Acta Crystallographica Section E
Structure Reports Online
ISSN 1600-5368

1,1,3,3,5,5,7,7-Octaphenyl-2,6-dioxa-4,8-diaza-1,3,5,7-tetrasilacyclooctane

Zhen Lv, Lina Dai, Xuezhong Zhang, Zhijie Zhang* and Zemin Xie

Institute of Chemistry, Chinese Academy of Sciences, Beijing 100190, People's Republic of China
Correspondence e-mail: zhangzj@iccas.ac.cn

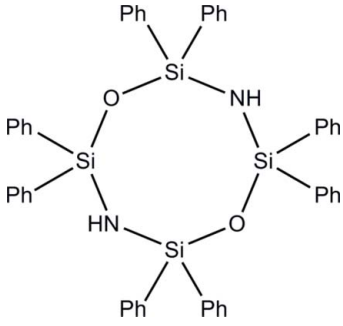
Received 11 April 2011; accepted 20 April 2011

Key indicators: single-crystal X-ray study; T = 173 K; mean σ(C–C) = 0.003 Å; R factor = 0.052; wR factor = 0.120; data-to-parameter ratio = 19.1.

The title molecule, $C_{48}H_{42}N_2O_2Si_4$, lies on a twofold rotation axis. The eight-membered ring has a slightly distorted boat conformation.

Related literature

For the hydrolysis of 1,3-bis-(hydroxydiphenylsilanyl)-2,2,4,4-tetraphenylcyclodisilazane, see: Voronkov *et al.* (1977).



Experimental

Crystal data

$C_{48}H_{42}N_2O_2Si_4$
M_r = 791.20
Monoclinic, $C2/c$
a = 12.1188 (18) Å
b = 17.016 (3) Å
c = 20.621 (3) Å
β = 93.216 (3)°
V = 4245.8 (11) Å^3
Z = 4
Mo $K\alpha$ radiation
μ = 0.18 mm^{-1}
T = 173 K
0.35 × 0.35 × 0.05 mm

Data collection

Rigaku MM007-HF CCD (Saturn 724+) diffractometer
Absorption correction: multi-scan (*CrystalClear*; Rigaku, 2007)
T_{min} = 0.939, T_{max} = 0.991
14029 measured reflections
4833 independent reflections
4411 reflections with $I > 2\sigma(I)$
R_{int} = 0.039

Refinement

$R[F^2 > 2\sigma(F^2)]$ = 0.052
$wR(F^2)$ = 0.120
S = 1.10
4833 reflections
253 parameters
H-atom parameters constrained
$\Delta\rho_{max}$ = 0.39 e Å^{-3}
$\Delta\rho_{min}$ = −0.30 e Å^{-3}

Data collection: *CrystalClear* (Rigaku, 2007); cell refinement: *CrystalClear*; data reduction: *CrystalClear*; program(s) used to solve structure: *SHELXS97* (Sheldrick, 2008); program(s) used to refine structure: *SHELXL97* (Sheldrick, 2008); molecular graphics: *SHELXTL* (Sheldrick, 2008); software used to prepare material for publication: *SHELXL97*.

The authors would like to thank the National Natural Science Foundation of China (grant No. 50803070) for financial support.

Supplementary data and figures for this paper are available from the IUCr electronic archives (Reference: LH5233).

References

Rigaku (2007). *CrystalClear*. Rigaku Corporation, Tokyo, Japan.
Sheldrick, G. M. (2008). *Acta Cryst.* A**64**, 112–122.
Voronkov, M. G., Varezhkin, Yu. M., Zhinkin, D. Ya., Morgunova, M. M., Gurkova, S. N., Gusev, A. I. & Alekseev, N. V. (1977). *Dokl. Akad. Nauk SSSR*, **237**, 102–104.

supporting information

Acta Cryst. (2011). E**67**, o1233 [doi:10.1107/S1600536811014851]

1,1,3,3,5,5,7,7-Octaphenyl-2,6-dioxa-4,8-diaza-1,3,5,7-tetrasilacyclooctane

Zhen Lv, Lina Dai, Xuezhong Zhang, Zhijie Zhang and Zemin Xie

S1. Comment

The title compound is one of the hydrolysis products of 1,3-bis-(hydroxydiphenylsilanyl)-2,2,4,4-tetraphenylcyclo-disilazane. Voronkov *et al.* (1977) reported that the hydrolysis of 1,3-bis-(hydroxydiphenylsilanyl)-2,2,4,4-tetraphenyl-cyclodisilazane in base medium could give 1,1,3,3,5,5,7,7-octaphenyl-2,4-dioxa-6,8,-diaza-1,3,5,7-tetrasilacyclo-octane and we have found that the title compound was also produced. Its crystal structure is presented herein. The molecular structure of the title compound is shown in Fig. 1. The eight-membered ring has a slightly disorted boat conformation.

S2. Experimental

The reaction scheme is shown in Fig. 2. 1 ml aqueous solution of sodium hydroxide (0.1 mol/*L*) was added to a solution of 1,3-bis-(hydroxydiphenylsilanyl)-2,2,4,4-tetraphenylcyclodisilazane (1 g) in tetrahydrofuran (10 ml). After stirring for 30 min at room temprature, the solvents were removed under reduced pressure. The crude product was recrystallized from n-hexane to give colorless crystals.

S3. Refinement

All the H atoms were located in difference maps but were subsequently placed in calculated positions with C-H = 0.95Å and constrained in a riding-model approximation with U_{iso}(H) = 1.2U_{eq}(C).

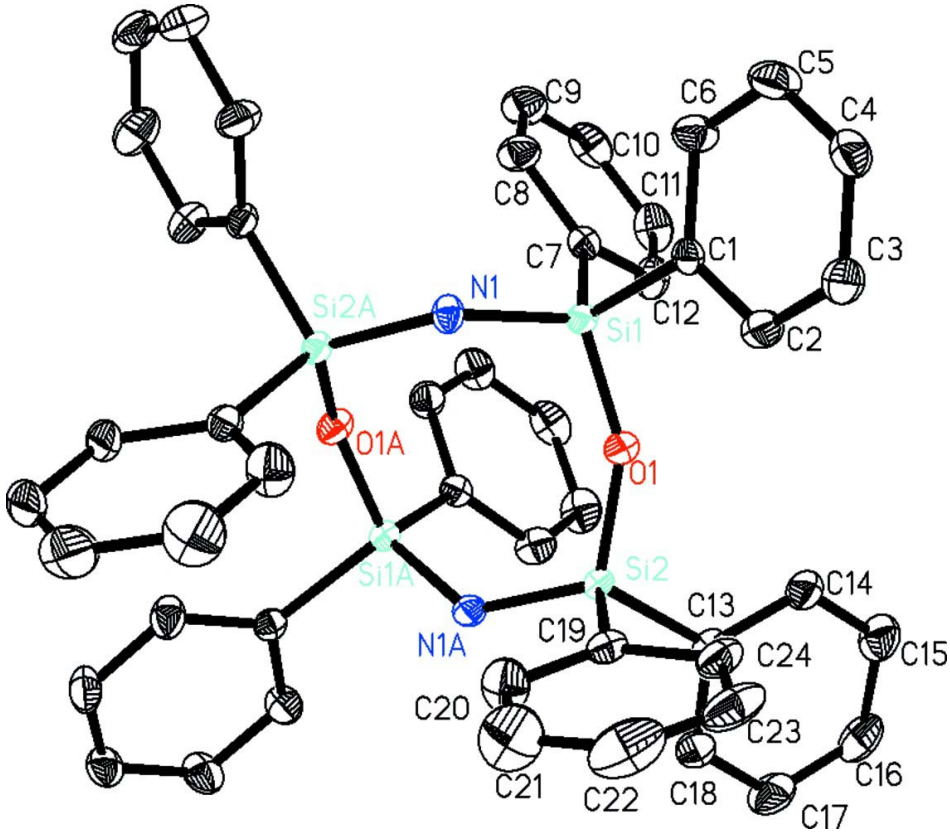


Figure 1

The molecular structure of the title compound with 30% ellipsoids. H atoms are not shown (symmetry code (A): -x+1, y, -z+3/2).

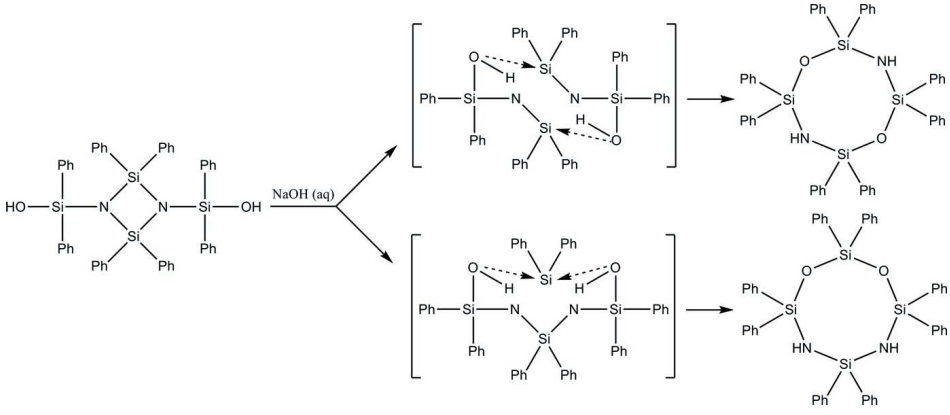


Figure 2

The hydrolysis reaction of 1,3-bis-(hydroxydiphenylsilanyl)-2,2,4,4-tetraphenylcyclodisilazane

2,2,4,4,6,6,8,8-octaphenyl-1,5,3,7,2,4,6,8-dioxadiazatetrasilocane

Crystal data

$C_{48}H_{42}N_2O_2Si_4$
M_r = 791.20
Monoclinic, *C*2/*c*

Hall symbol: -C 2yc
a = 12.1188 (18) Å
b = 17.016 (3) Å

c = 20.621 (3) Å
β = 93.216 (3)°
V = 4245.8 (11) Å^3
Z = 4
F(000) = 1664
D_x = 1.238 Mg m^{-3}
Mo $K\alpha$ radiation, λ = 0.71073 Å

Cell parameters from 7324 reflections
θ = 2.1–27.5°
μ = 0.18 mm^{-1}
T = 173 K
Platelet, colorless
0.35 × 0.35 × 0.05 mm

Data collection

Rigaku MM007-HF CCD (Saturn 724+) diffractometer
Radiation source: rotating anode
Confocal monochromator
ω scans at fixed χ = 45°
Absorption correction: multi-scan (*CrystalClear*; Rigaku, 2007)
T_{min} = 0.939, T_{max} = 0.991

14029 measured reflections
4833 independent reflections
4411 reflections with $I > 2\sigma(I)$
R_{int} = 0.039
θ_{max} = 27.5°, θ_{min} = 2.1°
h = −15→13
k = −18→22
l = −26→24

Refinement

Refinement on F^2
Least-squares matrix: full
$R[F^2 > 2\sigma(F^2)]$ = 0.052
$wR(F^2)$ = 0.120
S = 1.10
4833 reflections
253 parameters
0 restraints
Primary atom site location: structure-invariant direct methods

Secondary atom site location: difference Fourier map
Hydrogen site location: inferred from neighbouring sites
H-atom parameters constrained
$w = 1/[\sigma^2(F_o^2) + (0.0442P)^2 + 4.974P]$ where $P = (F_o^2 + 2F_c^2)/3$
$(\Delta/\sigma)_{max}$ = 0.001
$\Delta\rho_{max}$ = 0.39 e Å^{-3}
$\Delta\rho_{min}$ = −0.30 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}
Si1	0.34094 (4)	0.15720 (3)	0.71343 (2)	0.02431 (13)
Si2	0.55767 (4)	0.21644 (3)	0.65217 (2)	0.02461 (13)
O1	0.44552 (11)	0.16871 (8)	0.66768 (6)	0.0324 (3)
N1	0.35191 (13)	0.21530 (9)	0.78113 (7)	0.0282 (3)
H1A	0.3008	0.2520	0.7818	0.034*
C1	0.21399 (15)	0.18949 (11)	0.66561 (8)	0.0269 (4)
C2	0.21930 (18)	0.23932 (15)	0.61226 (10)	0.0437 (5)
H2A	0.2895	0.2534	0.5975	0.052*
C3	0.12476 (19)	0.26890 (15)	0.58017 (11)	0.0471 (6)
H3A	0.1310	0.3036	0.5445	0.057*

C4	0.02258 (18)	0.24847 (14)	0.59954 (10)	0.0415 (5)
H4A	−0.0422	0.2684	0.5772	0.050*
C5	0.01439 (18)	0.19908 (15)	0.65148 (12)	0.0478 (6)
H5A	−0.0564	0.1845	0.6651	0.057*
C6	0.10912 (17)	0.17011 (13)	0.68447 (11)	0.0390 (5)
H6A	0.1019	0.1363	0.7207	0.047*
C7	0.33633 (15)	0.05141 (11)	0.73523 (9)	0.0284 (4)
C8	0.29044 (18)	0.02462 (12)	0.79170 (11)	0.0405 (5)
H8A	0.2599	0.0613	0.8204	0.049*
C9	0.2889 (2)	−0.05507 (14)	0.80646 (12)	0.0503 (6)
H9A	0.2573	−0.0725	0.8450	0.060*
C10	0.3333 (2)	−0.10885 (13)	0.76511 (13)	0.0492 (6)
H10A	0.3335	−0.1632	0.7756	0.059*
C11	0.3772 (2)	−0.08378 (13)	0.70882 (12)	0.0481 (6)
H11A	0.4062	−0.1209	0.6799	0.058*
C12	0.37953 (19)	−0.00461 (12)	0.69411 (10)	0.0390 (5)
H12A	0.4111	0.0121	0.6553	0.047*
C13	0.61490 (16)	0.16531 (11)	0.58150 (8)	0.0289 (4)
C14	0.5520 (2)	0.11582 (13)	0.54049 (10)	0.0416 (5)
H14A	0.4766	0.1068	0.5485	0.050*
C15	0.5975 (2)	0.07921 (15)	0.48789 (12)	0.0550 (6)
H15A	0.5531	0.0461	0.4600	0.066*
C16	0.7078 (2)	0.09105 (15)	0.47616 (12)	0.0545 (7)
H16A	0.7399	0.0647	0.4412	0.065*
C17	0.7700 (2)	0.14071 (17)	0.51506 (12)	0.0543 (6)
H17A	0.8451	0.1501	0.5065	0.065*
C18	0.72369 (18)	0.17780 (15)	0.56732 (11)	0.0434 (5)
H18A	0.7679	0.2125	0.5938	0.052*
C19	0.52733 (15)	0.32134 (11)	0.63098 (9)	0.0306 (4)
C20	0.5545 (2)	0.38324 (14)	0.67257 (12)	0.0515 (6)
H20A	0.5909	0.3725	0.7136	0.062*
C21	0.5299 (3)	0.46049 (16)	0.65572 (16)	0.0752 (9)
H21A	0.5515	0.5019	0.6846	0.090*
C22	0.4745 (3)	0.47717 (17)	0.59751 (16)	0.0731 (9)
H22A	0.4558	0.5299	0.5866	0.088*
C23	0.4461 (2)	0.41749 (17)	0.55499 (13)	0.0591 (7)
H23A	0.4083	0.4290	0.5145	0.071*
C24	0.47270 (17)	0.34019 (14)	0.57119 (10)	0.0410 (5)
H24A	0.4535	0.2994	0.5412	0.049*

Atomic displacement parameters (Å²)

	U^{11}	U^{22}	U^{33}	U^{12}	U^{13}	U^{23}
Si1	0.0250 (2)	0.0252 (2)	0.0230 (2)	−0.00224 (18)	0.00372 (18)	−0.00254 (18)
Si2	0.0258 (3)	0.0269 (2)	0.0213 (2)	−0.00168 (19)	0.00308 (18)	0.00178 (18)
O1	0.0313 (7)	0.0380 (7)	0.0284 (6)	−0.0055 (6)	0.0064 (5)	−0.0020 (6)
N1	0.0297 (8)	0.0287 (8)	0.0260 (7)	0.0041 (6)	0.0004 (6)	−0.0057 (6)
C1	0.0293 (9)	0.0260 (8)	0.0254 (8)	−0.0021 (7)	0.0009 (7)	−0.0058 (7)

C2	0.0334 (11)	0.0624 (14)	0.0353 (11)	−0.0068 (10)	0.0012 (9)	0.0122 (10)
C3	0.0423 (12)	0.0627 (15)	0.0356 (11)	−0.0032 (11)	−0.0053 (9)	0.0159 (10)
C4	0.0353 (11)	0.0478 (12)	0.0404 (11)	0.0012 (9)	−0.0074 (9)	−0.0009 (10)
C5	0.0268 (10)	0.0570 (14)	0.0595 (14)	−0.0025 (10)	0.0014 (10)	0.0140 (12)
C6	0.0333 (10)	0.0390 (11)	0.0449 (12)	−0.0033 (9)	0.0038 (9)	0.0096 (9)
C7	0.0272 (9)	0.0271 (9)	0.0307 (9)	−0.0005 (7)	−0.0005 (7)	−0.0023 (7)
C8	0.0443 (12)	0.0326 (10)	0.0455 (12)	−0.0048 (9)	0.0114 (9)	0.0010 (9)
C9	0.0555 (15)	0.0413 (12)	0.0544 (14)	−0.0116 (11)	0.0062 (11)	0.0125 (11)
C10	0.0524 (14)	0.0262 (10)	0.0674 (16)	−0.0051 (9)	−0.0129 (12)	0.0027 (10)
C11	0.0611 (15)	0.0301 (11)	0.0521 (13)	0.0066 (10)	−0.0070 (11)	−0.0091 (10)
C12	0.0493 (12)	0.0333 (10)	0.0340 (10)	0.0054 (9)	−0.0003 (9)	−0.0042 (8)
C13	0.0335 (10)	0.0305 (9)	0.0232 (8)	0.0009 (7)	0.0058 (7)	0.0036 (7)
C14	0.0483 (13)	0.0445 (12)	0.0328 (10)	−0.0049 (10)	0.0081 (9)	−0.0050 (9)
C15	0.0738 (18)	0.0509 (14)	0.0413 (12)	−0.0061 (13)	0.0116 (12)	−0.0146 (11)
C16	0.0748 (18)	0.0516 (14)	0.0393 (12)	0.0140 (13)	0.0235 (12)	−0.0043 (11)
C17	0.0447 (13)	0.0709 (17)	0.0494 (14)	0.0074 (12)	0.0219 (11)	0.0007 (12)
C18	0.0358 (11)	0.0563 (14)	0.0393 (11)	−0.0031 (10)	0.0110 (9)	−0.0057 (10)
C19	0.0295 (9)	0.0315 (9)	0.0315 (9)	0.0007 (7)	0.0073 (7)	0.0071 (8)
C20	0.0683 (17)	0.0350 (12)	0.0507 (13)	0.0018 (11)	−0.0019 (12)	−0.0010 (10)
C21	0.113 (3)	0.0323 (13)	0.081 (2)	0.0055 (15)	0.0110 (19)	−0.0008 (13)
C22	0.094 (2)	0.0425 (15)	0.086 (2)	0.0219 (15)	0.0350 (19)	0.0248 (15)
C23	0.0513 (14)	0.0715 (18)	0.0562 (15)	0.0179 (13)	0.0186 (12)	0.0386 (14)
C24	0.0368 (11)	0.0514 (13)	0.0355 (11)	0.0043 (9)	0.0075 (9)	0.0163 (9)

Geometric parameters (Å, º)

Si1—O1	1.6338 (14)	C10—C11	1.372 (4)
Si1—N1	1.7099 (15)	C10—H10A	0.9500
Si1—C7	1.8571 (19)	C11—C12	1.381 (3)
Si1—C1	1.8630 (19)	C11—H11A	0.9500
Si2—O1	1.6302 (14)	C12—H12A	0.9500
Si2—N1^{i}	1.7098 (15)	C13—C18	1.383 (3)
Si2—C13	1.8643 (19)	C13—C14	1.390 (3)
Si2—C19	1.869 (2)	C14—C15	1.392 (3)
N1—Si2^{i}	1.7098 (15)	C14—H14A	0.9500
N1—H1A	0.8800	C15—C16	1.386 (4)
C1—C6	1.390 (3)	C15—H15A	0.9500
C1—C2	1.393 (3)	C16—C17	1.363 (4)
C2—C3	1.385 (3)	C16—H16A	0.9500
C2—H2A	0.9500	C17—C18	1.394 (3)
C3—C4	1.367 (3)	C17—H17A	0.9500
C3—H3A	0.9500	C18—H18A	0.9500
C4—C5	1.369 (3)	C19—C20	1.386 (3)
C4—H4A	0.9500	C19—C24	1.403 (3)
C5—C6	1.391 (3)	C20—C21	1.388 (3)
C5—H5A	0.9500	C20—H20A	0.9500
C6—H6A	0.9500	C21—C22	1.372 (4)
C7—C8	1.395 (3)	C21—H21A	0.9500

C7—C12	1.397 (3)	C22—C23	1.373 (4)
C8—C9	1.390 (3)	C22—H22A	0.9500
C8—H8A	0.9500	C23—C24	1.390 (3)
C9—C10	1.381 (4)	C23—H23A	0.9500
C9—H9A	0.9500	C24—H24A	0.9500

O1—Si1—N1	112.01 (8)	C11—C10—H10A	120.0
O1—Si1—C7	106.91 (8)	C9—C10—H10A	120.0
N1—Si1—C7	111.40 (8)	C10—C11—C12	120.2 (2)
O1—Si1—C1	107.65 (8)	C10—C11—H11A	119.9
N1—Si1—C1	106.60 (8)	C12—C11—H11A	119.9
C7—Si1—C1	112.27 (8)	C11—C12—C7	121.3 (2)
O1—Si2—N1^{i}	109.90 (7)	C11—C12—H12A	119.4
O1—Si2—C13	105.76 (8)	C7—C12—H12A	119.4
N1^{i}—Si2—C13	111.95 (8)	C18—C13—C14	117.47 (18)
O1—Si2—C19	111.49 (8)	C18—C13—Si2	119.63 (15)
N1^{i}—Si2—C19	107.92 (8)	C14—C13—Si2	122.87 (15)
C13—Si2—C19	109.86 (8)	C13—C14—C15	121.1 (2)
Si2—O1—Si1	148.79 (9)	C13—C14—H14A	119.4
Si2^{i}—N1—Si1	132.87 (10)	C15—C14—H14A	119.4
Si2^{i}—N1—H1A	113.6	C16—C15—C14	120.0 (2)
Si1—N1—H1A	113.6	C16—C15—H15A	120.0
C6—C1—C2	116.67 (18)	C14—C15—H15A	120.0
C6—C1—Si1	121.53 (15)	C17—C16—C15	119.6 (2)
C2—C1—Si1	121.61 (15)	C17—C16—H16A	120.2
C3—C2—C1	121.7 (2)	C15—C16—H16A	120.2
C3—C2—H2A	119.2	C16—C17—C18	120.2 (2)
C1—C2—H2A	119.2	C16—C17—H17A	119.9
C4—C3—C2	120.4 (2)	C18—C17—H17A	119.9
C4—C3—H3A	119.8	C13—C18—C17	121.6 (2)
C2—C3—H3A	119.8	C13—C18—H18A	119.2
C3—C4—C5	119.4 (2)	C17—C18—H18A	119.2
C3—C4—H4A	120.3	C20—C19—C24	117.0 (2)
C5—C4—H4A	120.3	C20—C19—Si2	122.97 (16)
C4—C5—C6	120.4 (2)	C24—C19—Si2	120.04 (16)
C4—C5—H5A	119.8	C19—C20—C21	121.6 (2)
C6—C5—H5A	119.8	C19—C20—H20A	119.2
C1—C6—C5	121.4 (2)	C21—C20—H20A	119.2
C1—C6—H6A	119.3	C22—C21—C20	120.2 (3)
C5—C6—H6A	119.3	C22—C21—H21A	119.9
C8—C7—C12	117.66 (18)	C20—C21—H21A	119.9
C8—C7—Si1	122.53 (15)	C21—C22—C23	119.9 (2)
C12—C7—Si1	119.81 (15)	C21—C22—H22A	120.0
C9—C8—C7	120.8 (2)	C23—C22—H22A	120.0
C9—C8—H8A	119.6	C22—C23—C24	120.0 (2)
C7—C8—H8A	119.6	C22—C23—H23A	120.0
C10—C9—C8	120.1 (2)	C24—C23—H23A	120.0
C10—C9—H9A	120.0	C23—C24—C19	121.2 (2)

C8—C9—H9A	120.0	C23—C24—H24A	119.4
C11—C10—C9	120.0 (2)	C19—C24—H24A	119.4
N1^{i}—Si2—O1—Si1	55.8 (2)	C9—C10—C11—C12	1.5 (4)
C13—Si2—O1—Si1	176.78 (17)	C10—C11—C12—C7	−0.9 (3)
C19—Si2—O1—Si1	−63.8 (2)	C8—C7—C12—C11	−0.2 (3)
N1—Si1—O1—Si2	−7.6 (2)	Si1—C7—C12—C11	−179.88 (17)
C7—Si1—O1—Si2	−129.94 (18)	O1—Si2—C13—C18	−162.77 (16)
C1—Si1—O1—Si2	109.24 (18)	N1^{i}—Si2—C13—C18	−43.10 (19)
O1—Si1—N1—Si2^{i}	−66.15 (15)	C19—Si2—C13—C18	76.79 (18)
C7—Si1—N1—Si2^{i}	53.55 (15)	O1—Si2—C13—C14	18.92 (19)
C1—Si1—N1—Si2^{i}	176.34 (12)	N1^{i}—Si2—C13—C14	138.60 (17)
O1—Si1—C1—C6	164.56 (16)	C19—Si2—C13—C14	−101.52 (18)
N1—Si1—C1—C6	−75.08 (18)	C18—C13—C14—C15	1.1 (3)
C7—Si1—C1—C6	47.16 (18)	Si2—C13—C14—C15	179.47 (18)
O1—Si1—C1—C2	−20.62 (19)	C13—C14—C15—C16	0.8 (4)
N1—Si1—C1—C2	99.73 (18)	C14—C15—C16—C17	−2.2 (4)
C7—Si1—C1—C2	−138.02 (17)	C15—C16—C17—C18	1.6 (4)
C6—C1—C2—C3	0.8 (3)	C14—C13—C18—C17	−1.7 (3)
Si1—C1—C2—C3	−174.23 (19)	Si2—C13—C18—C17	179.86 (19)
C1—C2—C3—C4	−1.3 (4)	C16—C17—C18—C13	0.4 (4)
C2—C3—C4—C5	0.7 (4)	O1—Si2—C19—C20	107.10 (19)
C3—C4—C5—C6	0.2 (4)	N1^{i}—Si2—C19—C20	−13.7 (2)
C2—C1—C6—C5	0.1 (3)	C13—Si2—C19—C20	−135.99 (19)
Si1—C1—C6—C5	175.18 (18)	O1—Si2—C19—C24	−71.58 (17)
C4—C5—C6—C1	−0.6 (4)	N1^{i}—Si2—C19—C24	167.65 (15)
O1—Si1—C7—C8	153.74 (16)	C13—Si2—C19—C24	45.33 (18)
N1—Si1—C7—C8	31.06 (19)	C24—C19—C20—C21	−0.6 (4)
C1—Si1—C7—C8	−88.42 (18)	Si2—C19—C20—C21	−179.4 (2)
O1—Si1—C7—C12	−26.55 (18)	C19—C20—C21—C22	2.0 (5)
N1—Si1—C7—C12	−149.23 (15)	C20—C21—C22—C23	−1.9 (5)
C1—Si1—C7—C12	91.29 (17)	C21—C22—C23—C24	0.6 (4)
C12—C7—C8—C9	0.5 (3)	C22—C23—C24—C19	0.8 (4)
Si1—C7—C8—C9	−179.76 (18)	C20—C19—C24—C23	−0.7 (3)
C7—C8—C9—C10	0.1 (4)	Si2—C19—C24—C23	178.04 (17)
C8—C9—C10—C11	−1.2 (4)		

Symmetry code: (i) $-x+1, y, -z+3/2$.