Supporting Information

Silver-Catalyzed [2+2] Cycloadditions of Siloxy Alkynes

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General. Dichloromethane (HPLC grade), ethyl acetate (ACS grade), hexanes (ACS grade), acetonitrile (HPLC grade), diethyl ether (ACS grade) were purchased from Fisher Scientific and used without further purification. Anhydrous tetrahydrofuran was purified by distillation from sodium-benzophenone. Anhydrous dichloromethane was prepared by passing over activated alumina and copper. Triisopropylsilyl trifluoromethanesulfonate (TIPSOTf) was distilled under reduced pressure over calcium hydride. Commercially available reagents were used without further purification. Reactions were monitored by thin layer chromatography (TLC) using Whatman precoated silica gel plates. Flash column chromatography was performed over Silacyle silica gel (230-400 mesh). ^1H NMR and ^{13}C NMR spectra were recorded on Bruker DRX-400 or DMX-500 spectrometers using residual solvent peaks as an internal standard. Infrared spectra (IR) were recorded with a Nicolet FTIR spectrometer and are reported in reciprocal centimeter (cm^{-1}). Mass Spectra were recorded with an Agilent 1100 LCMS using the following conditions unless otherwise noted; APCI, POS, SCAN, 70, with methanol or dichloromethane as the eluting solvent. X-ray crystal structure analysis was performed on a Bruker Analytical X-ray system with a Smart Apex CCD based single crystal diffractometer.

General Procedure A: Preparation of Siloxy Alkynes.

This protocol is based on the original report by Julia et al.¹ A solution of alkyne (30 mmol) in THF (100 mL) was treated at -78°C with freshly prepared 1.0 M solution of LiHMDS in THF (33 mmol). The resulting solution of alkynyl lithium was treated at -78°C with lithium *t*-butyl hydroperoxide, which was freshly prepared from anhydrous *t*-butyl hydroperoxide² (33 mmol) in toluene (8 mL)-THF (100 mL) and 1.0 M LiHMDS in THF (36 mL). The reaction mixture was allowed to warm to 0°C , stirred for 2 h, cooled to -78°C and treated with triisopropyltrifluoromethanesulfonate (8.4 mL, 31 mmoles) dropwise. The resulting solution of siloxy alkyne was allowed to reach 0°C , stirred for 30 minutes, and diluted with 300 mL of hexanes. The organic layer was washed with 150 mL of saturated NaHCO_3 solution, 100 mL of brine, dried over sodium sulfate, filtered, concentrated, and purified via Kugelrohr distillation.

Siloxy Alkyne 1. The title compound was prepared in 86% yield according to General Procedure A. Kugelrohr distillation was conducted at 1 mm Hg and 130°C . ^1H NMR (500 MHz, C_6D_6) δ 2.13-2.15 (t, 2H, $J = 6.8$ Hz), 1.39-1.45 (m, 4H), 1.15-1.20 (m, 3H), 1.08-1.10 (m, 18H), 0.83-0.86 (t, 3H $J = 7.2$ Hz); ^{13}C NMR (125 MHz, C_6D_6) δ 87.0, 32.3, 30.7, 22.0, 17.3, 17.2, 13.6, 11.9; IR (neat) 2946, 2868, 2278 cm^{-1} ; MS (APCI) calculated for $\text{C}_{15}\text{H}_{31}\text{OSi}$ (M+H) 255.48 found 255.0.

Siloxyalkyne 4. The title compound was prepared in 81% yield according to General Procedure A. Kugelrohr distillation was conducted at 1 mm Hg and 145°C . ^1H NMR (500 MHz, CD_2Cl_2) δ 7.33-7.35 (m, 2H), 7.28-7.31 (m, 2H), 7.19-7.22 (m, 1H), 3.51 (s, 2H), 1.27-1.33 (m, 3H), 1.14-1.16 (m, 18H); ^{13}C NMR (125 MHz, CD_2Cl_2) δ 139.6, 128.5, 128.1, 126.4, 89.0, 28.7, 23.9, 17.5, 12.2;

¹ Julia, M.; Saint-Jalmes, V. P.; Verpeaux, J.-N. *Synlett* **1993**, 3, 233-234.

² Hill, J. G.; Rossiter, B. E.; Sharpless, K. B. *J. Org. Chem.* **1983**, 48, 3607-3608.

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Siloxy Alkyne 5. The title compound was prepared in 82% yield according to General Procedure A from phenyl acetylene and purified *via* Kugelrohr distillation (1 mmHg, 160 °C). ^1H NMR (500 MHz, CD_2Cl_2) δ 7.29-7.31 (m, 2H), 7.23-7.26 (m, 2H), 7.17-7.21 (m, 1H), 1.34-1.38 (m, 3H), 1.91-1.21 (d, 18H, $J = 7.5$ Hz); ^{13}C NMR (125 MHz, CD_2Cl_2) δ 131.7, 128.5, 126.4, 125.6, 33.8, 17.5, 12.4; IR (neat) 2946, 2868, 2266 cm^{-1} ; MS (APCI) calculated for $\text{C}_{18}\text{H}_{31}\text{OSi}$ 307.52 (M+MeOH+H) found 307.2.

General Procedure B: Silver-Catalyzed [2+2] Cycloaddition.

A 50mL round-bottomed flask was charged with siloxy alkyne (1.87 mmol) and 13.0 mL anhydrous dichloromethane. This solution was treated sequentially with the unsaturated carbonyl compound (1.56 mmol) and silver trifluoromethanesulfonimide³ (30.3 mg, 0.078 mmol). Generally after 5 min, TLC indicated complete consumption of the starting carbonyl compound. The reaction mixture was diluted with 30 mL of dichloromethane, washed with saturated aqueous NaHCO_3 (30mL), dried over MgSO_4 , filtered, and concentrated. The crude product was purified by flash chromatography on silica gel (typically 10:1 hexanes:ether) to afford the siloxy cyclobutene.

Siloxy Cyclobutene 3. The title compound was prepared according to General Procedure B in 90% yield: ^1H NMR (500 MHz, CDCl_3) δ 7.97-7.98 (d, 2H, $J = 7$ Hz), 7.52-7.55 (m, 1H), 7.43-7.46 (t, 2H, $J = 8$ Hz), 4.46-4.47 (m, 1H), 2.29-2.32 (dd, 1H, $J = 5$ Hz, 10.5 Hz), 2.12-2.14 (dd, 1H, $J = 1$ Hz, 10.5 Hz), 2.05-2.08 (m, 2H), 1.30-1.42 (m, 4H), 1.05-1.10 (m, 3H), 1.02-1.06 (m, 18H), 0.88-0.91 (m, 3H); ^{13}C NMR (125 MHz, CDCl_3) δ 200.0, 140.1, 137.5, 133.1, 128.8, 128.5, 119.4, 52.0, 29.7, 27.4, 26.4, 23.0, 18.1, 14.3, 13.1; IR (neat) 2923, 2866, 1682; MS (APCI) calculated for $\text{C}_{24}\text{H}_{38}\text{O}_2\text{Si}$ 387.64 (M+H) found 387.1

Siloxy Cyclobutene 6. The title compound was prepared according to General Procedure B in 77% yield. ^1H NMR (400MHz, CDCl_3) δ 3.48-3.51 (m, 1H), 2.16-2.19 (m, 1H), 2.15 (s, 3H), 2.00-2.13 (m, 2H), 1.92-1.95 (d, 1H, $J = 11\text{Hz}$), 1.31-1.46 (m, 4H), 1.11-1.17 (m, 3H), 1.05-1.10 (m, 18H), 0.90-0.94 (t, 3H, $J = 7.2$ Hz); ^{13}C NMR (100MHz, CDCl_3) δ 210.6, 140.7, 121.5, 57.4, 29.7, 26.4, 26.1, 26.0, 23.1, 18.1, 14.3, 13.0; IR (neat) 2926, 2867, 1707 cm^{-1} ; MS (APCI) calculated for $\text{C}_{19}\text{H}_{37}\text{O}_2\text{Si}$ 325.57 (M+H) found 325.2

³ Vij, A.; Zheng, Y. Y.; Kirchmeier, R. L.; Shreeve, J. M. *Inorg. Chem.* **1994**, 33, 3281-3288.

Siloxy Cyclobutene 7. The title compound was prepared in 69% yield according to General Procedure B (reaction time: 30 min): ^1H NMR (500MHz, CDCl_3) δ 3.48-3.49 (m, 1H), 2.33-2.36 (dd, 1H, J = 5 Hz, 10 Hz), 2.22-2.24 (d, 1H, J = 11 Hz), 2.00-2.06 (m, 2H), 1.29-1.39 (m, 4H), 1.16-1.21 (m, 3H), 1.09-1.11 (m, 18H), 0.88-0.91 (t, 3H, J = 7.2 Hz); ^{13}C NMR (125MHz, CDCl_3) δ 136.1, 121.7, 120.1, 31.9, 29.3, 27.8, 26.3, 22.9, 18.0, 14.2, 12.9; IR (neat) 2930, 2867, 1704, 1464 cm^{-1} ; MS (APCI) calculated for $\text{C}_{18}\text{H}_{34}\text{NOSi}$ 308.55 (M+H) found 308.2

Siloxy Cyclobutene 8. The title compound was prepared in 78% yield according to General Procedure B: ^1H NMR (400 MHz, CDCl_3) δ 3.68 (s, 3H), 3.52-3.53 (m, 1H), 2.13-2.16 (dd, 1H, J = 4.6 Hz, 10.4 Hz), 2.02-2.07 (m, 3H), 1.29-1.41 (m, 4H), 1.10-1.13 (m, 3H), 1.06-1.09 (m, 18H), 0.88-0.91 (t, 3H, J = 7.2 Hz); ^{13}C NMR (100 MHz, CDCl_3) δ 174.1, 139.0, 121.3, 52.0, 48.4, 29.6, 26.7, 26.3, 23.1, 18.1, 14.4, 13.0; IR (neat) 2923, 2866, 2279, 1682 cm^{-1} ; MS (APCI) calculated for $\text{C}_{19}\text{H}_{37}\text{O}_3\text{Si}$ 341.57 (M+H) found 341.2.

Siloxy Cyclobutene 9. The title compound was prepared according to General Procedure B: ^1H NMR (400 MHz, CDCl_3) δ 3.37 (s, 1H), 2.81 (s, 1H), 2.50-2.56 (m, 1H), 2.09-2.14 (m, 2H), 1.86-1.92 (m, 3H), 1.61-1.68 (m, 1H), 1.54-1.59 (m, 1H), 1.31-1.43 (m, 4H), 1.10-1.15 (m, 3H), 1.06-1.08 (m, 18H), 0.89-0.92 (m, 3H); ^{13}C NMR (100MHz, CDCl_3) δ 211.6, 138.3, 122.1, 58.0, 40.1, 34.8, 29.6, 25.1, 24.8, 23.3, 18.1, 17.9, 14.3, 13.0; IR (neat) 2929, 2866, 1696 cm^{-1} ; MS (APCI) calculated for $\text{C}_{21}\text{H}_{39}\text{O}_2\text{Si}$ 351.61 (M+H) found 351.2.

Siloxy Cyclobutene 10. The title compound was prepared in 83% yield according to General Procedure B: ^1H NMR (500 MHz, CDCl_3) δ 7.93-7.95 (dd, 2H, J = 8, 1 Hz), 7.50-7.53 (m, 1H), 7.40-7.43 (m, 2H), 7.26-7.29 (m, 2H), 7.16-7.21 (m, 3H), 4.48-4.50 (m, 1H), 3.45 (s, 2H), 2.24-2.27 (dd, 1H J = 10.5, 5 Hz), 2.08-2.10 (d, 1H, J = 10.5 Hz), 1.09-1.13 (m, 3H), 1.04-1.07 (m, 18H); ^{13}C NMR (125 MHz, CDCl_3) δ 199.3, 141.2, 138.6, 137.0, 132.8, 128.7, 128.4, 128.3, 128.1, 125.9, 116.3, 51.8, 32.8, 27.3, 17.7, 12.8; IR (neat) 2943, 2866, 1682 cm^{-1} ; MS (APCI) calculated for $\text{C}_{27}\text{H}_{37}\text{O}_2\text{Si}$ 421.66 (M+H) found 421.3.

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Siloxy Cyclobutene 11. The title compound was prepared in 70% yield according to General Procedure B: ^1H NMR (500 MHz, CDCl_3) δ 7.26-7.29 (m, 2H), 7.17-7.20 (m, 3H), 3.52-3.54 (m, 1H), 3.48-3.51 (d, 1H, J = 16 Hz), 3.31-3.34 (d, 1H, J = 15.5 Hz), 2.10-2.14 (dd, 1H, J = 11, 5 Hz), 2.09 (s, 3H), 1.84-1.86 (dd, 1H, J = 11, 0.5 Hz), 1.10-1.15 (m, 3H), 1.05-1.08 (m, 18H); ^{13}C NMR (125 MHz, CDCl_3) δ 209.6, 141.4, 138.5, 128.6, 128.4, 126.0, 118.6, 57.1, 32.9, 25.8, 25.6, 17.7, 12.5; IR (neat) 2943, 2866, 1695 cm^{-1} ; MS (APCI) calculated for $\text{C}_{22}\text{H}_{35}\text{O}_2\text{Si}$ 359.6 (M+H) found 359.2.

Siloxy Cyclobutene 12. The title compound was prepared in 68% yield according to General Procedure B: ^1H NMR (500 MHz, CDCl_3) δ 7.24-7.28 (m, 2H), 7.17-7.19 (m, 3H), 3.46-3.50 (d, 1H, J = 15.5 Hz), 3.38-3.39 (m, 1H), 3.23-3.26 (d, 1H, J = 15.5 Hz), 2.76 (m, 1H), 2.48-2.53 (dd, 1H, J = 18.5, 4.5 Hz), 2.04-2.12 (m, 1H), 1.80-1.84 (m, 1H), 1.67-1.70 (m, 1H), 1.53-1.57 (m, 1H), 1.40-1.46 (m, 1H), 1.12-1.19 (m, 3H), 1.06-1.108 (m, 18H); ^{13}C NMR (125 MHz, CDCl_3) δ 211.4, 139.7, 139.1, 129.3, 129.0, 126.6, 119.8, 58.4, 40.3, 35.1, 32.1, 24.8, 18.3, 18.0, 13.3; IR (neat) 2941, 2867, 2245, 1693 cm^{-1} ; MS (APCI) calculated for $\text{C}_{24}\text{H}_{37}\text{O}_2\text{Si}$ 385.6 (M+H) found 385.1.

Siloxy Cyclobutene 13. The title compound was prepared in 75% yield according to General Procedure B: ^1H NMR (500 MHz, CDCl_3) δ 8.01-8.02 (d, 2H, J = 7.5 Hz), 7.57-7.60 (m, 1H), 7.45-7.52 (m, 4H), 7.31-7.34 (t, 2H, J = 7.5 Hz), 7.17-7.19 (t, 1H, J = 7.5 Hz), 4.67-4.69 (m, 1H), 2.83-2.86 (dd, 1H, J = 5 Hz, 10 Hz), 2.37-2.40 (dd, 1H, J = 2 Hz, 10 Hz), 1.18-1.24 (m, 3H), 1.08-1.13 (m, 18H); ^{13}C NMR (125 MHz, CDCl_3) δ 199.0, 141.5, 136.6, 134.0, 133.1, 128.7, 128.2, 128.0, 125.9, 125.6, 117.5, 51.9, 27.1, 17.8, 12.8; IR (neat) 2943, 2866, 1686 cm^{-1} ; MS (APCI) calculated for $\text{C}_{26}\text{H}_{35}\text{O}_2\text{Si}$ 407.63 (M+H) found 407.1.

Siloxy Cyclobutene 14. The title compound was prepared in 76% yield according to General Procedure B: ^1H NMR (400 MHz, CDCl_3) δ 7.45-7.47 (d, 2H, J = 10.5 Hz), 7.32-7.36 (t, 2H, J = 9.9 Hz), 7.20-7.22 (t, 1H, J = 9.2 Hz), 3.72-3.73 (dd, 1H, J = 4.9, 1.0 Hz), 2.62-2.66 (dd, 1H, J = 13.6, 6.3 Hz), 2.25-2.28 (dd, 1H, J = 13.6, 1.9 Hz), 2.19 (s, 3H), 1.16-1.23 (m, 3H), 1.10-1.12 (m, 18H); ^{13}C NMR (100 MHz, CDCl_3) δ 209.8, 142.4, 134.2, 128.7, 126.8, 126.1, 120.0, 57.9, 25.6, 24.9, 18.1, 13.0; IR (neat) 2944, 2866, 1705, 1665 cm^{-1} ; MS (APCI) calculated for $\text{C}_{21}\text{H}_{33}\text{O}_2\text{Si}$ 345.56 (M+H) found 345.2.

Siloxy Cyclobutene 17. The title compound was prepared in 81% yield according to General Procedure B. ^1H NMR (500 MHz, CDCl_3) δ 3.66 (s, 3H), 3.02-3.04 (m, 1H), 2.42-2.45 (q, 1H, J = 6.6 Hz), 2.04-2.10 (m, 1H), 1.88-1.94 (m, 1H), 1.37-1.43 (m, 2H), 1.29-1.35 (m, 2H), 1.12-1.13 (d, 3H), J = 6.6 Hz), 1.08-1.11 (m, 3H), 1.05-1.07 (m, 18H), 0.87-0.90 (t, 3H, J = 7.2 Hz); ^{13}C NMR (125 MHz, CDCl_3) δ 173.9, 138.8, 125.8, 56.8, 51.9, 35.4, 29.7, 25.0, 23.2, 18.4, 18.06, 18.11, 14.3, 13.0; IR (neat) 2948, 2867, 1735, 1702 cm^{-1} ; MS (APCI) calculated for $\text{C}_{20}\text{H}_{39}\text{O}_3\text{Si}$ 355.60 (M+H) found 355.2.

Siloxy Cyclobutene 17. The title compound was prepared 75% yield from methyl *cis*-butenoate⁴ according to General Procedure B. The product prepared by this method was identical to the material prepared from the methyl *trans*-butenoate.

cis-3-Deuterio-1-phenyl-2-propene-1-ol: A flame-dried, 100 mL round-bottomed flask was charged with LiAlH_4 powder (261 mg, 6.88 mmole), anhydrous THF (20.2 mL), and cooled to 0 °C. 1-Phenyl-2-propyne-1-ol (1.00 g, 7.57 mmole) was added drop-wise over 5 minutes causing hydrogen evolution. The reaction mixture was stirred for 2 h at 0 °C, and additional 15 h at 20 °C, at which point the flask was cooled to 0 °C and the reaction was quenched slowly with D_2O (1.0 mL, Aldrich 99.9%). The resulting mixture was treated with 1.0 M aqueous solution of NaOH (1.0 mL), dried over anhydrous MgSO_4 , filtered, and concentrated. The crude product (1.02 g, 100% yield) was used in the next reaction without further purification. ^1H NMR (500 MHz, CDCl_3) δ 7.37-7.41 (m, 4H), 7.30-7.34 (m, 1H), 6.01-6.07 (m, 1H), 5.17-5.20 (dd, 1H, J = 1.2 Hz, 10.3 Hz), 5.15-5.16 (d, 1H, J = 5.8 Hz), 2.80-3.15 (b, 1H); ^{13}C NMR (125 MHz, CDCl_3) δ 143.2, 140.7, 129.0, 128.1, 126.9, 115.0-115.4 (t, J_{DC} = 23.7 Hz), 75.6; MS (APCI) calc for $\text{C}_9\text{H}_7\text{D}$ 118.18 (M-OH) found 118.0.

cis-3-Deuterio phenyl vinyl ketone (18): A dry, 100 mL round-bottomed flask was charged with CrO_3 (38.0 mg, 0.38 mmol) and 30.4 mL of CH_2Cl_2 . 70% solution of *t*BuOOH in H_2O (2.21 mL, 22.8 mmol, Aldrich T-Hydro®) was added slowly inducing dark purple color of the resulting solution. *Cis*-3-deuterio-1-phenyl-2-propene-1-ol (1.02 g, 7.57 mmol) was added. After 2 h at 20 °C TLC indicated complete consumption of the starting material. The reaction mixture was quenched with 1.0 mL of saturated aqueous sodium thiosulfite, stirred for 5 minutes, filtered through a plug of alumina, and concentrated. The crude product was purified via flash chromatography on silica gel (10:1 hexanes:ether) to give *cis*-3-deuterio phenyl vinyl ketone (**18**) as a yellow oil (750 mg, 75%). ^1H NMR (500 MHz, CDCl_3) δ 7.92-7.95-7.97 (m, 2H), 7.59-7.63 (tt, 1H, J = 1.2 Hz, 6.8 Hz), 7.49-7.53 (m, 2H), 7.12-7.15 (dt, 1H, J = 2.5 Hz, 10.6 Hz), 5.89-5.91 (d, 1H, J = 10.6 Hz); ^{13}C NMR (125 MHz, CDCl_3) δ 191.0, 137.2, 133.0, 132.3, 129.7-130.1 (t, J_{DC} = 24.3 Hz), 128.7, 128.6; IR (neat) 3062, 2092, 1666, 1585 cm^{-1} .

⁴ *cis*-methyl 2-butenoate was prepared by the following a procedure: Wuts, P. G. M.; Jung, Y.-W. *J. Org. Chem.* **1988**, 53, 5989-5994.

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[2+2] Cycloaddition of Alkyne 1 with Enone 18. The reaction was conducted according to a General Procedure B to give a 1:1 mixture of siloxy cyclobutenes **19** and **20** as judged by the ^1H NMR of the crude reaction mixture. ^1H NMR (500 MHz, CDCl_3) δ 7.97-7.99 (d, 2H, $J = 7.5$ Hz), 7.52-7.55 (t, 1H, $J = 7.5$ Hz), 7.42-7.45 (t, 2H, $J = 7.5$ Hz), 4.46-4.47 (m, 1H), 2.28-2.29 (d, 0.5H, $J = 4.5$ Hz, from **19**), 2.12 (s, 0.5H, from **20**), 2.05-2.09 (m, 2H), 1.32-1.45 (m, 4H), 1.06-1.13 (m, 3H), 1.02-1.04 (m, 18H), 0.88-0.92 (t, 3H, $J = 7.2$ Hz); ^{13}C NMR (125 MHz, CDCl_3) δ 199.8, 140.1, 137.5, 133.0, 128.7, 128.5, 119.2, 51.8, 29.6, 26.8-27.2 (t, $J_{\text{DC}} = 21.5$ Hz), 26.4, 23.0, 18.0, 14.2, 13.1; IR (neat) 2944, 2866, 1682 cm^{-1} ; MS (APCI) calc for $\text{C}_{24}\text{H}_{38}\text{DO}_2\text{Si}$ 388.65 (M+H) found 388.3.

Hydrazone 21. A 10 mL round-bottomed flask was charged with siloxy cyclobutene **14** (60.0 mg, 0.174 mmol), 1.7 mL anhydrous methanol, and 4-methoxybenzenesulfonyl hydrazide (35.0 mg, 0.174 mmol). The reaction was heated at reflux for 2 h, diluted with a minimum amount of ethyl acetate and purified by column chromatography (2:1 hexanes:ethyl acetate) to yield 61 mg (66%) of the title compound as a white solid, which was slowly recrystallized from ethyl acetate:pentanes. ^1H NMR (500 MHz, CDCl_3) δ 7.94-7.96 (d, 2H, J = 9.0 Hz), 7.71 (s, 1H), 7.40-7.42 (d, 2H, J = 7.0 Hz), 7.30-7.33 (t, 2H, J = 8.0 Hz), 7.16-7.19 (t, 1H, J = 7.0 Hz), 6.98-7.00 (d, 2H, J = 9.0 Hz), 3.87 (s, 3H), 3.79-3.80 (d, 1H, J = 4.0 Hz), 2.57-2.60 (dd, 1H, J = 5.0 Hz, 11.0 Hz), 2.02-2.05 (dd, 1H, J = 1.0 Hz, 11.0 Hz), 1.78 (s, 3H), 1.01-1.06 (m, 3H), 0.96-0.97 (d, 9H, J = 6.0 Hz), 0.89-0.90 (d, 9H, J = 7.0 Hz); ^{13}C NMR (125 MHz, CDCl_3) δ 163.8, 142.5, 134.0, 130.7, 130.5, 130.1, 128.6, 126.6, 126.0, 118.9, 114.6, 56.0, 53.1, 25.5, 17.9, 12.9, 11.9; IR (neat) 3222, 2945, 2864, 1665, 1596 cm^{-1} ; MS (APCI) calculated for $\text{C}_{28}\text{H}_{41}\text{N}_2\text{O}_4\text{SSi}$ 529.79 (M+H) found 529.2. X-ray crystallographic data follows in a subsequent section.

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Current Data Parameters		F2 - Acquisition Parameters	
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		NS	4
		DS	0
		SMH	4807.692 Hz
		FIDRES	0.123129 Hz
		AQ	4.0809359 sec
		R6	18
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		PL1	-6.00 dB
F2 - Processing Parameters			
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F1	3401.10 Hz		
F2P	0.000 ppm		
F2	0.00 Hz		
PRQNM	0.42500 ppm/cm		
HZCM	170.05525 Mhz/cm		

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Current Data Parameters

NAME	VALUE
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PROCNO	1

F2 - Acquisition Parameters

Date_	Time
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INSTRUM spect

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TD 32768

SOLVENT CDCl3

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AQ 1.9268084 sec

RG 32

DM 58.800 usec

DE 4.50 usec

TE 300.0 K

D1 5.00000000 sec

===== CHANNEL f1 =====

NUC1 1H

P1 10.00 usec

PL1 0.00 dB

SFO1 500.1325272 MHz

F2 - Processing parameters

SI	VALUE
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1D NMR plot parameters

Parameter	Value
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F1P	8.000 ppm
F1	4001.04 Hz
F2P	-0.300 ppm
F2	-250.05 Hz
PPMCM	0.42500 ppm/cm
HZCM	212.55525 Hz/cm

Silver-Catalyzed [2+2] Cycloadditions of Siloxy Alkynes

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Current Data Parameters
 NAME rs261
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20031108
 Time 19.19
 INSTRUM spect
 PROBHD 5 mm QNP 1H
 PULPROG zg
 TD 32768
 SOLVENT CDCl3
 NS 4
 DS 0
 SMH 8503.401 Hz
 FIDRES 0.259603 Hz
 AQ 1.9269064 sec
 RG 8
 DK 56.800 usec
 DE 4.50 usec
 TE 286.0 K
 D1 10.00000000 sec

===== CHANNEL f1 =====
 NUC1 1H
 P1 10.00 usec
 PL1 0.00 dB
 SF01 500.1320159 MHz

F2 - Processing parameters
 SI 16394
 SF 500.1300134 MHz
 MDK EM
 SS8 0
 LB 0.30 Hz
 GB 0
 PC 1.00

1D NMR plot parameters
 CX 20.00 cm
 F1P 8.500 ppm
 F1 4251.10 Hz
 F2P 0.000 ppm
 F2 0.00 Hz
 PPM0M 0.42500 ppm/cm
 HZCM 212.55525 Hz/cm

Silver-Catalyzed [2+2] Cycloadditions of Siloxy Alkynes

500 MHz DQF COSY Spectrum of compound **9**

Silver-Catalyzed [2+2] Cycloadditions of Siloxy Alkynes

500 MHz NOESY Spectrum of Compound **9**

500 MHz DQF COSY Spectrum of Compound **17**

500 MHz NOESY Spectrum of Compound **17**

X-ray Crystallography Data for Hydrazone 21

Crystallographic Experimental Section

Data Collection

An irregular broken fragment (0.60 x 0.40 x 0.10 mm) was selected under a stereo-microscope while immersed in Fluorolube oil to avoid possible reaction with air. The crystal was removed from the oil using a tapered glass fiber that also served to hold the crystal for data collection. The crystal was mounted and centered on a Bruker SMART APEX system at 107 K. Rotation and still images showed the diffractions to be sharp. Frames separated in reciprocal space were obtained and provided an orientation matrix and initial cell parameters. Final cell parameters were obtained from the full data set.

A “fullsphere” data set was obtained which samples approximately all of reciprocal space to a resolution of 0.84 Å using 0.3° steps in ω using 30 second integration times for each frame. Data collection was made at 107 K. Integration of intensities and refinement of cell parameters were done using SAINT [1]. Absorption corrections were applied using SADABS [1] based on redundant diffractions.

Structure solution and refinement

The space group was determined as P1(bar) based on systematic absences and intensity statistics. Direct methods were used to locate most non-hydrogen atoms from the E-map. Repeated difference Fourier maps allowed recognition of all expected non-hydrogen atoms. Following anisotropic refinement of the non-hydrogen atoms, a disordered carbon atom was located on the triisopropyl moiety of the molecule. Occupancy refinement showed each to be 0.56 and this was fixed at 0.50 (labeled C28A and C28B). Ideal H atom positions were calculated and final refinement was anisotropic for all non-hydrogen atoms and isotropic-riding for hydrogen atoms. Four hydrogen atoms were omitted from the structure; three from the disordered center (C28), and one from the adjacent methine center (C21). All ORTEP diagrams have been drawn with 50% probability ellipsoids.

Equations of interest:

$$R_{\text{int}} = \Sigma | F_o^2 - \langle F_o^2 \rangle | / \Sigma | F_o^2 |$$

$$R1 = \Sigma | | F_o | - | F_c | | / \Sigma | F_o |$$

$$wR2 = [\Sigma [w (F_o^2 - F_c^2)^2] / \Sigma [w (F_o^2)^2]]^{1/2}$$

$$\text{GooF} = S = [\Sigma [w (F_o^2 - F_c^2)^2] / (n-p)]^{1/2}$$

$$\text{where: } w = q / \sigma^2 (F_o^2) + (aP)^2 + bP;$$

n = number of independent reflections;

q, a, b, P as defined in [1]

p = number of parameters refined.

References

[1] All software and sources of scattering factors are contained in the SHELXTL (version 5.1) program library (G. Sheldrick, Bruker Analytical X-ray Systems, Madison, WI).

Table 1. Crystal and structure refinement for Hydrazone 21.

Identification Code	Mike17
Empirical formula	C ₂₈ H ₄₀ N ₂ O ₄ SSi
Formula weight	528.78
Temperature	107 K
Wavelength	0.71073 Å
Crystal system	Triclinic
Space Group	P1(bar)
Unit cell dimensions	$a = 7.857(3) \text{ Å}$ $\alpha = 81.092(5)^\circ$ $b = 10.517(4) \text{ Å}$ $\beta = 81.484(6)^\circ$ $c = 18.996(6) \text{ Å}$ $\gamma = 69.293(5)^\circ$
Volume	1443.2(9) Å ³
Z	2
Density (calculated)	1.208 Mg/m ³
Absorption coefficient	0.188 mm ⁻¹
F(000)	560
Crystal size, color, habit	0.60 x 0.40 x 0.10 mm, transparent, plate
Theta range for data collection	2.08 – 25.03°
Index ranges	-9 ≤ h ≤ 9, -12 ≤ k ≤ 12, -22 ≤ l ≤ 22
Reflections collected	14,069
Independent reflections	5,106 (R _{int} = 0.0303)
Reflections with I > 4σ(F _o)	4,868
Absorption correction	SADABS based on redundant diffractions
Max. and min. transmission	0.710, 1.00
Refinement method	Full-matrix least squares on F ²
Weighting scheme	w = q [σ ² (F _o ²) + (aP) ² + bP] ⁻¹ where: P = (F _o ² + 2F _c ²)/3, a = 0.080, b = 1.364, q = 1
Data / restraints / parameters	5106 / 0 / 334
Goodness-of-fit on F ²	1.082
Final R indices [I > 2 sigma(I)]	R1 = 0.0534, wR2 = 0.1450
R indices (all data)	R1 = 0.0554, wR2 = 0.1469
Largest diff. peak and hole	0.741, -0.550 eÅ ⁻³

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Table 2. Atomic coordinates [$\times 10^4$] and equivalent isotropic displacement parameters [$\text{\AA}^2 \times 10^3$] for Mikel7. U(eq) is defined as one third of the trace of the orthogonalized U_{ij} tensor.

	x	y	z	U(eq)	SOF
C(1)	12667(3)	204(2)	7439(1)	22(1)	
C(2)	10905(3)	916(2)	7359(1)	20(1)	
C(3)	10387(3)	1322(2)	8112(1)	20(1)	
C(4)	12459(3)	507(2)	8207(1)	24(1)	
C(5)	14267(3)	-590(2)	7008(1)	23(1)	
C(6)	14188(3)	-790(3)	6306(1)	30(1)	
C(7)	15743(4)	-1550(3)	5913(2)	38(1)	
C(8)	17399(4)	-2113(3)	6212(2)	39(1)	
C(9)	17487(3)	-1930(3)	6907(2)	34(1)	
C(10)	15937(3)	-1174(2)	7301(1)	27(1)	
C(11)	9109(3)	743(2)	8609(1)	20(1)	
C(12)	9367(3)	-741(2)	8619(1)	28(1)	
C(13)	3618(3)	3114(2)	9599(1)	20(1)	
C(14)	3704(3)	4363(2)	9263(1)	25(1)	
C(15)	2257(3)	5259(2)	8920(1)	28(1)	
C(16)	685(3)	4933(2)	8914(1)	22(1)	
C(17)	587(3)	3684(2)	9256(1)	23(1)	
C(18)	2061(3)	2779(2)	9589(1)	22(1)	
C(19)	-2375(3)	5646(3)	8620(1)	29(1)	
C(20)	9943(3)	3838(2)	6196(1)	29(1)	
C(21)	7888(6)	2211(3)	5648(2)	64(1)	
C(22)	6582(3)	3432(2)	7133(1)	28(1)	
C(23)	5474(3)	2490(3)	7433(2)	33(1)	
C(24)	5317(4)	4849(3)	6864(2)	46(1)	
C(25)	11737(4)	3131(3)	5748(2)	45(1)	
C(26)	10352(3)	4387(3)	6824(1)	31(1)	
C(27)	7240(7)	3413(3)	5073(2)	71(1)	
C(28A)	8942(8)	915(5)	5376(3)	34(1)	0.50
C(28B)	7041(8)	1319(6)	5706(3)	40(1)	0.50
N(1)	7961(2)	1555(2)	9030(1)	20(1)	
N(2)	6917(2)	949(2)	9545(1)	21(1)	
O(1)	9876(2)	1158(2)	6812(1)	23(1)	
O(2)	6325(2)	2775(2)	10319(1)	25(1)	
O(3)	4685(2)	1100(2)	10581(1)	22(1)	
O(4)	-686(2)	5896(2)	8571(1)	29(1)	
S(1)	5417(1)	1991(1)	10075(1)	19(1)	
Si(2)	8540(1)	2682(1)	6454(1)	24(1)	

Table 3. Bond lengths [Å] and angles [°] for Mikel7.

C(1)-C(2)	1.339(3)
C(1)-C(5)	1.453(3)
C(1)-C(4)	1.513(3)
C(2)-O(1)	1.348(3)
C(2)-C(3)	1.513(3)
C(3)-C(11)	1.498(3)
C(3)-C(4)	1.572(3)
C(5)-C(10)	1.396(3)
C(5)-C(6)	1.397(3)
C(6)-C(7)	1.383(4)
C(7)-C(8)	1.391(4)
C(8)-C(9)	1.377(4)
C(9)-C(10)	1.381(4)
C(11)-N(1)	1.277(3)
C(11)-C(12)	1.499(3)
C(13)-C(14)	1.389(3)
C(13)-C(18)	1.391(3)
C(13)-S(1)	1.754(2)
C(14)-C(15)	1.370(3)
C(15)-C(16)	1.396(3)
C(16)-O(4)	1.358(3)
C(16)-C(17)	1.395(3)
C(17)-C(18)	1.378(3)
C(19)-O(4)	1.429(3)
C(20)-C(26)	1.523(4)
C(20)-C(25)	1.536(4)
C(20)-Si(2)	1.882(3)
C(21)-C(28B)	1.312(7)
C(21)-C(28A)	1.450(6)
C(21)-C(27)	1.527(4)
C(21)-Si(2)	1.871(3)
C(22)-C(24)	1.529(4)
C(22)-C(23)	1.534(3)
C(22)-Si(2)	1.877(3)
N(1)-N(2)	1.406(3)
N(2)-S(1)	1.6364(19)
O(1)-Si(2)	1.6784(17)
O(2)-S(1)	1.4269(16)
O(3)-S(1)	1.4391(16)
C(2)-C(1)-C(5)	137.4(2)
C(2)-C(1)-C(4)	92.60(18)
C(5)-C(1)-C(4)	130.0(2)
C(1)-C(2)-O(1)	133.1(2)
C(1)-C(2)-C(3)	96.20(18)
O(1)-C(2)-C(3)	130.59(19)
C(11)-C(3)-C(2)	118.90(18)
C(11)-C(3)-C(4)	113.25(18)
C(2)-C(3)-C(4)	84.06(16)
C(1)-C(4)-C(3)	87.13(17)
C(10)-C(5)-C(6)	118.6(2)

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C(10)-C(5)-C(1)	119.4(2)
C(6)-C(5)-C(1)	121.9(2)
C(7)-C(6)-C(5)	120.1(2)
C(6)-C(7)-C(8)	120.4(2)
C(9)-C(8)-C(7)	119.9(2)
C(8)-C(9)-C(10)	120.0(2)
C(9)-C(10)-C(5)	121.0(2)
N(1)-C(11)-C(3)	115.92(19)
N(1)-C(11)-C(12)	125.4(2)
C(3)-C(11)-C(12)	118.46(19)
C(14)-C(13)-C(18)	119.9(2)
C(14)-C(13)-S(1)	120.32(17)
C(18)-C(13)-S(1)	119.68(17)
C(15)-C(14)-C(13)	119.9(2)
C(14)-C(15)-C(16)	120.4(2)
O(4)-C(16)-C(17)	124.1(2)
O(4)-C(16)-C(15)	116.0(2)
C(17)-C(16)-C(15)	119.9(2)
C(18)-C(17)-C(16)	119.3(2)
C(17)-C(18)-C(13)	120.6(2)
C(26)-C(20)-C(25)	109.8(2)
C(26)-C(20)-Si(2)	114.44(17)
C(25)-C(20)-Si(2)	111.02(18)
C(28B)-C(21)-C(28A)	64.1(4)
C(28B)-C(21)-C(27)	114.1(4)
C(28A)-C(21)-C(27)	114.9(3)
C(28B)-C(21)-Si(2)	121.4(4)
C(28A)-C(21)-Si(2)	120.0(3)
C(27)-C(21)-Si(2)	113.7(2)
C(24)-C(22)-C(23)	110.5(2)
C(24)-C(22)-Si(2)	112.97(19)
C(23)-C(22)-Si(2)	113.83(17)
C(11)-N(1)-N(2)	114.93(18)
N(1)-N(2)-S(1)	115.09(14)
C(2)-O(1)-Si(2)	127.20(14)
C(16)-O(4)-C(19)	117.04(18)
O(2)-S(1)-O(3)	119.89(10)
O(2)-S(1)-N(2)	107.27(10)
O(3)-S(1)-N(2)	103.51(10)
O(2)-S(1)-C(13)	108.41(10)
O(3)-S(1)-C(13)	107.32(10)
N(2)-S(1)-C(13)	110.19(10)
O(1)-Si(2)-C(21)	101.78(11)
O(1)-Si(2)-C(22)	109.07(10)
C(21)-Si(2)-C(22)	115.05(16)
O(1)-Si(2)-C(20)	108.75(10)
C(21)-Si(2)-C(20)	111.55(16)
C(22)-Si(2)-C(20)	110.17(11)

Table 4. Anisotropic displacement parameters [$\text{\AA}^2 \times 10^3$] for Mikel17. The anisotropic displacement factor exponent takes the form:

$$-2\pi^2[h^2a^{*2}U_{11} + \dots + 2hka^*b^*U_{12}]$$

	U_{11}	U_{22}	U_{33}	U_{23}	U_{13}	U_{12}
C(1)	24(1)	19(1)	23(1)	-1(1)	-2(1)	-10(1)
C(2)	24(1)	17(1)	21(1)	-1(1)	-2(1)	-10(1)
C(3)	21(1)	20(1)	23(1)	-3(1)	-1(1)	-10(1)
C(4)	20(1)	27(1)	24(1)	-3(1)	-2(1)	-10(1)
C(5)	25(1)	18(1)	28(1)	-3(1)	0(1)	-10(1)
C(6)	25(1)	33(1)	32(1)	-8(1)	-2(1)	-7(1)
C(7)	34(1)	44(2)	34(1)	-19(1)	2(1)	-9(1)
C(8)	27(1)	38(2)	47(2)	-18(1)	4(1)	-3(1)
C(9)	22(1)	30(1)	49(2)	-10(1)	-6(1)	-3(1)
C(10)	26(1)	23(1)	33(1)	-5(1)	-5(1)	-8(1)
C(11)	20(1)	18(1)	23(1)	-2(1)	-2(1)	-8(1)
C(12)	28(1)	20(1)	34(1)	-7(1)	8(1)	-11(1)
C(13)	21(1)	20(1)	21(1)	-8(1)	2(1)	-9(1)
C(14)	23(1)	21(1)	36(1)	-5(1)	1(1)	-14(1)
C(15)	30(1)	18(1)	38(1)	0(1)	0(1)	-14(1)
C(16)	23(1)	20(1)	24(1)	-6(1)	0(1)	-7(1)
C(17)	23(1)	23(1)	26(1)	-6(1)	0(1)	-14(1)
C(18)	27(1)	20(1)	25(1)	-2(1)	0(1)	-15(1)
C(19)	22(1)	30(1)	36(1)	-7(1)	-3(1)	-7(1)
C(20)	30(1)	22(1)	30(1)	2(1)	3(1)	-6(1)
C(21)	109(3)	28(2)	50(2)	-7(1)	-53(2)	0(2)
C(22)	21(1)	25(1)	41(1)	-8(1)	-4(1)	-10(1)
C(23)	26(1)	33(1)	44(2)	-7(1)	-1(1)	-14(1)
C(24)	26(1)	27(1)	77(2)	-4(1)	2(1)	-5(1)
C(25)	45(2)	37(2)	46(2)	-5(1)	17(1)	-13(1)
C(26)	25(1)	27(1)	41(1)	-1(1)	1(1)	-13(1)
C(27)	119(3)	37(2)	57(2)	0(2)	-59(2)	-7(2)
C(28A)	41(3)	28(3)	31(3)	-11(2)	-8(2)	-4(2)
C(28B)	46(3)	46(3)	41(3)	-5(2)	-10(2)	-31(3)
N(1)	19(1)	20(1)	24(1)	-2(1)	1(1)	-11(1)
N(2)	23(1)	16(1)	27(1)	-4(1)	3(1)	-10(1)
O(1)	24(1)	22(1)	24(1)	-4(1)	-4(1)	-8(1)
O(2)	24(1)	25(1)	32(1)	-10(1)	-2(1)	-13(1)
O(3)	23(1)	23(1)	23(1)	-3(1)	0(1)	-12(1)
O(4)	24(1)	24(1)	40(1)	0(1)	-4(1)	-9(1)
S(1)	19(1)	18(1)	23(1)	-5(1)	1(1)	-10(1)
Si(2)	24(1)	20(1)	27(1)	-4(1)	-6(1)	-5(1)

Table 5. Hydrogen coordinates [$\times 10^4$] and isotropic displacement parameters [$\text{\AA}^2 \times 10^3$] for Mikel7.

H(3A)	10072	2307	8125	24
H(4A)	13146	1069	8286	28
H(4B)	12664	-296	8556	28
H(6A)	13087	-412	6101	36
H(7A)	15682	-1687	5447	45
H(8A)	18446	-2611	5943	46
H(9A)	18589	-2315	7109	41
H(10A)	16006	-1052	7770	33
H(12A)	8459	-969	8959	41
H(12B)	10563	-1288	8752	41
H(12C)	9243	-916	8151	41
H(14A)	4742	4590	9270	30
H(15A)	2321	6091	8690	33
H(17A)	-462	3465	9260	27
H(18A)	2015	1936	9809	27
H(19A)	-3234	6393	8358	44
H(19B)	-2856	5565	9113	44
H(19C)	-2170	4814	8420	44
H(20A)	9234	4629	5889	35
H(22A)	7124	3558	7539	34
H(23A)	4499	2935	7775	49
H(23B)	6258	1653	7662	49
H(23C)	4971	2292	7049	49
H(24A)	4344	5183	7231	68
H(24B)	4813	4790	6445	68
H(24C)	6000	5465	6748	68
H(25A)	12428	3740	5623	68
H(25B)	11465	2894	5320	68
H(25C)	12438	2316	6022	68
H(26A)	11069	4965	6650	46
H(26B)	11019	3637	7144	46
H(26C)	9224	4905	7074	46
H(27A)	6927	3103	4677	107
H(27B)	8200	3787	4912	107
H(27C)	6185	4105	5270	107
H(2A)	7056	94	9580	25

Table 6. Torsion angles [$^{\circ}$] for Mike17.

C(5)-C(1)-C(2)-O(1)	1.6(5)
C(4)-C(1)-C(2)-O(1)	-178.1(2)
C(5)-C(1)-C(2)-C(3)	178.9(3)
C(4)-C(1)-C(2)-C(3)	-0.83(18)
C(1)-C(2)-C(3)-C(11)	-112.5(2)
O(1)-C(2)-C(3)-C(11)	64.9(3)
C(1)-C(2)-C(3)-C(4)	0.80(17)
O(1)-C(2)-C(3)-C(4)	178.2(2)
C(2)-C(1)-C(4)-C(3)	0.80(17)
C(5)-C(1)-C(4)-C(3)	-178.9(2)
C(11)-C(3)-C(4)-C(1)	118.25(19)
C(2)-C(3)-C(4)-C(1)	-0.71(15)
C(2)-C(1)-C(5)-C(10)	178.7(3)
C(4)-C(1)-C(5)-C(10)	-1.7(4)
C(2)-C(1)-C(5)-C(6)	-1.3(4)
C(4)-C(1)-C(5)-C(6)	178.3(2)
C(10)-C(5)-C(6)-C(7)	-0.2(4)
C(1)-C(5)-C(6)-C(7)	179.8(2)
C(5)-C(6)-C(7)-C(8)	-0.5(4)
C(6)-C(7)-C(8)-C(9)	1.0(4)
C(7)-C(8)-C(9)-C(10)	-0.9(4)
C(8)-C(9)-C(10)-C(5)	0.2(4)
C(6)-C(5)-C(10)-C(9)	0.3(4)
C(1)-C(5)-C(10)-C(9)	-179.7(2)
C(2)-C(3)-C(11)-N(1)	-142.6(2)
C(4)-C(3)-C(11)-N(1)	121.2(2)
C(2)-C(3)-C(11)-C(12)	42.2(3)
C(4)-C(3)-C(11)-C(12)	-54.0(3)
C(18)-C(13)-C(14)-C(15)	-0.2(3)
S(1)-C(13)-C(14)-C(15)	-177.06(18)
C(13)-C(14)-C(15)-C(16)	0.7(4)
C(14)-C(15)-C(16)-O(4)	178.9(2)
C(14)-C(15)-C(16)-C(17)	-0.2(4)
O(4)-C(16)-C(17)-C(18)	-179.9(2)
C(15)-C(16)-C(17)-C(18)	-0.9(3)
C(16)-C(17)-C(18)-C(13)	1.4(3)
C(14)-C(13)-C(18)-C(17)	-0.9(3)
S(1)-C(13)-C(18)-C(17)	175.99(17)
C(3)-C(11)-N(1)-N(2)	-173.19(17)
C(12)-C(11)-N(1)-N(2)	1.6(3)
C(11)-N(1)-N(2)-S(1)	-178.86(16)
C(1)-C(2)-O(1)-Si(2)	-128.4(2)
C(3)-C(2)-O(1)-Si(2)	55.2(3)
C(17)-C(16)-O(4)-C(19)	5.3(3)
C(15)-C(16)-O(4)-C(19)	-173.8(2)
N(1)-N(2)-S(1)-O(2)	-47.01(18)
N(1)-N(2)-S(1)-O(3)	-174.71(14)
N(1)-N(2)-S(1)-C(13)	70.80(17)
C(14)-C(13)-S(1)-O(2)	26.6(2)
C(18)-C(13)-S(1)-O(2)	-150.32(18)

Silver-Catalyzed [2+2] Cycloadditions of Siloxy Alkynes

C(14)-C(13)-S(1)-O(3)	157.43(18)
C(18)-C(13)-S(1)-O(3)	-19.5(2)
C(14)-C(13)-S(1)-N(2)	-90.5(2)
C(18)-C(13)-S(1)-N(2)	92.57(19)
C(2)-O(1)-Si(2)-C(21)	171.3(2)
C(2)-O(1)-Si(2)-C(22)	-66.7(2)
C(2)-O(1)-Si(2)-C(20)	53.4(2)
C(28B)-C(21)-Si(2)-O(1)	58.3(4)
C(28A)-C(21)-Si(2)-O(1)	-17.9(4)
C(27)-C(21)-Si(2)-O(1)	-159.5(3)
C(28B)-C(21)-Si(2)-C(22)	-59.5(4)
C(28A)-C(21)-Si(2)-C(22)	-135.6(4)
C(27)-C(21)-Si(2)-C(22)	82.7(4)
C(28B)-C(21)-Si(2)-C(20)	174.1(4)
C(28A)-C(21)-Si(2)-C(20)	97.9(4)
C(27)-C(21)-Si(2)-C(20)	-43.7(4)
C(24)-C(22)-Si(2)-O(1)	178.10(17)
C(23)-C(22)-Si(2)-O(1)	-54.8(2)
C(24)-C(22)-Si(2)-C(21)	-68.3(2)
C(23)-C(22)-Si(2)-C(21)	58.8(2)
C(24)-C(22)-Si(2)-C(20)	58.8(2)
C(23)-C(22)-Si(2)-C(20)	-174.11(18)
C(26)-C(20)-Si(2)-O(1)	-74.80(19)
C(25)-C(20)-Si(2)-O(1)	50.2(2)
C(26)-C(20)-Si(2)-C(21)	173.75(19)
C(25)-C(20)-Si(2)-C(21)	-61.2(2)
C(26)-C(20)-Si(2)-C(22)	44.7(2)
C(25)-C(20)-Si(2)-C(22)	169.71(19)