This version of the ESI published 09/09/2021 replaces the previous version published 26/10/2020. The authors regret that due to a copy and paste error mistakes in the ^{29}Si NMR and IR data of compound 3, which are now corrected, occurred in the previous version of the ESI (p.S4). The depicted ^{29}Si NMR and IR spectra in Figures S9 and S 24 were already correct in the previous version.

Supporting Information

A Cyclopentadienyl Functionalized Silylene – A Flexible Ligand for Si- and C-Coordination

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Contents

Synthesis.

General Procedures.

All manipulations were performed under exclusion of moisture and oxygen in flame-dried Schlenk-type glassware or in an argon-filled MBraun glovebox. Toluene and n-heptane were dried using an MBraun solvent purification system (SPS-800). THF was distilled under nitrogen from potassium/benzophenone prior to use. THF-d_8 and C_6D_6 were vacuum transferred from sodium/potassium alloy into thoroughly dried glassware and flame sealed afterwards. IR spectra were recorded using an IR spectrometer in the range from 4000 to 400 cm^{-1} using a KBr beam splitter. Samples were measured by using the attenuated total reflection (ATR) technique on bulk material. Solution NMR spectra were recorded with NMR instruments operating at ^{1}H Larmor frequencies of 300 and 400 MHz. ^{1}H, ^{13}C{^{1}H} and ^{29}Si NMR chemical shifts were referenced to the residual ^{1}H and ^{13}C resonances of the deuterated solvents and are reported relative to tetramethyl silane (TMS). Coupling constants J are given in Hertz as positive values, regardless of their actual individual signs. The multiplicity of the signals is indicated as s, d, q, or m for singlets, doublets, quartets, or multiplets, respectively. The abbreviation bs is given for broadened signals. IR spectra were obtained on a Bruker Tensor 37 FTIR spectrometer equipped with a room temperature DLaTGS detector and a diamond ATR (attenuated total reflection) unit. Elemental analyses were carried out with a Micro Cube from Elementar Analysensysteme GmbH. Because of the air-sensitive nature of some reported complexes, only slightly deviating elemental analyses could be obtained. Experimental procedure for X-ray analysis is given in the Supporting Information.

[{PhC(NtBu)$_2$}SiCl],[1] [K(C$_4$Me$_4$H)],[2] [ZnCp*$_2$],[3] HC$_5$Me$_4$iPr,[4] [K(C$_5$Me$_4$iPr)],[5] [Zn(C$_5$Me$_4$iPr)$_2$],[3] [Ca(C$_5$Me$_5$)I],[6] [Y(N(SiMe$_3$)$_2$}$_3$][7] were synthesized using literature known methods. All other reagents were used as received without further purification.

Preparation of [{PhC(NtBu)$_2$}Si(C$_5$Me$_4$H)] (1)

1.00 g of [{PhC(N*t*Bu)$_2$}SiCl] (3.39 mmol, 1.00 eq.) and 544 mg of [K(C$_5$Me$_4$H)] (3.39 mmol, 1.00 eq.) were combined in a 100 mL Schlenk flask. 50 mL of toluene were added to the mixture at –88°C and the mixture was allowed to warm to room temperature before stirring for 12 h. The resulting residue was filtered off and then extracted with additional 10 mL of toluene. The solvent was removed *in vacuo* to give an analytical pure orange powder in 89% yield (1.15 g, 3.02 mmol). Crystals suitable for X-ray analysis were obtained after recrystallization from hot n-heptane.

^{1}H NMR (C_6D_6, 300 MHz, 25 °C): δ [ppm] = 1.01 (s, 18 H, *t*Bu), 2.02 (s, 6 H, Cp-*Me*), 2.39 (s, 6 H, Cp-*Me*), 3.33 (s, 1 H, Cp-*H*), 6.85-6.99 (m, 4 H, Ph), 7.29-7.33 (m, 1 H, Ph).

^{13}C{^{1}H} NMR (C_6D_6, 75 MHz, 25 °C): δ [ppm] = 11.6 (Cp-*Me*),15.0 (Cp-*Me*), 31.3 (*t*Bu-*Me*), 52.9 (*t*Bu-*C*), 66.7 (CpH-*C*), 127.9 (Cp-*C*), 129.0 (Ph), 129.6 (Ph), 130.5 (Ph), 134.5 (*i*-Ph), 157.1 (N*C*N). A Cp-*C* signal is located underneath the signal of the deuterated solvent.

^{29}Si NMR (C_6D_6, 59MHz, 25 °C): δ [ppm] = 38.0 (d, $^2J_{Si,H}$ = 4.2 Hz).

IR (ATR, ν, cm^{-1}): 1206 (s, ν_{C-H}), 1360 (s, ν_{C-H}), 1410 (s, ν_{C-H}), 2862 (s, ν_{C-H}), 2930 (s, ν_{C-H}), 2995 (s, ν_{C-H}).

High Resolution EI-MS (70 eV, QT = 100 °C; calcd for $C_{24}H_{36}N_2Si$): 380.2657 (380.2642).

Preparation of [{PhC(NtBu)$_2$}(C$_5$Me$_4$)SiH] (2)

250 mg of **1** (0.657 mmol, 1.00 eq.) and 75 mg [Y{N(SiMe$_3$)$_2$}$_3$] (0.131 mmol, 0.20 eq.) were combined in a 50 mL Schlenk flask. 25 mL of toluene were added onto the mixture at –88°C. Then, the mixture was allowed to reach room temperature and subsequently stirred for 12 h during which an orange precipitate formed. Afterwards, the solution was concentrated to 4 mL and precipitate recrystallized from the hot mother liqueur. The liquid was filtered off and the product was washed with 5 mL of cold n-pentane. The product was obtained as orange crystals in 76% yield (190 mg, 0.499 mmol). These crystals were suitable for X-ray analysis.

^{1}H NMR (C$_6$D$_6$, 300 MHz, 25 °C): δ [ppm] = 0.88 (s, 18 H, *t*Bu), 2.43 (s, 3 H, Cp-*Me*), 2.47 (s, 3 H, Cp-*Me*), 2.66 (s, 3 H, Cp-*Me*), 2.81 (s, 3 H, Cp-*Me*), 5.92 (s, 1 H, Cp-*H*), 6.66-6.70 (m, 1 H, Ph), 6.79-6.96 (m, 4 H, Ph).

^{13}C{^{1}H} NMR (C$_6$D$_6$, 75 MHz, 25 °C): δ [ppm] = 11.6 (Cp-*Me*),15.0 (Cp-*Me*), 31.4 (*t*Bu-*Me*), 56.1 (*t*Bu-*C*), 66.7 (CpH-*C*), 127.3 (Cp-*C*), 127.9 (Cp-*C*), 129.0 (Ph), 129.6 (Ph), 130.5 (Ph), 134.5 (*i*-Ph-*C*$_q$), 157.1 (NCN).

^{29}Si NMR (C$_6$D$_6$, 59MHz, 25 °C): δ [ppm] = -18.6 (d, $^1J_{Si,H}$ = 232 Hz).

IR (ATR, ν, cm^{-1}) : 1302 (s, ν_{C-H}), 1394 (s, ν_{C-H}), 1647 (s, ν_{C-H}), 2204 (m, ν_{Si-H}), 2840 (s, ν_{C-H}), 2931 (s, ν_{C-H}), 2987 (s, ν_{C-H}).

High Resolution EI-MS (70 eV, QT = 100 °C; calcd for C$_{24}$H$_{36}$N$_2$Si): 380.2657 (380.2642). High resolution mass gave the same spectrum as compound **1**.

Preparation of [{PhC(NtBu)$_2$}(C$_5$Me$_4$)Si{Zn(C$_5$Me$_5$)}] (3)

Onto a mixture of 100 mg of **1** (0.263 mmol, 1.00 eq.) and 88 mg [Zn(C$_5$Me$_5$)$_2$] (0.263 mmol, 1.00 eq.) 10 mL were condensed at –88°C. The mixture was allowed to warm to room temperature before being subsequently stirred for 12 h during which an orange precipitate formed. The solution was concentrated to 3 mL and the precipitate was recrystallized from the hot mother liqueur. Afterwards, the solution was filtered of and the resulting orange crystals were washed with 5 mL cold n-pentane. The product was obtained as orange crystals in 83% yield (127 mg, 0.218 mmol). These crystals were suitable for the X-ray analysis.

^{1}H NMR (C$_6$D$_6$, 300 MHz, 25 °C): δ [ppm] = 0.99 (s, 18 H, *t*Bu), 2.08 (s, 15 H, Cp*), 2.56 (s, 3 H, Cp-*Me*), 2.59 (s, 3 H, Cp-*Me*), 2.72 (s, 3 H, Cp-*Me*), 2.76 (s, 3 H, Cp-*Me*), 6.86-7.01 (m, 5 H, Ph).

^{13}C{^{1}H} NMR (C$_6$D$_6$, 75 MHz, 25 °C): δ [ppm] = 10.1 (Cp*-*Me*), 11.9 (Cp^4-*Me*), 12.1 (Cp^4-*Me*), 14.7 (Cp^4-*Me*), 14.9 (Cp^4-*Me*), 31.1 (*t*Bu-*Me*), 53.9 (*t*Bu-*C*), 108.5 (Cp*-*C*), 118.8 (Cp^4-*C*), 118.9 (Cp^4-*C*), 119.3 (Cp^4-*C*), 121.2 (Cp^4-*C*), 126.8 (Ph) 128.3 (Ph), 129.6 (Ph), 132.2 (*i*-Ph-*C*$_q$), 169.5.1 (NCN).

^{29}Si NMR (C$_6$D$_6$, 59MHz, 25 °C): δ [ppm] = 5.95.

IR (ATR, ν, cm^{-1}) : 1298 (s, ν$_{C-H}$), 1408(s, ν$_{C-H}$), 1474 (m, ν$_{C-H}$), 1646 (w, ν$_{C-H}$), 2835 (s, ν$_{C-H}$), 2904 (s, ν$_{C-H}$), 2972 (s, ν$_{C-H}$)

High Resolution EI-MS (70 eV, QT = 100 °C; calcd for C$_{24}$H$_{36}$N$_2$Si): 578.3039 (578.3029).

Preparation of [{PhC(NtBu)$_2$}(C$_5$Me$_4$)Si{Zn(C$_5$Me$_4$iPr)}] (4)

Compound **4** was prepared analogue to compound **3** from 100 mg of **1** (0.263 mmol, 1.00 eq.) and 103 mg [Zn(C$_5$Me$_4$iPr)$_2$] (0.263 mmol, 1.00 eq.). The product was obtained as orange crystals in 78% yield (125 mg, 0.205 mmol).

^{1}H NMR (300 MHz, C$_6$D$_6$, 25 °C): [ppm] = 1.00 (s, 18 H, *t*Bu), 1.34 (d, ^{3}J$_{H,H}$ = 7.1 Hz, 6 H, *i*Pr-*CH*), 2.05 (s, 6 H, Cp^{4iPr}-*CH*$_3$), 2.15 (s, 6 H, Cp^{4iPr}-*CH*$_3$), 2.55 (s, 3 H, Cp^4-C*H*$_3$), 2.60 (s, 3 H, Cp^4-C*H*$_3$), 2.73 (s, 3 H, Cp^4-C*H*$_3$), 2.77 (s, 3 H, Cp^4-C*H*$_3$), 3.05 (hept., ^{3}J$_{H,H}$ = 7.1 Hz, 1 H, iPr-*H*), 6.86–7.02 (m, 4 H, Ph), 7.23–7.25 (m, 1 H, Ph).

^{13}C{^{1}H} NMR (75 MHz, C$_6$D$_6$, 25 °C): [ppm] = 10.0 (Cp^{4iPr}-*Me*), 10.9 (Cp^{4iPr}-*Me*) 11.9 (Cp^4-*Me*), 12.1 (Cp^4-*Me*), 14.8 (Cp^4-*Me*), 15.1 (Cp^4-*Me*), 24.3 (*i*Pr-*CH*$_3$), 26.3 (*i*Pr-*CH*), 31.1 (*t*Bu-*CH*$_3$), 54.0 (*t*Bu-C), 95.7 (Cp^{4iPr}-*C*), 107.4 (Cp^{4iPr}-*C*), 109.4 (Cp^{4iPr}-*C*), 118.7 (Cp^4-*C*), 119.1 (Cp^4-*C*), 119.3 (Cp^4-*C*), 119.8 (Cp^4-*C*), 121.3 (Cp^4-*C*), 126.8 (Ph), 128.3 (Ph), 130.3 (Ph), 132.5 (*i*-Ph), 168.8 (N*C*N).

^{29}Si NMR (59 MHz, C$_6$D$_6$, 25 °C): δ [ppm] = 7.3.

IR (ATR, ν, cm^{-1}) : 1294 (s, ν$_{C-H}$), 1364 (s, ν$_{C-H}$), 1405 (s, ν$_{C-H}$), 1646 (s, ν$_{C-H}$), 2867 (s, ν$_{C-H}$), 2922 (s, ν$_{C-H}$), 2960 (s, ν$_{C-H}$).

High Resolution EI-MS (70 eV, QT = 100 °C; calcd for C$_{24}$H$_{36}$N$_2$Si): 606.3350 (606.3342).

Preparation of [{PhC(NtBu)$_2$}SiH(C$_5$Me$_4$){Ca(C$_5$Me$_5$)I}] (5)

Onto a mixture of 100 mg of **1** (0.263 mmol, 1.00 eq.) and 79 mg [Ca(C$_5$Me$_5$)I] (0.263 mmol, 1.00 eq.) 10 mL toluene were condensed at –88°C. The mixture was allowed to reach room temperature before being subsequently stirred for 12 h. Afterwards the solvent was removed *in vacuo* and the solid was washed with 10 mL hot n-heptane. The residue was recrystallized from hot toluene to yield the product as a yellow crystalline solid in 67% yield (120 mg, 0.176 mmol).

^{1}H NMR (300 MHz, C$_6$D$_6$, 25 °C): δ [ppm] = 1.22 (s, 18 H, *t*Bu), 1.43 (s, 15 H, Cp*), 1.74 (bs, 6 H, Cp^4-*Me*), 1.80 (bs, 6 H, Cp^4-*Me*), 3.27 (s, 1 H, SiH), 7.01-7.03 (m, 5 H, Ph).

^{13}C{^{1}H} NMR (75 MHz, C$_6$D$_6$, 25 °C): [ppm] = 10.9 (Cp-*Me*), 11.4 (Cp-*Me*), 13.0 (Cp-*Me*), 13.9 (Cp-*Me*), 28.8 (Cp*-*Me*) 32.6 (*t*Bu-*Me*), 48.2 (Cp*-*C*), 51.0 (Cp^4-C), 51.5(Cp^4-C), 53.0 (*t*Bu-*C*), 131.2 (Ph-*C*), 134.1 (Ph-*C*), 137.2 (Ph-*C*), 140.6 (*i*-Ph), 152.6 (N*C*N).

No resonance could be observed in the ^{29}Si NMR spectra.

IR (ATR, ν, cm^{-1}): 1202 (s, ν_{C-H}), 1302 (s, ν_{C-H}), 1647 (s, ν_{C-H}), 2204 (m, ν_{Si-H}), 2855 (s, ν_{C-H}), 2930 (s, ν_{C-H}), 2987 (s, ν_{C-H}).

High Resolution EI-MS was not possible for this compound because of adduct breakage.

Elemental analysis (calcd for C$_{34}$H$_{52}$CaIN$_2$Si) [%]: C 58.93 (59.72), H 7.19 (7.66), N 3.87 (4.10), elemental analysis gave reproducibly to low carbon values.

Preparation of [{PhC(NtBu)$_2$}(C$_5$Me$_4$H)Si{RhCl(cod)}] (6)

Onto a mixture of 100 mg of **1** (0.263 mmol, 1.00 eq.) and 130 mg [RhCl(cod)]$_2$ (0.263 mmol, 1.00 eq.) 15 mL THF were condensed at –88°C. The mixture was allowed to reach room temperature before being stirred for 12 h. Afterwards the solvent was removed *in vacuo* and 5 mL toluene were added to the solid. The product could be obtained as red crystals in 68% yield (112 mg, 0.179 mmol).

^{1}H NMR (C$_6$D$_6$, 300 MHz): [ppm] = 1.10 (bs, 18 H, *t*Bu), 1.90 (s, 6 H, Cp^4-*Me*), 1.93 (m, 2 H, cod-*CH$_2$*), 2.08 (m, 2 H, cod-*CH$_2$*), 2.23 (m, 2 H, cod-*CH$_2$*), 2.44(m, 2 H, cod-*CH$_2$*) 2.59 (bs, 6 H, Cp^4-*Me*), 3.57 (bs, 2 H, cod-*CH*), 4.66 (s, 1 H, Cp^4*H*), 6.08 (s, 2 H, cod-*CH*), 6.72-6.97 (m, 3 H, Ph), 7.11-7.13 (m, 1 H, Ph), 7.17-7.19 (m, 1 H, Ph).

^{13}C{^{1}H} NMR (C$_6$D$_6$, 75 MHz): [ppm] =11.7 (Cp^4-*Me*), 16.8 (Cp^4-*Me*), 28.1 (COD-*CH$_2$*), 30.9 (*t*Bu-*Me*), 34.8 (COD-*CH$_2$*), 54.1 (*t*Bu-*C*) 57.3 (COD-*CH*), 60.9 (COD-*CH*), 110.5 (d, $^2J_{Rh,H}$ =4.2 Hz, Cp4-*CH*), 129.4 (Cp^4-C), 129.7 (Cp^4-C), 130.4 (Ph), 132.0 (Ph), 134.3 (Ph), 134.9 (*i*-Ph), 167.5 (N*C*N).

^{29}Si NMR (C$_6$D$_6$, 59 MHz, 25 °C): δ [ppm] = 70.1 (dd, $^1J_{Si,Rh}$ = 84.9 Hz, $^2J_{Si,H}$ = 11.4 Hz).

IR (ATR, ν, cm^{-1}) : 1200 (s, ν_{C-H}), 1363 (s, ν_{C-H}), 1406 (s, ν_{C-H}), 1614, (s, ν_{C-H}), 2854 (s, ν_{C-H}), 2909 (s, ν_{C-H}), 2973 (s, ν_{C-H}).

High Resolution EI-MS (70 eV, QT = 100 °C; calcd for C$_{24}$H$_{36}$N$_2$Si): 626.2363 (626.2325).

Preparation of [{PhC(NtBu)$_2$}(C$_5$Me$_4$H)Si{IrCl(cod)}] (7)

Onto a mixture of 100 mg of **1** (0.263 mmol, 1.00 eq.) and 177 mg [IrCl(cod)]$_2$ (0.263 mmol, 1.00 eq.) 15 mL THF were condensed at –88°C. The mixture was allowed to reach room temperature before being stirred for 12 h. Afterwards the solvent was removed *in vacuo* and 5 mL toluene were added to the solid. The product could be obtained as red crystals in 73% yield (138 mg, 0.192 mmol).

^{1}H NMR (C$_6$D$_6$, 300 MHz): [ppm] = 1.07 (bs, 18 H, *t*Bu), 1.75 (m, 4 H, COD-*CH$_2$*), 1.89 (s, 6 H, Cp^4-*Me*), 2.11 (m, 2 H, COD-*CH$_2$*), 2.29 (m, 2 H, COD-*CH$_2$*), 2.51 (bs, 6 H, Cp^4-*Me*), 3.36 (bs, 2 H, COD-*CH*), 4.42 (s, 1 H, Cp^4*H*), 5.60 (s, 2 H, COD-*CH*), 6.82-6.98 (m, 3 H, Ph), 7.10-7.14 (m, 1 H, Ph), 7.22-7.26 (m, 1 H, Ph).

^{13}C{^{1}H} NMR (C$_6$D$_6$, 75 MHz): [ppm] = 11.3 (Cp^4-*Me*), 16.8 (Cp^4-*Me*), 28.5 (COD-*CH$_2$*), 30.5 (*t*Bu-*Me*), 35.1 (COD-*CH$_2$*), 44.7 (COD-*CH*), 53.5 (COD-*CH*), 56.8 (*t*Bu-*C*), 96.6 (Cp^{4}H), 129.2 (Cp^4-*C*), 129.5 (Cp^4-*C*), 130.0 (Ph), 131.4 (Ph), 133.9 (Ph), 134.7 (*i*-Ph), 168.6 (N*C*N).

^{29}Si NMR (C$_6$D$_6$, 59 MHz): δ [ppm] = 69.2 (d, $^2J_{Si,H}$ = 12.8 Hz).

IR (ATR, ν, cm^{-1}) : 1200 (s, ν_{C-H}), 1406 (s, ν_{C-H}), 1473 (s, ν_{C-H}), 1604, (s, ν_{C-H}), 2870 (s, ν_{C-H}), 2930 (s, ν_{C-H}), 2969 (s, ν_{C-H}).

High Resolution EI-MS (70 eV, QT = 100 °C; calcd for C$_{24}$H$_{36}$N$_2$Si): 716.2911 (716.2899).

NMR Spectra

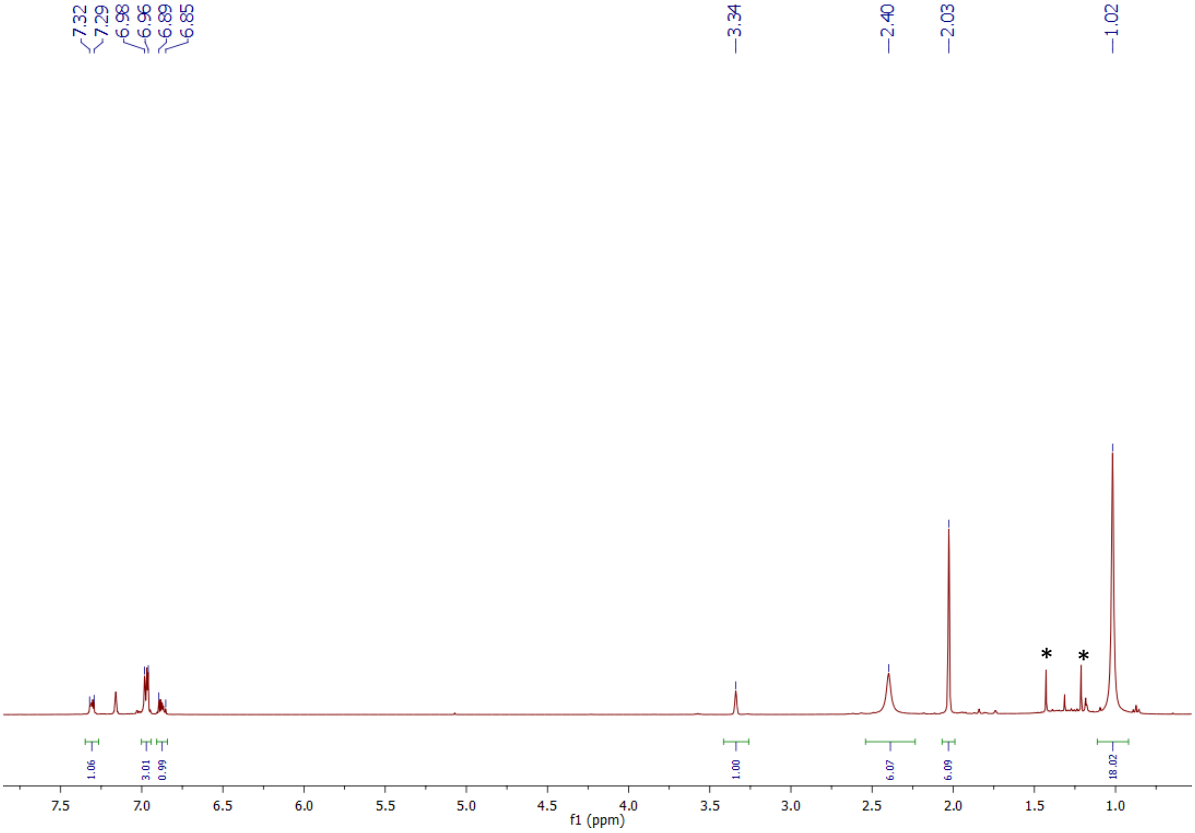

*Figure S 1: ^{1}H NMR spectrum of compound **1**. Asterisk peaks are unknown decomposition products.*

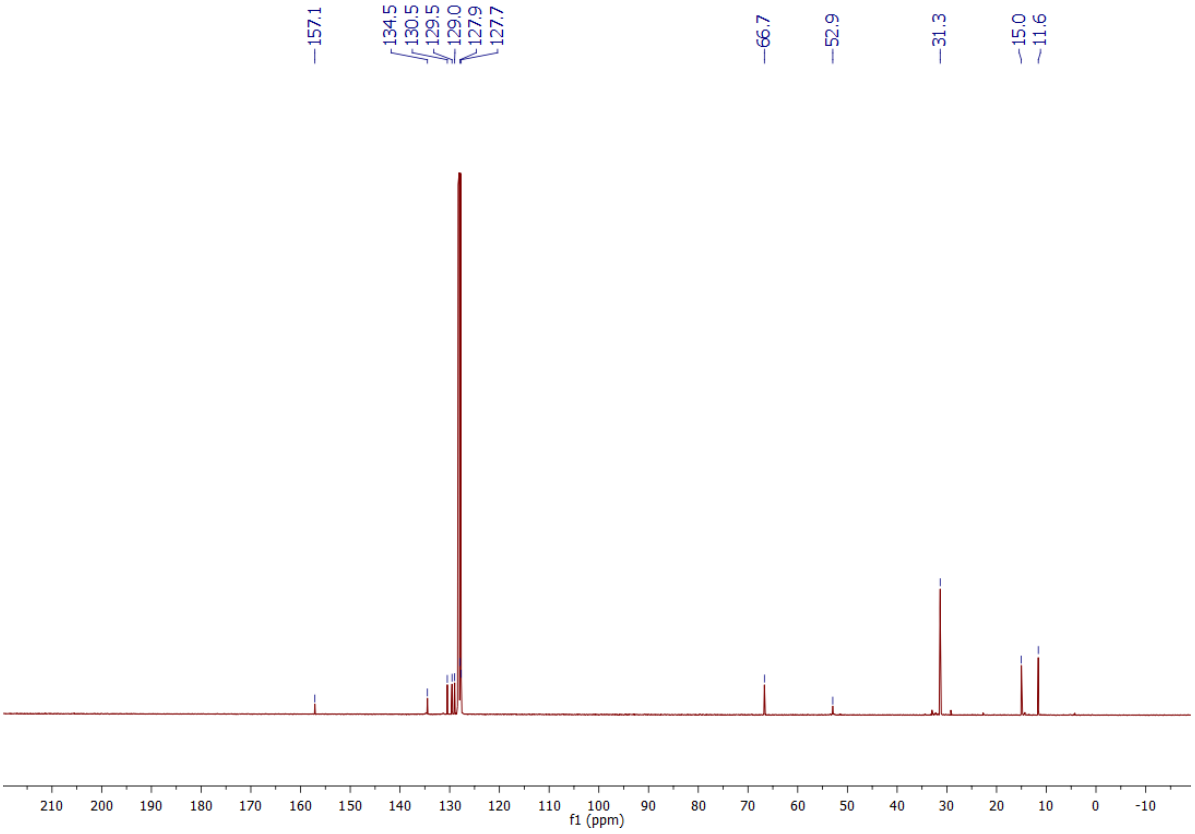

*Figure S 2: $^{13}C\{^{1}H\}$ NMR spectrum of compound **1**.*

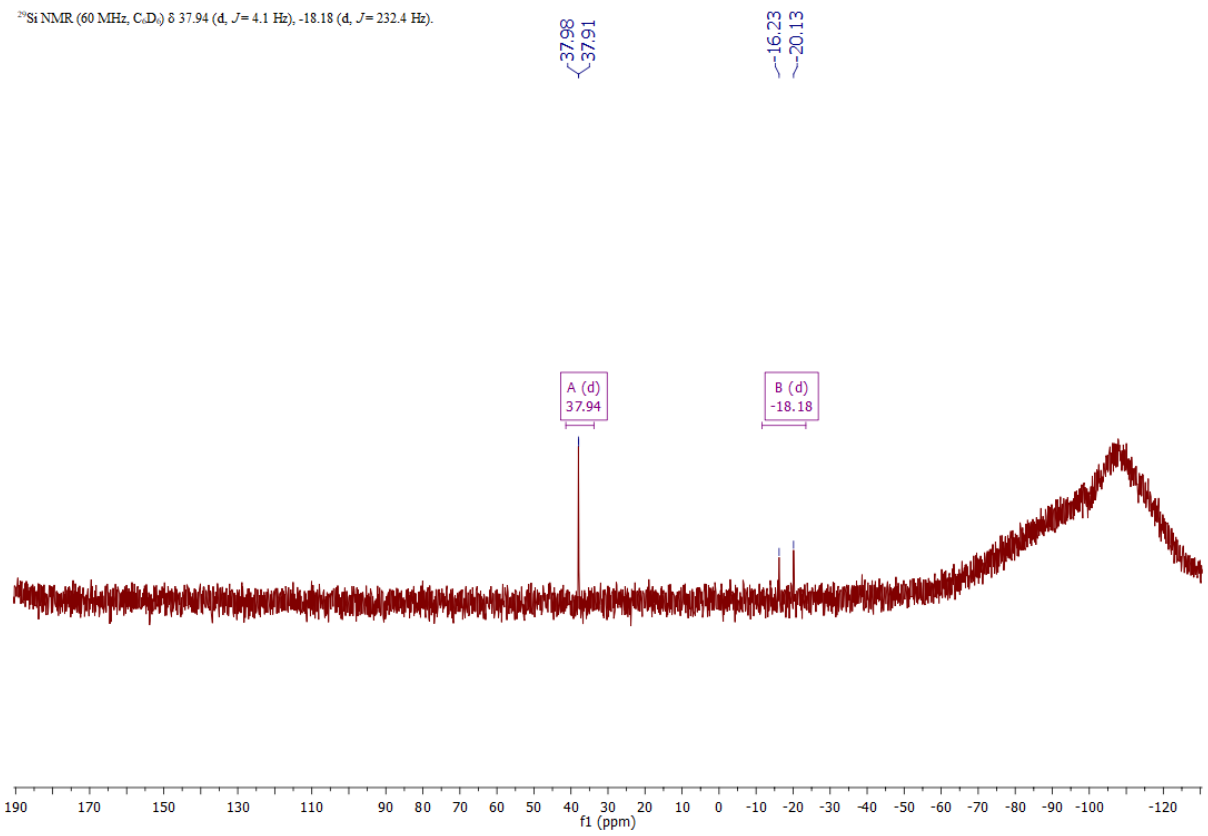

*Figure S 3: ^{29}Si NMR spectrum of compound **1**.*

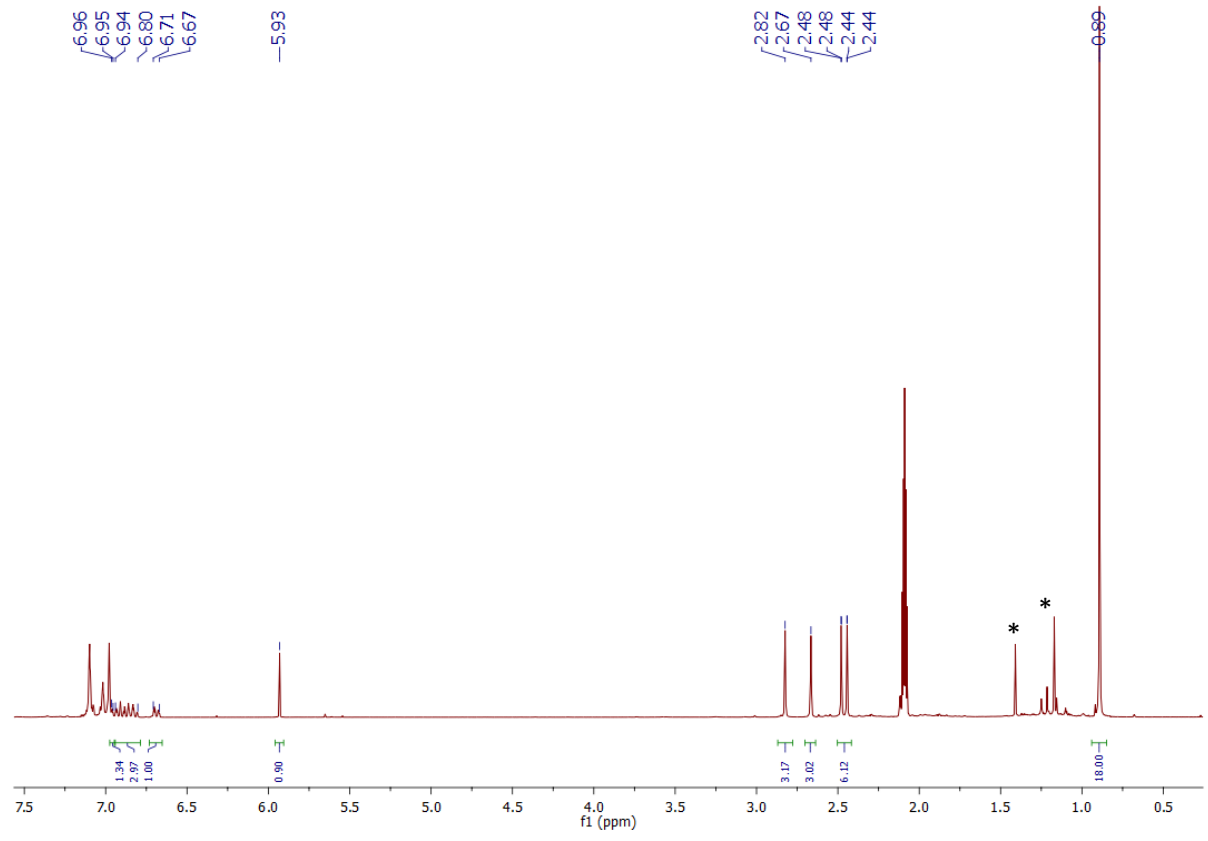

*Figure S 4: ^{1}H NMR spectrum of compound **2**. Asterisk peaks are unknown decomposition products.*

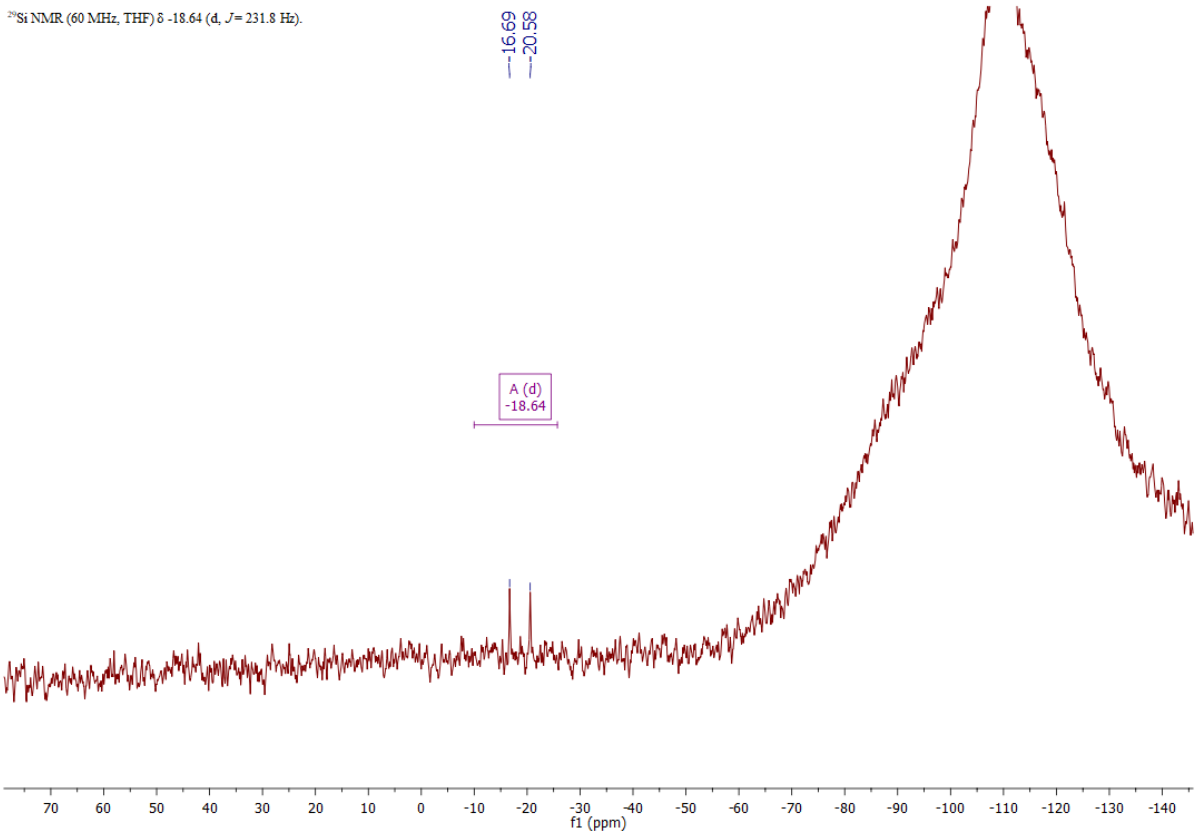

*Figure S 5: ^{29}Si NMR spectrum of compound **2**.*

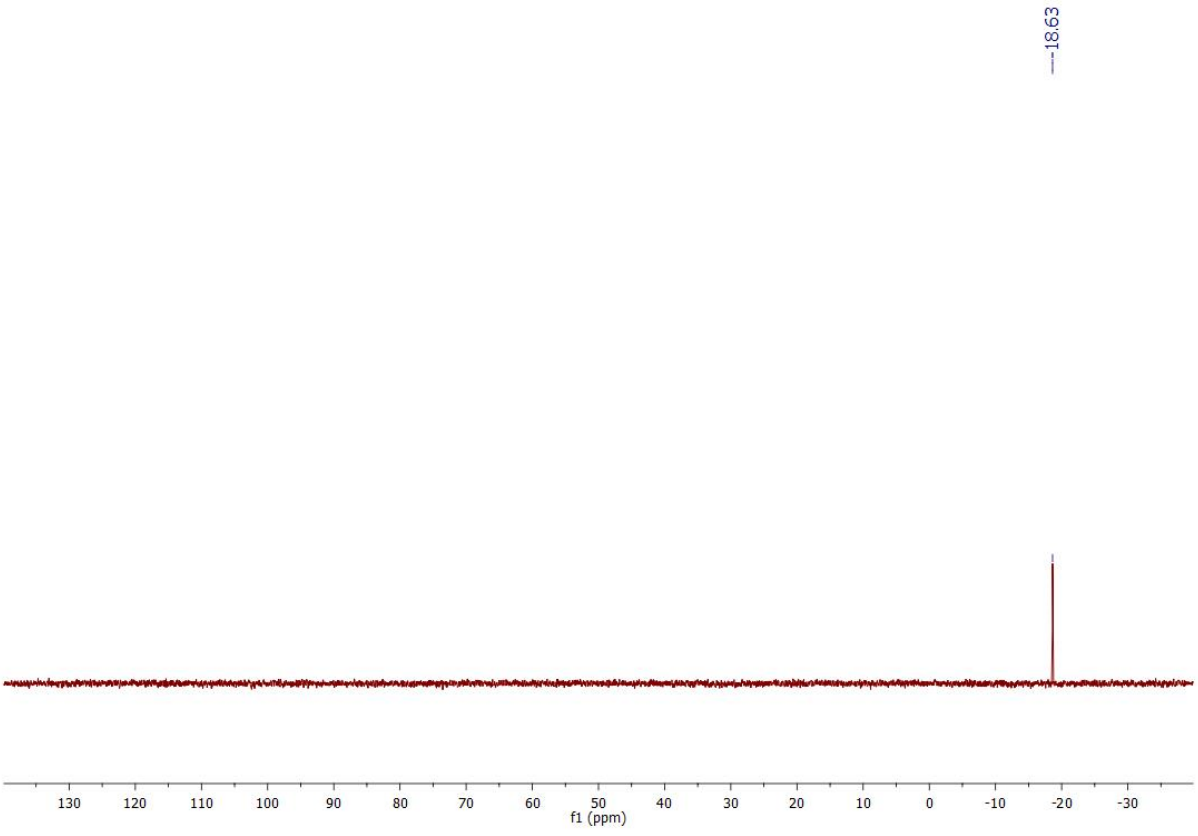

*Figure S 6: $^{29}Si\{^{1}H\}$ NMR spectrum of compound **2**.*

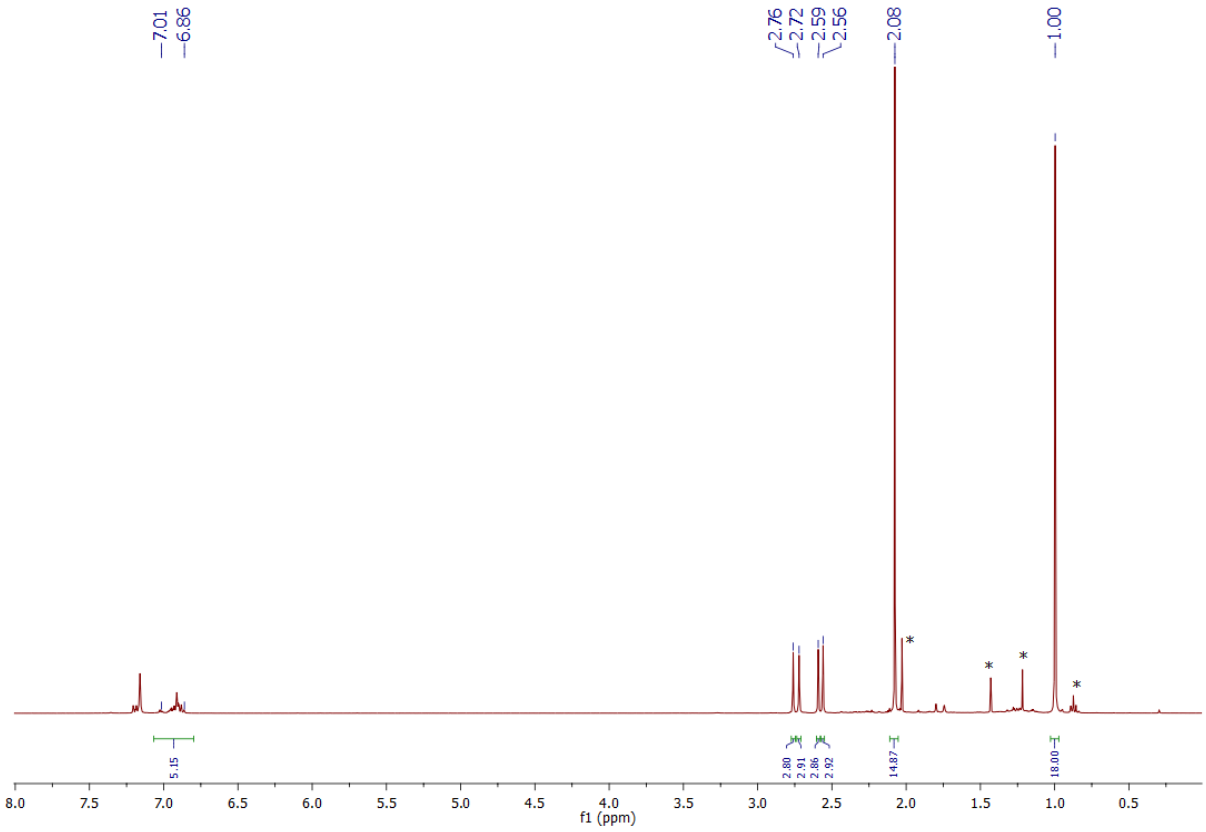

*Figure S 7: ^{1}H NMR spectrum of compound **3**. Asterisk peaks are unknown decomposition products.*

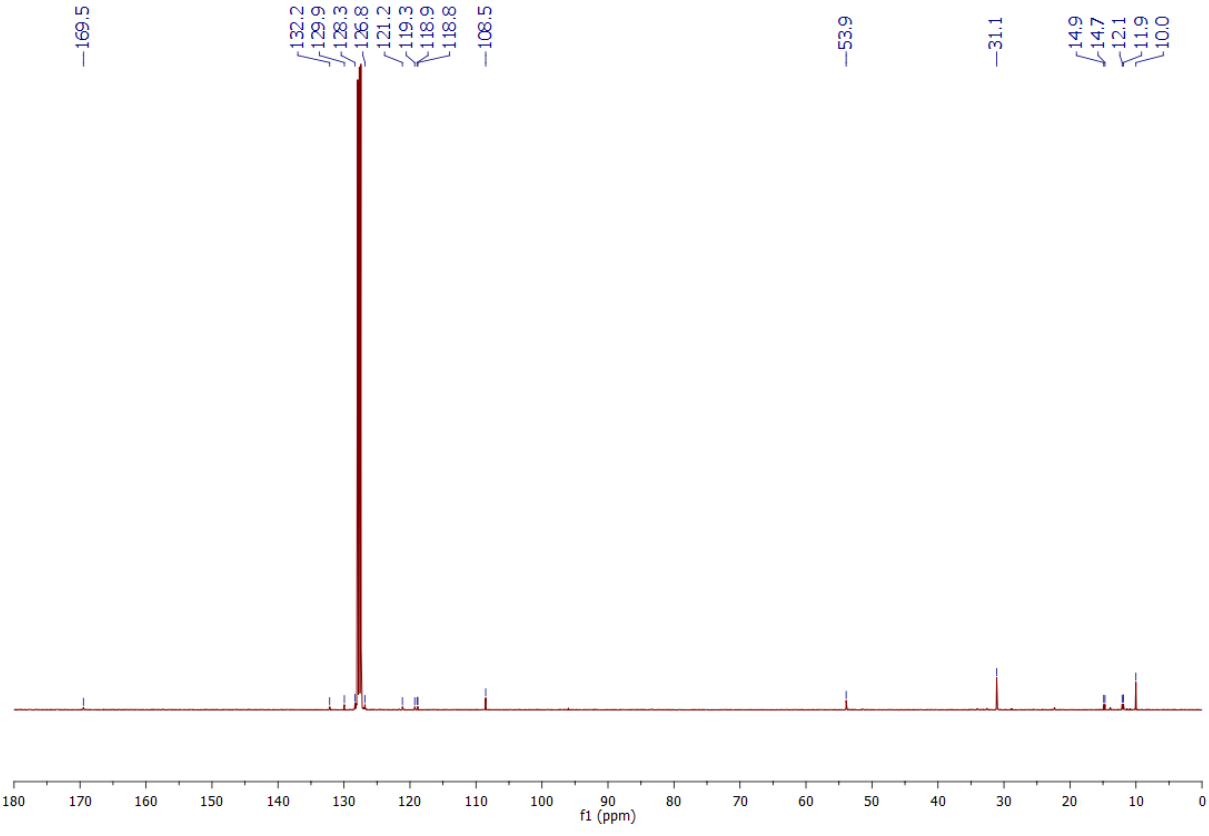

*Figure S 8: $^{13}C\{^{1}H\}$ NMR spectrum of compound **3**.*

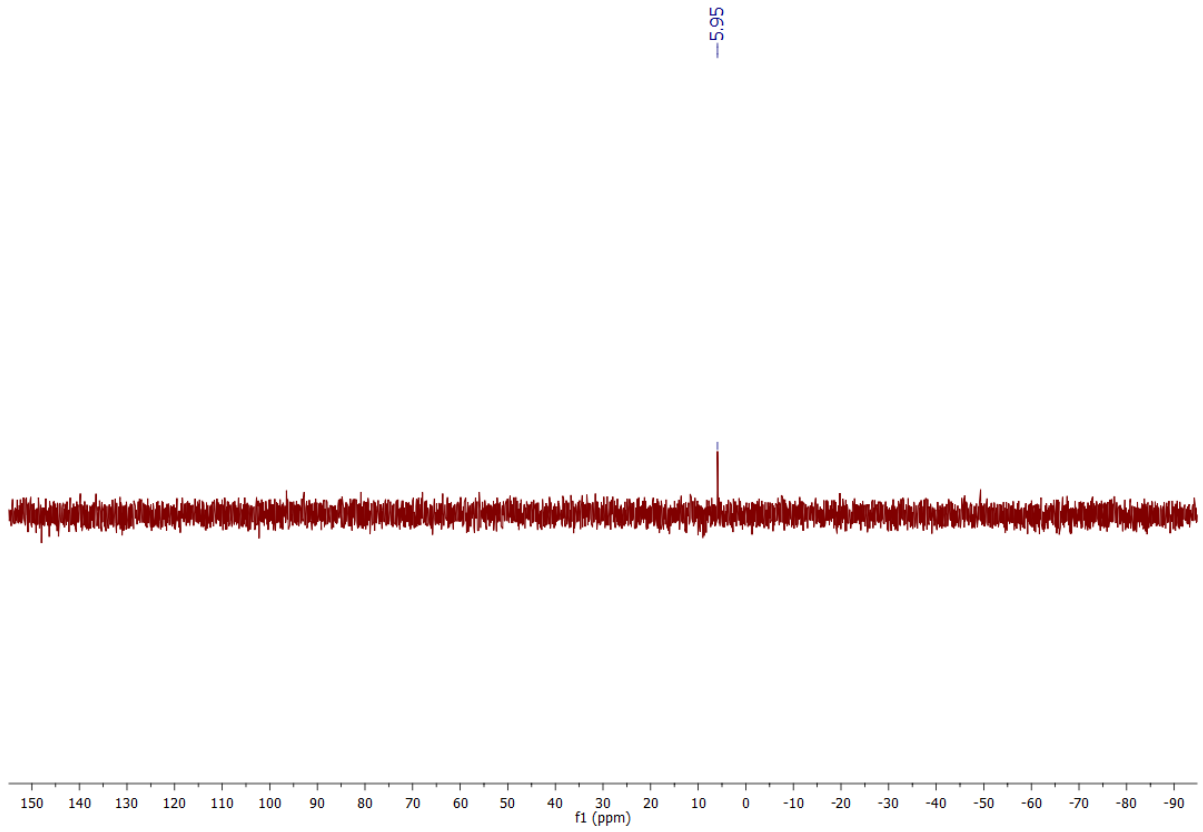

*Figure S 9: ^{29}Si NMR spectrum of compound **3**.*

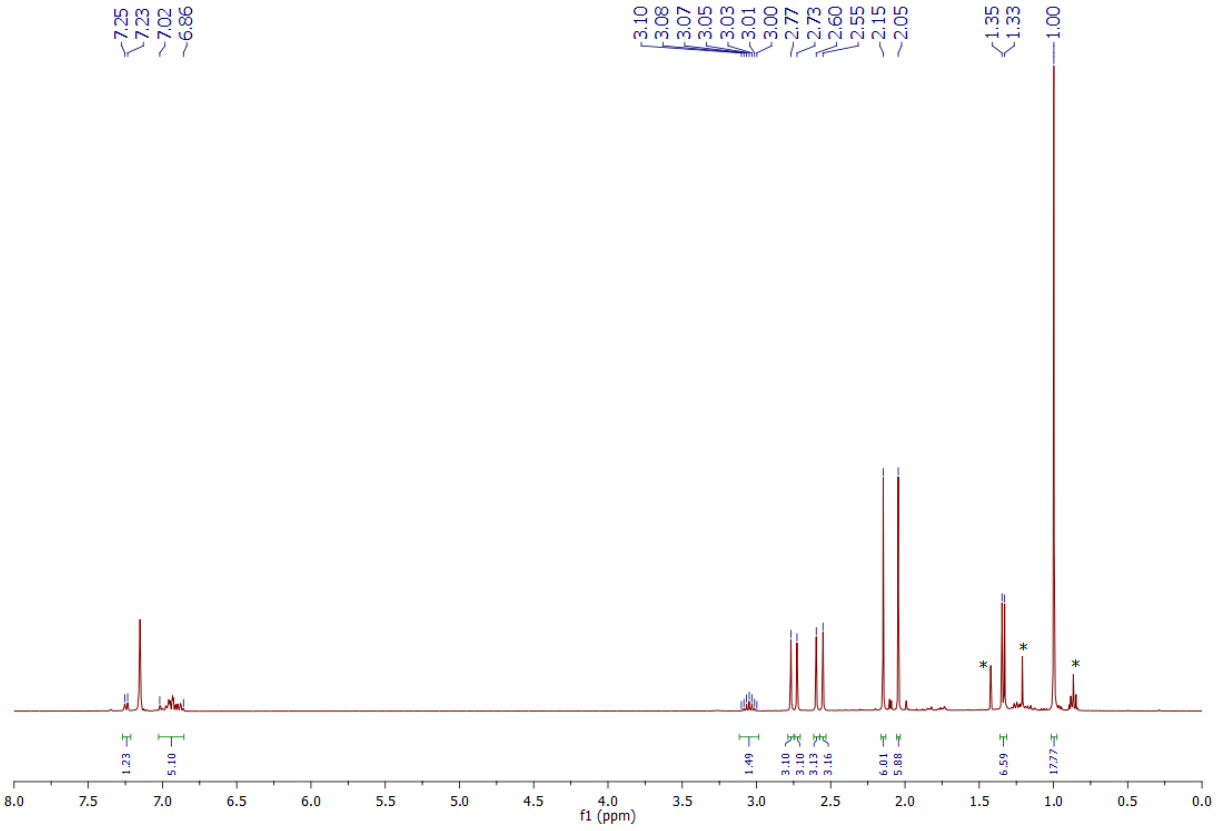

*Figure S 10: ^{1}H NMR spectrum of compound **4**. Asterisk peaks are unknown decomposition products.*

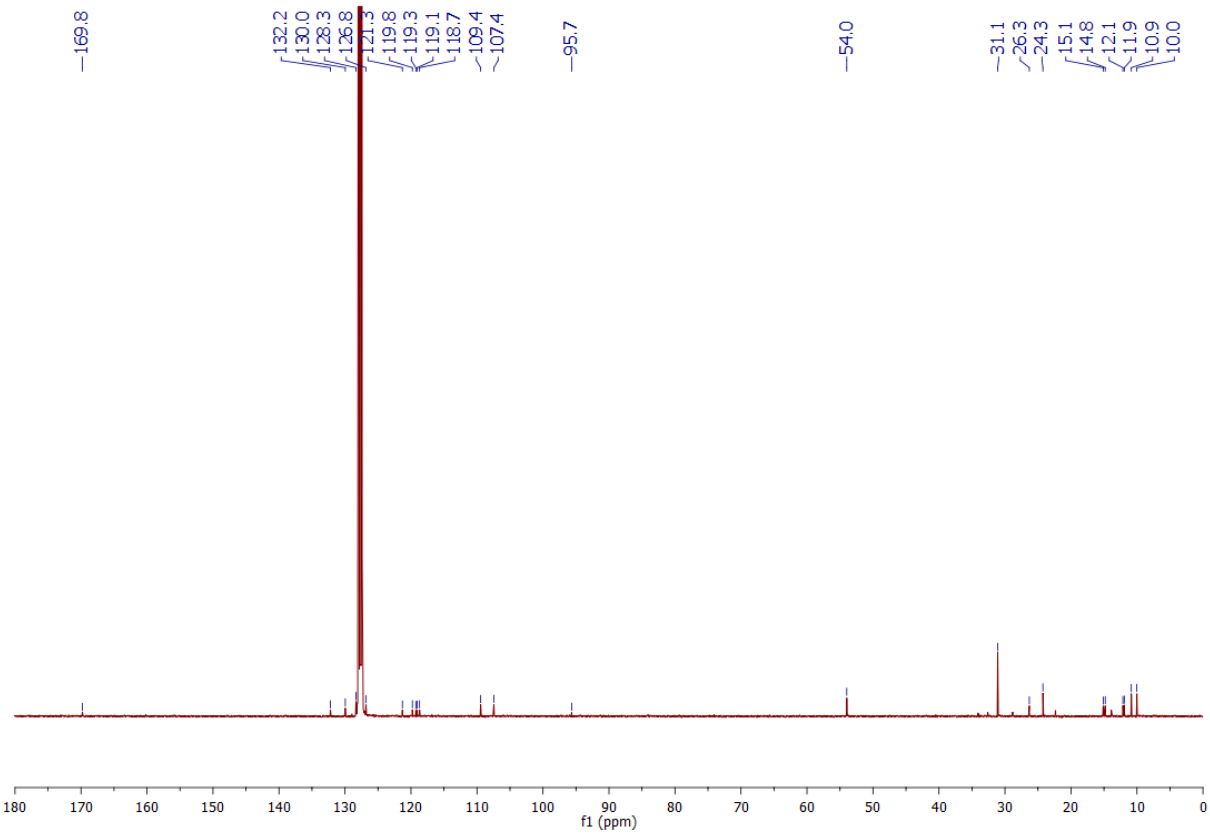

*Figure S 11: $^{13}C\{^{1}H\}$ NMR spectrum of compound **4**.*

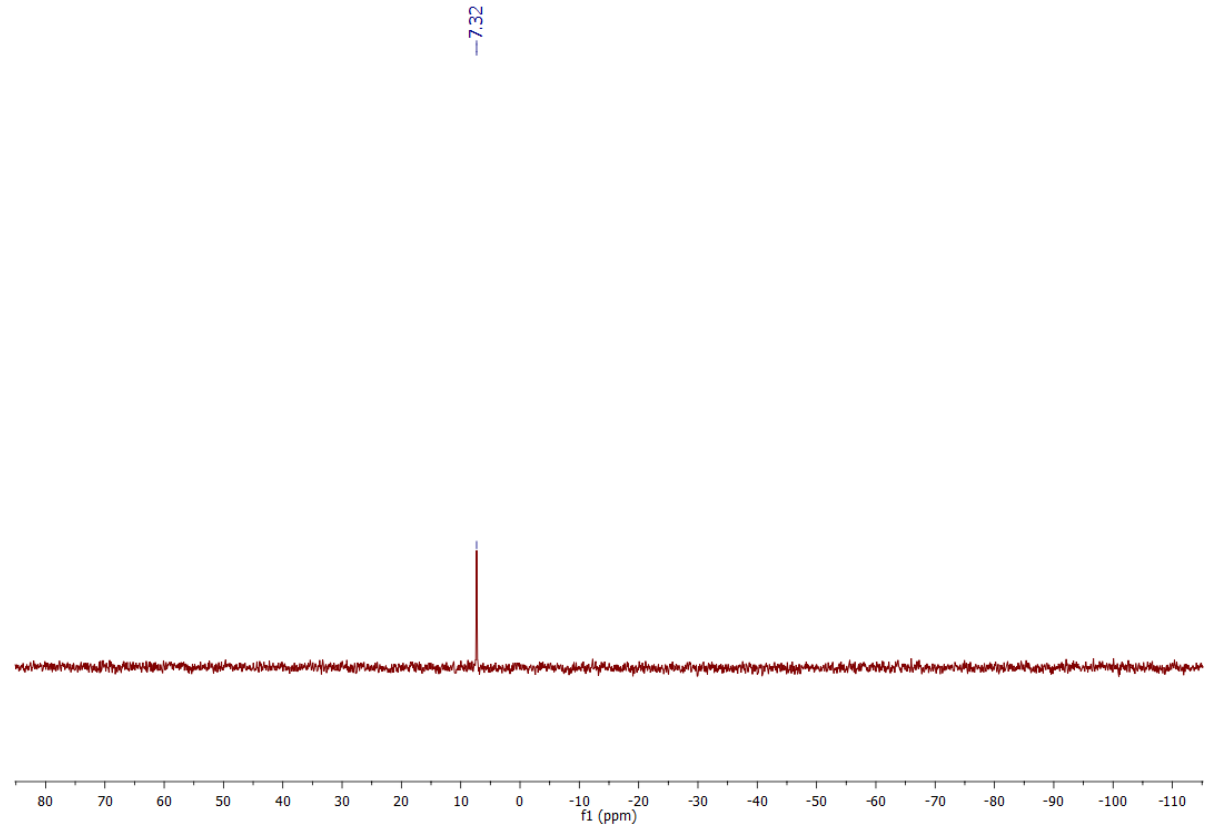

*Figure S 12: ^{29}Si NMR spectrum of compound **4**.*

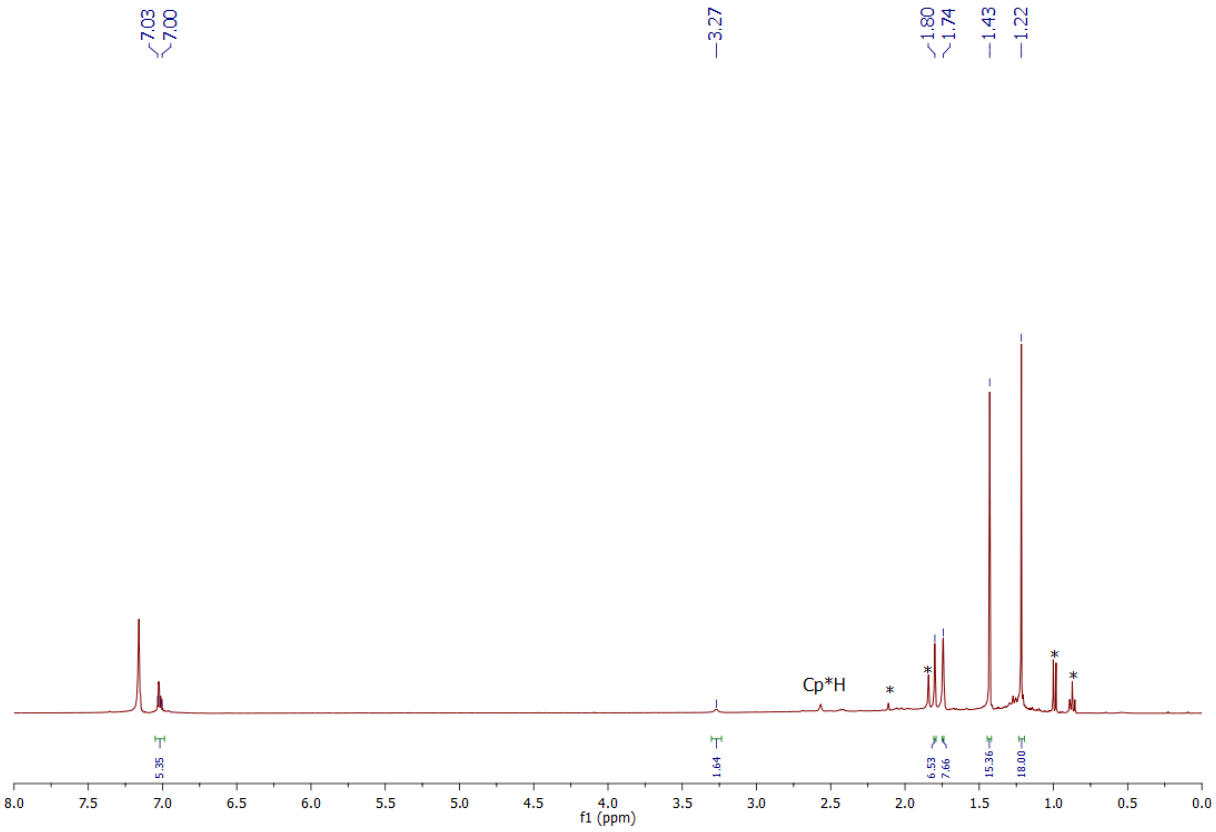

*Figure S 13: ^{1}H NMR spectrum of compound **5**. Asterisk peaks are unknown decomposition products.*

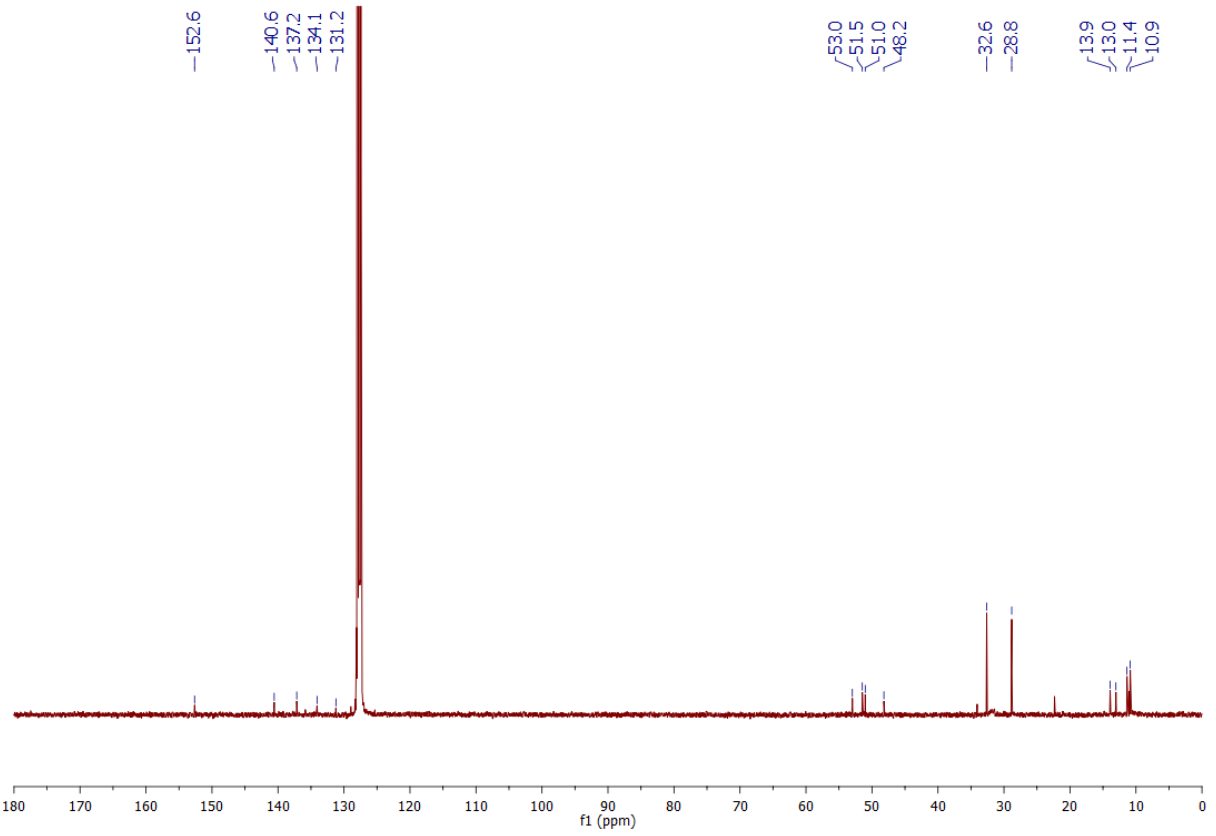

*Figure S 14: $^{13}C\{^{1}H\}$ NMR spectrum of compound **5**.*

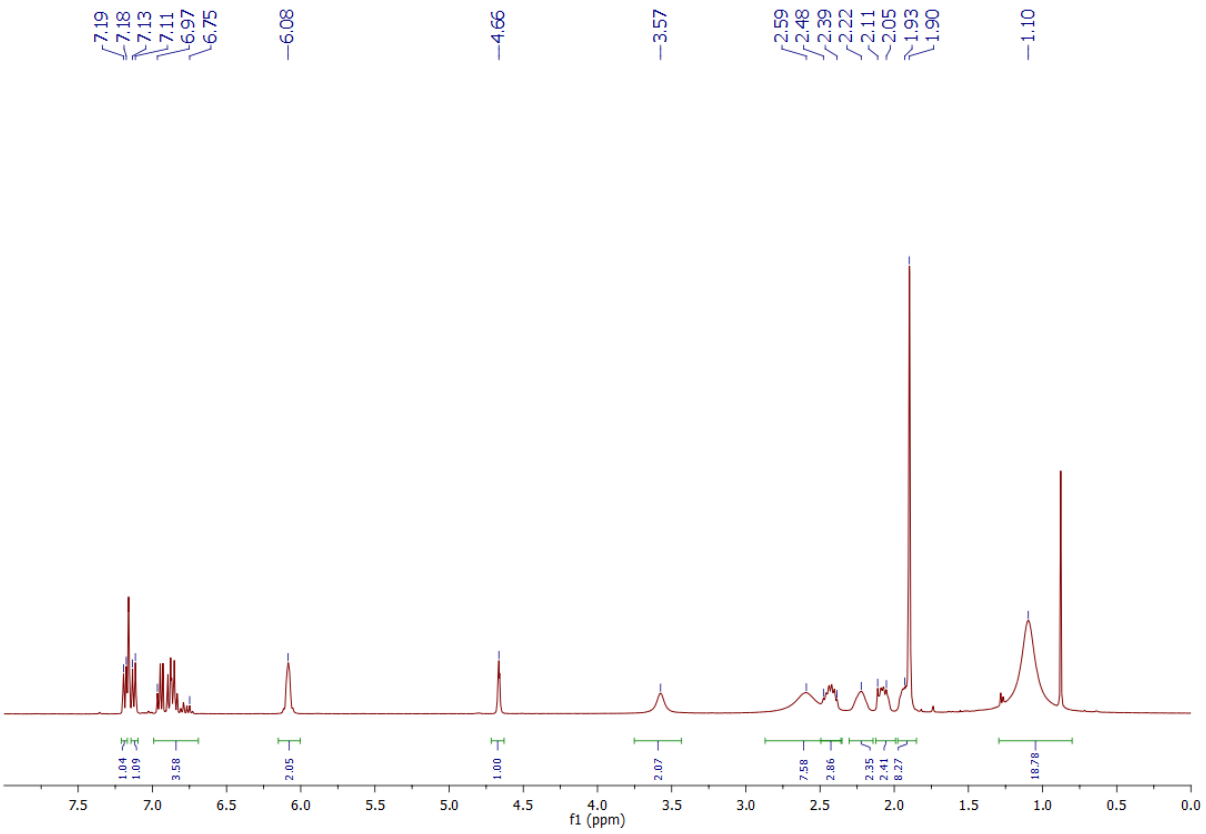

*Figure S 15: ^{1}H NMR spectrum of compound **6.***

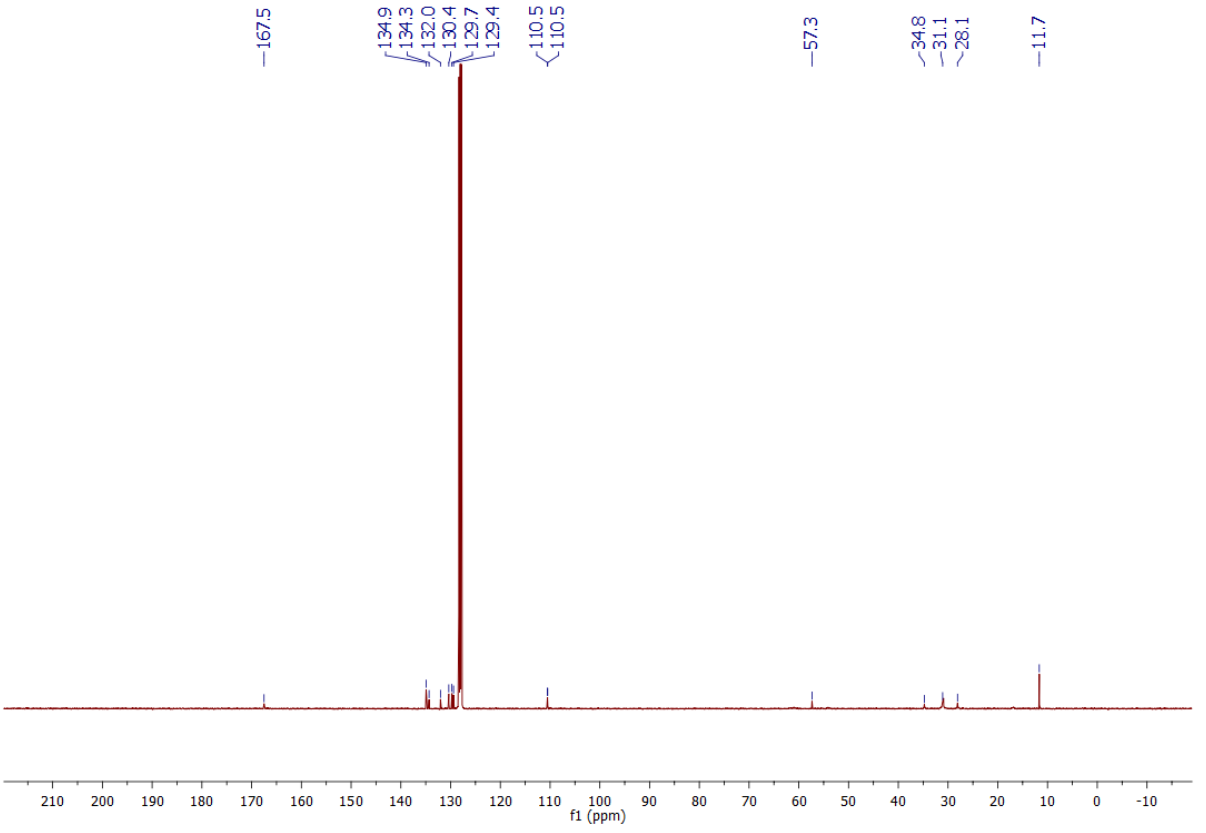

*Figure S 16: $^{13}C\{^{1}H\}$ NMR spectrum of compound **6**.*

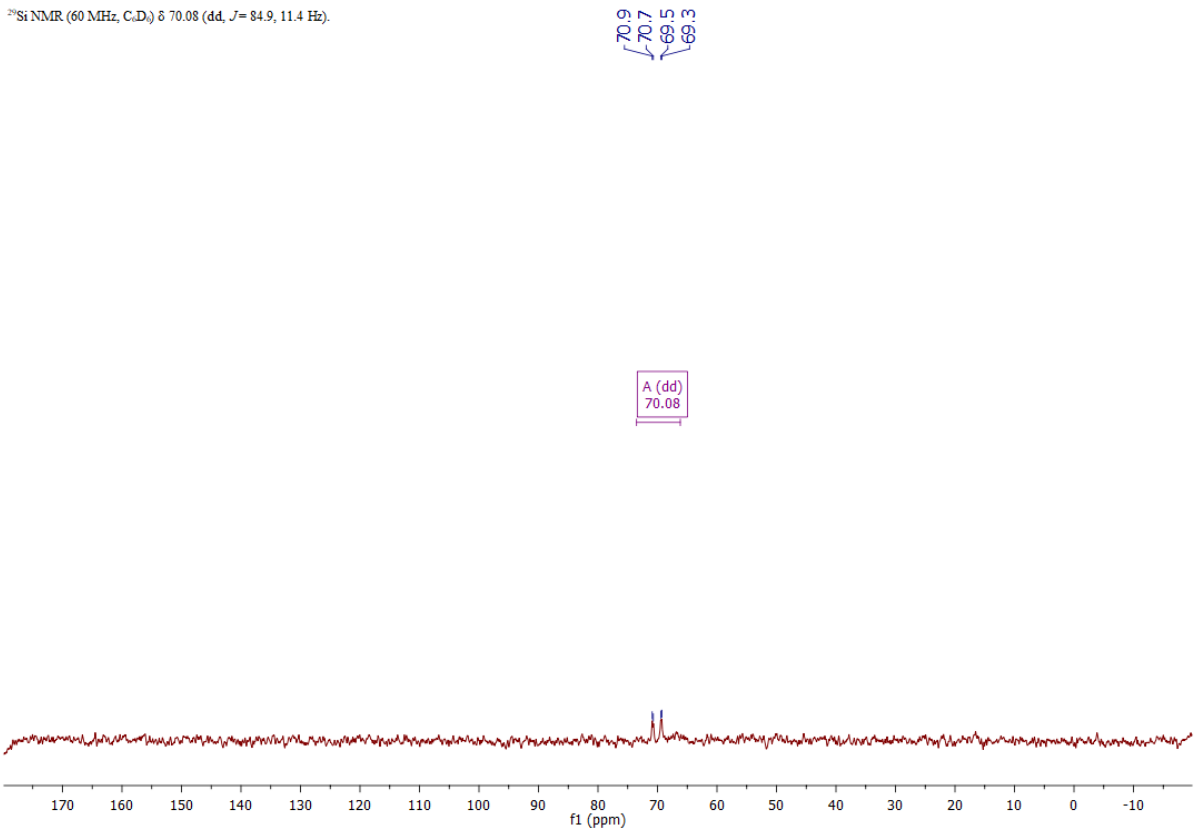

*Figure S 17: ^{29}Si NMR spectrum of compound **6**.*

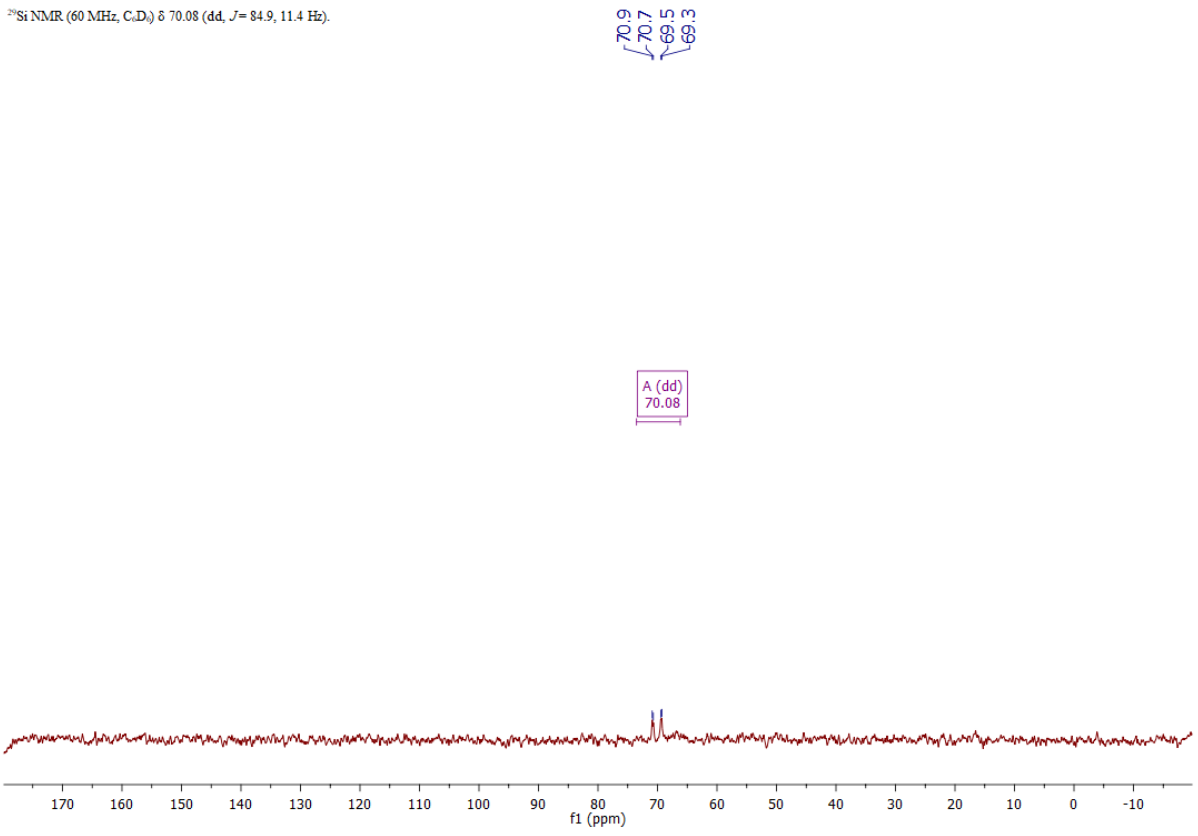

*Figure S 18: ^{29}Si{^{1}H} NMR spectrum of compound **6**.*

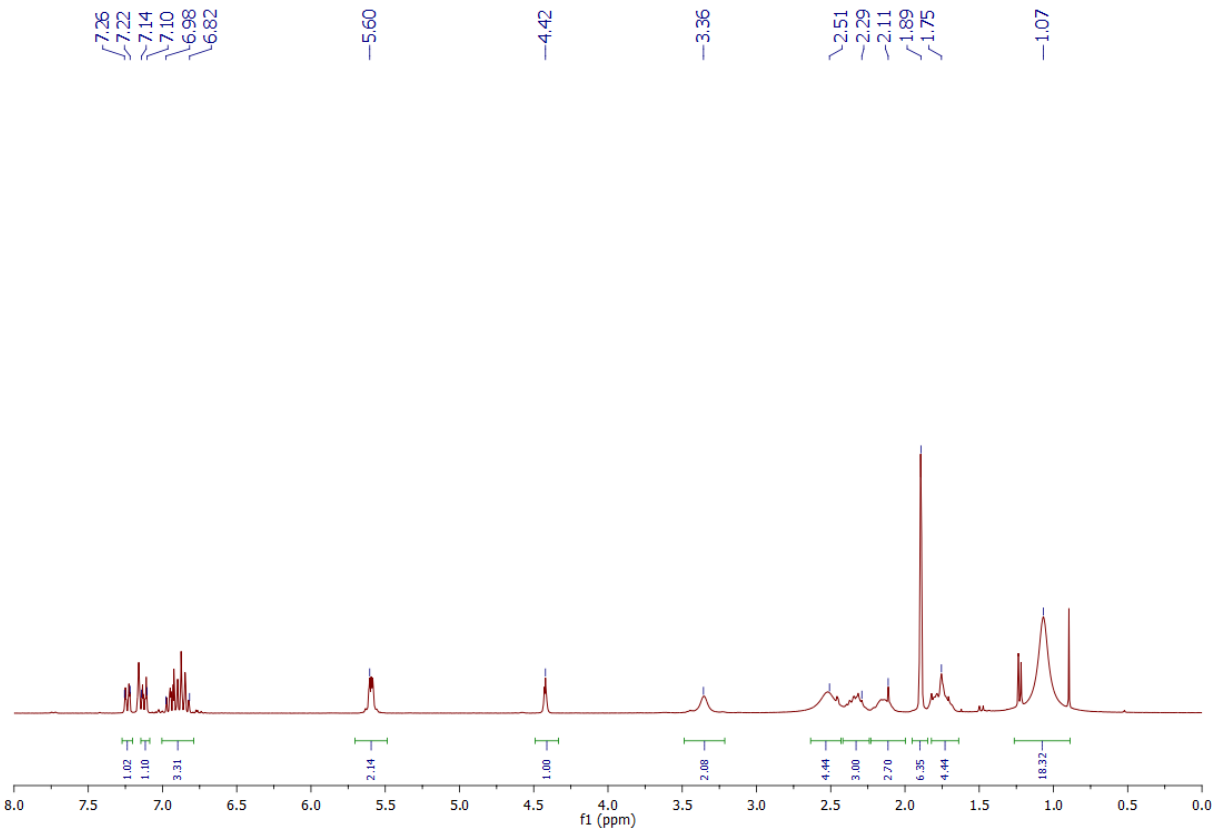

*Figure S 19: ^{1}H NMR spectrum of compound **7**.*

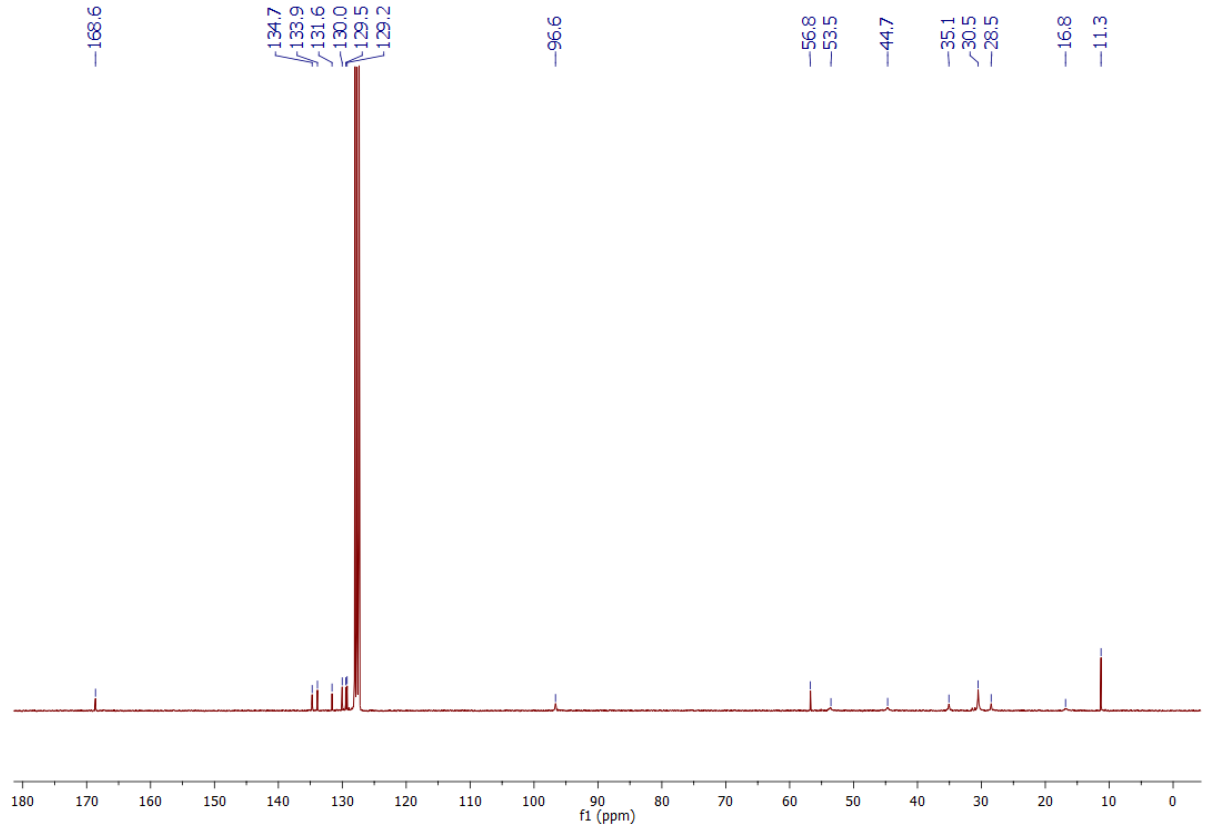

*Figure S 20: $^{13}C\{^{1}H\}$ NMR spectrum of compound **7**.*

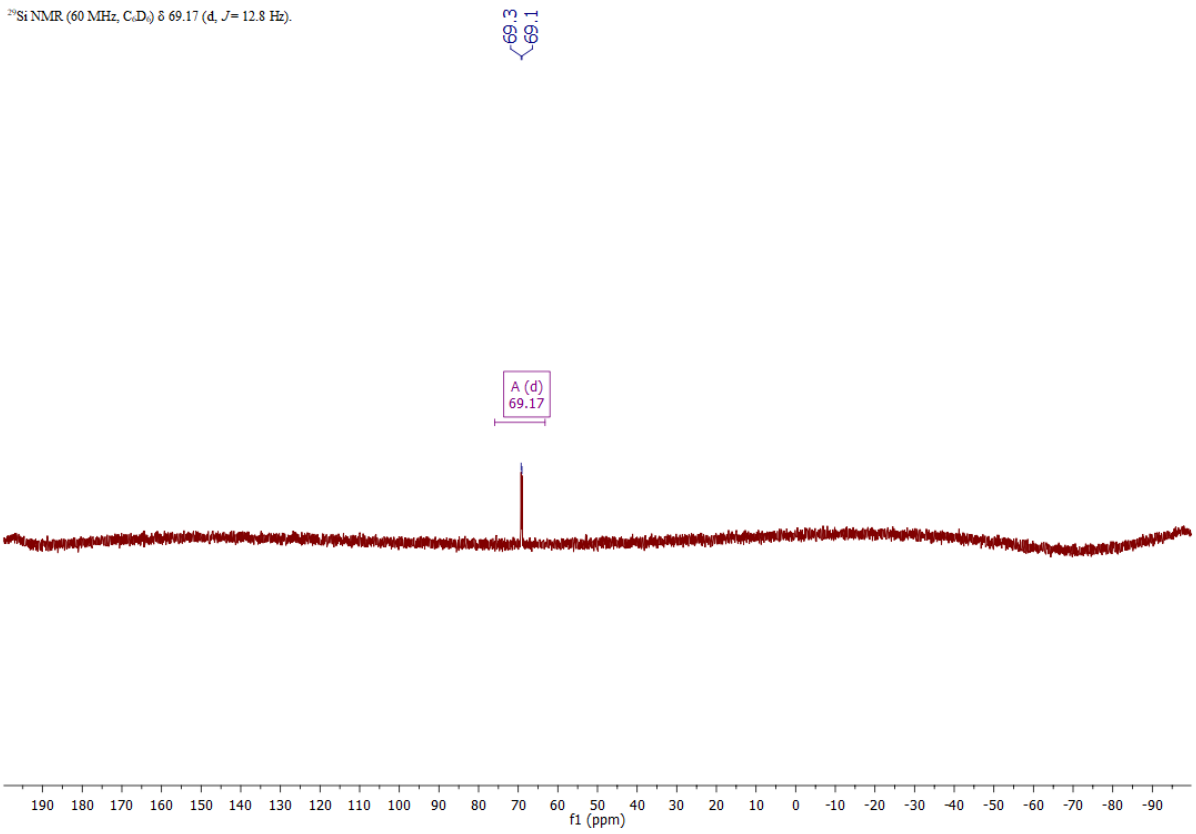

*Figure S 21: ^{29}Si NMR spectrum of compound **7**.*

IR Spectra

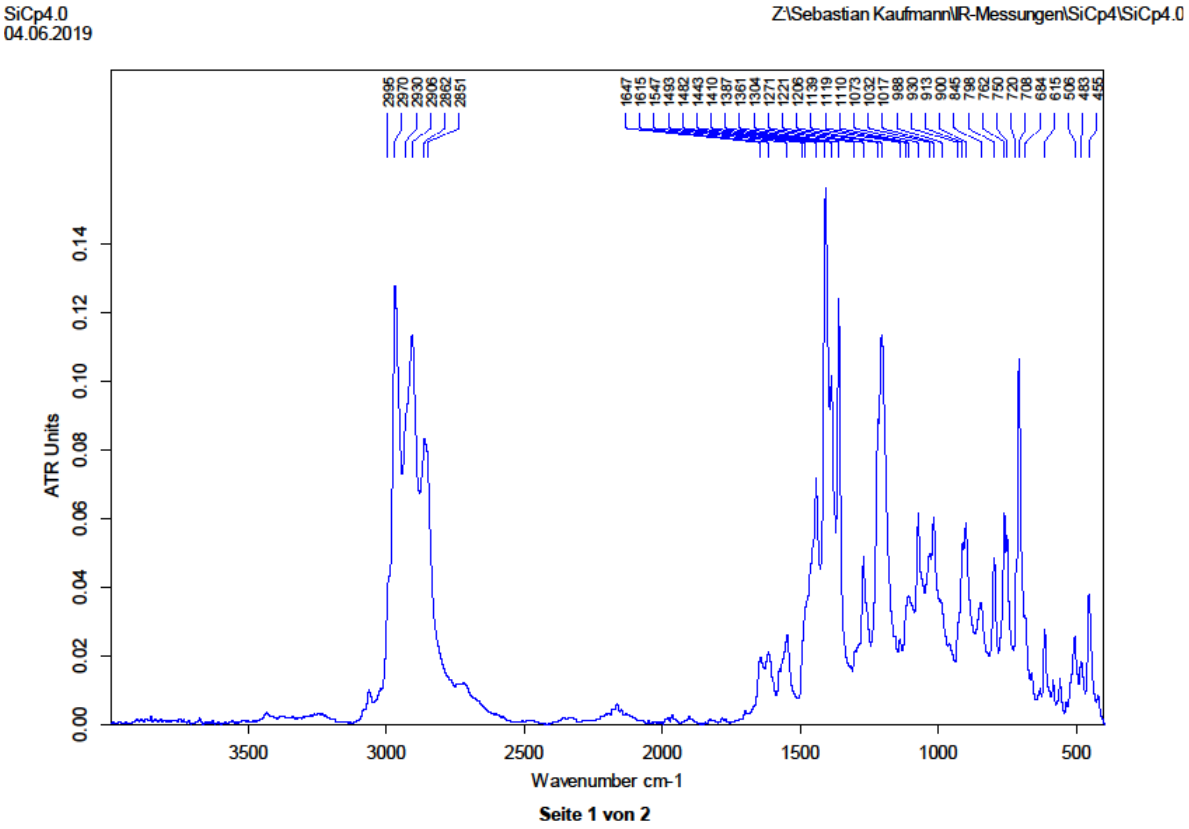

*Figure S 22: IR spectrum of compound **1**.*

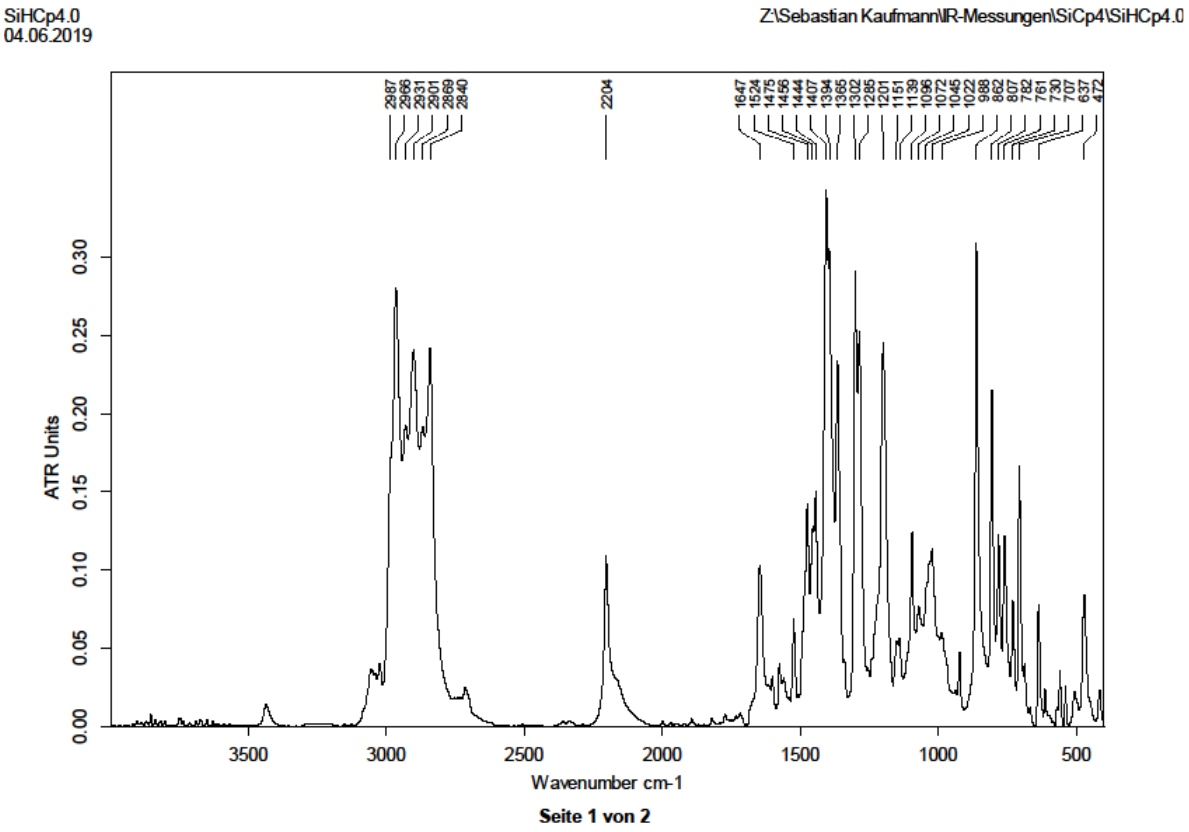

*Figure S 23:IR spectrum of compound **2**.*

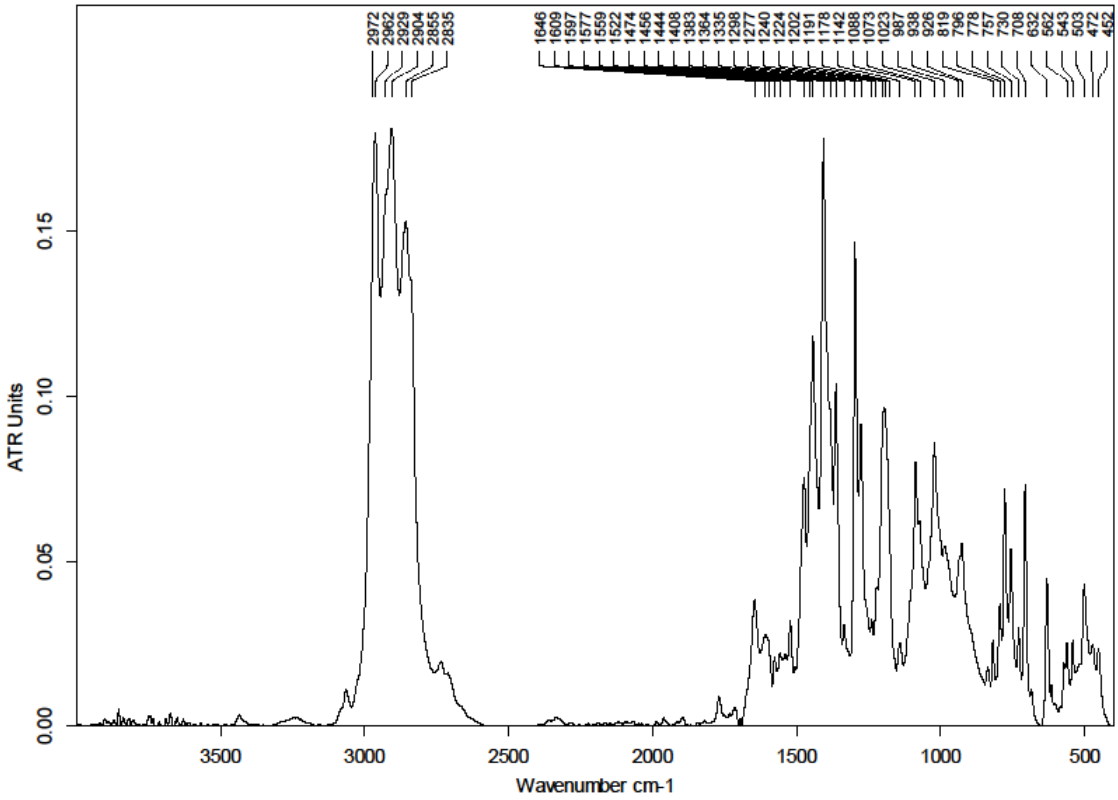

*Figure S 24: IR spectrum of compound **3**.*

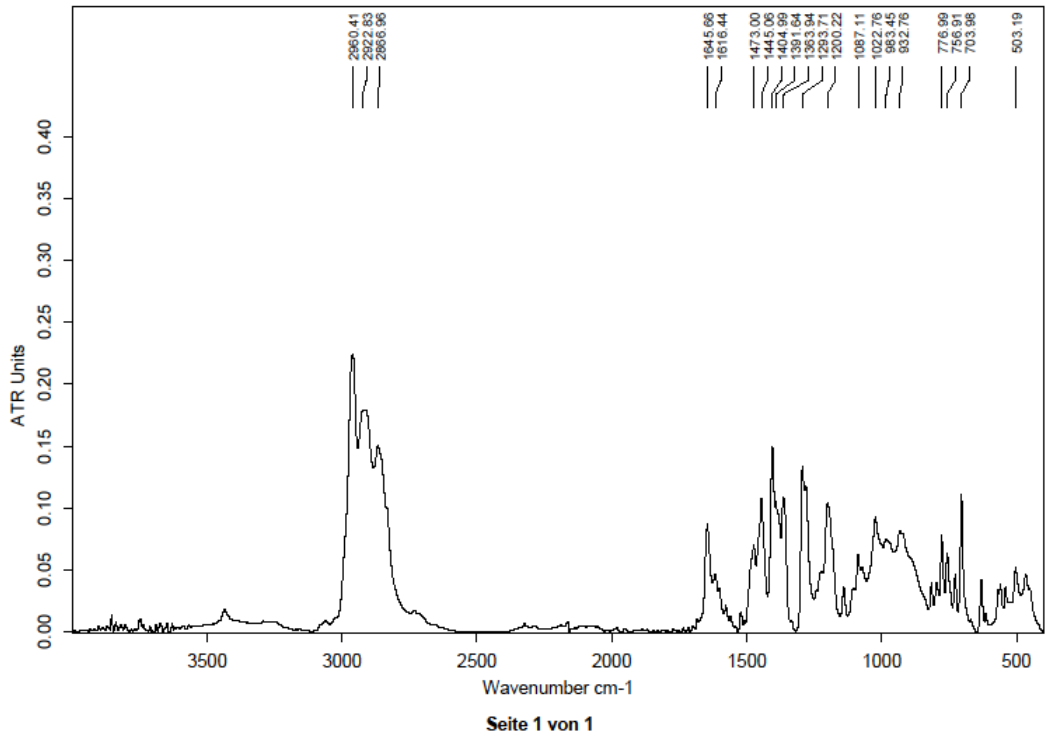

*Figure S 25: IR spectrum of compound **4**.*

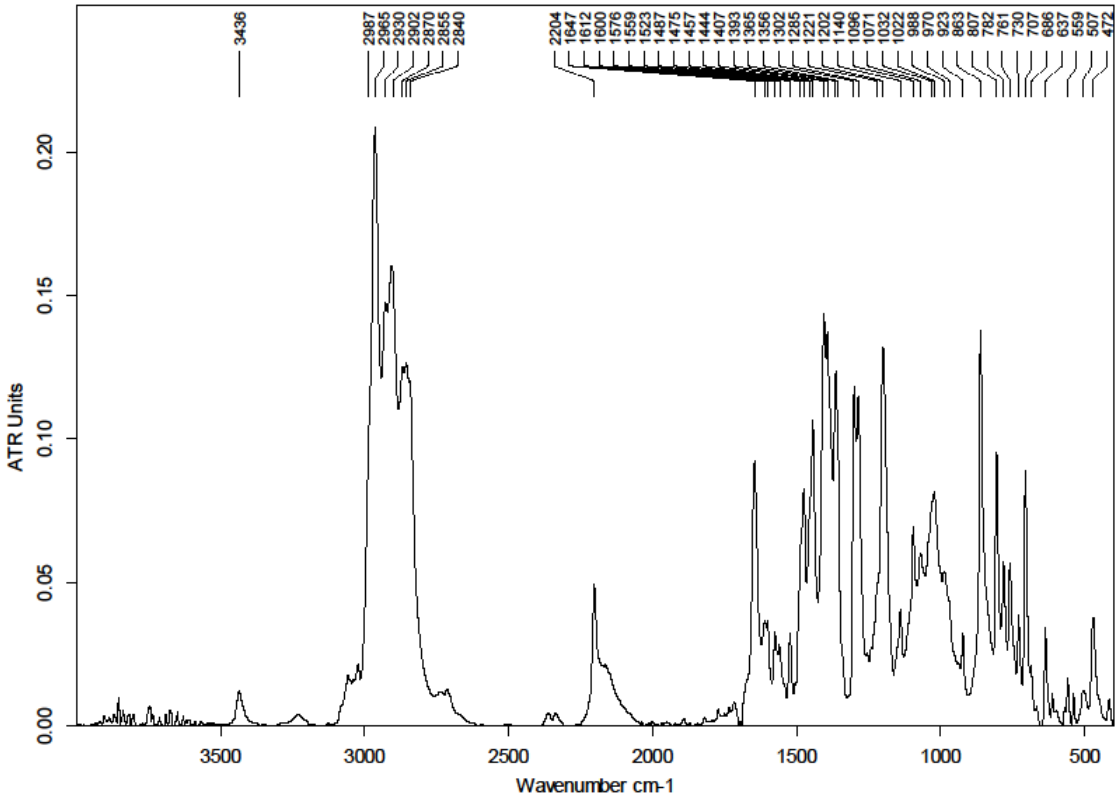

*Figure S 26: IR spectrum of compound **5**.*

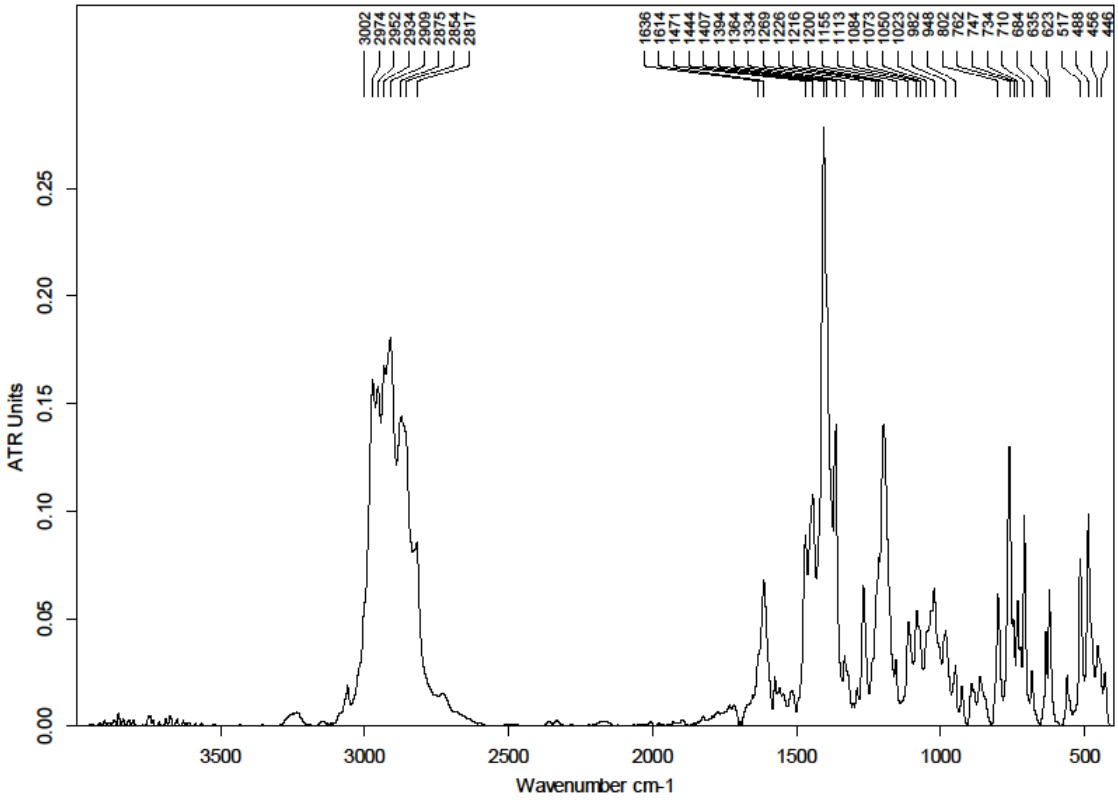

*Figure S 27: IR spectrum of compound **6**.*

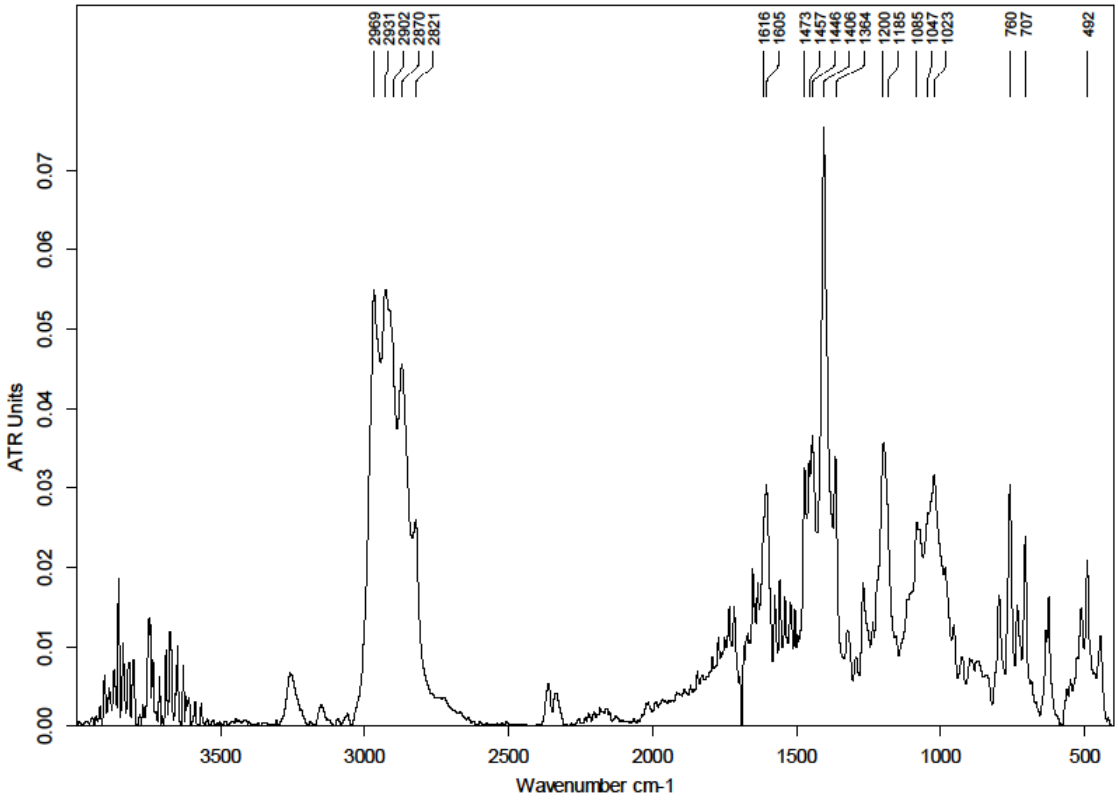

*Figure S 28: IR spectrum of compound **7**.*

High Resolution Mass Spectra

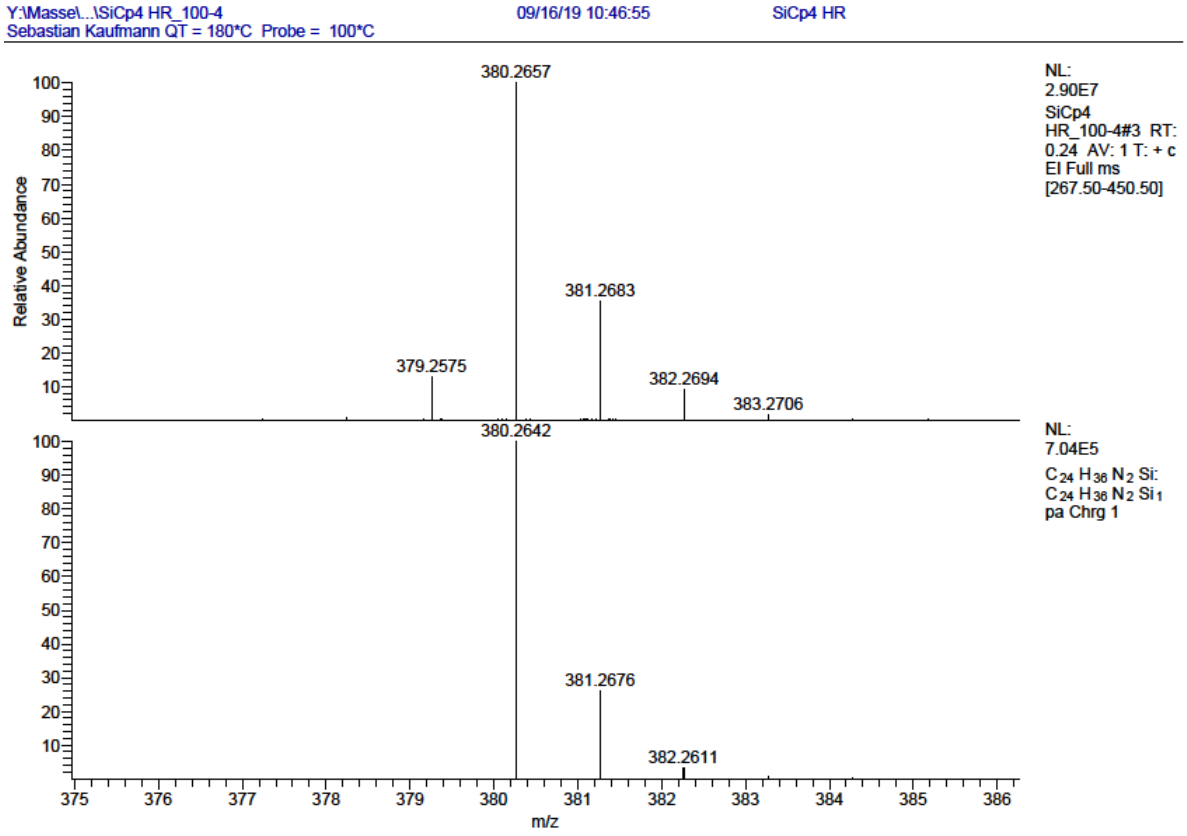

*Figure S 29: High resolution mass spectra of compound **1** (top). Calculated spectrum for $C_{24}H_{36}N_2Si$ shown in the bottom.*

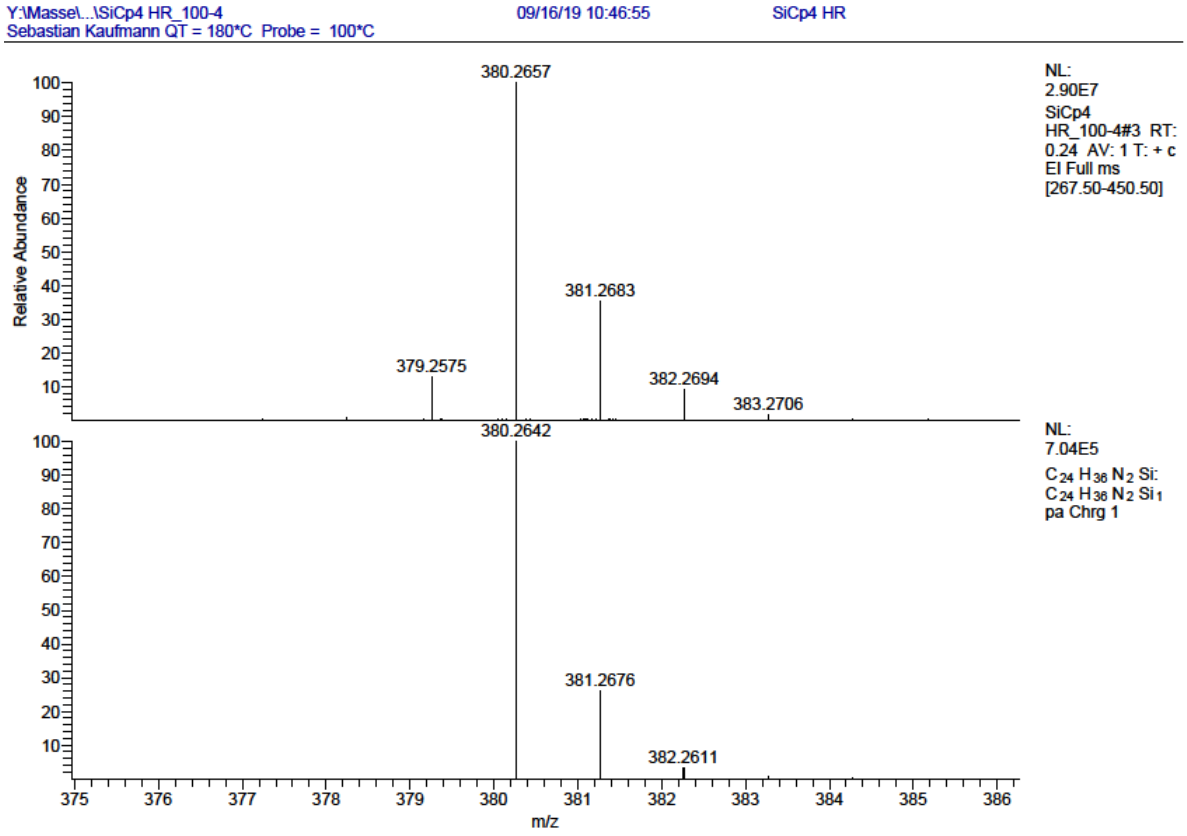

*Figure S 30: High resolution mass spectra of compound **2** (top). Calculated spectrum for $C_{24}H_{36}N_2Si$ shown in the bottom.*

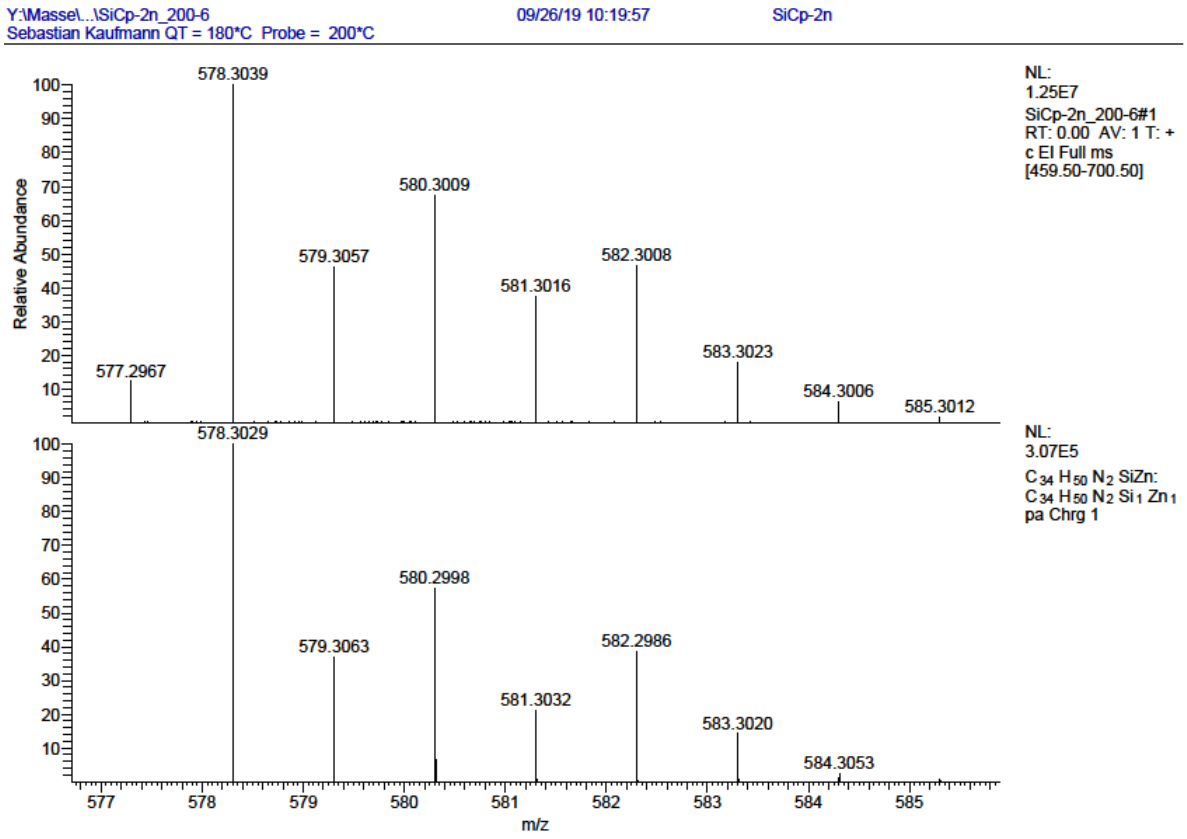

*Figure S 31:High resolution mass spectra of compound **3** (top). Calculated spectrum for $C_{34}H_{50}N_2SiZn$ shown in the bottom.*

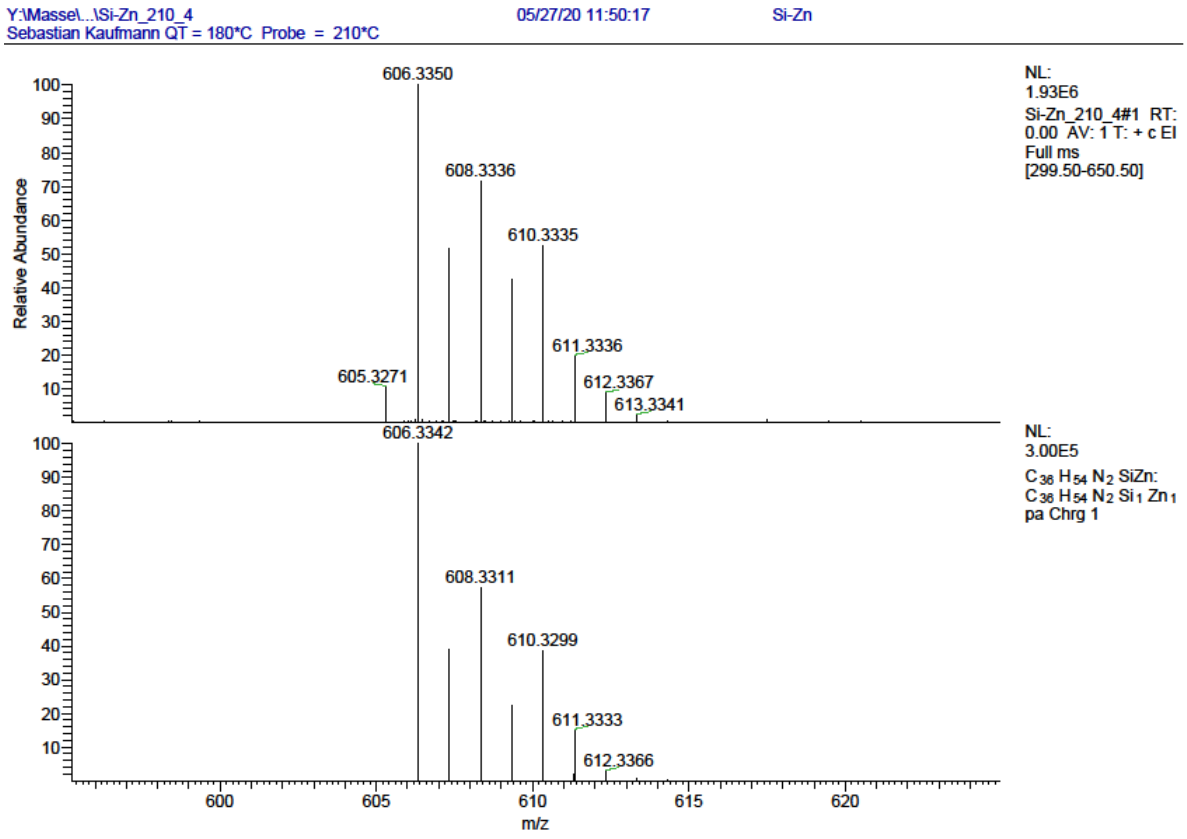

*Figure S 32:High resolution mass spectra of compound **4** (top). Calculated spectrum for $C_{36}H_{54}N_2SZn$ shown in the bottom.*

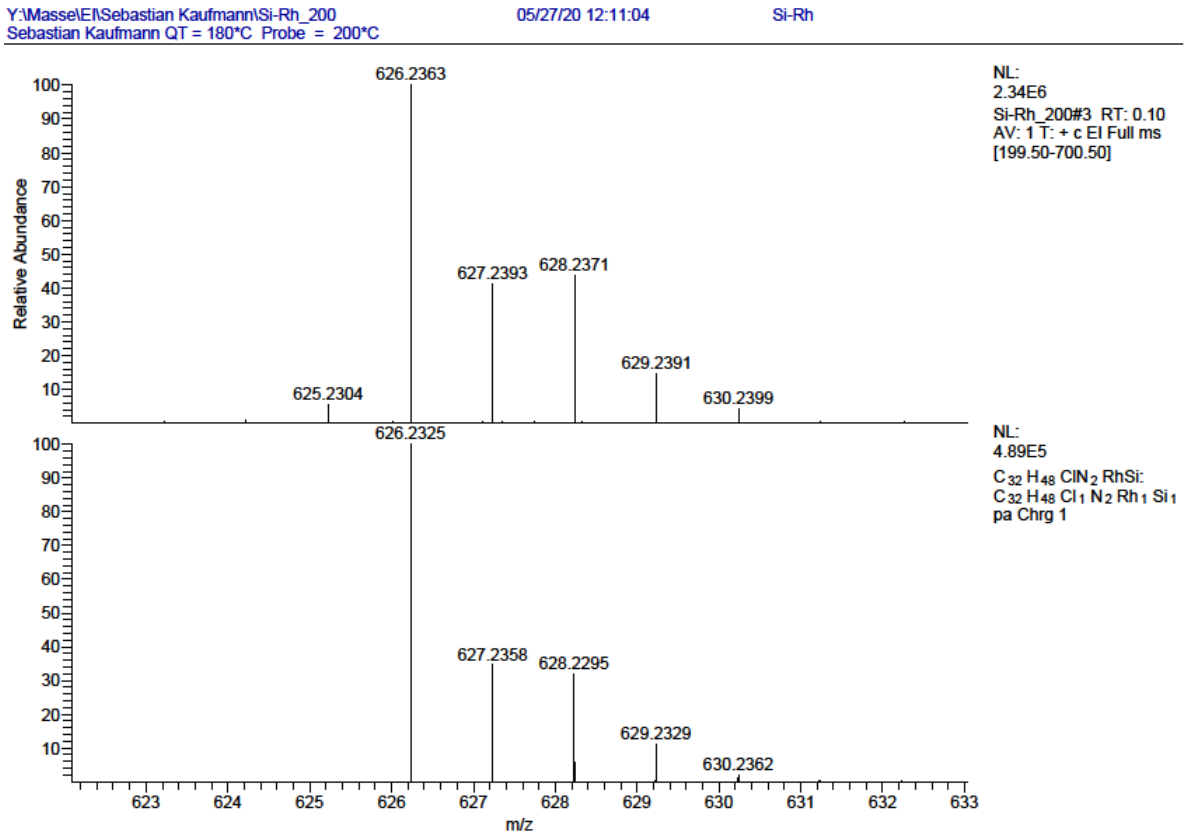

*Figure S 33:High resolution mass spectra of compound **6** (top). Calculated spectrum for $C_{32}H_{48}N_2SiRhCl$ shown in the bottom.*

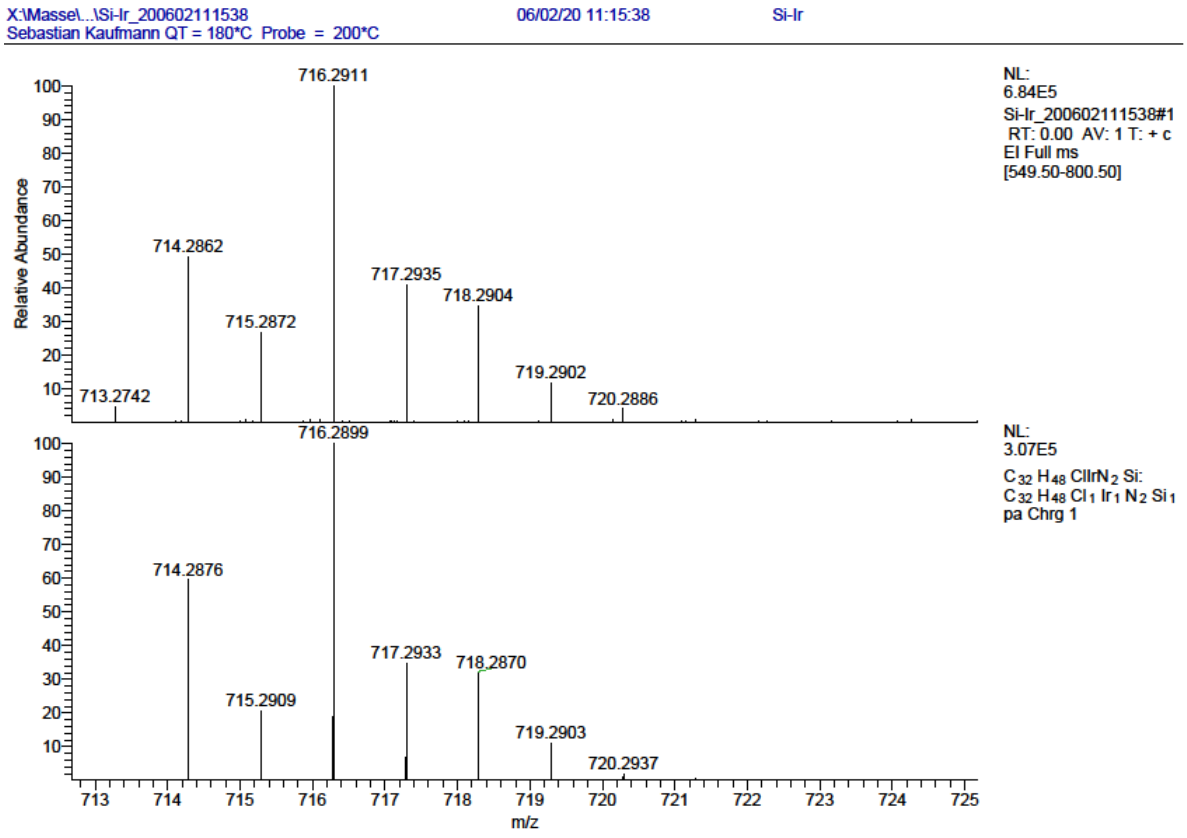

*Figure S 34: High resolution mass spectra of compound **7** (top). Calculated spectrum for $C_{32}H_{48}N_2SiIrCl$ shown in the bottom.*

Crystallographic Appendix

A suitable crystal was covered in mineral oil (Aldrich) and mounted on a glass fiber or a mylar loop. The crystal was transferred directly to the cold stream of a STOE IPDS 2 or STOE StadiVari diffractometer. All structures were solved by using the program SHELXS/T[8, 9] using Olex2.[10] The remaining non-hydrogen atoms were located from successive difference Fourier map calculations. The refinements were carried out by using full-matrix least-squares techniques on F^2 by using the program SHELXL.[8, 11] In each case, the locations of the largest peaks in the final difference Fourier map calculations, as well as the magnitude of the residual electron densities, were of no chemical significance.

Crystallographic data for the structures reported in this paper have been deposited with the Cambridge Crystallographic Data Centre as a supplementary publication no. 2019953-2019959. Copies of the data can be obtained free of charge on application to CCDC, 12 Union Road, Cambridge CB21EZ, UK (fax: (+(44)1223-336-033; email: deposit@ccdc.cam.ac.uk).

*Table S 1: Structural Data of complexes **1**, **2**, **3** and **4**.*

Compound	**1**	**2**	**3** (0.5 toluene)	**4**
Formula	$C_{24}H_{36}N_2Si$	$C_{24}H_{36}N_2Si$	$C_{37.5}H_{54}N_2SiZn$	$C_{36}H_{54}N_2SiZn$
$D_{calc.}$/ g cm^{-3}	1.123	1.062	1.044	1.185
μ/mm^{-1}	0.115	0.109	0.670	0.781
Formula Weight	380.64	380.64	626.28	608.27
Colour	colourless	yellow	clear orange	yellow
Shape	plate	irregular	plank	irregular
Size/mm^3	0.41×0.28×0.12	0.39×0.32×0.25	0.49×0.20×0.18	0.53×0.35×0.12
T/K	100	150	210	150
Crystal System	monoclinic	monoclinic	monoclinic	monoclinic
Flack Parameter	-	-	-	-0.015(7)
Hooft Parameter	-	-	-	-0.004(3)
Space Group	$P2_1/c$	$P2_1/c$	$P2_1/n$	Pc
a/Å	14.931(3)	8.6931(17)	11.4292(5)	8.5961(4)
b/Å	8.6942(17)	16.799(3)	20.8212(11)	10.5095(3)
β/°	107.50(3)	102.11(3)	97.269(3)	99.139(4)
V/Å^3	2251.7(9)	2380.6(9)	3984.4(3)	1705.28(12)
Z	4	4	4	2
Z'	1	1	1	1
Wavelength/Å	0.71073	0.71073	0.71073	0.71073
Radiation type	MoK_α	MoK_α	MoK_α	MoK_α
Θ_{min}/°	2.348	1.741	1.561	1.938
Θ_{max}/°	26.061	29.491	26.114	26.038
Measured Refl.	10902	14814	27224	21928
Independent Refl.	4404	6591	7837	6435
Reflections with I > 2(I)	3270	4932	4703	5781
R_{int}	0.0342	0.0193	0.0490	0.0319
Parameters	258	258	738	386
Restraints	0	0	1112	2
Largest Peak	0.313	0.453	0.646	0.206
Deepest Hole	-0.246	-0.239	-0.283	-0.211
GooF	0.927	1.048	0.953	0.986
wR_2 (all data)	0.0905	0.1486	0.1698	0.0671
wR_2	0.0867	0.1354	0.1518	0.0659
R_1 (all data)	0.0514	0.0698	0.1030	0.0345
R_1	0.0365	0.0489	0.0580	0.0293

*Table S 2: Structural Data of complexes **5**, **6** and **7**.*

Compound	**5**	**6**	**7**
Formula	$C_{34}H_{51}CaIN_2Si$	$C_{32}H_{48}ClN_2RhSi$	$C_{32}H_{48}ClIrN_2Si$
$D_{calc.}$/ g cm^{-3}	1.293	1.323	1.537
μ/mm^{-1}	1.117	0.688	4.462
Formula Weight	682.84	627.17	716.46
Colour	clear yellow	yellow	orange
Shape	prism	prism	hexagonal
Size/mm^3	0.36×0.28×0.15	0.31×0.30×0.28	0.32×0.25×0.12
T/K	150	150	150
Crystal System	triclinic	monoclinic	monoclinic
Space Group	$P\bar{1}$	$P2_1/n$	$C2/c$
a/Å	10.2454(7)	11.4019(6)	33.271(7)
b/Å	12.6409(9)	20.6248(10)	9.5771(19)
c/Å	15.4096(9)	13.6772(9)	19.943(4)
α/°	105.459(5)		
β/°	107.476(5)	101.761(5)	103.05(3)
γ/°	100.998(5)		
V/Å^3	1753.3(2)	3148.8(3)	6191(2)
Z	2	4	8
Z'	1	1	1
Wavelength/Å	0.71073	0.71073	0.71073
Radiation type	MoK_α	MoK_α	MoK_α
Θ_{min}/°	1.858	1.813	2.217
Θ_{max}/°	26.081	29.506	26.071
Measured Refl.	13758	20489	12406
Independent Refl.	6876	8650	6047
Reflections with I > 2(I)	5130	7018	4848
R_{int}	0.0307	0.0179	0.0278
Parameters	371	354	344
Restraints	0	0	0
Largest Peak	0.777	0.493	0.600
Deepest Hole	-0.339	-0.410	-0.580
GooF	0.938	1.054	0.956
wR_2 (all data)	0.0689	0.0713	0.0484
wR_2	0.0667	0.0675	0.0467
R_1 (all data)	0.0499	0.0385	0.0342
R_1	0.0328	0.0267	0.0224

Ortep Plots

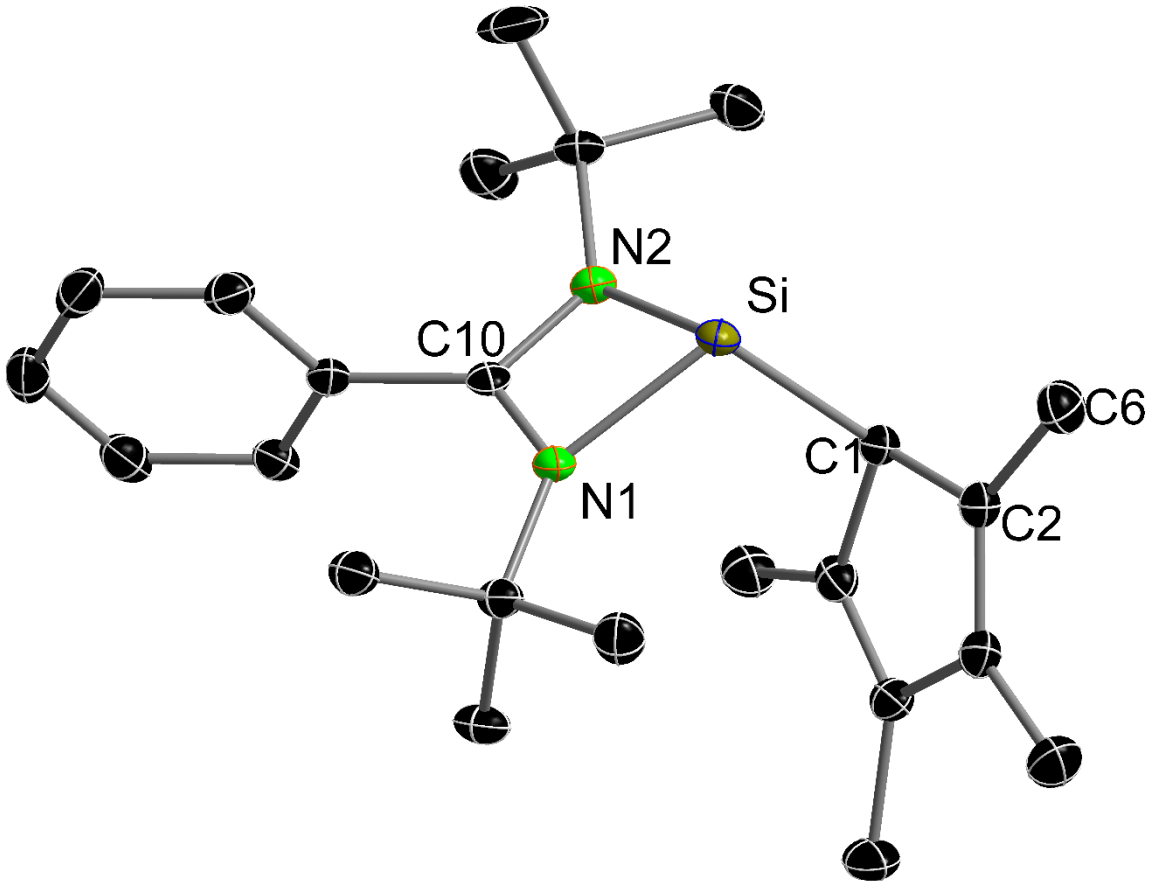

*Figure S 35: Ortep plot of the solid-state structure of complex **1**. Ellipsoids are displayed at 50% probability.*

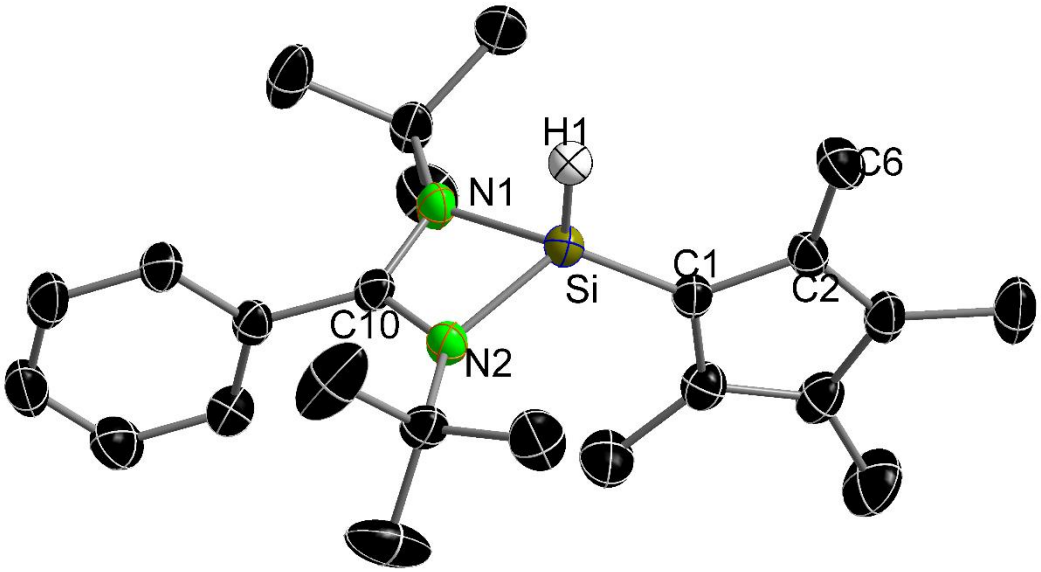

*Figure S 36: Ortep plot of the solid-state structure of complex **2**. Ellipsoids are displayed at 50% probability.*

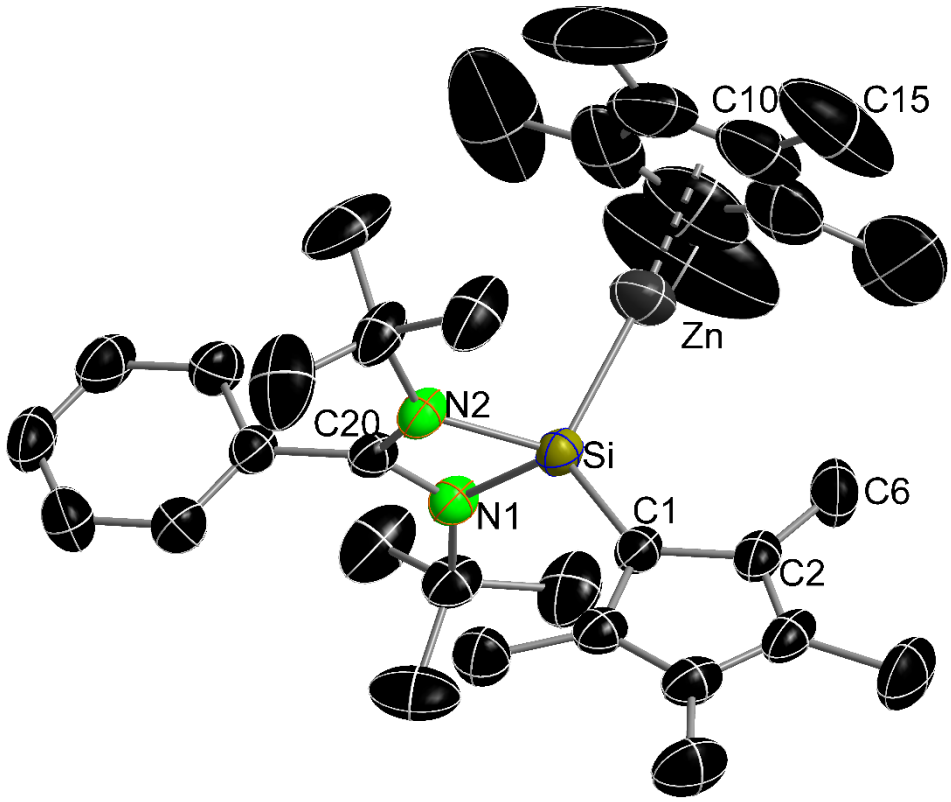

*Figure S 37: Ortep plot of the solid-state structure of complex **3**. Ellipsoids are displayed at 50% probability.*

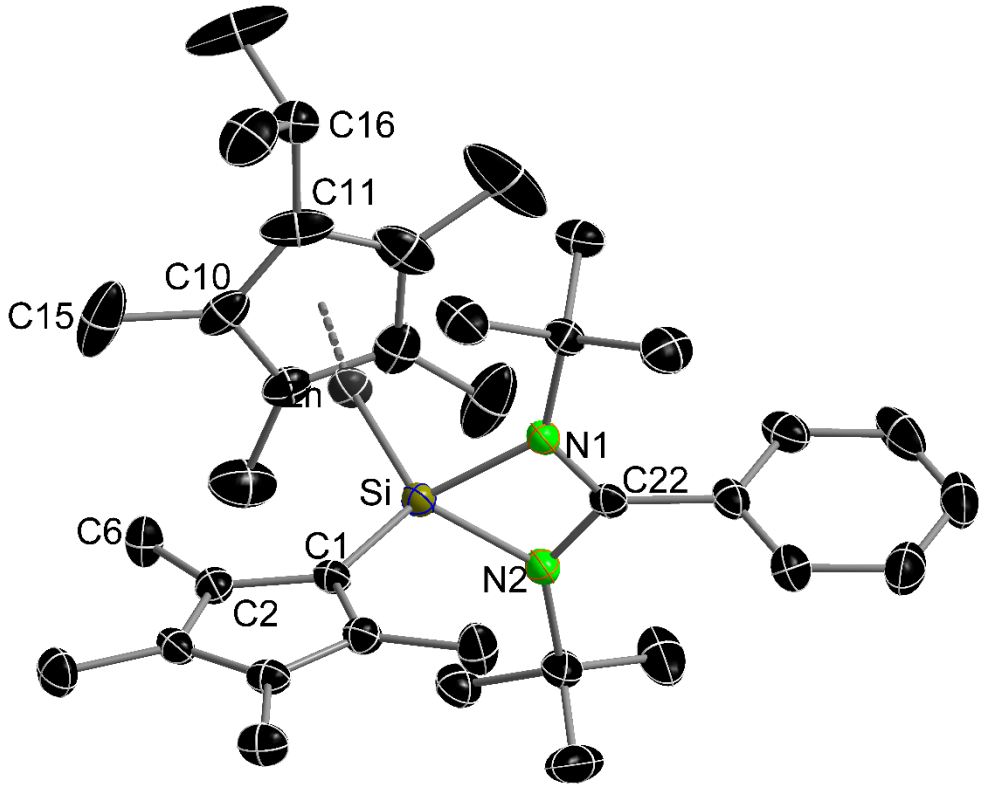

*Figure S 38: Ortep plot of the solid-state structure of complex **4**. Ellipsoids are displayed at 50% probability.*

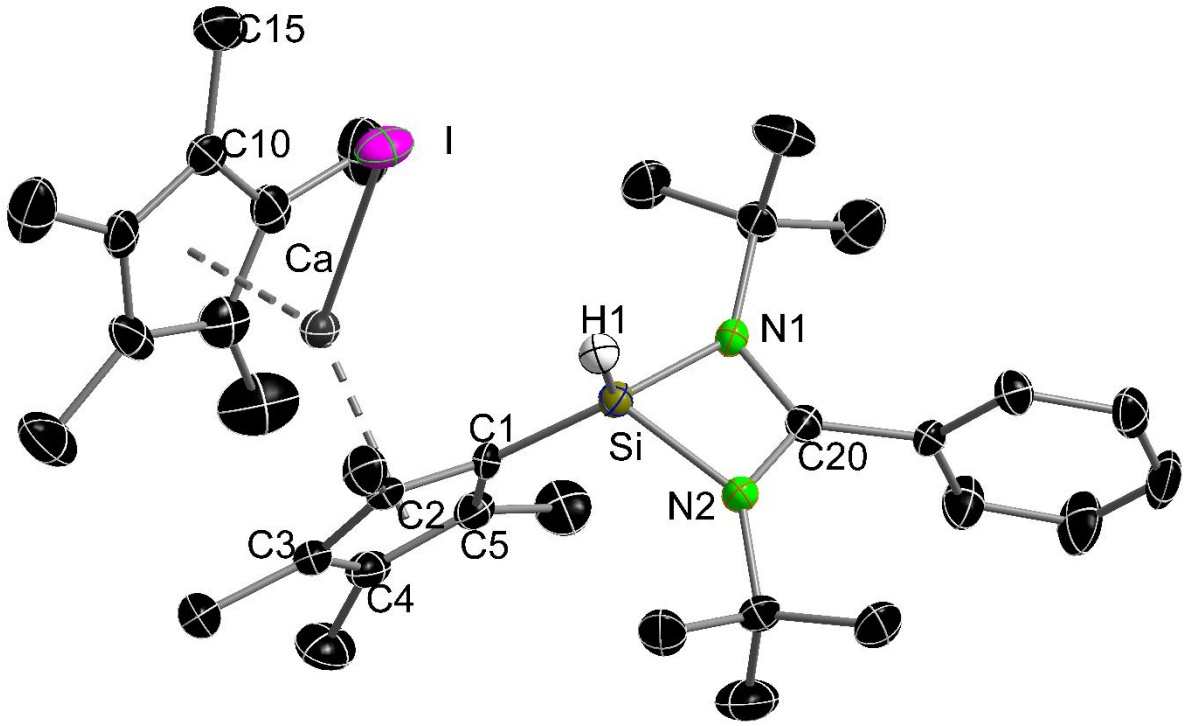

*Figure S 39: Ortep plot of the solid-state structure of complex **5**. Ellipsoids are displayed at 50% probability.*

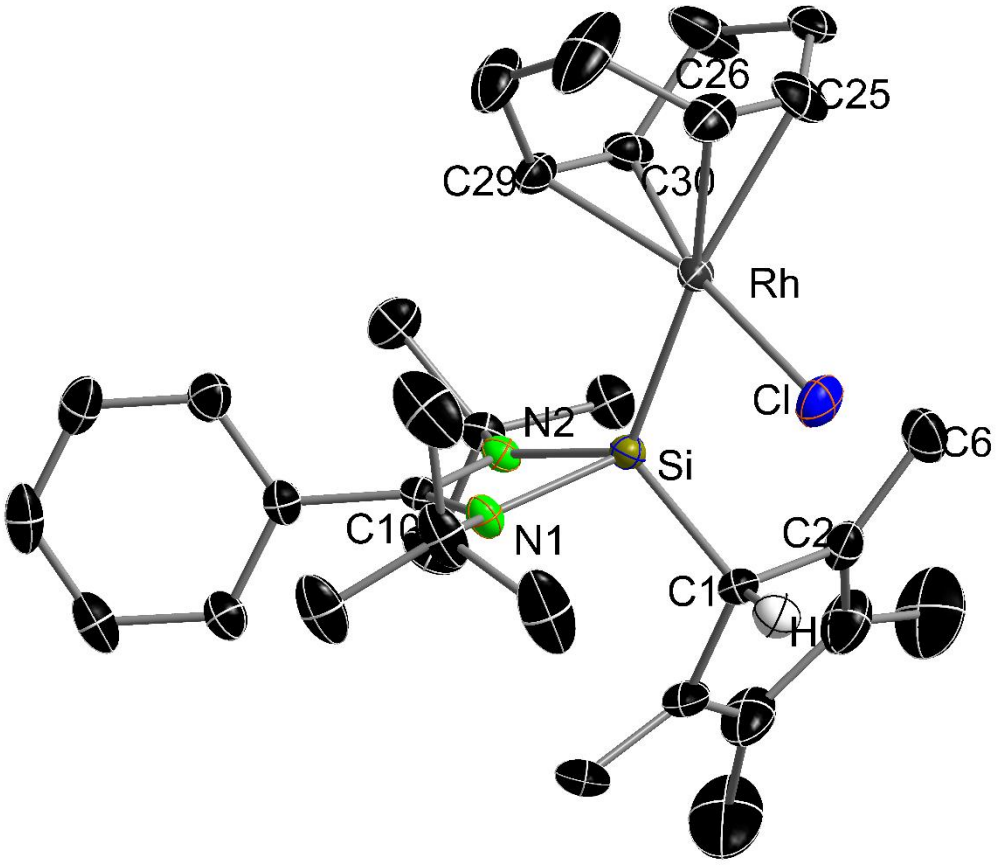

*Figure S 40: Ortep plot of the solid-state structure of complex **6**. Ellipsoids are displayed at 50% probability.*

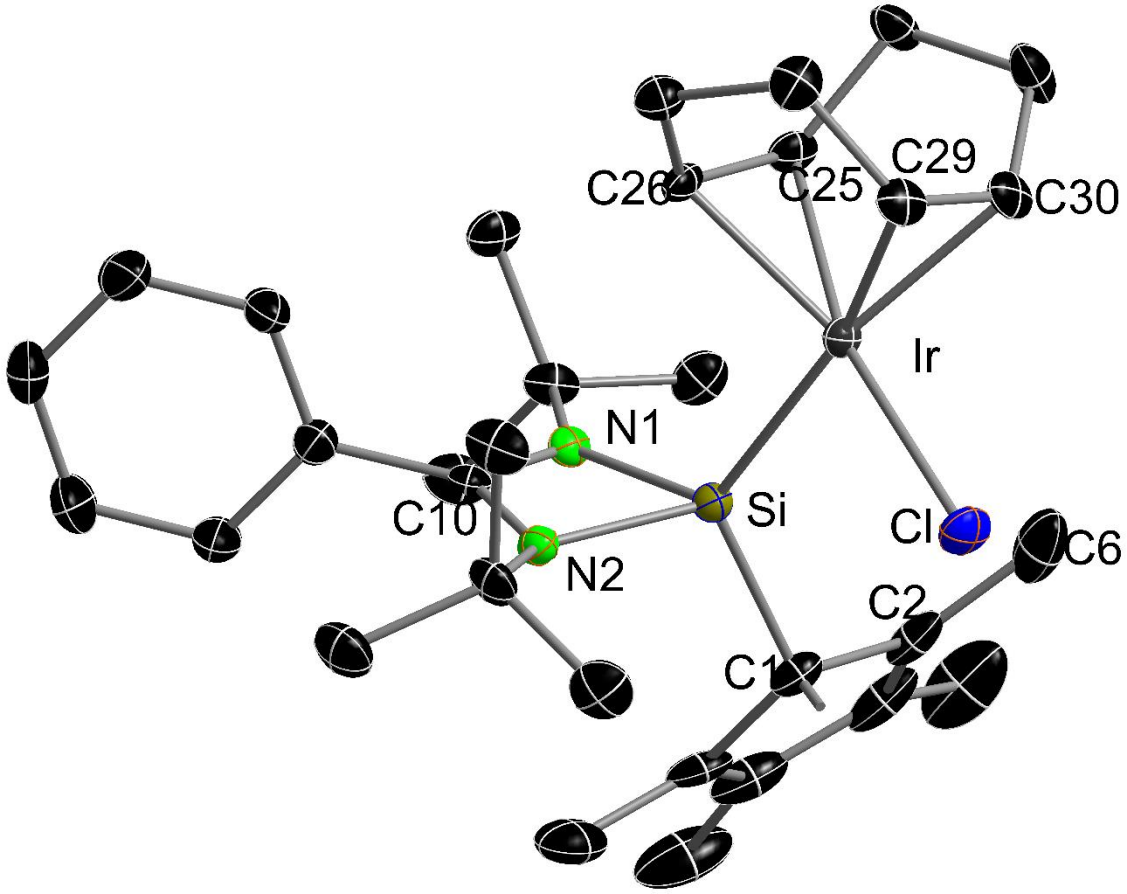

*Figure S 41: Ortep plot of the solid-state structure of complex **7**. Ellipsoids are displayed at 50% probability.*

Theoretical Calculations

Computational Details

The quantum chemical RI-DFT calculations were performed by means of the program system TURBOMOLE[12] using the RI-BP86 functional.[13-18] The basis sets for each atom were of def-SV(P) quality.[19, 20] For Rh[21] an effective core potential (ecp) containing 28 electrons was chosen. Population analyses based on occupation numbers were performed to calculate partial atomic charges and shared electron numbers (SEN) as reliable measures for covalent bonding.[22, 23] Reaction energies were calculated on the basis of absolute total energies.

Table S 3: Results of the theoretical calculations.

	1	**2**	**3**	**5** (Ca(Cp*)I bound to **2**)	**5'** (Ca(Cp*)I bound to **1**)	**6**
M			Zn	Ca	Ca	Rh
r(Si-C)/Å	2.020	1.766	1.786	1.810	2.050	1.959
r(Si-H) /Å	-	1.503	-	1.490		
r(C-H) /Å	1.117		-		1.116	
r(M-Si) /Å			2.337	(3.911)	(4.512)	2.347
r(Ca-C(Ligand))/ Å				2.708/2.733/2.797/ 2.815/2.856	2.810/2.984	
SEN(Si-C)[1]	1.12	1.55	1.53	1.44	1.06	1.16
SEN(Si-H)	-	1.27	-			
SEN(C-H)	1.25		-		1.25	
SEN(M-Si)			0.90			0.64
Q(M)			+1.01	1.27	1.34	-0.06
Q(I)					-0.60	
Q(Cl)						-0. 46
Q(Cp*)			-0.75	-0.55	-0.67	
Q(COD)						-0.10
Q(C_5(Ligand))	+0.03			-0.31	-0.09	
Q(Ligand **1**)	0				-0.07	+0.62
Q(Ligand **2**)		0		-0.08		
Q(Ligand Anion)			-0.24	-		
reaction energy/ kJ mol^{-1}		11.7[2]		-127.0[3]	-14.7[4]	-100.6[5]

[1]Reference values on the model compound silaethen: r(C=Si) = 1.723 Å, SEN(C=Si) = 2.13.

[2] **1** = **2**;

[3] Ca(Cp*)I + **2** = **5**;

[4] Ca(Cp*)I + **1** = **5'**;

[5] $(RhCl(COD))_2$ + **1** = **6**

Cartesian Coordinates of the Molecules under Discussion (given a. u.)

1:

-2.28785524670158	3.73682777123633	1.71229316381849	c
-2.89254072704914	6.18536537992020	0.40210539590073	c
-4.87194007750527	5.76016852779229	-1.24303456849304	c
-5.73261020816490	3.12637744031068	-0.97614648962006	c
-4.27744548428616	1.92576765368770	0.83033459179267	c
1.37113412857336	2.88569740346753	1.03265880108369	si
1.96476379762639	-1.53136180978048	0.40957974018770	c
1.74680629369819	-0.34149111729423	2.66920039716157	n
1.30628287959732	0.18184572747112	-1.36392490275238	n
2.97951729824265	-4.13768954014089	-0.04948341024859	c
1.35591469305811	-6.25536071986523	-0.00166427214118	c
2.30962007631479	-8.69669400720185	-0.42605035053024	c
4.89823970435346	-9.05454149217673	-0.89852586259452	c
6.52960218840388	-6.95827358771087	-0.95213800608809	c
5.57741871497954	-4.51591527987830	-0.53615370180888	c
-0.67215069016710	-5.98096442838033	0.38465569040439	h
1.01804398591549	-10.33069968592314	-0.38303298821801	h
5.64686674125031	-10.97077983981376	-1.22761547988785	h
8.56223660580724	-7.22417760190156	-1.32561046867208	h
6.85810193878873	-2.87574579662896	-0.60189920503638	h
2.66571383082258	-1.04810559005897	5.21358184817368	c
tert			
5.58831980068826	-1.02971777321923	5.31657343450996	c
6.40226553045043	-2.51997828271684	4.08183643053603	h
6.26030561556214	-1.38679061061247	7.27775259774939	h
6.33026753292308	0.83479318538915	4.69176808497316	h
1.64094682319676	0.98288969127438	7.04121703248584	c
1.64071186342960	-3.65469381968750	6.03867851644465	c
2.27752626487849	2.90168564370872	6.45547563688227	h
-0.45306105323659	-3.71280687894580	5.87247237272304	h
2.34307525312502	0.63708034497660	8.99064648188829	h
2.14872214190489	-4.01460987710470	8.04654549935306	h
-0.45873232335550	0.96560919785406	7.08593260968058	h
2.44086234187016	-5.21592948316378	4.88934779835054	h
1.06205083354116	0.01215249921100	-4.14164745953571	c
tert			
3.57153633703700	-0.76877469872974	-5.42094235988461	c
4.10650397685592	-2.74478764739168	-4.96432311517993	h
3.38292484596214	-0.62515737279857	-7.51040850307154	h
5.13173280765855	0.50517744396630	-4.81988771078589	h
0.33114642517005	2.68248267771756	-5.05823491140544	c
-1.06363134654122	-1.86403603211388	-4.84366111454500	c
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3.76809176394519	-14.63621703637348	-0.12683938283450	h
1.19416783783162	-14.00535743880722	-3.27954290042268	c
-1.45199312717437	-12.83212626220702	-6.20700036748415	h
1.46765585651738	-15.90909777895752	-4.07948213250738	h

5': complexation of **1** to (Ca(Cp*)I

2.49318690329595	3.69511683389848	4.38002914878488	i
-0.40714107092793	4.85308145759091	-0.28156596568743	ca
-4.52165703623943	1.29141122150522	3.21967655281172	c
-4.27599345566731	-1.07568501216536	1.68901336894792	c
-4.90422314069640	-0.31998588288073	-0.95611618026873	c
-5.11231683316403	3.26800695468020	1.60034854269317	c
-5.36534039139905	2.26423833167149	-0.99921565678710	c
3.11941908958949	7.89703605590851	-2.01600833878640	c
2.13338609915350	6.67748193325140	-4.23037475543694	c
1.16832737382143	9.48276131238929	-0.99800263534142	c
-0.41971300079539	7.52657838442400	-4.60111434630313	c
-1.01698593724566	9.27055618420269	-2.60378117587649	c
-4.26539879226377	1.32984366008993	6.03853726052430	c
-1.12646163610948	-3.13427866626258	2.61342854976863	si
-5.29447571126554	-2.16781067247893	-3.07349781518821	c
-5.65858038053996	5.97731723126574	2.31106865938296	c
-6.43748961209279	3.77312080382675	-3.16718157704077	c

5.80288777214806	7.74693786302529	-1.06763828550217	c
3.62963191557300	5.13327661494196	-6.10441992886304	c
1.45674147391051	11.22300731606844	1.24424230755869	c
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-3.34289844992786	10.92154116736937	-2.46228949832111	c
-2.40429658074249	0.54220330039228	6.63656948489869	h
-5.76285401750956	0.15563258658312	6.94894349960505	h
-4.39991449565362	3.26646427173862	6.83199137739113	h
0.26394365874850	-4.27576071327600	-0.54690683424713	n
-2.30550128459988	-6.49889720635259	1.73755503389684	n
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-7.02931240339187	-3.32851362965681	-2.76364248270730	h
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-5.97055080496819	2.93665001683556	-5.03340766615975	h
5.91253241896515	7.94472138148782	1.01977764339098	h
6.99969654611613	9.26825336430175	-1.91117693193102	h
6.71661405311557	5.91570931334165	-1.54586745156717	h
5.28324651895239	4.18854543405870	-5.21561411246736	h
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-0.38402327306371	11.65277686871442	2.16581618374674	h
2.29897598709772	13.07694879559237	0.68809526122666	h
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1.94456815603351	-0.39536597411303	-2.26604444053860	c
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-4.97073752865110	-10.40247182585073	1.56582606222695	c
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-0.95820266630813	-9.98617624538264	-3.55770952032813	c
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3.50675553175622	-3.33867305802097	-6.13403254107973	h
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3.41853773293511	0.49453628126169	-3.46160404908465	h
2.14217796847332	0.38746985460693	-0.31164180524721	h
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6.43974969145199	-2.96389918256518	-2.20218888045276	h
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-6.33975580598422	-8.55058248261507	6.30774373935515	h
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-6.30162734526028	-9.39449829092921	0.28912487748051	h
-6.08609284132641	-11.71718801755887	2.76828496036543	h
-3.67363889946811	-11.56014515806576	0.39322030918898	h
3.51506901958241	-9.53660810719084	1.12228789565014	h
3.36950818051944	-12.47301098275570	-1.75060945210076	c
-2.65426673633240	-9.00904991732946	-4.26948868480104	h
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2.76676719726522	-15.15067086562435	-4.81845118344517	h
-5.59234647166571	-2.57625668016879	2.36764939008810	h

6:

-5.03692421623889	0.83715059658333	-0.27754002958457	rh
-5.51264061792941	3.78823322460405	3.13873372575585	cl
-0.70656633499727	1.26840792256139	0.57944890478358	si
-4.74845305541349	-2.77901999648022	-1.97390545549161	c
-4.87234351861308	-0.91161190203067	-3.92750249311119	c
-9.15770554358168	-0.36661931489588	0.00610507905565	c
-8.97586732125625	1.73568330844184	-1.58707140633490	c
1.83550350781735	-0.83834026806206	-0.85806974283315	n
0.57122031453993	-1.02213243813141	3.05710434827273	n
0.76516684365978	4.60957789307966	1.19603752165504	c
-2.86366142102158	-3.62232400933365	-1.61770499531439	h
-6.91064147804777	-4.48219707187873	-1.14256294016857	c
-3.06590632322707	-0.44216611130424	-4.86232414096804	h
-7.20659637182905	-0.40062896937973	-5.56388902901485	c
-9.55768113110771	0.01367920806436	2.01851807348863	h
-9.47396809680888	-3.08346657624717	-0.88301450121111	c
-9.31032766576847	3.60548768909699	-0.72068690894990	h
-8.94303914691563	1.68210022606770	-4.45356442685193	c
2.02267768769116	-2.18288368460241	1.30512766976814	c
3.26976227796181	-1.02008920959897	-3.26574551851292	c
-0.34586036670144	-1.87327873007349	5.57948229137877	c
-0.42248768379623	5.17447415001946	2.85229466450704	h
0.30740725730117	6.35842339318072	-1.02348464729662	c
3.56355123636402	4.79391080879710	1.69467994931350	c
-7.10653822898275	-6.13013699071455	-2.45582015732108	h
-6.38906602083964	-5.29745897648907	0.72457819706130	h
-8.28405768101999	-2.18468610697014	-5.84779093366988	h
-6.58605827651024	0.18954015676496	-7.48284466012220	h
-10.68106157972076	-4.12008638332374	0.48992829076937	h
-10.51514020156117	-3.12447575706301	-2.70521694083634	h
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-8.26670197567337	3.55959607240910	-5.11034472712042	h
3.48183029125699	-4.58421929837356	1.65497237589848	c
6.12925807467863	-0.66149660684593	-2.78563043843422	c
2.77186199537862	-3.56502760800193	-4.61165931087103	c
2.33630255671882	1.15344843127939	-4.96479794663718	c
1.66475076842046	-3.38159698552414	7.06174128808329	c
-0.99888533138968	0.52920748308492	7.09693287144427	c
-2.75197105857470	-3.49310513088616	5.23359776093359	c
-2.26160041855304	6.93318643594274	-2.07355348298403	c

2.60468192968765	7.32138990512154	-1.78238847550882	c
4.61188495070494	6.35835337652385	-0.10660666004621	c
4.87893924427405	3.62013042876241	3.91772597821116	c
2.34809735903508	-6.92802565103531	1.06972744320462	c
5.97837257164432	-4.54449610835610	2.59388296761930	c
6.46895833339859	1.13689564271555	-1.75389153409569	h
7.15601672604076	-0.58029852961350	-4.61734093951913	h
6.93726309589907	-2.24941445425506	-1.67737804780772	h
3.51970249760103	-5.19273485225626	-3.51868395794641	h
3.71588585742475	-3.57021560322490	-6.48929238985552	h
0.71265983189340	-3.85534130932762	-4.91803556148474	h
0.28712806935098	0.96027506398812	-5.38443273293269	h
3.37338202198357	1.12957193021015	-6.79022065451826	h
2.64186780907256	3.01752245987559	-4.04684222082200	h
2.04405195370636	-5.27191384323485	6.24077277868661	h
0.96378275320704	-3.67308294151853	9.02109234132822	h
3.47868105606529	-2.32930211432710	7.18023098427383	h
0.71617352994051	1.69833152415001	7.41829537132010	h
-1.78089083983935	-0.00915718519499	8.97149651613275	h
-2.44286067756761	1.69177629169737	6.10454357607208	h
-4.21824552753804	-2.40096003017749	4.19244706937908	h
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7.33563709522489	7.12560381129386	-0.38937250001627	c
4.02443619862840	4.25558542452176	5.73742949369286	h
6.91168937895092	4.14157537892642	3.97761646279888	h
4.75616628168667	1.51846114945798	3.92534485773250	h
0.40135595063410	-6.97367667070972	0.33280499894003	h
3.68785236229529	-9.19152620661382	1.42731749585347	c
6.87054391334852	-2.72427760462101	3.06923630653336	h
7.31500299638290	-6.81007100718040	2.94353823544856	c
4.48053759378072	8.33474794541233	-5.30830696718446	h
3.97776375740979	10.92866419603798	-3.21185453893427	h
1.37443884784409	9.64505438676722	-4.95733479901988	h
8.10596465811679	6.58414536225007	-2.27498162862855	h
8.56943930225169	6.24835648957777	1.06398690274425	h
7.57243344854308	9.21397951838954	-0.23548101213363	h
2.78098897508528	-11.01022352625926	0.96985099481818	h
6.17322359221731	-9.13753578378050	2.36415540985949	c
9.26237309596975	-6.75469693720261	3.68075039764363	h
7.22272082564595	-10.91512998966174	2.64447846355630	h

Ca(Cp*)I:

0.00000000000000	0.00000000000000	-9.42162016351287	i
0.00000000000000	0.00000000000000	-3.95585127432776	ca
1.87115739170747	1.35947542166702	0.35320571334870	c
1.87115739170747	-1.35947542166702	0.35320571334870	c
-0.71471852533165	-2.19967743912736	0.35320571334870	c
-2.31287773275157	0.00000000000000	0.35320571334870	c
-0.71471852533165	2.19967743912736	0.35320571334870	c
4.17619436301005	3.03418280994307	0.52950004442862	c
5.86866300227763	2.17087475284127	-0.37188351749834	h

4.70137158268546	3.41574639477685	2.53655556478890	h
3.87814118171362	4.91059299896894	-0.37188351749834	h
-1.59516430304412	4.90941091456852	0.52950004442862	c
-5.16206011993186	0.00000000000000	0.52950004442862	c
-1.59516430304412	-4.90941091456852	0.52950004442862	c
4.17619436301005	-3.03418280994307	0.52950004442862	c
-0.25110797778707	6.25226738154388	-0.37188351749834	h
-6.02385626739624	1.69323899570513	-0.37188351749834	h
-3.47183993880792	-5.20578813112135	-0.37188351749834	h
3.87814118171362	-4.91059299896894	-0.37188351749834	h
5.86866300227763	-2.17087475284127	-0.37188351749834	h
-0.25110797778707	-6.25226738154388	-0.37188351749834	h
-6.02385626739624	-1.69323899570513	-0.37188351749834	h
-3.47183993880792	5.20578813112135	-0.37188351749834	h
-1.79576415084297	5.52679376369888	2.53655556478890	h
-5.81121486368500	0.00000000000000	2.53655556478890	h
-1.79576415084297	-5.52679376369888	2.53655556478890	h
4.70137158268546	-3.41574639477685	2.53655556478890	h

$[Rh(COD)Cl]_2$:

0.00000000000000	0.00000000000000	-3.41629839256370	rh
0.00000000000000	3.14458191737758	0.00000000000000	cl
-1.35044389940996	-2.62450196540890	-6.09550103857251	c
-2.95113231229271	-1.47211351218996	-8.19979806716037	c
-2.28327469307056	-4.14743171261068	-5.00783359282390	h
-4.91929145546857	-2.16535799481738	-7.98573476253693	h
-2.28091549276457	-2.20586439723469	-10.06010383282289	h
0.00000000000000	0.00000000000000	3.41629839256370	rh
0.00000000000000	-3.14458191737758	0.00000000000000	cl
1.35044389940996	2.62450196540890	-6.09550103857251	c
-1.35044389940996	2.62450196540890	6.09550103857251	c
1.35044389940996	-2.62450196540890	6.09550103857251	c
-1.35044389940996	-2.62450196540890	6.09550103857251	c
1.35044389940996	2.62450196540890	6.09550103857251	c
-1.35044389940996	2.62450196540890	-6.09550103857251	c
1.35044389940996	-2.62450196540890	-6.09550103857251	c
2.95113231229271	1.47211351218996	-8.19979806716037	c
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-2.95113231229271	-1.47211351218996	8.19979806716037	c
2.95113231229271	1.47211351218996	8.19979806716037	c
-2.95113231229271	1.47211351218996	-8.19979806716037	c
2.95113231229271	-1.47211351218996	-8.19979806716037	c
2.28327469307056	4.14743171261068	-5.00783359282390	h
-2.28327469307056	4.14743171261068	5.00783359282390	h
2.28327469307056	-4.14743171261068	5.00783359282390	h
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2.28327469307056	4.14743171261068	5.00783359282390	h
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2.28327469307056	-4.14743171261068	-5.00783359282390	h
4.91929145546857	2.16535799481738	-7.98573476253693	h
-4.91929145546857	2.16535799481738	7.98573476253693	h
4.91929145546857	-2.16535799481738	7.98573476253693	h
-4.91929145546857	-2.16535799481738	7.98573476253693	h
4.91929145546857	2.16535799481738	7.98573476253693	h
-4.91929145546857	2.16535799481738	-7.98573476253693	h
4.91929145546857	-2.16535799481738	-7.98573476253693	h

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 2.28091549276457     2.20586439723469   -10.06010383282289  h
-2.28091549276457     2.20586439723469    10.06010383282289  h
 2.28091549276457    -2.20586439723469    10.06010383282289  h
-2.28091549276457    -2.20586439723469    10.06010383282289  h
 2.28091549276457     2.20586439723469    10.06010383282289  h
-2.28091549276457     2.20586439723469   -10.06010383282289  h
 2.28091549276457    -2.20586439723469   -10.06010383282289  h
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