

Regio- and stereoselective hydrosilylation of alkynes catalyzed by SiO₂ support Pd-Cu bimetallic nanoparticles

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synergistic effects

1. General Considerations

All chemical reagents are obtained from commercial suppliers and used without further purification. ^1H NMR and ^{13}C NMR spectra are recorded on an AVANCE III Bruker spectrometer operating at 500 MHz and 125 MHz in CDCl_3 , respectively, and chemical shifts were reported in ppm relative to the center of the singlet at 7.27 ppm for CDCl_3 . GC-MS was performed on an ISQ Trace 1300 in the electron ionization (EI) mode. GC analyses are performed on an Agilent 7890A instrument (Column: Agilent 19091J-413: 30 m \times 320 μm \times 0.25 μm , carrier gas: H_2 , FID detection. Transmission electron microscopy (TEM) images were taken using a PHILIPS Tecnai 12 microscope operating at 120kv. High Resolution Transmission electron microscopy was performed on Philips-FEI Tecnai G2 F20 operating at 300kv. TEM samples were prepared by dispersing the catalyst (5mg) into ethanol (1.5 ml), following which one drop of the solution was placed on a carbon film covered copper grid and dried under air. X-ray photoelectron spectroscopy (XPS) were performed on a ESCALAB 250Xi spectrometer, using a Al $\text{K}\alpha$ X-ray source (1350 eV of photons) and calibrated by setting the C 1s peak to 284.80 eV. Inductively coupled plasma mass spectrometry (ICP-MS) was analyzed on Optima 7300 DV. Fouriertrans-forminfraredspectroscopy (FTIR) was recorded on NICOLET IS10 spectrometer.

2. Catalyst preparation

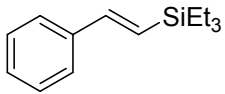
Nanoparticles immobilized on SiO_2 were prepared by impregnation-reduction method, and the composition of the bimetallic nanoparticles was controlled by adjusting the ratio of the metal precursors. In a typical procedure, Pd_1Cu_2 BMNPs supported on SiO_2 were prepared as following: 200 mg SiO_2 was dispersed into 100 mL aqueous solution of metal precursors (0.035 mmol PdCl_2 and 0.07 mmol CuCl_2) under ultrasonic. Lysine aqueous solution (0.53 M) was then added into the mixture with vigorous stirring for 30 min. To this suspension, NaBH_4 aqueous solution (0.05 M) was added dropwise, the color of the mixture would turn to black immediately indicating the formation of metal particles, the mixture was further stirred for 30 min and then aged for 24 h. Finally, the catalyst was collected by centrifugation, washed with water and ethanol for 3 times respectively, and then dried at room temperature under *vacuum* for 12h. The obtained black powder was $\text{Pd}_1\text{Cu}_2/\text{SiO}_2$ catalyst, which can be used as catalyst in the

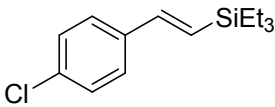
hydrosilylation reaction or characterized by spectroscopic techniques. Other BMNPs were prepared by the similar procedure except that the metal precursors was different.

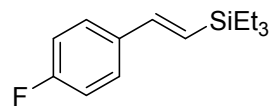
3. General Procedure

Typical procedure for Pd₁Cu₂/SiO₂ catalyzed regio- and stereoselective hydrosilylation of alkynes: 0.5 mmol alkynes, 2×10⁻³ mmol catalyst (based on metal palladium), 1 mmol triethylsilane, 0.5 mmol NaI and 1mL THF were sequentially added into a tube with a magnetic stir bar, and the resulting mixture was stirred at room temperature for 1 h. Upon completion of the reaction, the catalyst was filtrated and washed with water and EtOH, dried under air and then directly reused under the same conditions. The reaction solution was diluted with ethyl acetate, washed with water, dried over anhydrous Na₂SO₄, the solution was further diluted by ethyl acetate and then analyzed by gas chromatography (GC) and GC-mass spectroscopy (GC-MS). Finally, the solvent was removed under reduced pressure and the residue was purified (if necessary) by flash chromatography using *n*-pentane as the eluent to give corresponding vinylsilanes.

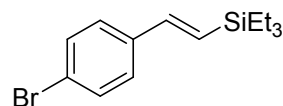
Characterization Data

 **(E)-triethyl(styryl)silane (3a)** ¹H NMR (500 MHz, CDCl₃) δ 7.48 (d, *J* = 7.7 Hz, 2H), 7.36 (t, *J* = 7.6 Hz, 2H), 7.30 – 7.26 (m, 1H), 6.93 (d, *J* = 19.3 Hz, 1H), 6.46 (d, *J* = 19.3 Hz, 1H), 1.02 (d, *J* = 8.2 Hz, 9H), 0.70 (q, *J* = 7.9 Hz, 6H). ¹³C NMR (126 MHz, CDCl₃) δ 143.90, 137.60, 127.55, 126.94, 125.52, 125.18, 6.46, 2.60. **MS (EI)** *m/z*: 218[M⁺]. IR (cm⁻¹): 2953, 2909, 2874, 1603, 1494, 1457, 1416, 1237, 1016, 989, 908, 827, 785, 735, 689.

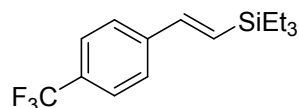
 **(E)-(4-chlorostyryl)triethylsilane (3b)** ¹H NMR (500 MHz, CDCl₃) δ 7.38 (d, *J* = 8.5 Hz, 2H), 7.30 (d, *J* = 8.5 Hz, 2H), 6.85 (d, *J* = 19.3 Hz, 1H), 6.42 (d, *J* = 19.3 Hz, 1H), 1.00 (t, *J* = 7.9 Hz, 9H), 0.68 (q, *J* = 7.9 Hz, 6H). ¹³C NMR (126 MHz, CDCl₃) δ 142.49, 136.05, 132.55, 127.68, 126.57, 126.01, 6.43, 2.52. **MS (EI)** *m/z*: 252 [M⁺]. IR (cm⁻¹): 2953, 2909, 2874, 1610, 1452, 1460, 1419, 1241, 1019, 989, 908, 827, 785, 735, 700.



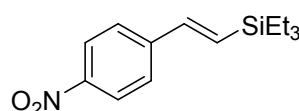
(E)-triethyl(4-fluorostyryl)silane (3c) ¹H NMR (500 MHz, CDCl₃) δ 7.42 (dd, $J = 8.6, 5.5$ Hz, 2H), 7.03 (t, $J = 8.7$ Hz, 2H), 6.86 (d, $J = 19.3$ Hz, 1H), 6.34 (d, $J = 19.3$ Hz, 1H), 1.00 (t, $J = 7.9$ Hz, 9H), 0.68 (q, $J = 7.9$ Hz, 6H). ¹³C NMR (126 MHz, CDCl₃) δ 162.59, 160.63, 142.55, 133.82, 126.88, 124.71, 114.48, 114.30, 6.43, 2.55. **MS (EI)** m/z : 236 [M⁺]. IR (cm⁻¹): 2954, 2910, 2875, 1602, 1507, 1458, 1411, 1232, 1156, 1093, 1014, 987, 908, 849, 792, 760, 733.



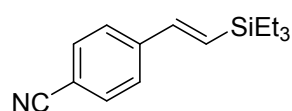
(E)-(4-bromostyryl)triethylsilane (3d) ¹H NMR (500 MHz, CDCl₃) δ 7.45 (d, $J = 8.1$ Hz, 2H), 7.31 (d, $J = 8.1$ Hz, 2H), 6.83 (d, $J = 19.3$ Hz, 1H), 6.43 (d, $J = 19.3$ Hz, 1H), 0.99 (t, $J = 7.9$ Hz, 9H), 0.67 (q, $J = 7.9$ Hz, 6H). ¹³C NMR (126 MHz, CDCl₃) δ 142.53, 136.48, 130.64, 126.90, 126.23, 120.75, 76.34, 76.08, 75.83, 6.45, 2.51. **MS (EI)** m/z : 296 [M⁺]. IR (cm⁻¹): 2952, 2909, 2873, 1603, 1486, 1457, 1415, 1397, 1236, 1212, 1072, 1008, 986, 906, 846, 828, 781, 719.



(E)-triethyl(4-(trifluoromethyl)styryl)silane (3e) ¹H NMR (500 MHz, CDCl₃) δ 7.59 (d, $J = 8.1$ Hz, 2H), 7.54 (d, $J = 8.1$ Hz, 2H), 6.92 (d, $J = 19.3$ Hz, 1H), 6.57 (d, $J = 19.3$ Hz, 1H), 1.00 (t, $J = 7.9$ Hz, 9H), 0.69 (q, $J = 7.9$ Hz, 6H). ¹³C NMR (126 MHz, CDCl₃) δ 142.34, 140.82, 128.65, 125.01, 122.21, 76.31, 76.06, 75.81, 6.40, 2.46. ¹⁹F NMR (470 MHz, CDCl₃) δ -62.37. **MS (EI)** m/z : 286 [M⁺]. IR (cm⁻¹): 2955, 2911, 2876, 1615, 1574, 1458, 1412, 1322, 1236, 1214, 1201, 1163, 1123, 1106, 1066, 1015, 987, 857, 836, 785, 755, 720.

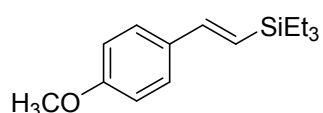


(E)-triethyl(4-nitrostyryl)silane (3f) ¹H NMR (500 MHz, CDCl₃) δ 8.19 (d, $J = 8.4$ Hz, 2H), 7.56 (d, $J = 8.4$ Hz, 2H), 6.94 (d, $J = 19.3$ Hz, 1H), 6.67 (d, $J = 19.3$ Hz, 1H), 1.00 (t, $J = 7.9$ Hz, 9H), 0.69 (q, $J = 7.9$ Hz, 6H). ¹³C NMR (126 MHz, CDCl₃) δ 143.48, 141.46, 132.02, 125.89, 123.01, 76.32, 76.07, 75.82, 6.40, 2.38. **MS (EI)** m/z : 263 [M⁺]. IR (cm⁻¹): 2955, 2875, 1593, 1519, 1343, 1110, 1066, 1014, 988, 909, 861, 816, 804, 782, 739.

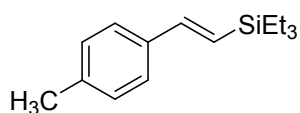


(E)-4-(2-(triethylsilyl)vinyl)benzonitrile (3g) ¹H NMR (500 MHz, CDCl₃) δ 7.62 (d, $J = 8.0$ Hz, 2H), 7.51 (d, $J = 8.0$ Hz, 2H), 6.88 (d, $J = 19.3$ Hz, 1H), 6.60 (d, $J = 19.3$ Hz, 1H), 0.98 (t, $J = 7.9$ Hz, 9H), 0.68 (q, $J = 7.9$ Hz, 6H). ¹³C NMR (126 MHz, CDCl₃) δ 141.90, 131.05,

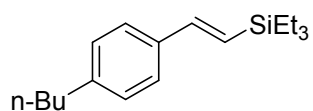
125.84, 118.05, 110.04, 76.32, 76.06, 75.81, 6.39, 2.39. **MS (EI)** *m/z*: 243 [M⁺]. IR (cm⁻¹): 2953, 2910, 2874, 2227, 1604, 1507, 1457, 1409, 1378, 1284, 1236, 1197, 1174, 1015, 987, 858, 839, 784, 723, 679, 547.



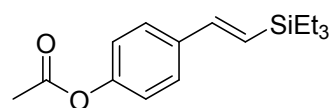
(E)-triethyl(4-methoxystyryl)silane (3h) ¹H NMR (500 MHz, CDCl₃) δ 7.38 (d, *J* = 8.7 Hz, 2H), 6.89 – 6.79 (m, 3H), 6.25 (d, *J* = 19.3 Hz, 1H), 3.81 (s, 3H), 0.98 (t, *J* = 7.9 Hz, 9H), 0.65 (q, *J* = 7.9 Hz, 6H). ¹³C NMR (126 MHz, CDCl₃) δ 158.53, 143.22, 130.63, 126.56, 122.09, 112.92, 76.31, 76.06, 75.81, 54.37, 6.47, 2.63. **MS (EI)** *m/z*: 248 [M⁺]. IR (cm⁻¹): 2952, 2910, 2873, 1606, 1570, 1509, 1464, 1417, 1303, 1295, 1250, 1171, 1106, 1037, 1016, 986, 907, 843, 790, 750, 731.



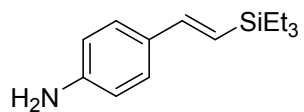
(E)-triethyl(4-methylstyryl)silane (3i) ¹H NMR (500 MHz, CDCl₃) δ 7.28 (d, *J* = 8.1 Hz, 2H), 7.07 (d, *J* = 7.9 Hz, 2H), 6.80 (d, *J* = 19.3 Hz, 1H), 6.29 (d, *J* = 19.3 Hz, 1H), 2.27 (s, 3H), 0.91 (t, *J* = 7.9 Hz, 9H), 0.59 (q, *J* = 7.9 Hz, 6H). ¹³C NMR (126 MHz, CDCl₃) δ 143.73, 136.80, 134.92, 128.24, 125.28, 123.58, 76.33, 76.08, 75.82, 20.27, 6.47, 2.60. **MS (EI)** *m/z*: 232 [M⁺]. IR (cm⁻¹): 2954, 2910, 2874, 1608, 1510, 1458, 1415, 1237, 1017, 987, 908, 791, 780, 733.



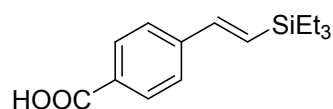
(E)-(4-butylstyryl)triethylsilane (3j) ¹H NMR (500 MHz, DMSO) δ 7.28 (d, *J* = 7.7 Hz, 2H), 7.04 (d, *J* = 7.9 Hz, 2H), 6.76 (d, *J* = 19.4 Hz, 1H), 6.26 (d, *J* = 19.4 Hz, 1H), 2.38 (s, 2H), 1.40 (dd, *J* = 14.8, 7.2 Hz, 2H), 1.16 (dd, *J* = 14.8, 7.4 Hz, 2H), 0.83 (t, *J* = 7.9 Hz, 9H), 0.76 (t, *J* = 7.3 Hz, 3H), 0.51 (q, *J* = 7.9 Hz, 6H). ¹³C NMR (126 MHz, DMSO) δ 144.32, 128.00, 125.72, 123.17, 39.14, 38.97, 38.80, 34.75, 32.52, 21.15, 13.24, 6.81, 2.53. **MS (EI)** *m/z*: 274 [M⁺]. IR (cm⁻¹): 2953, 2909, 2874, 1938, 1768, 1610, 1452, 1460, 1419, 1344, 1241, 1019, 989, 908, 827, 785, 735, 700.



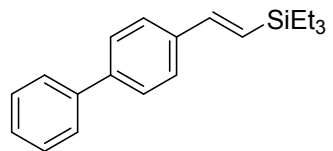
(E)-4-(2-(triethylsilyl)vinyl)phenyl acetate (3k) ¹H NMR (500 MHz, CDCl₃) δ 7.37 (d, *J* = 8.5 Hz, 2H), 6.98 (d, *J* = 8.5 Hz, 2H), 6.79 (d, *J* = 19.3 Hz, 1H), 6.30 (d, *J* = 19.3 Hz, 1H), 2.23 (s, 3H), 0.90 (t, *J* = 7.9 Hz, 9H), 0.58 (q, *J* = 7.9 Hz, 6H). ¹³C NMR (126 MHz, CDCl₃) δ 169.65, 143.83, 136.51, 127.40, 126.47, 121.73, 77.41, 77.16, 76.91, 21.29, 7.53, 3.62. **MS (EI)** *m/z*: 276 [M⁺]. IR (cm⁻¹): 2953, 2910, 2874, 1763, 1603, 1504, 1458, 1412, 1369, 1200, 1164, 1015, 987, 908, 858, 788, 768, 730.



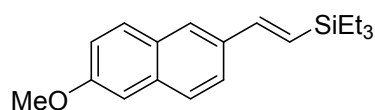
(E)-4-(2-(triethylsilyl)vinyl)aniline (3l) $^1\text{H NMR}$ (500 MHz, CDCl_3) δ 7.13 (t, $J = 7.7$ Hz, 1H), 6.83 (dd, $J = 23.7, 13.4$ Hz, 3H), 6.60 (d, $J = 7.9$ Hz, 1H), 6.37 (d, $J = 19.3$ Hz, 1H), 3.65 (s, 2H), 0.98 (t, $J = 7.9$ Hz, 9H), 0.65 (q, $J = 7.9$ Hz, 6H). $^{13}\text{C NMR}$ (126 MHz, CDCl_3) δ 143.97, 128.47, 124.68, 116.21, 113.94, 111.75, 76.34, 76.08, 75.83, 6.47, 2.56. **MS (EI)** m/z : 233 [M^+]. IR (cm^{-1}): 3461, 3368, 2953, 2909, 2873, 1618, 1580, 1489, 1457, 1416, 1303, 1237, 1202, 1163, 1016, 987, 908, 866, 796, 769, 755, 731, 684.



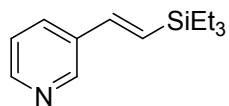
(E)-4-(2-(triethylsilyl)vinyl)benzoic acid (3m) $^1\text{H NMR}$ (500 MHz, DMSO) δ 12.78 (s, 1H), 7.78 (d, $J = 8.0$ Hz, 2H), 7.47 (d, $J = 7.9$ Hz, 2H), 6.85 (d, $J = 19.4$ Hz, 1H), 6.50 (d, $J = 19.4$ Hz, 1H), 0.81 (t, $J = 7.9$ Hz, 9H), 0.51 (q, $J = 7.8$ Hz, 6H). $^{13}\text{C NMR}$ (126 MHz, DMSO) δ 166.53, 143.34, 141.23, 129.55, 129.16, 128.27, 125.79, 40.26, 40.12, 40.02, 39.47, 39.31, 39.14, 38.97, 38.81, 38.64, 6.75, 2.40. **MS (EI)** m/z : 262 [M^+]. IR (cm^{-1}): 3602, 2953, 2909, 2874, 1760, 1722, 1603, 1494, 1457, 1416, 1237, 1016, 989, 935, 908, 827, 785, 735, 689.



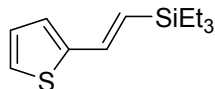
(E)-2-([1,1'-biphenyl]-4-yl)vinyltriethylsilane (3n) $^1\text{H NMR}$ (500 MHz, CDCl_3) δ 7.63 (dd, $J = 13.3, 7.8$ Hz, 4H), 7.57 (d, $J = 8.2$ Hz, 2H), 7.48 (t, $J = 7.6$ Hz, 2H), 7.38 (t, $J = 7.4$ Hz, 1H), 6.99 (d, $J = 19.3$ Hz, 1H), 6.53 (d, $J = 19.3$ Hz, 1H), 1.06 (t, $J = 7.9$ Hz, 9H), 0.73 (q, $J = 7.9$ Hz, 6H). $^{13}\text{C NMR}$ (126 MHz, CDCl_3) δ 144.45, 140.89, 140.78, 137.66, 128.91, 127.42, 127.35, 127.10, 126.89, 126.28, 77.41, 77.16, 76.91, 7.57, 3.68. **MS (EI)** m/z : 294 [M^+]. IR (cm^{-1}): 2952, 2908, 2873, 1602, 1554, 1517, 1486, 1457, 1406, 1378, 1236, 1075, 1006, 987, 907, 854, 835, 786, 755, 728, 695, 597.



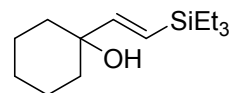
(E)-triethyl(2-(6-methoxynaphthalen-2-yl)vinyl)silane (3o) $^1\text{H NMR}$ (500 MHz, CDCl_3) δ 7.73 – 7.64 (m, 4H), 7.15 – 7.09 (m, 2H), 7.03 (d, $J = 19.3$ Hz, 1H), 6.49 (d, $J = 19.3$ Hz, 1H), 3.92 (s, 3H), 1.02 (t, $J = 7.9$ Hz, 9H), 0.69 (q, $J = 7.9$ Hz, 6H). $^{13}\text{C NMR}$ (126 MHz, CDCl_3) δ 156.85, 143.93, 133.48, 133.04, 128.72, 128.05, 126.00, 125.41, 124.08, 122.96, 117.98, 104.90, 76.33, 76.07, 75.82, 54.36, 6.51, 2.64. **MS (EI)** m/z : 298 [M^+]. IR (cm^{-1}): 2951, 2907, 2872, 1628, 1602, 1585, 1571, 1501, 1480, 1462, 1438, 1412, 1390, 1341, 1268, 1240, 1203, 1175, 1164, 1148, 1118, 1031, 1004, 987, 962, 930, 898, 855, 825, 801, 787, 758, 716, 671, 653, 613.



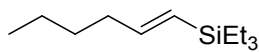
(E)-3-(2-(triethylsilyl)vinyl)pyridine (3p) $^1\text{H NMR}$ (500 MHz, DMSO) δ 8.44 (d, $J = 100.0$ Hz, 2H), 7.76 (d, $J = 7.5$ Hz, 1H), 7.21 (s, 1H), 6.79 (d, $J = 19.5$ Hz, 1H), 6.44 (d, $J = 19.4$ Hz, 1H), 0.81 – 0.76 (m, 9H), 0.47 (q, $J = 7.9$ Hz, 6H). $^{13}\text{C NMR}$ (126 MHz, DMSO) δ 148.85, 148.16, 141.45, 132.37, 128.01, 123.59, 39.85, 39.69, 39.52, 39.35, 39.19, 7.07, 6.61, 5.68, 2.90. **MS (EI)** m/z : 219 [M⁺]. IR (cm^{-1}): 3050, 3000, 2953, 2910, 2874, 1605, 1458, 1411, 1237, 1207, 1015, 988, 907, 859, 835, 773, 727, 703.



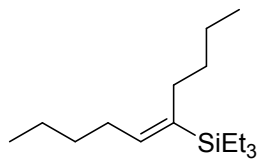
(E)-triethyl(2-(thiophen-2-yl)vinyl)silane (3q) $^1\text{H NMR}$ (500 MHz, CDCl_3) δ 7.21 (d, $J = 5.0$ Hz, 1H), 7.19 – 7.14 (m, 1H), 7.11 (s, 1H), 6.81 (d, $J = 19.2$ Hz, 1H), 6.11 (d, $J = 19.2$ Hz, 1H), 0.90 (t, $J = 7.9$ Hz, 9H), 0.56 (q, $J = 8.0$ Hz, 6H). $^{13}\text{C NMR}$ (126 MHz, CDCl_3) δ 141.41, 137.69, 124.89, 124.64, 123.93, 121.43, 76.34, 76.08, 75.83, 6.46, 2.56. **MS (EI)** m/z : 224 [M⁺]. IR (cm^{-1}): 2952, 2909, 2873, 1604, 1510, 1457, 1415, 1376, 1241, 1198, 1152, 1081, 1011, 984, 936, 906, 865, 838, 791, 758, 724, 667.



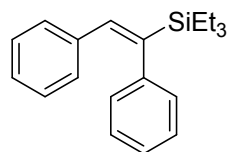
(E)-1-(2-(triethylsilyl)vinyl)cyclohexan-1-ol (3r) $^1\text{H NMR}$ (500 MHz, CDCl_3) δ 6.07 (d, $J = 19.1$ Hz, 1H), 5.70 (d, $J = 19.1$ Hz, 1H), 1.44 (dd, $J = 10.5, 6.0$ Hz, 10H), 0.84 (t, $J = 7.9$ Hz, 9H), 0.51 – 0.46 (m, 6H). $^{13}\text{C NMR}$ (126 MHz, CDCl_3) δ 153.81, 120.22, 76.32, 76.07, 75.82, 71.75, 36.60, 24.59, 21.15, 6.36, 2.48. **MS (EI)** m/z : 240 [M⁺]. IR (cm^{-1}): 3378, 2954, 2934, 2874, 1621, 1449, 1416, 1237, 1171, 994, 907, 852, 803, 733.



(E)-triethyl(hex-1-enyl)silane (3s) $^1\text{H NMR}$ (500 MHz, CDCl_3) δ 6.02 (dd, $J = 15.6, 9.3$ Hz, 1H), 5.53 (d, $J = 18.7$ Hz, 1H), 2.12 (q, $J = 6.5$ Hz, 2H), 1.39 – 1.28 (m, 4H), 0.96 – 0.87 (m, 12H), 0.54 (q, $J = 7.9$ Hz, 6H). $^{13}\text{C NMR}$ (126 MHz, CDCl_3) δ 147.84, 124.53, 76.32, 76.06, 75.81, 35.80, 30.08, 21.24, 13.03, 6.43, 2.60. **MS (EI)** m/z : 198 [M⁺]. IR (cm^{-1}): 2955, 2926, 2874, 1617, 1459, 1378, 1066, 1017, 907, 783, 734, 650.

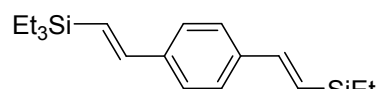


(E)-dec-5-en-5-yltriethylsilane (3t) $^1\text{H NMR}$ (500 MHz, CDCl_3) δ 5.67 (t, $J = 6.8$ Hz, 1H), 2.11 (dd, $J = 13.9, 6.9$ Hz, 2H), 2.08 – 2.04 (m, 2H), 1.36 – 1.24 (m, 8H), 0.92 (dd, $J = 11.0, 5.1$ Hz, 15H), 0.58 (dd, $J = 11.2, 4.4$ Hz, 6H). $^{13}\text{C NMR}$ (126 MHz, CDCl_3) δ 142.06, 137.39, 77.41, 77.16, 76.91, 32.63, 32.13, 29.90, 28.29, 23.38, 22.64, 14.17, 7.58, 3.32. **MS (EI)** m/z : 254 [M⁺]. IR (cm^{-1}): 2954, 2928, 2873, 1609, 1458, 1417, 1378, 1237, 1007, 971, 842, 714, 670.



(E)-(1,2-diphenylvinyl)triethylsilane (3u) ¹H NMR (500 MHz, CDCl₃) δ 7.23 (t, J = 7.6 Hz, 2H), 7.14 (d, J = 7.2 Hz, 1H), 7.04 – 7.00 (m, 3H), 6.94 (d, J = 7.3 Hz, 2H), 6.91 – 6.86 (m, 2H), 6.71 (s, 1H), 0.90 (t, J = 7.9 Hz, 9H), 0.59 (q, J = 7.9 Hz, 6H). ¹³C NMR

(126 MHz, CDCl₃) δ 144.25, 143.31, 138.88, 137.55, 129.65, 128.74, 128.01, 127.42, 127.09, 125.65, 77.41, 77.16, 76.91, 7.46, 2.90. **MS (EI)** m/z: 294 [M⁺]. IR (cm⁻¹): 2952, 2909, 2873, 1599, 1493, 1446, 1415, 1377, 1237, 1071, 1005, 964, 946, 908, 803, 766, 755, 730, 691.

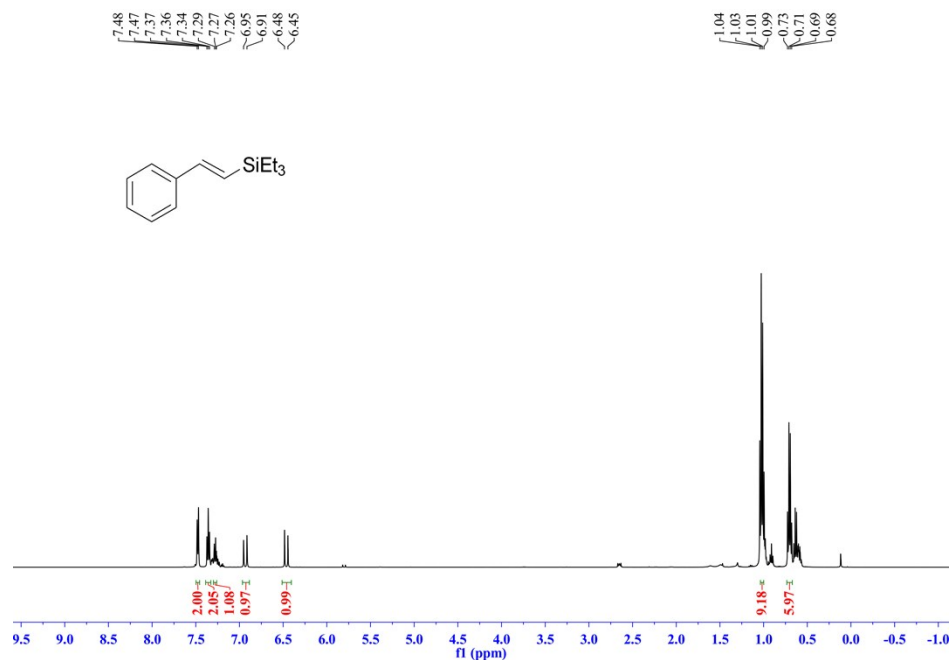


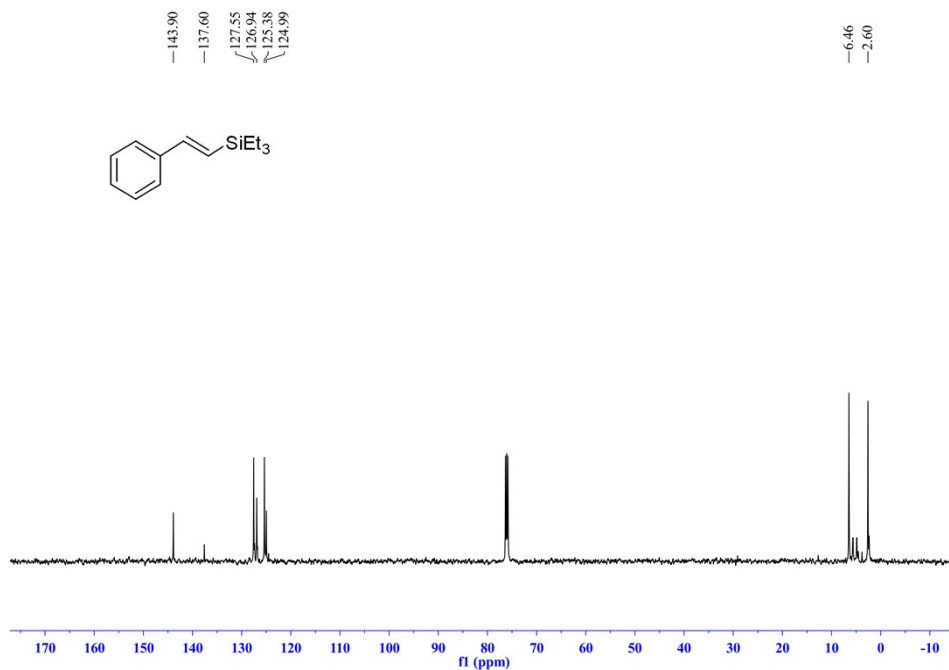
1,4-bis((E)-2-(triethylsilyl)vinyl)benzene (3v) ¹H NMR (500

MHz, CDCl₃) δ 7.34 (s, 4H), 6.81 (d, J = 19.3 Hz, 2H), 6.36 (d, J = 19.3 Hz, 2H), 0.92 (dd, J = 9.7, 6.1 Hz, 18H), 0.60 (q, J = 7.9 Hz, 12H). ¹³C NMR (126 MHz, CDCl₃) δ 143.58, 137.22, 125.59, 124.98, 76.37, 76.12, 75.87, 6.52, 2.65. **MS (EI)** m/z: 358 [M⁺]. IR (cm⁻¹): 2953, 2909, 2874, 1603, 1506, 1457, 1411, 1237, 1197, 1013, 986, 907, 861, 799, 772, 732.

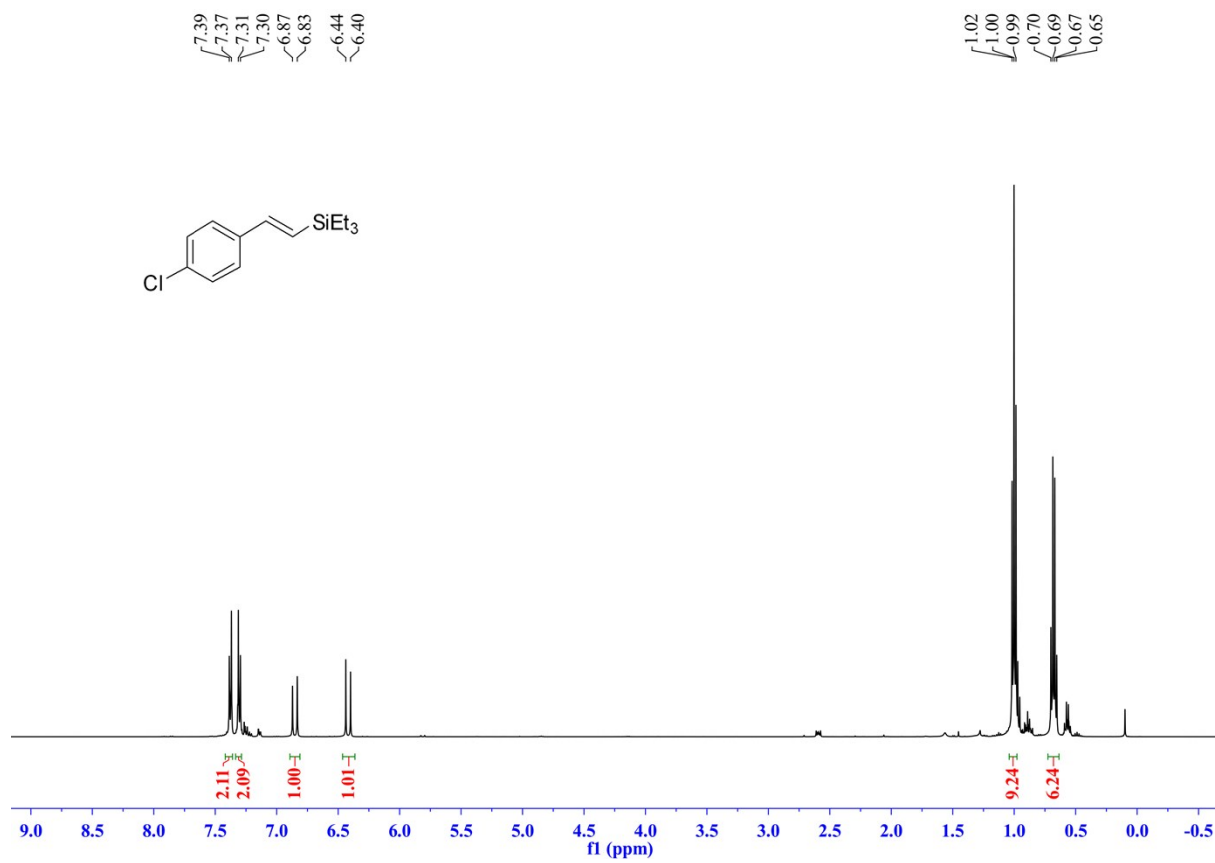
NMR Spectra

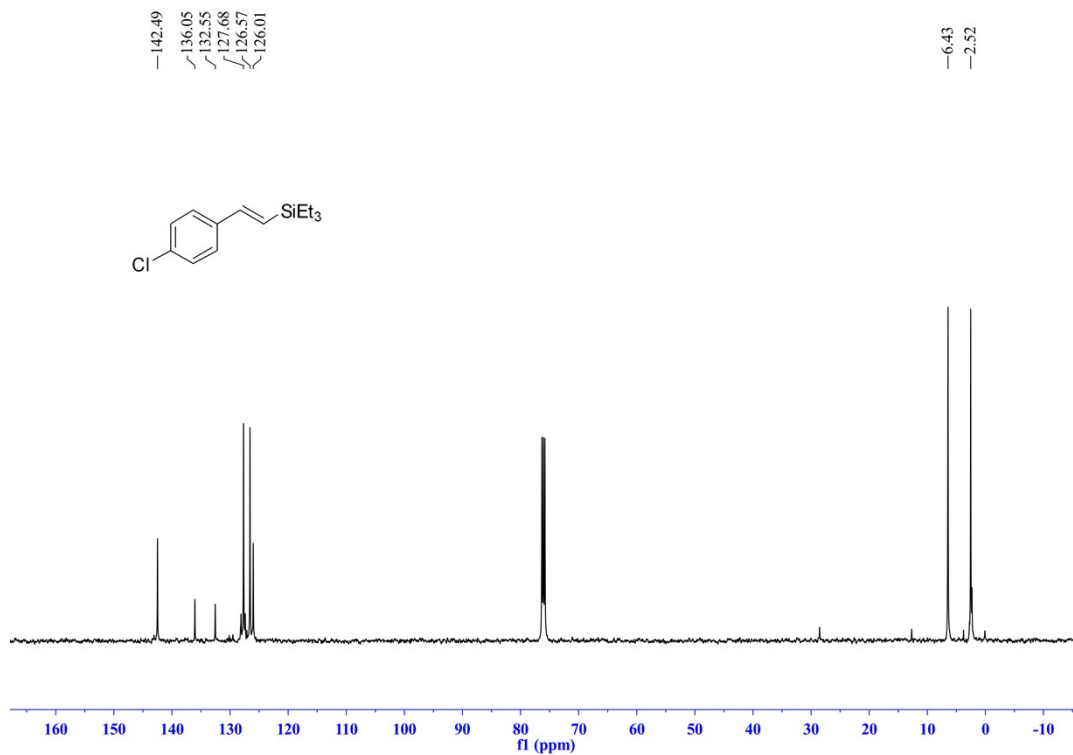
3a (E)-triethyl(styryl)silane



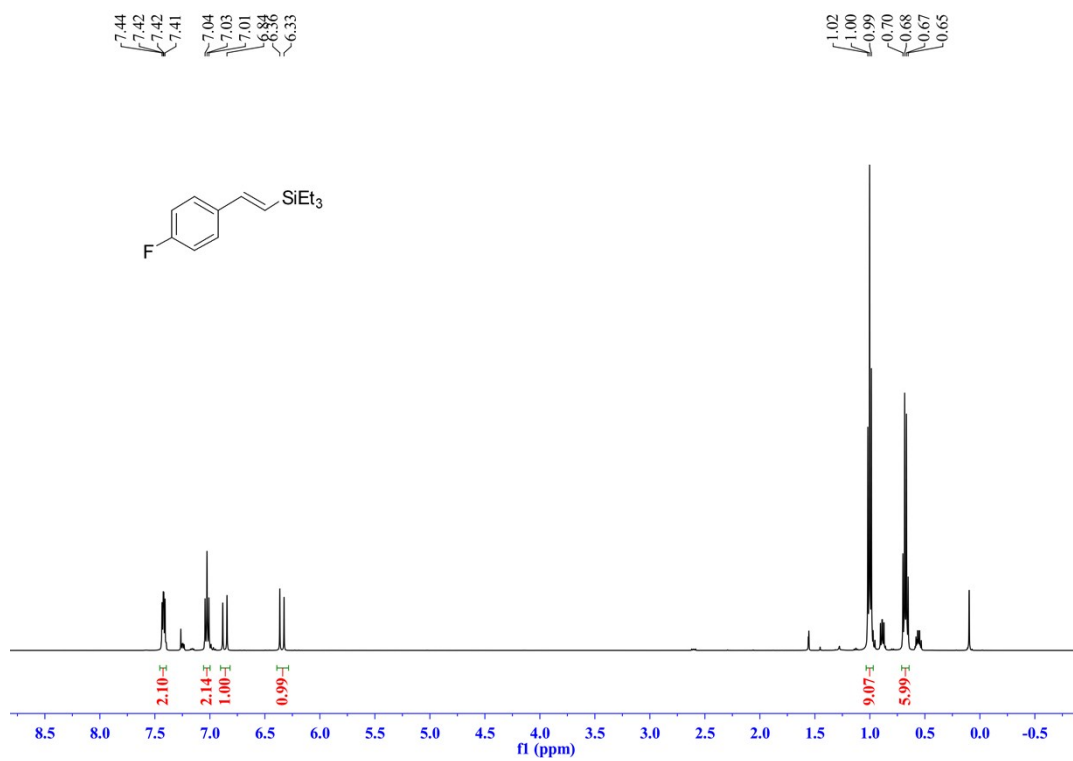


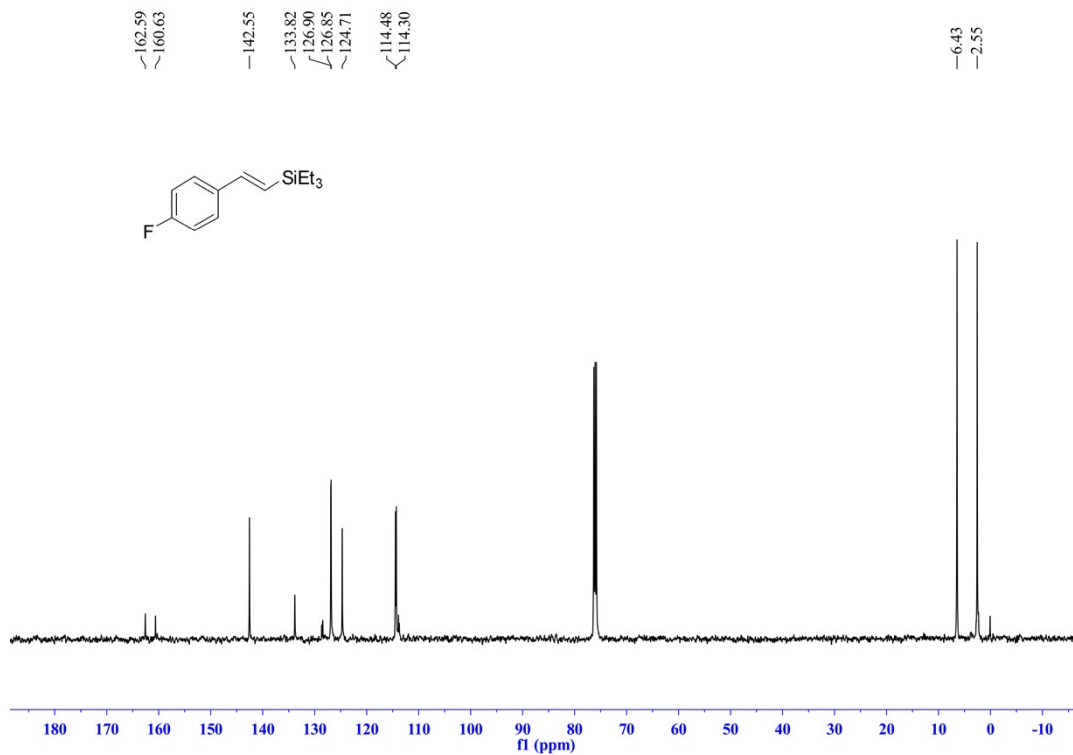
3b (*E*)-(4-chlorostyryl)triethylsilane



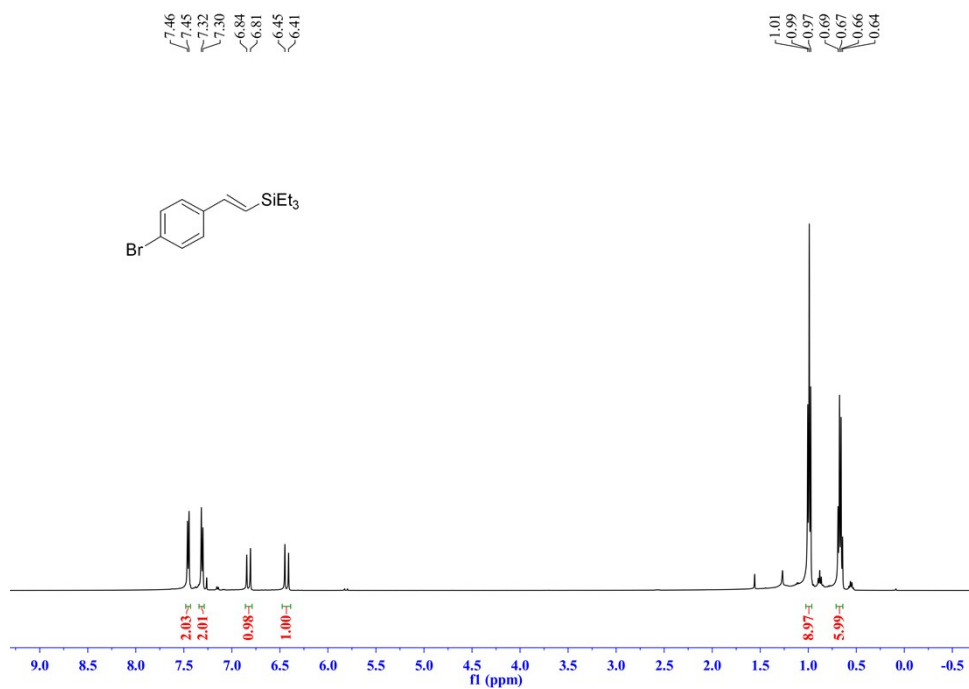


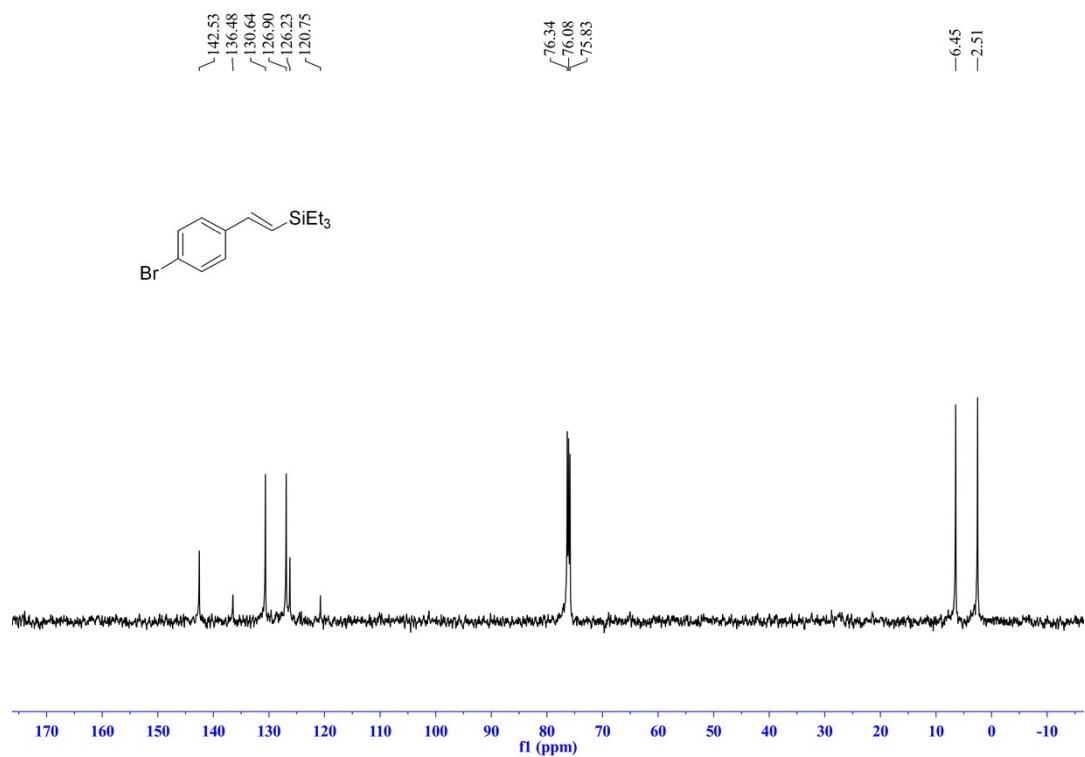
3c (E)-triethyl(4-fluorostyryl)silane



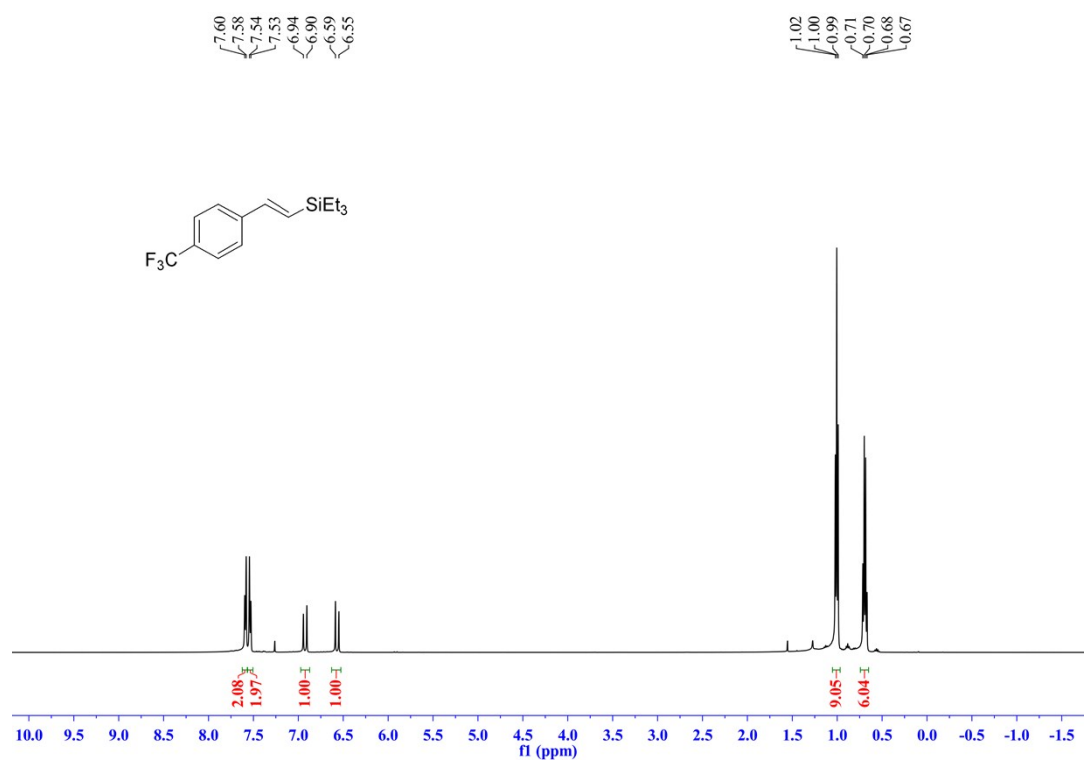


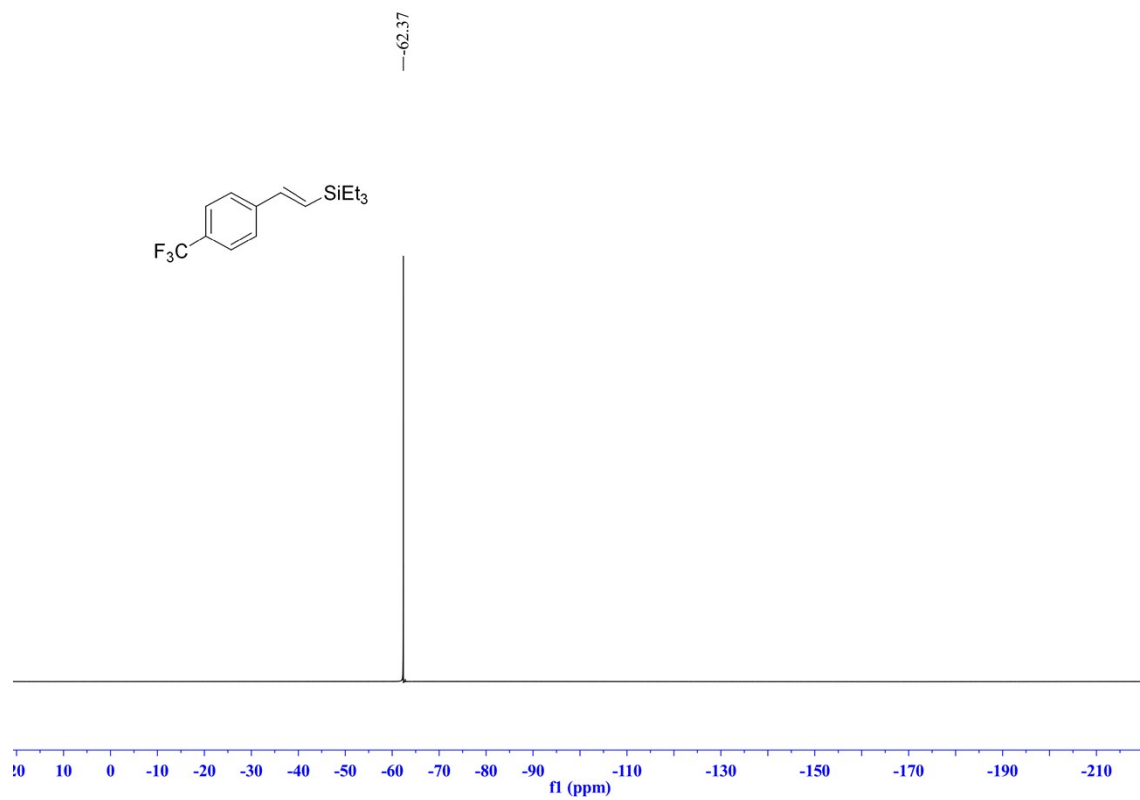
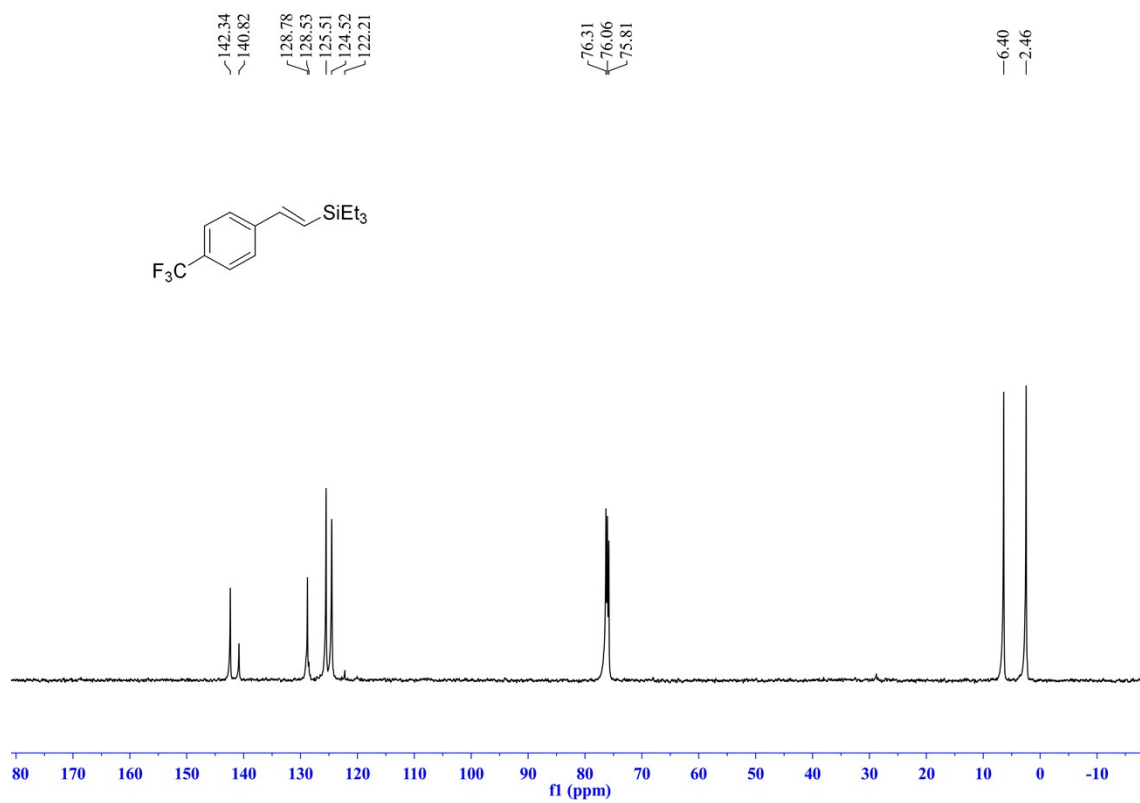
3d (*E*)-(4-bromostyryl)triethylsilane



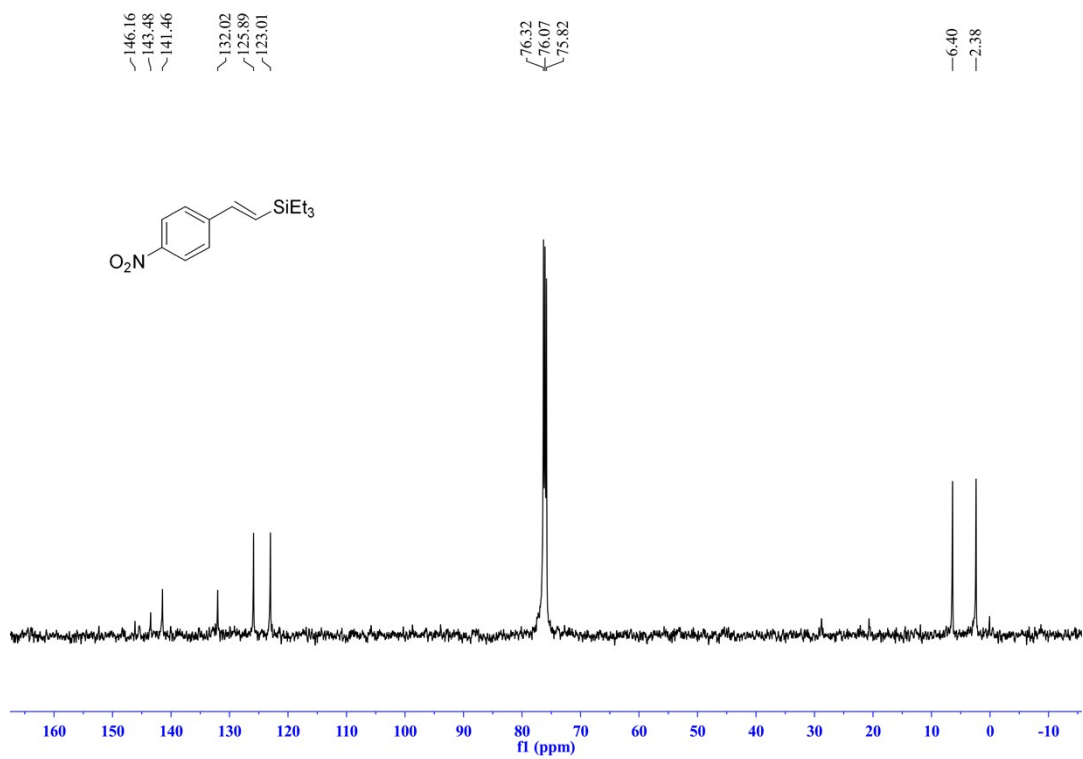
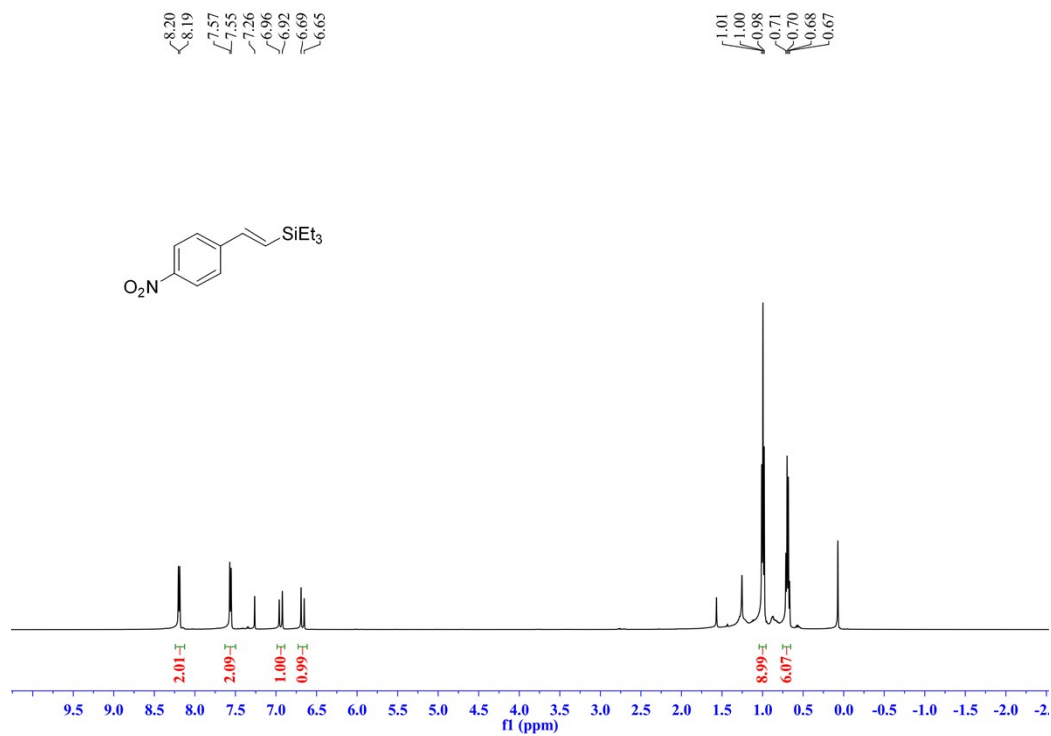


3e (*E*)-triethyl(4-(trifluoromethyl)styryl)silane

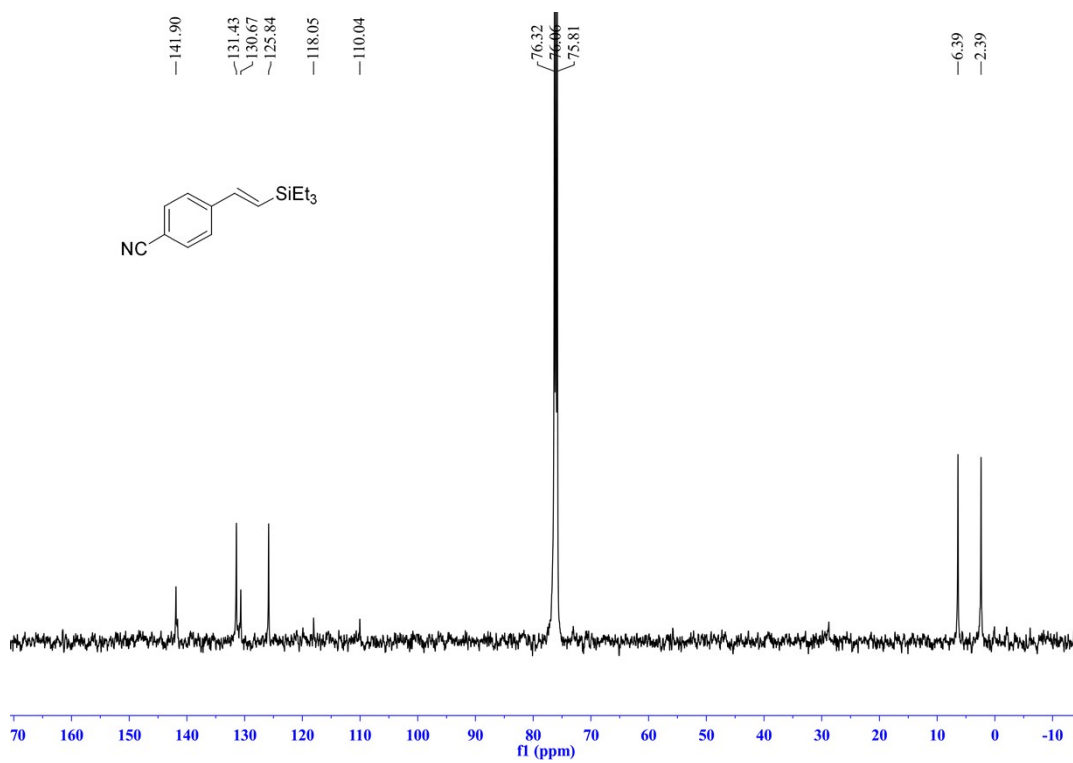
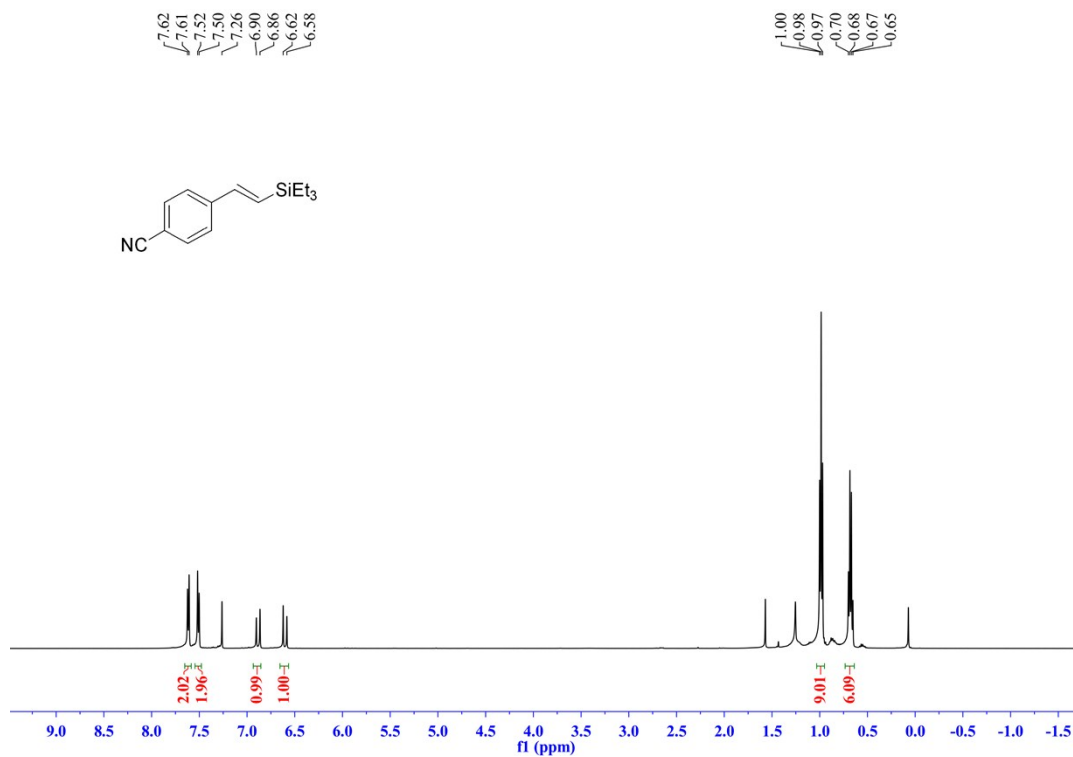




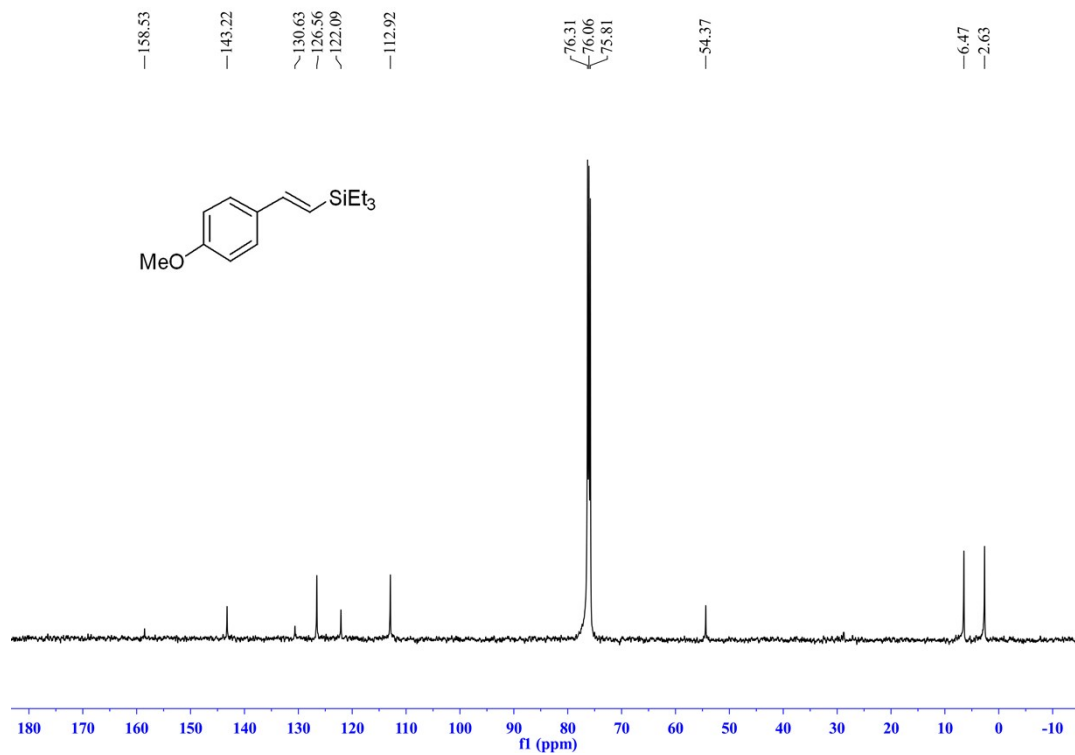
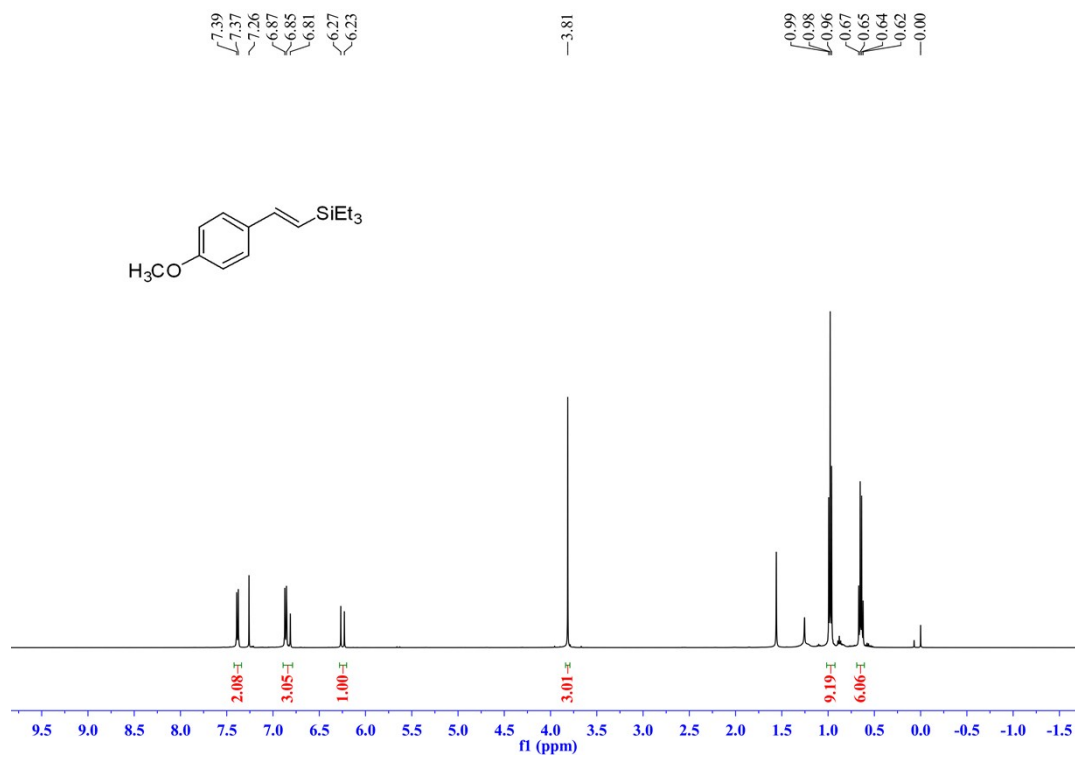
3f (*E*)-triethyl(4-nitrostyryl)silane



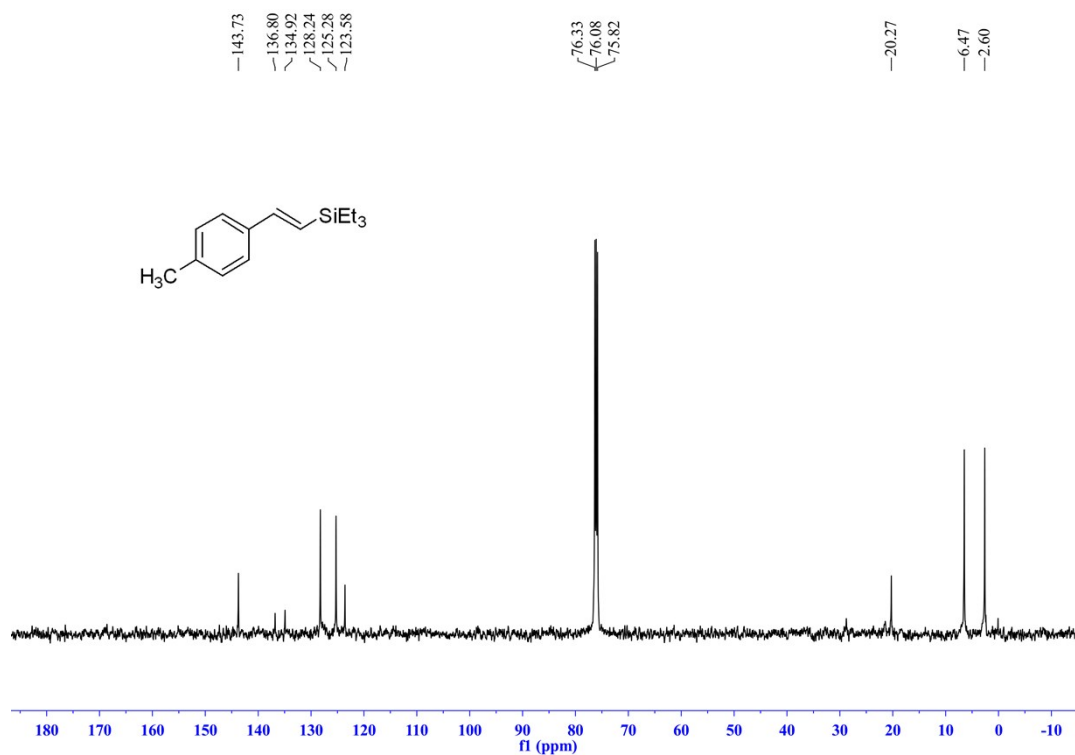
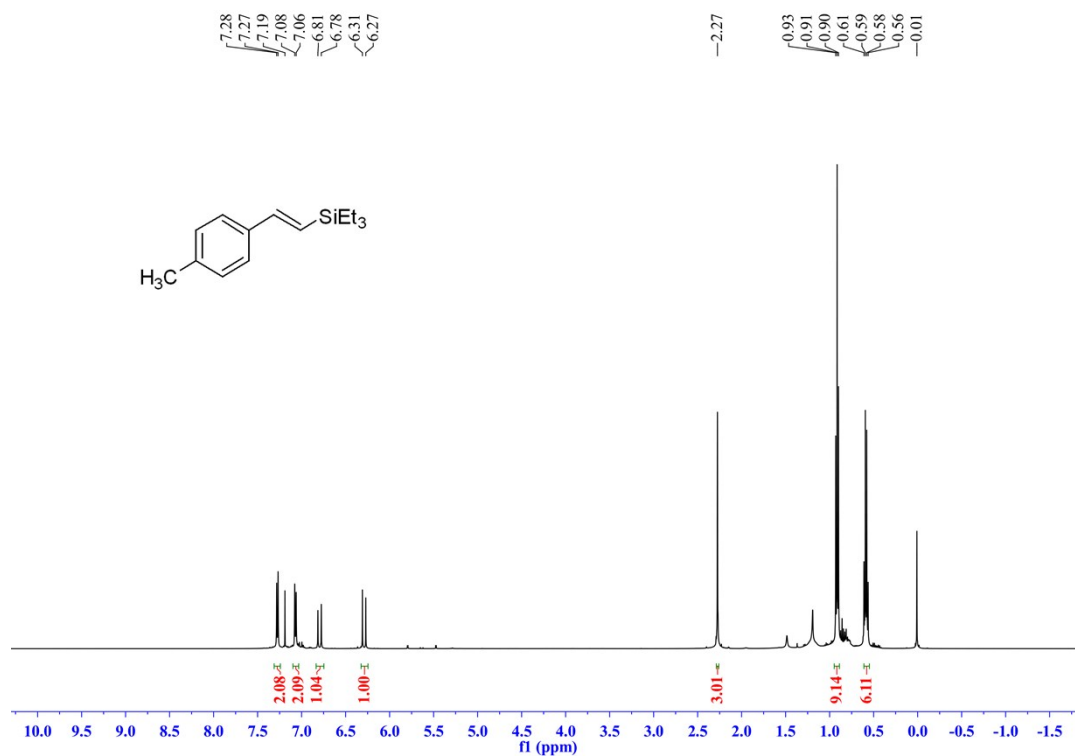
3g (*E*)-4-(2-(triethylsilyl)vinyl)benzonitrile



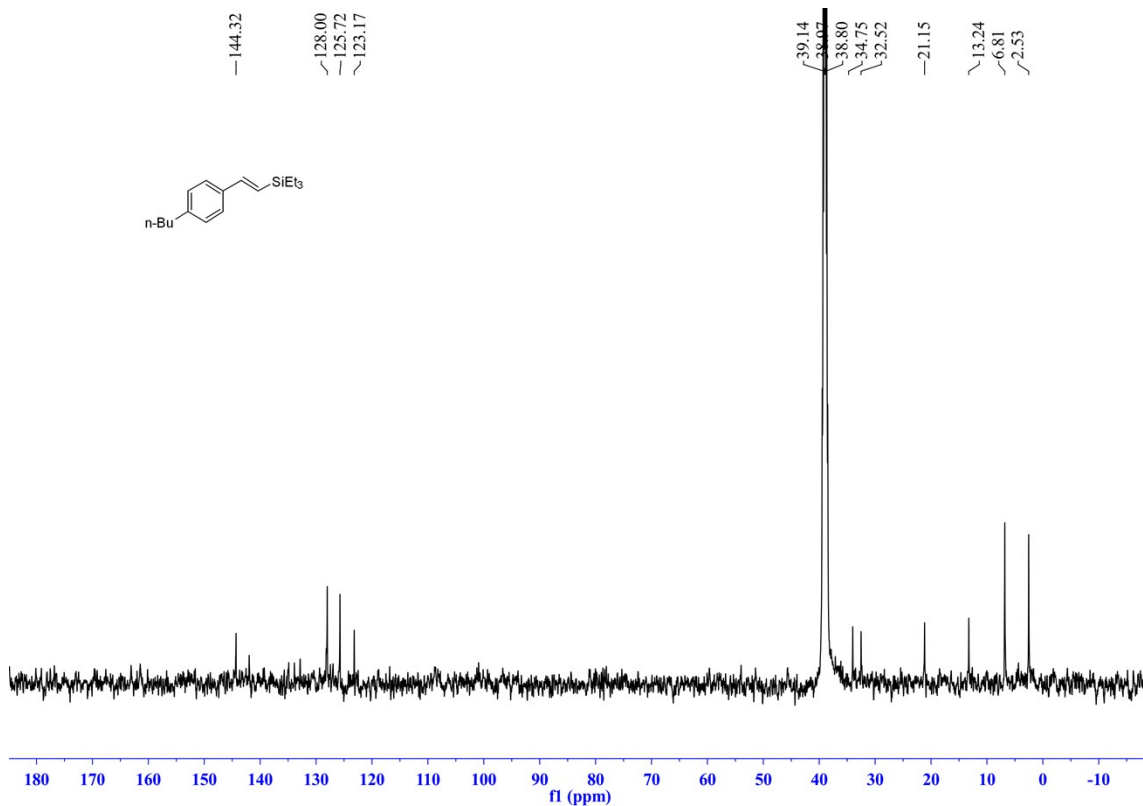
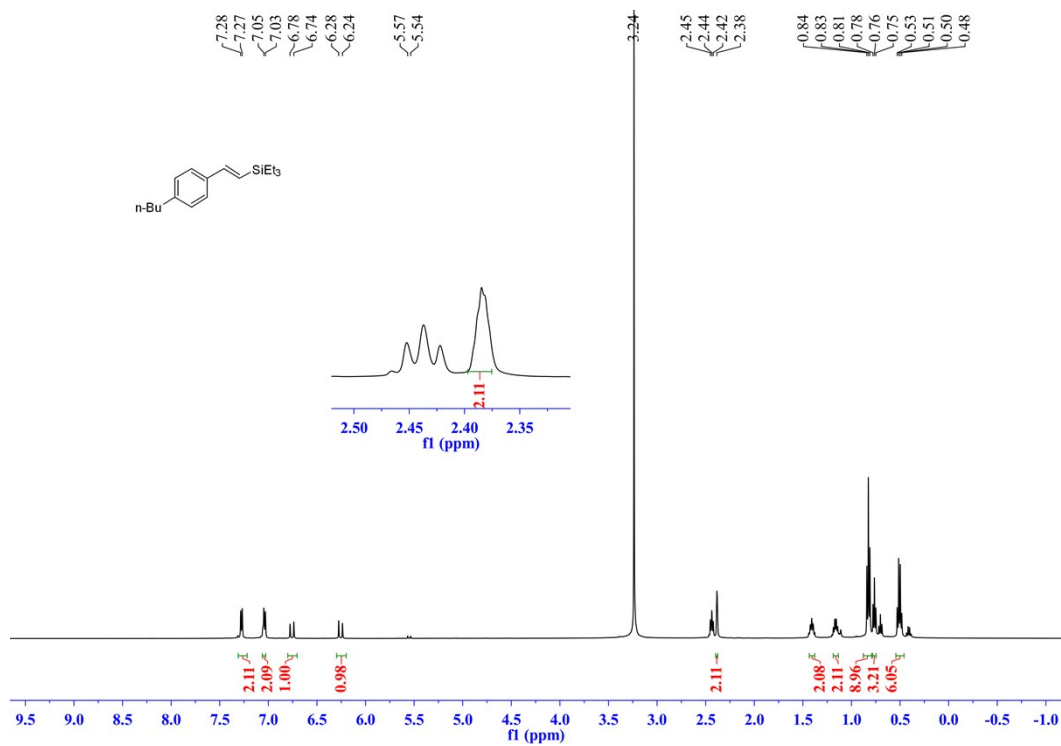
3h. (*E*)-triethyl(4-methoxystyryl)silane



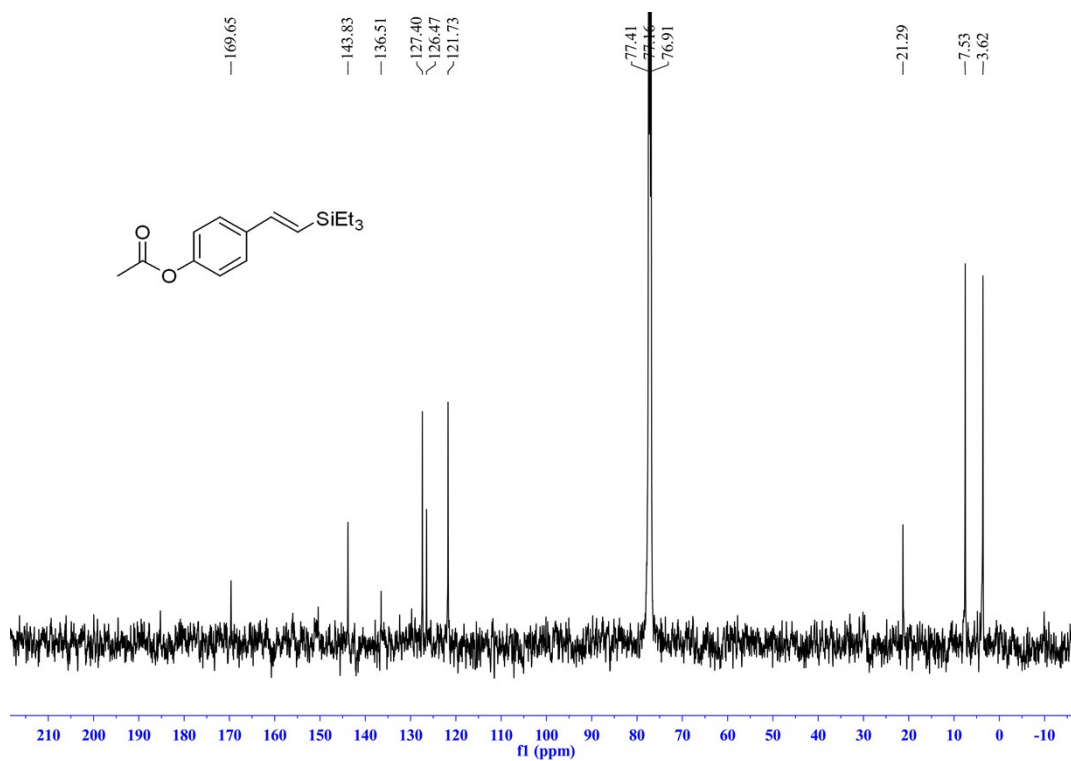
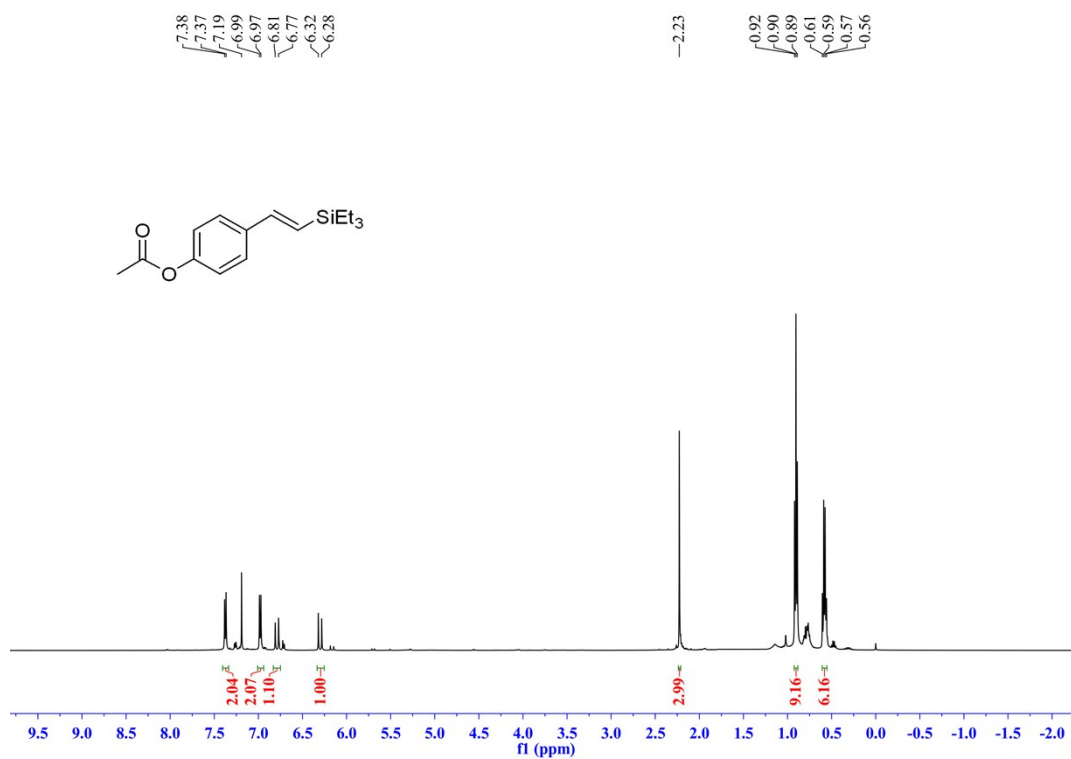
3i (*E*)-triethyl(4-methylstyryl)silane



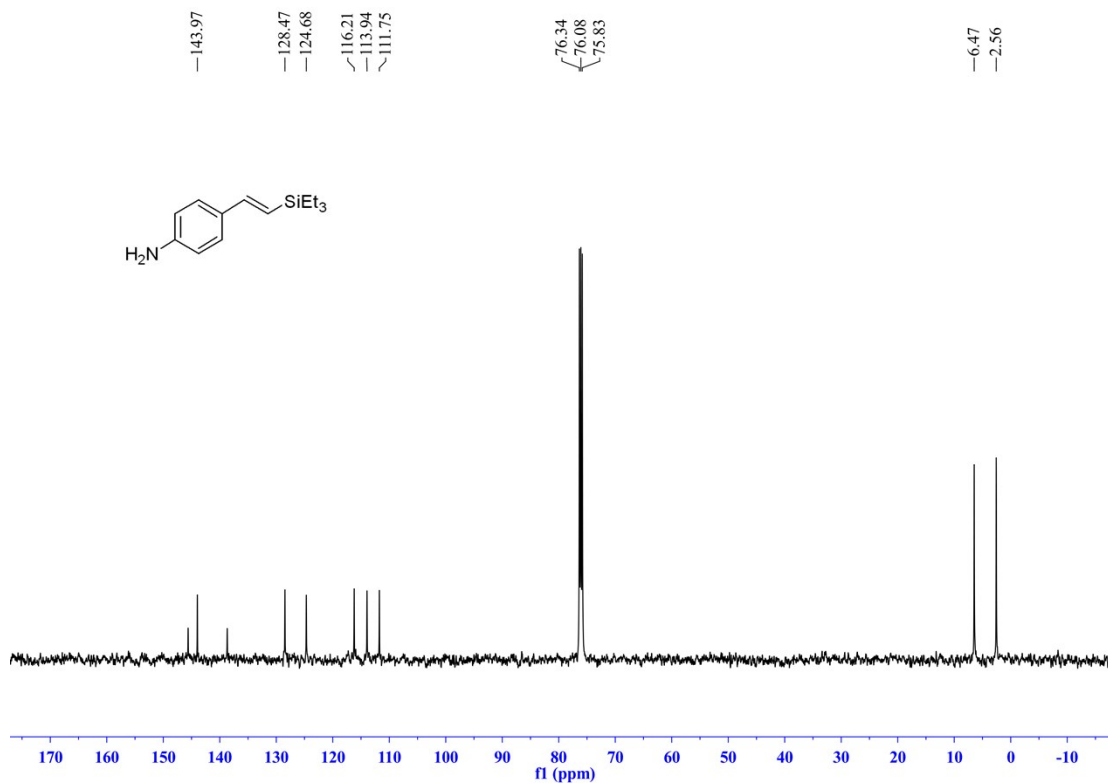
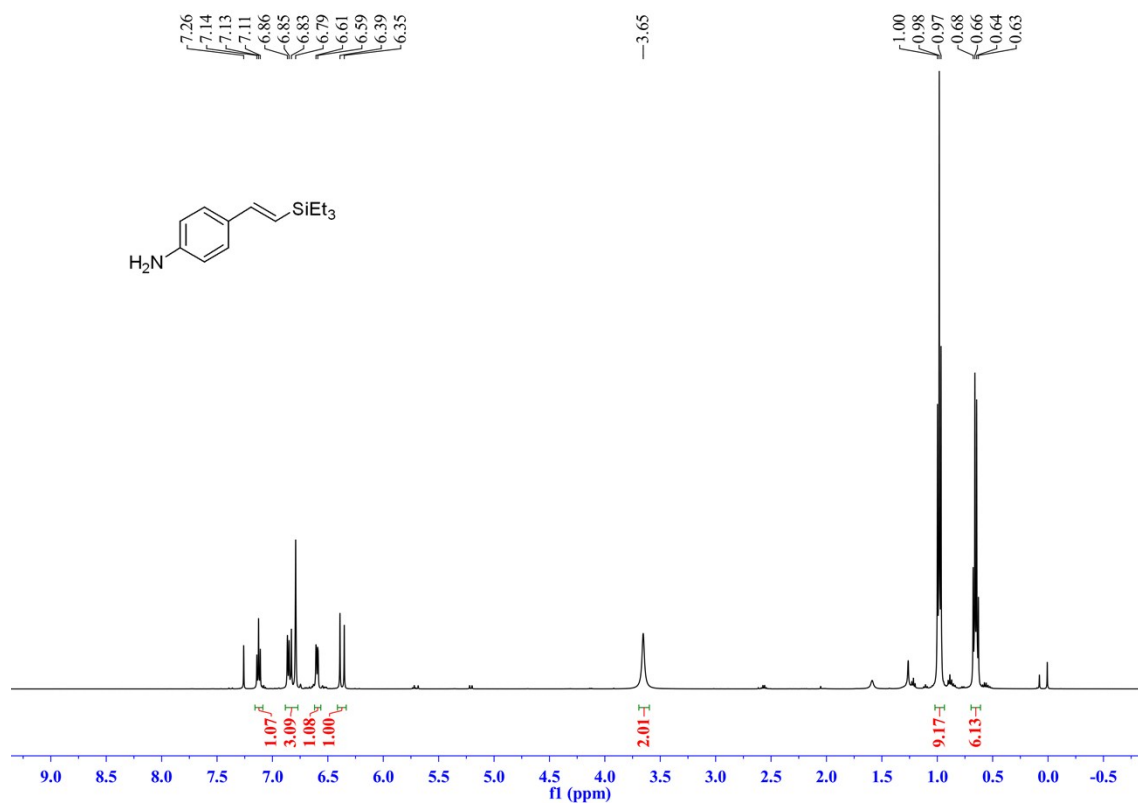
3j. (*E*)-(4-butylstyryl)triethylsilane



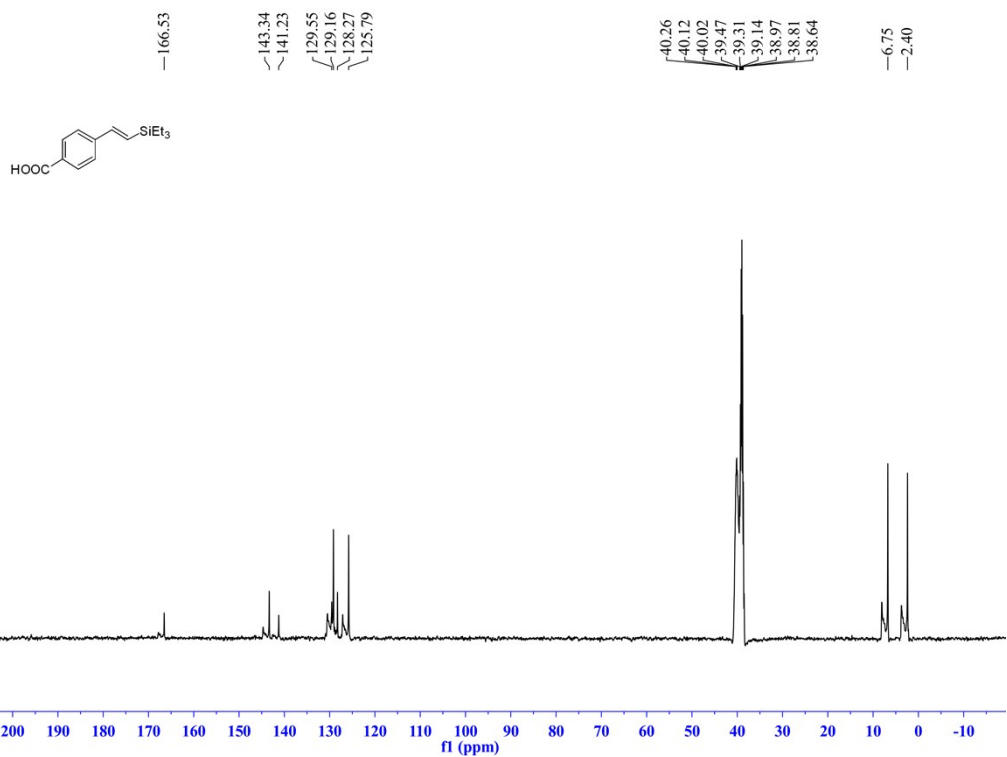
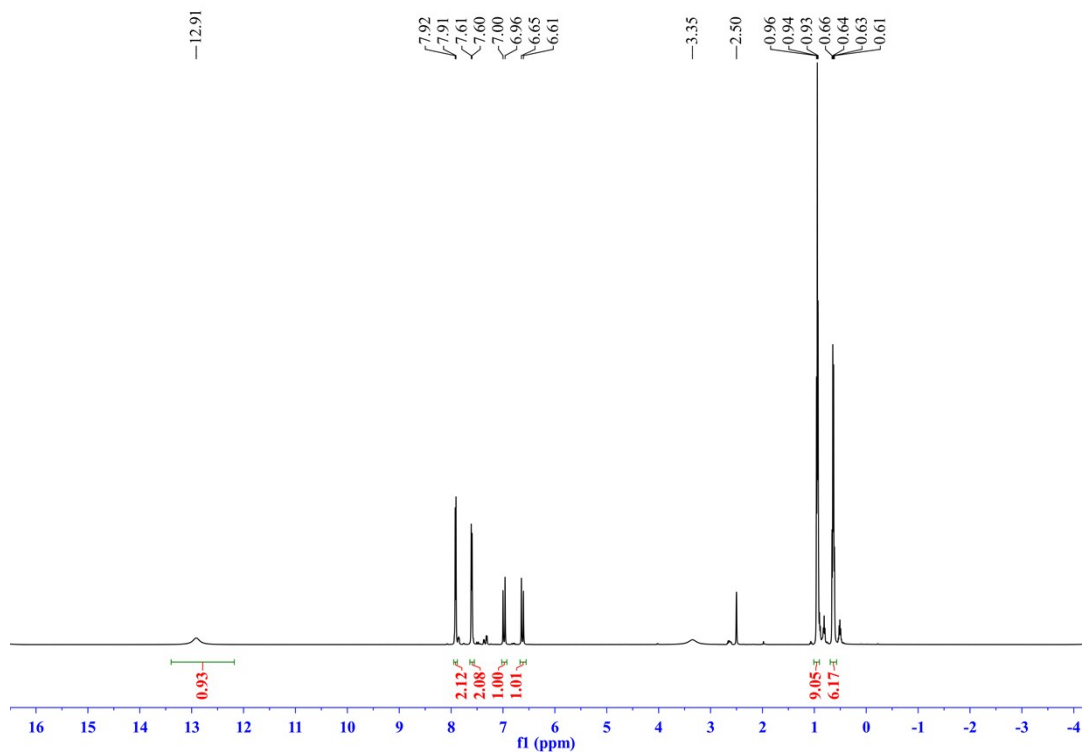
3k. (*E*)-4-(2-(triethylsilyl)vinyl)phenyl acetate



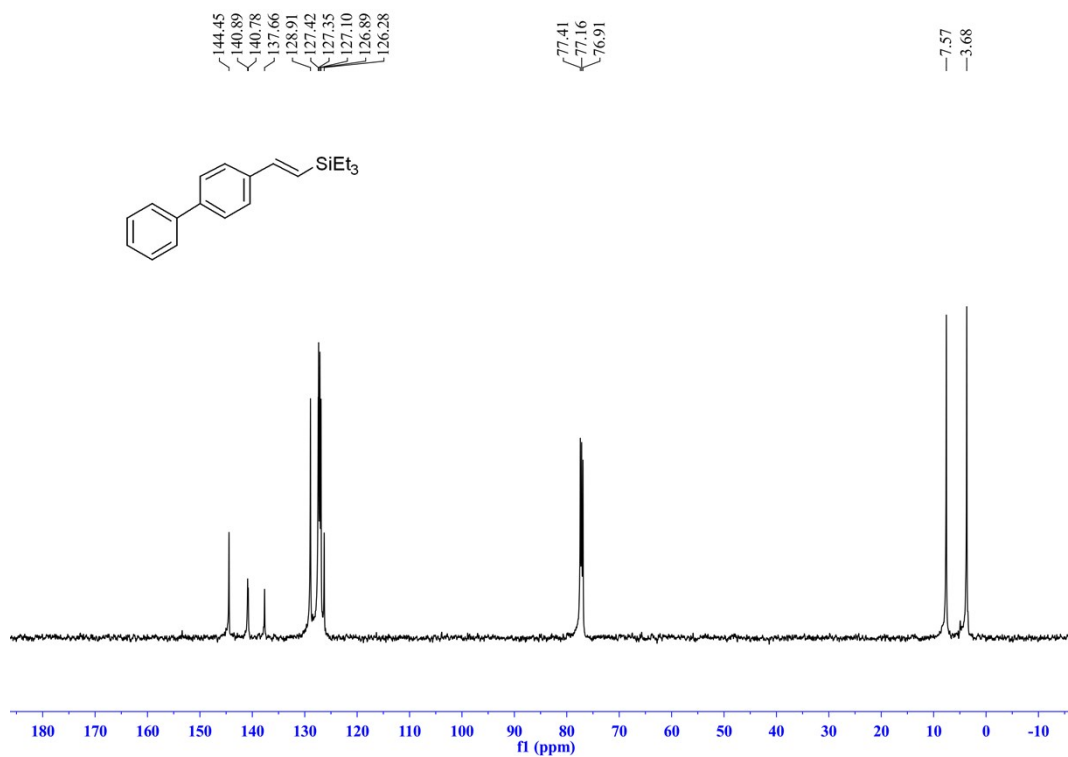
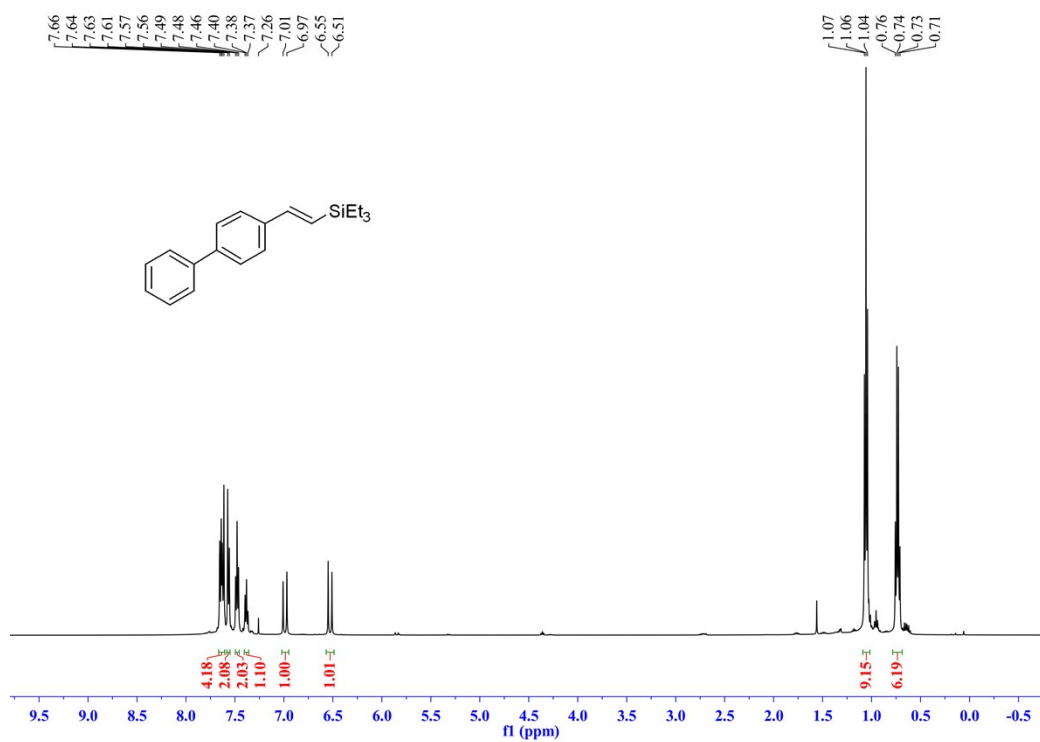
31. (*E*)-4-(2-(triethylsilyl)vinyl)aniline



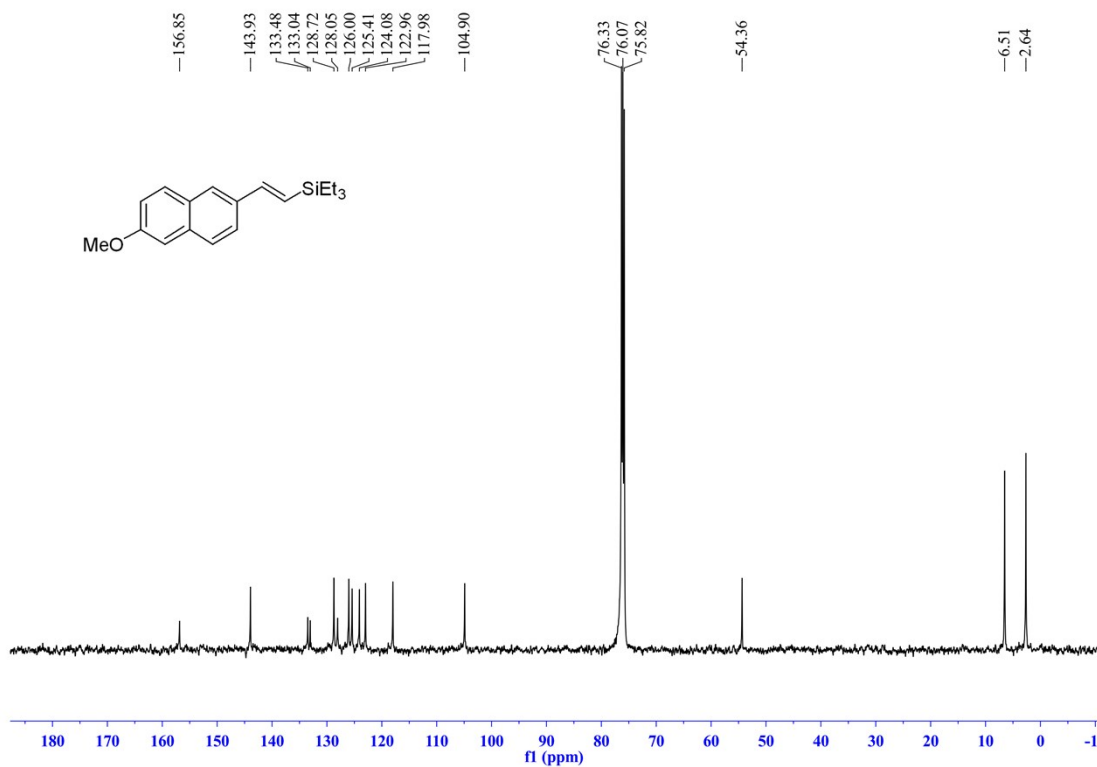
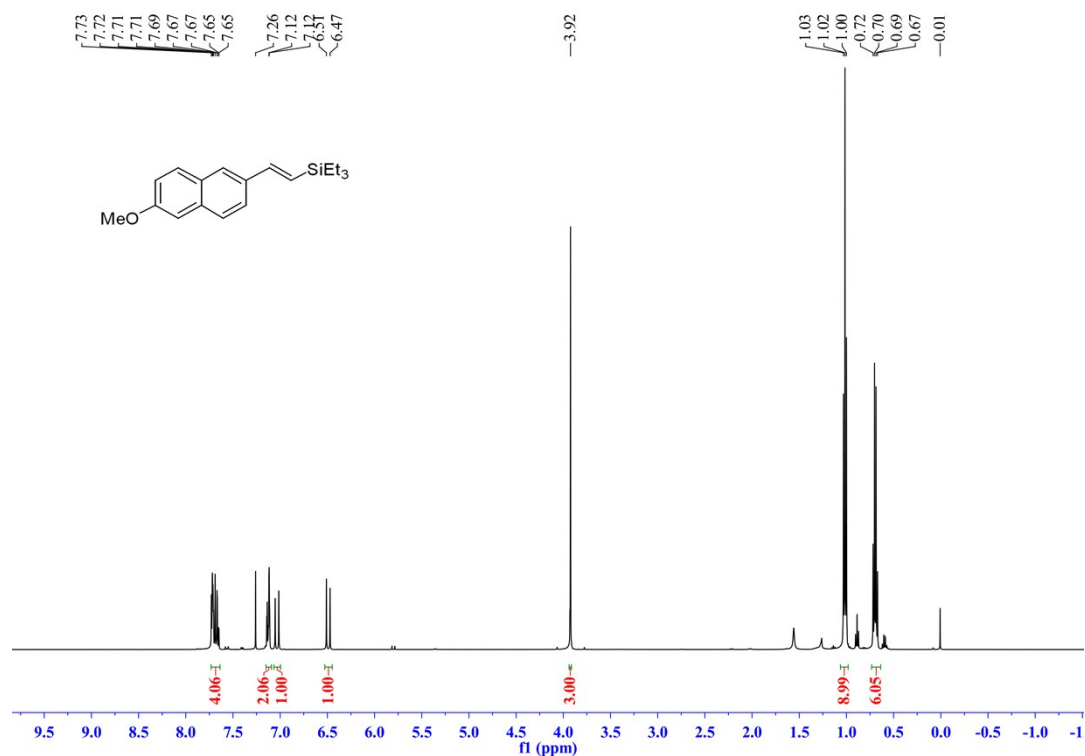
3m. (*E*)-4-(2-(triethylsilyl)vinyl)benzoic acid



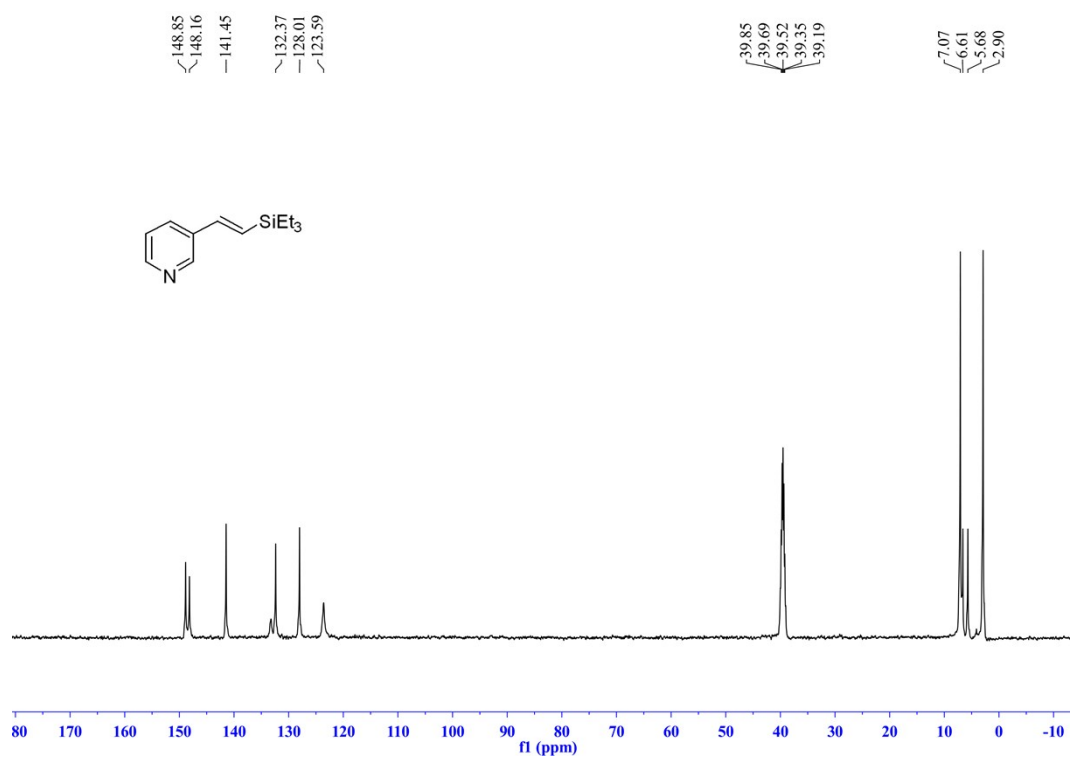
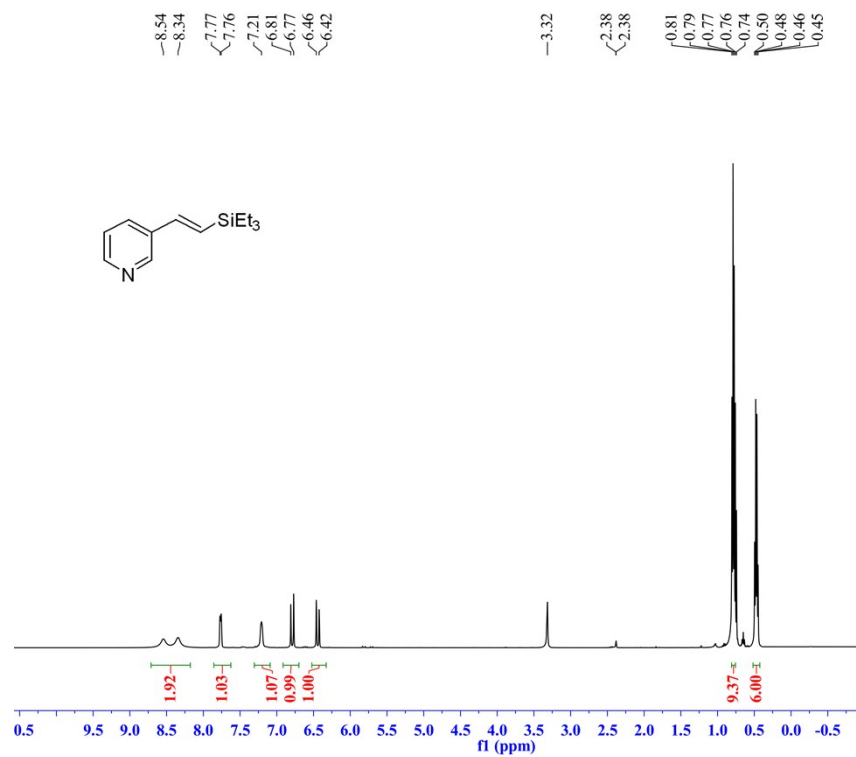
3n. (*E*)-(2-([1,1'-biphenyl]-4-yl)vinyl)triethylsilane



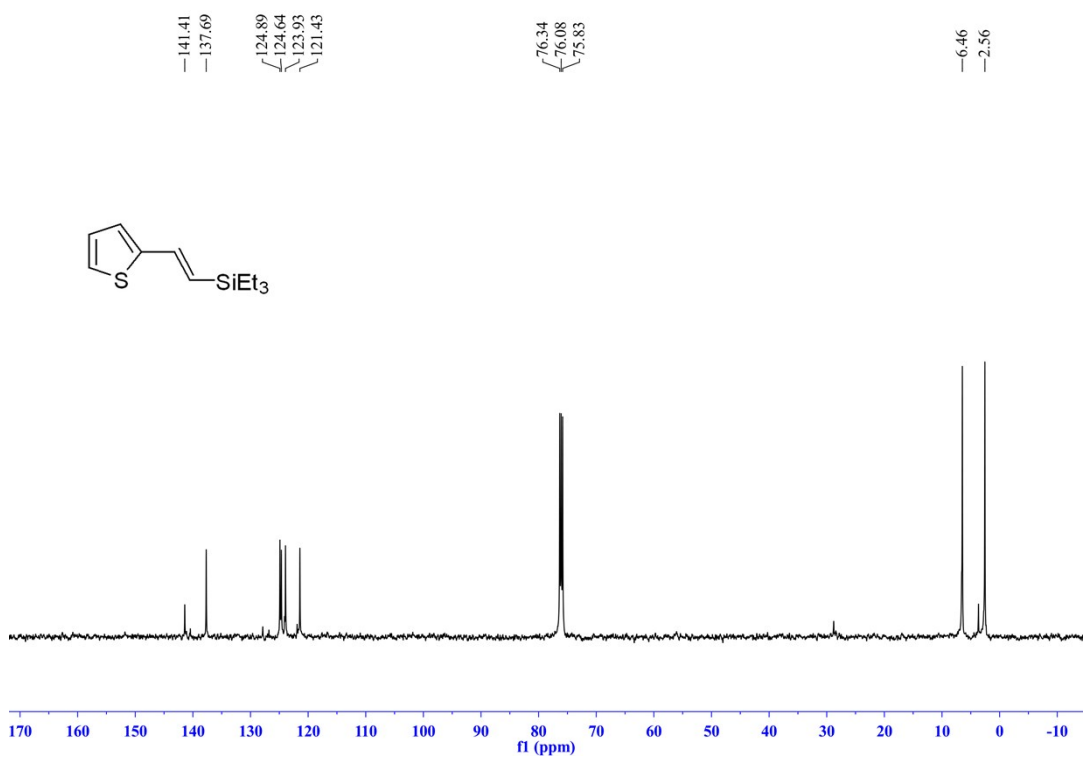
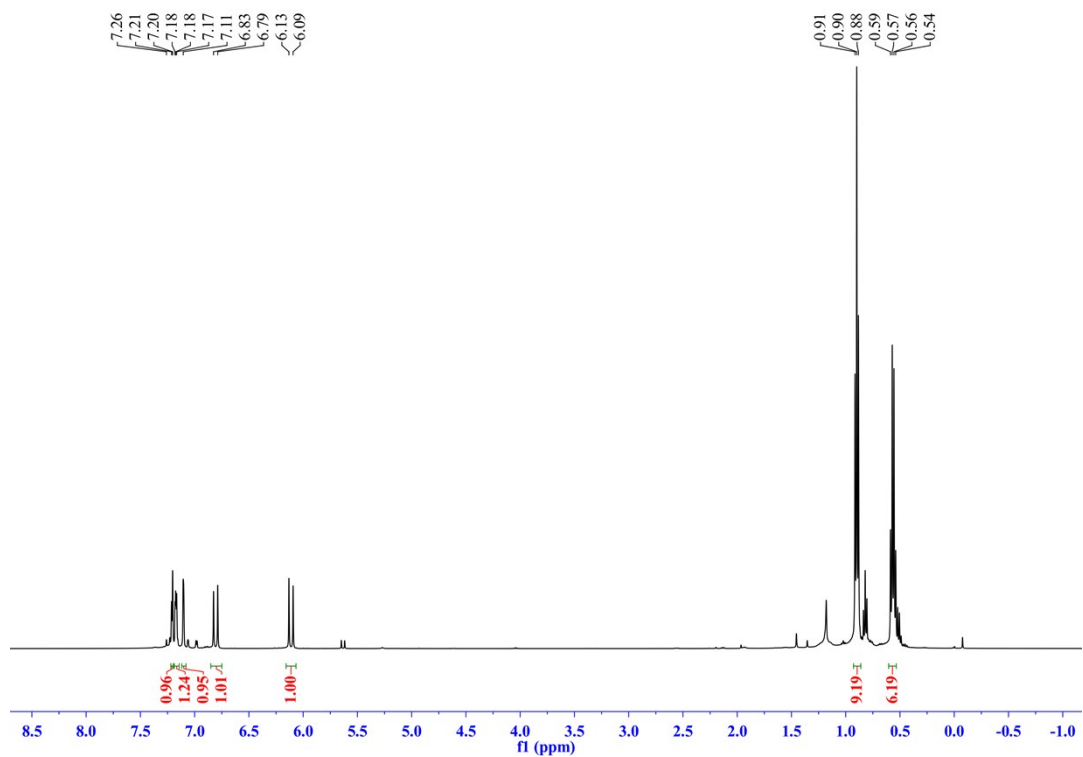
30. (*E*)-triethyl(2-(6-methoxynaphthalen-2-yl)vinyl)silane



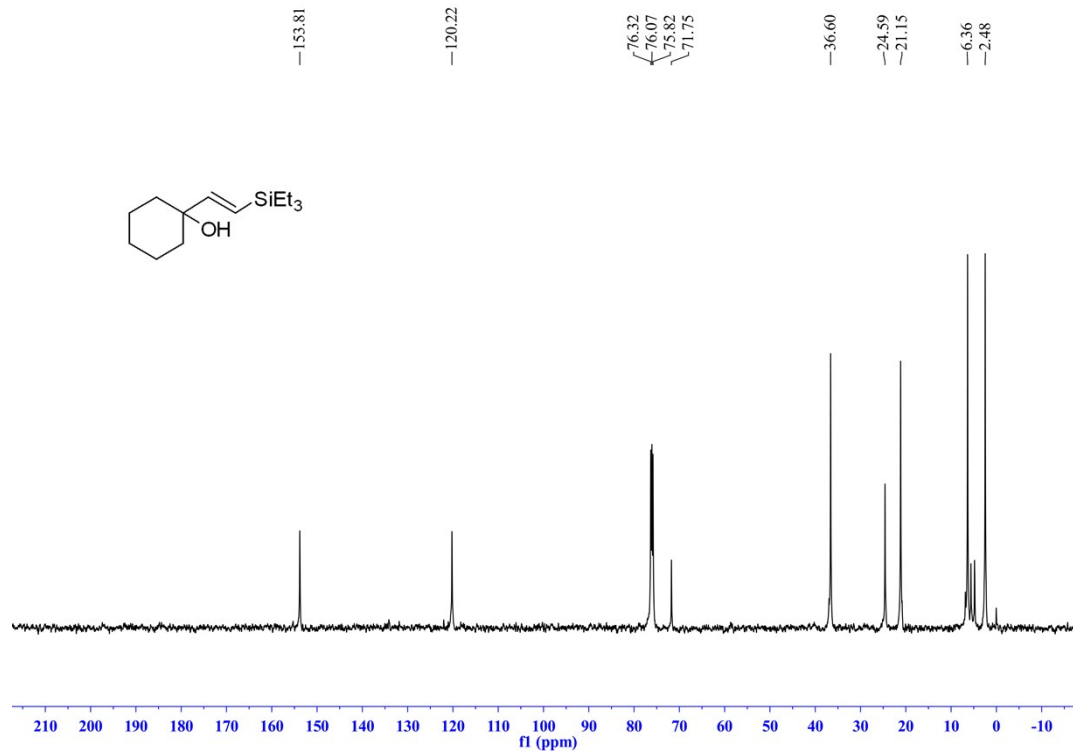
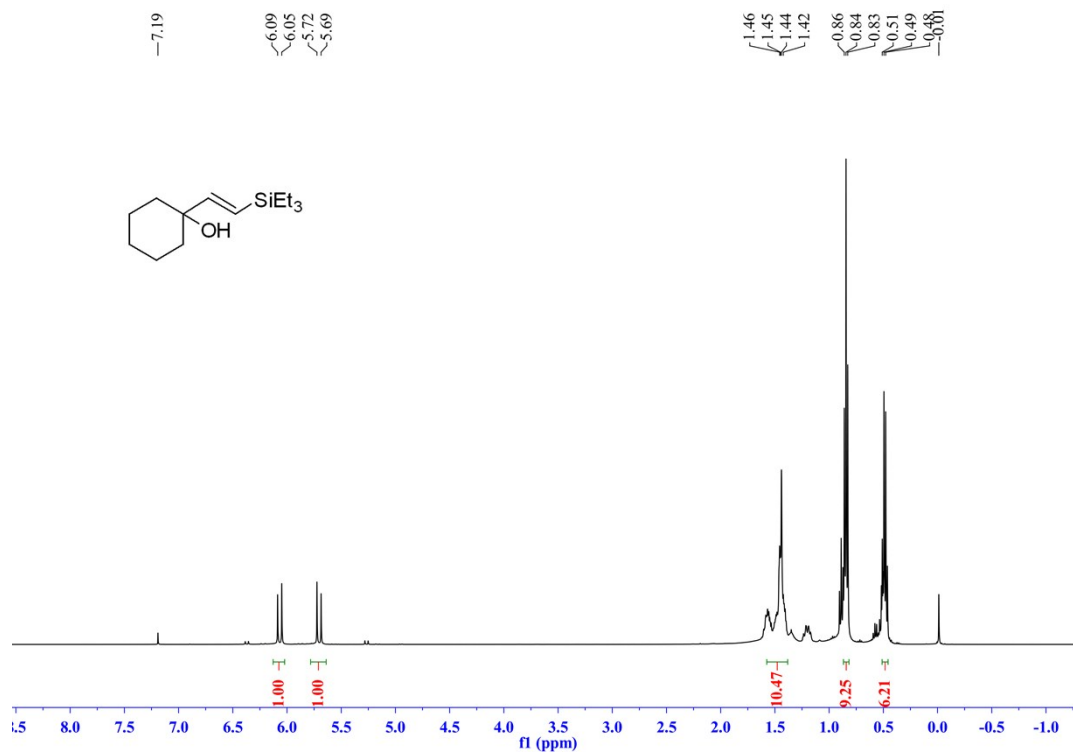
3p. (E)-3-(2-(triethylsilyl)vinyl)pyridine



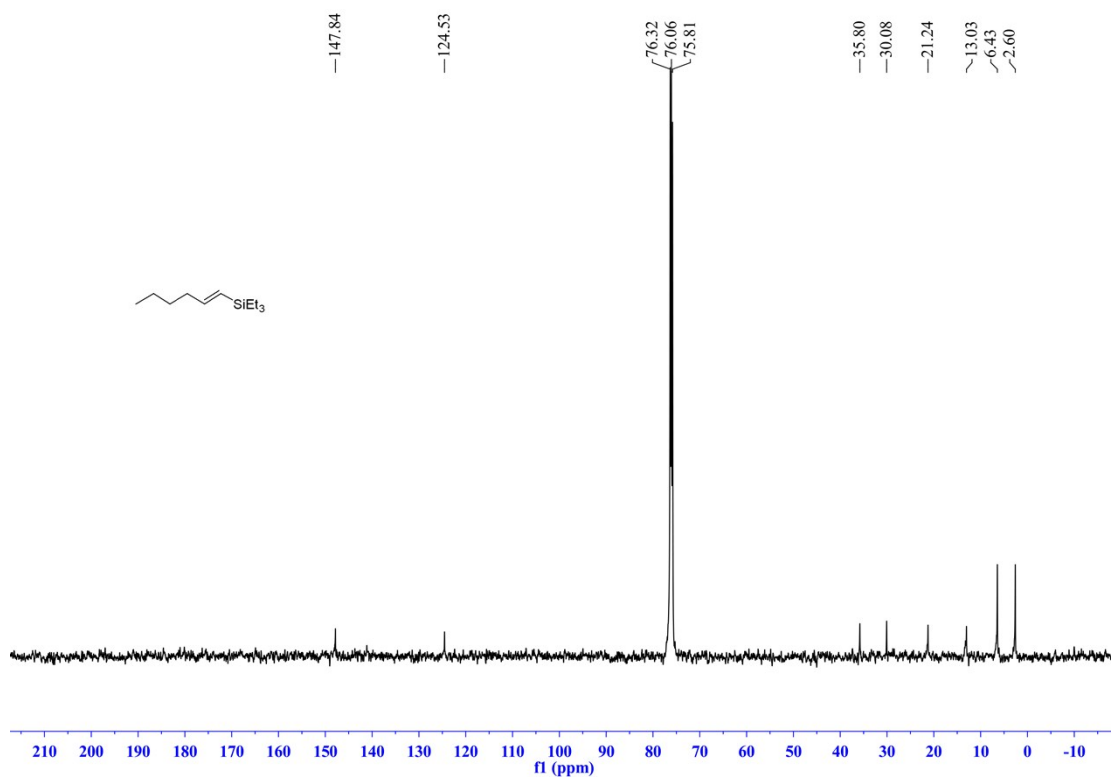
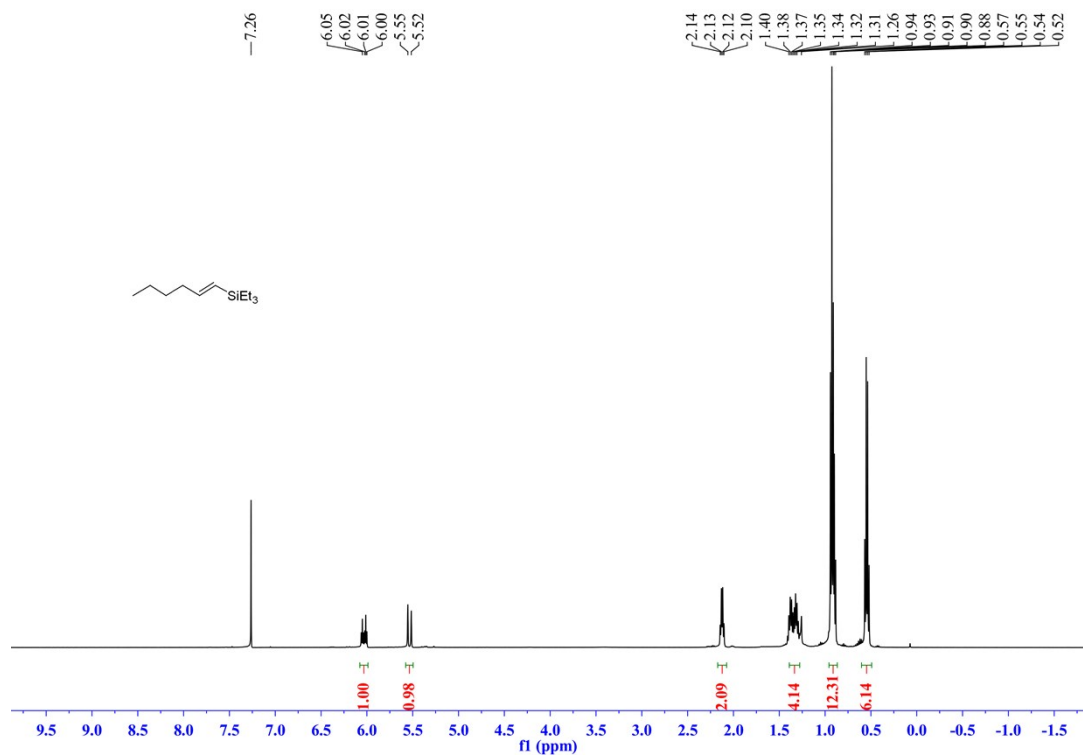
3q. (*E*)-triethyl(2-(thiophen-2-yl)vinyl)silane



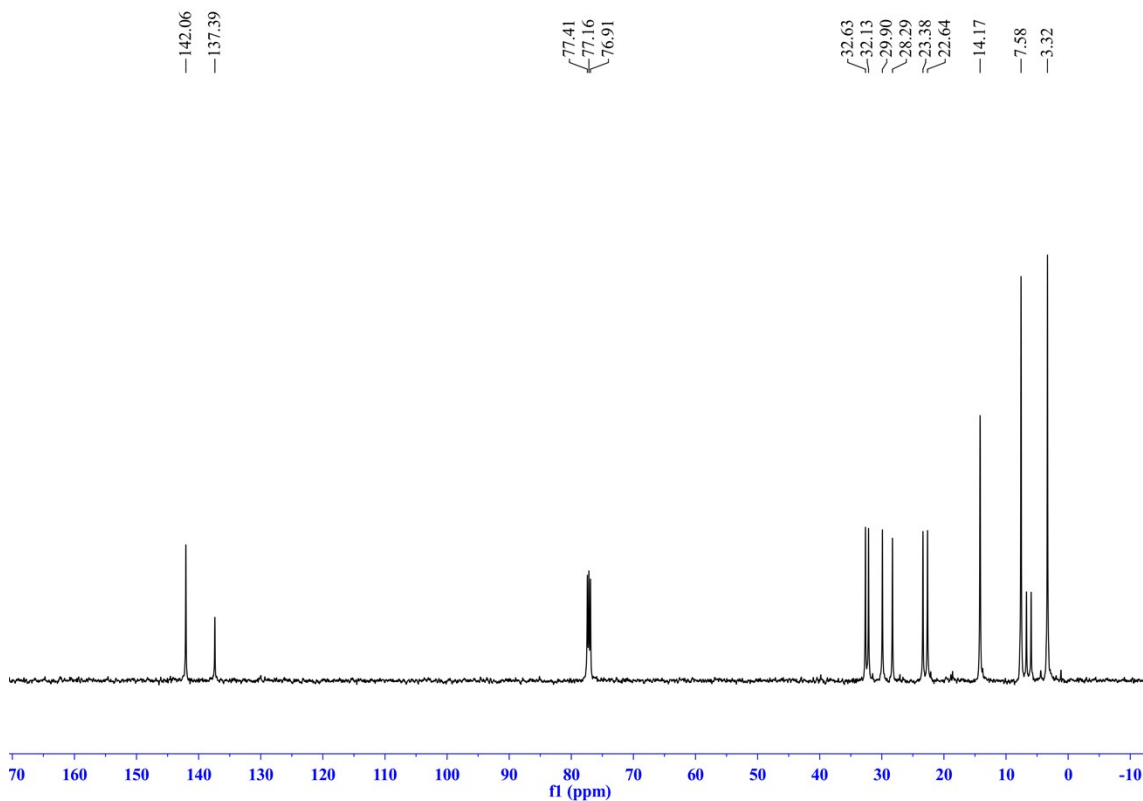
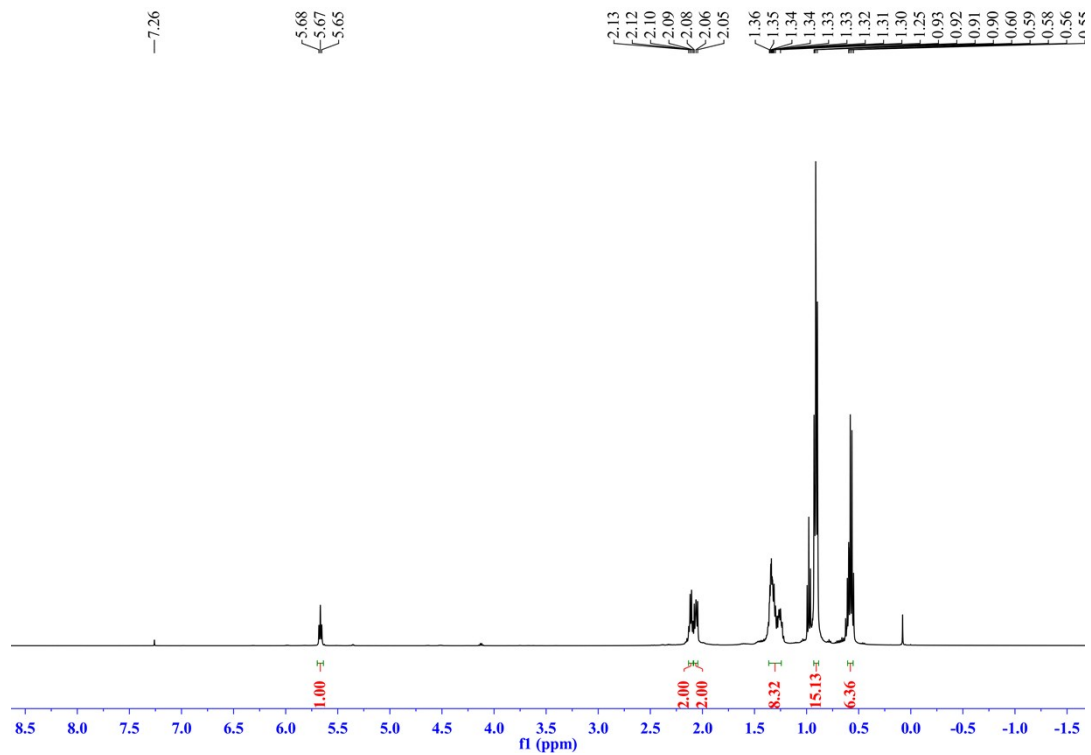
3r. (E)-1-(2-(triethylsilyl)vinyl)cyclohexan-1-ol



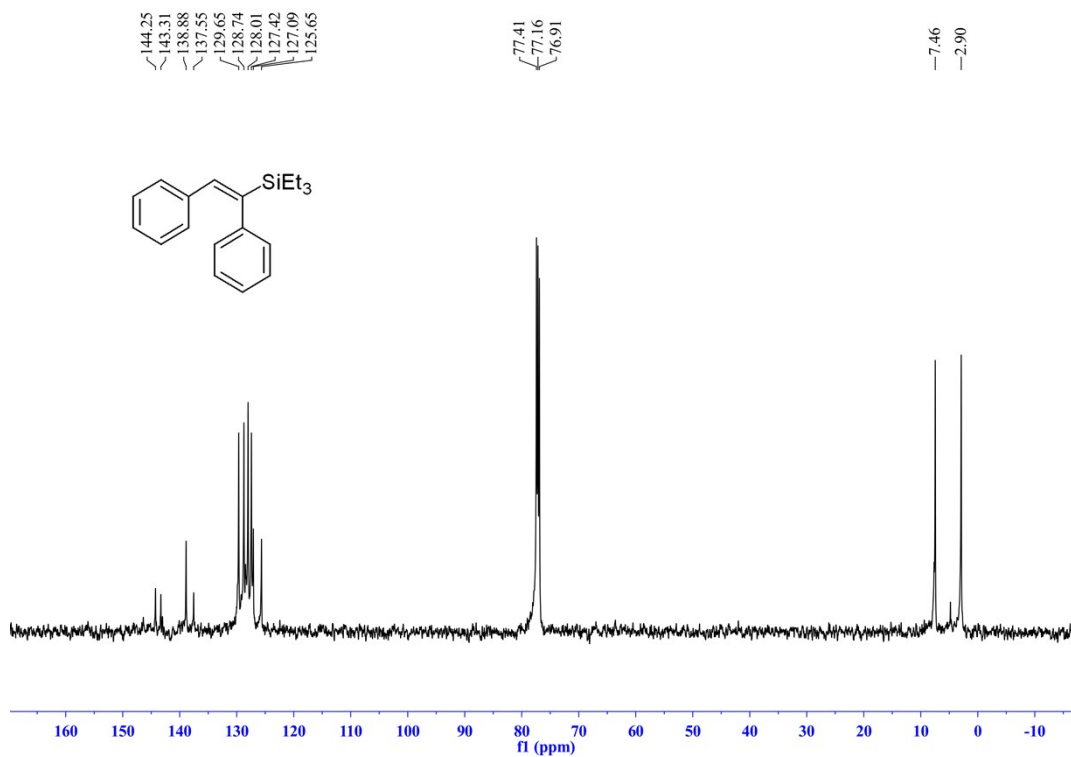
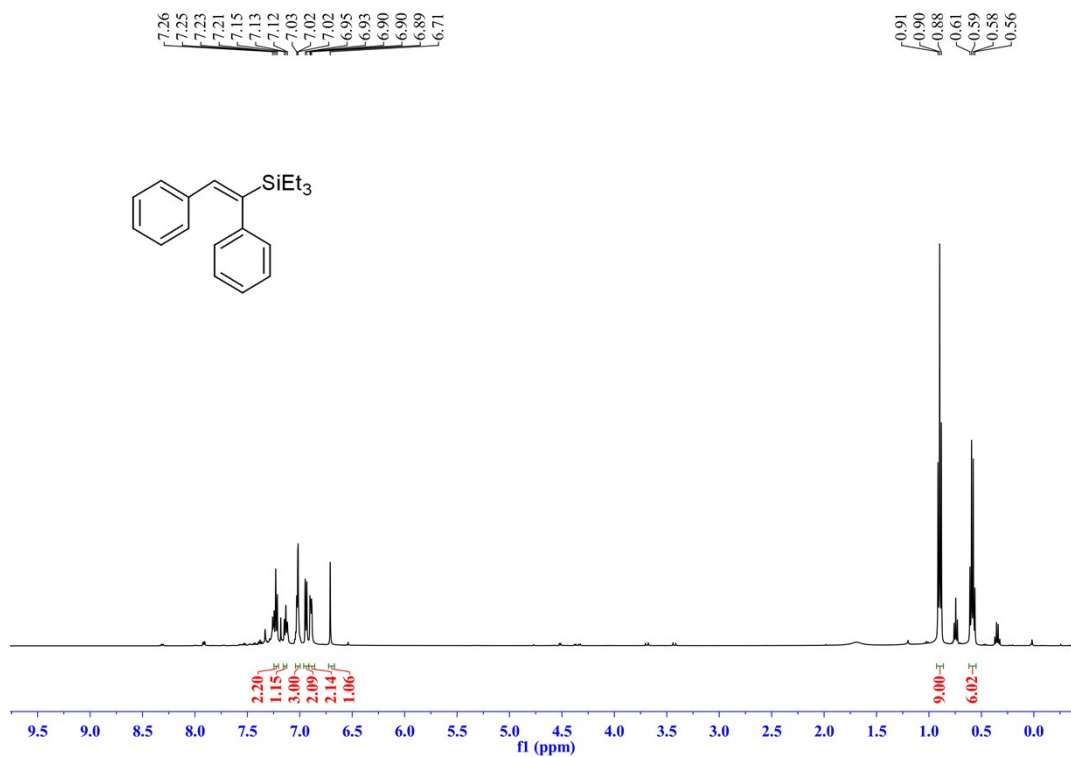
3s. (*E*)-triethyl(hex-1-enyl)silane



3t. (*E*)-dec-5-en-5-yltriethylsilane



3u. (*E*)-(1,2-diphenylvinyl)triethylsilane



3v. 1,4-bis((E)-2-(triethylsilyl)vinyl)benzene

