C1	1.364 (3)	C11—H11A	0.9800

N2—Li01^{i}	2.088 (5)	C11—H11B	0.9800
N2—Li01	2.098 (5)	C11—H11C	0.9800
N3—H3A	0.79 (4)	C12—H12A	0.9900
N3—H3B	0.79 (4)	C12—H12B	0.9900
N3—C5	1.400 (4)	C12—C13	1.506 (5)
O1—C12	1.432 (4)	C13—H13A	0.9800
O1—C14	1.442 (4)	C13—H13B	0.9800
O1—Li01	1.915 (5)	C13—H13C	0.9800
C1—C2	1.423 (4)	C14—H14A	0.9900
C2—H2	0.9500	C14—H14B	0.9900
C2—C3	1.386 (4)	C14—C15	1.460 (5)
C3—H3	0.9500	C15—H15A	0.9800
C3—C4	1.389 (4)	C15—H15B	0.9800
C4—H4	0.9500	C15—H15C	0.9800
C4—C5	1.392 (4)	Li01—Si1^{i}	3.184 (5)
C6—H6A	0.9800	Li01—N2^{i}	2.088 (5)
C6—H6B	0.9800	Li01—Li01^{i}	2.515 (9)
C6—H6C	0.9800		

N2—Si1—C6	113.31 (15)	Si1—C8—H8C	109.5
N2—Si1—C7	112.67 (16)	H8A—C8—H8B	109.5
N2—Si1—C8	107.94 (13)	H8A—C8—H8C	109.5
N2—Si1—Li01^{i}	36.99 (11)	H8B—C8—H8C	109.5
C6—Si1—Li01^{i}	149.26 (15)	Si2—C9—H9A	109.5
C7—Si1—C6	107.8 (2)	Si2—C9—H9B	109.5
C7—Si1—Li01^{i}	85.89 (17)	Si2—C9—H9C	109.5
C8—Si1—C6	106.35 (16)	H9A—C9—H9B	109.5
C8—Si1—C7	108.53 (18)	H9A—C9—H9C	109.5
C8—Si1—Li01^{i}	94.47 (14)	H9B—C9—H9C	109.5
N3—Si2—C9	111.36 (15)	Si2—C10—H10A	109.5
N3—Si2—C10	110.46 (16)	Si2—C10—H10B	109.5
N3—Si2—C11	103.72 (15)	Si2—C10—H10C	109.5
C9—Si2—C10	109.81 (16)	H10A—C10—H10B	109.5
C11—Si2—C9	110.23 (17)	H10A—C10—H10C	109.5
C11—Si2—C10	111.15 (18)	H10B—C10—H10C	109.5
C1—N1—Li01	89.4 (2)	Si2—C11—H11A	109.5
C5—N1—C1	120.5 (2)	Si2—C11—H11B	109.5
C5—N1—Li01	150.2 (2)	Si2—C11—H11C	109.5
Si1—N2—Li01	134.99 (18)	H11A—C11—H11B	109.5
Si1—N2—Li01^{i}	113.43 (17)	H11A—C11—H11C	109.5
C1—N2—Si1	125.15 (19)	H11B—C11—H11C	109.5
C1—N2—Li01^{i}	108.7 (2)	O1—C12—H12A	109.1
C1—N2—Li01	89.1 (2)	O1—C12—H12B	109.1
Li01^{i}—N2—Li01	73.8 (2)	O1—C12—C13	112.5 (3)
Si2—N3—H3A	116.7	H12A—C12—H12B	107.8
Si2—N3—H3B	110.6	C13—C12—H12A	109.1
C5—N3—Si2	132.4 (2)	C13—C12—H12B	109.1
C5—N3—H3A	100.6	C12—C13—H13A	109.5

C5—N3—H3B	115.2	C12—C13—H13B	109.5
C12—O1—C14	115.8 (3)	C12—C13—H13C	109.5
C12—O1—Li01	126.9 (2)	H13A—C13—H13B	109.5
C14—O1—Li01	117.1 (3)	H13A—C13—H13C	109.5
N1—C1—C2	119.1 (2)	H13B—C13—H13C	109.5
N2—C1—N1	114.5 (2)	O1—C14—H14A	109.1
N2—C1—C2	126.4 (3)	O1—C14—H14B	109.1
C1—C2—H2	120.6	O1—C14—C15	112.7 (3)
C3—C2—C1	118.8 (3)	H14A—C14—H14B	107.8
C3—C2—H2	120.6	C15—C14—H14A	109.1
C2—C3—H3	119.3	C15—C14—H14B	109.1
C2—C3—C4	121.3 (3)	C14—C15—H15A	109.5
C4—C3—H3	119.3	C14—C15—H15B	109.5
C3—C4—H4	121.1	C14—C15—H15C	109.5
C3—C4—C5	117.8 (3)	H15A—C15—H15B	109.5
C5—C4—H4	121.1	H15A—C15—H15C	109.5
N1—C5—N3	115.0 (2)	H15B—C15—H15C	109.5
N1—C5—C4	122.5 (3)	N1—Li01—Si1^{i}	97.29 (17)
C4—C5—N3	122.5 (3)	N1—Li01—N2	67.04 (16)
Si1—C6—H6A	109.5	N1—Li01—N2^{i}	113.4 (2)
Si1—C6—H6B	109.5	N1—Li01—Li01^{i}	90.3 (3)
Si1—C6—H6C	109.5	N2—Li01—Si1^{i}	124.2 (2)
H6A—C6—H6B	109.5	N2^{i}—Li01—Si1^{i}	29.58 (9)
H6A—C6—H6C	109.5	N2^{i}—Li01—N2	106.2 (2)
H6B—C6—H6C	109.5	N2^{i}—Li01—Li01^{i}	53.26 (18)
Si1—C7—H7A	109.5	N2—Li01—Li01^{i}	52.89 (18)
Si1—C7—H7B	109.5	O1—Li01—Si1^{i}	113.1 (2)
Si1—C7—H7C	109.5	O1—Li01—N1	118.9 (2)
H7A—C7—H7B	109.5	O1—Li01—N2	121.4 (2)
H7A—C7—H7C	109.5	O1—Li01—N2^{i}	118.9 (2)
H7B—C7—H7C	109.5	O1—Li01—Li01^{i}	146.7 (3)
Si1—C8—H8A	109.5	Li01^{i}—Li01—Si1^{i}	75.4 (2)
Si1—C8—H8B	109.5		

Si1—N2—C1—N1	−149.7 (2)	C8—Si1—N2—C1	150.0 (2)
Si1—N2—C1—C2	31.2 (4)	C8—Si1—N2—Li01^{i}	−72.9 (2)
Si2—N3—C5—N1	−170.6 (2)	C8—Si1—N2—Li01	17.3 (3)
Si2—N3—C5—C4	10.6 (5)	C9—Si2—N3—C5	−67.9 (3)
N1—C1—C2—C3	−0.3 (4)	C10—Si2—N3—C5	54.4 (3)
N2—C1—C2—C3	178.8 (3)	C11—Si2—N3—C5	173.6 (3)
C1—N1—C5—N3	−178.1 (2)	C12—O1—C14—C15	−100.7 (4)
C1—N1—C5—C4	0.7 (4)	C14—O1—C12—C13	−83.7 (4)
C1—C2—C3—C4	0.5 (5)	Li01^{i}—Si1—N2—C1	−137.1 (3)
C2—C3—C4—C5	−0.1 (5)	Li01^{i}—Si1—N2—Li01	90.3 (3)
C3—C4—C5—N1	−0.5 (4)	Li01—N1—C1—N2	1.0 (3)
C3—C4—C5—N3	178.2 (3)	Li01—N1—C1—C2	−179.8 (3)
C5—N1—C1—N2	−179.5 (2)	Li01—N1—C5—N3	0.8 (6)
C5—N1—C1—C2	−0.3 (4)	Li01—N1—C5—C4	179.7 (4)

C6—Si1—N2—C1	32.5 (3)	Li01^{i}—N2—C1—N1	71.6 (3)
C6—Si1—N2—Li01	−100.2 (3)	Li01—N2—C1—N1	−1.0 (3)
C6—Si1—N2—Li01^{i}	169.6 (2)	Li01^{i}—N2—C1—C2	−107.5 (3)
C7—Si1—N2—C1	−90.2 (3)	Li01—N2—C1—C2	179.9 (3)
C7—Si1—N2—Li01^{i}	46.9 (2)	Li01—O1—C12—C13	91.0 (4)
C7—Si1—N2—Li01	137.1 (3)	Li01—O1—C14—C15	84.1 (4)

Symmetry code: (i) $-x, -y+1, -z+1$.