SUPPORTING INFORMATION FOR

Design, synthesis and bioevaluation of novel 6-substituted aminoindazole derivatives as anticancer agents

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Chemistry

1-Methyl-6-nitro-2*H*-indazole (12). Prepared from commercially available 6-nitroindazole (**9**) following the general procedure 1 to afford a yellow solid, yield 54.8%. mp 124-126 °C. *^{1}H NMR (500 MHz, $CDCl_3$, ppm): δ* 8.31 (s, *J* = 1.00 Hz, 1H), 8.03 (d, *J* = 0.50 Hz, 1H), 7.96 (dd, *J* = 9.00, 2.00 Hz, 1H), 7.77 (d, *J* = 8.50 Hz, 1H), 4.12 (3H).

1,3-Dimethyl-6-nitro-1*H*-indazole (13). Prepared from commercially available 3-methyl-6-nitroindazole (**10**) and iodomethane following the general procedure 1 to afford a yellow solid, yield 52.3%. mp 175-177 °C. ^{1}H NMR (300MHz, $CDCl_3$) *δ* 8.58 (dd, *J* = 1.83, 0.75 Hz, 1H), 7.81 (dd, *J* = 9.15, 2.01 Hz, 1H), 7.63 (dd, *J* = 9.15, 0.57 Hz, 1H), 4.16 (s, 3H), 2.56 (s, 3H).

2-Dimethyl-6-nitro-2*H*-indazole (14). Prepared from commercially available 6-nitroindazole (**9**) following the general procedure 1 to afford a yellow solid, yield 43.9%. mp 164-166 °C. *^{1}H NMR (500 MHz, $CDCl_3$, ppm): δ* 8.59 (s, 1H), 7.95 (s, 1H), 7.82 (dd, *J* = 9.00, 1.50 Hz, 1H), 7.68 (d, *J* = 9.50 Hz, 1H), 4.23 (s, 3H).

2,3-Dimethyl-6-nitro-1*H*-indazole (15). Prepared from commercially available 3-methyl-6-nitroindazole (**10**) and iodomethane following the general procedure 1 to afford a yellow solid, yield 42.8%. mp 183-185 °C. *^{1}H NMR (500 MHz, $CDCl_3$, ppm): δ* 8.59 (dd, *J* = 1.83, 0.75 Hz, 1H), 7.83

(dd, *J* = 9.15, 2.01 Hz, 1H), 7.64 (dd, *J* = 9.15, 0.57 HZ, 1H), 4.15 (s, 3H), 2.64 (s, 3H).

1-Methyl-1*H*-indazol-6-amine (16). Prepared from compound **12** following the general procedure 2 to afford a reddish solid, yield 91.0%. mp 87-89 °C. *^{1}H NMR (500 MHz, $CDCl_3$, ppm): δ* 7.79 (s, 1H), 7.47 (d, *J* = 8.50 Hz, 1H), 6.56 (dd, *J* = 8.50, 1.50 Hz, 1H), 6.51 (d, *J* = 0.50 Hz, 1H), 3.92 (s, 3H). *^{13}C NMR (125 MHz,* $CDCl_3$*, ppm): δ* 145.7, 141.5, 132.7, 121.8, 117.9, 112.4, 91.61, 35.1. ESI-MS *m/z* 147.8 $[M+H]^+$.

1,3-Dimethyl-1*H*-indazol-6-amine (17). Prepared from compound **13** following the general procedure 2 to afford a reddish solid, yield 85.6%. mp 92-94 °C. *^{1}H NMR (500 MHz, $CDCl_3$, ppm): δ* 7.33 (d, *J* = 8.50 Hz, 1H), 7.19 (s, 1H), 6.49 (dd, *J* = 8.50, 1.50 Hz, 1H), 6.42 (s, 1H), 3,78 (s, 3H), 2.41 (s, 3H). *^{13}C NMR (125 MHz,* $CDCl_3$*, ppm): δ* 145.2, 142.4, 141.3, 121.3, 117.5, 111.6, 92.1, 34.8, 11.7. ESI-MS *m/z* 161.8 $[M+H]^+$.

2-Methyl-2*H*-indazol-6-amine (18). Prepared from compound **14** following the general procedure 2 to afford a reddish solid, yield 95.7%. mp 81-83 °C. *^{1}H NMR (500 MHz, $CDCl_3$, ppm): δ* 7.64 (s, 1H), 7.37 (d, *J* = 9.00 Hz, 1H), 6.72 (t, *J* = 1.00 Hz, 1H), 6.51 (dd, *J* = 9.00, 1.50 Hz, 1H), 4.03 (s, 3H). *^{13}C NMR (125 MHz,* $CDCl_3$*, ppm): δ* 150.5, 144.6, 123.6, 120.7, 117.1, 116.0, 96.9, 39.9. ESI-MS *m/z* 147.8 $[M+H]^+$.

2,3-Dimethyl-2*H*-indazol-6-amine (19). Prepared from compound **15** following the general procedure 2 to afford a reddish solid, yield 93.2%. mp 78-80 °C. *^{1}H NMR (500 MHz, $CDCl_3$, ppm): δ* 7.35 (d, *J* = 8.50 Hz, 1H), 6.72 (s, 1H), 6.54 (dd, *J* = 8.50, 1.50 Hz, 1H), 3.99 (s, 3H), 2.51 (s, 3H). *^{13}C NMR (125 MHz,* $CDCl_3$*, ppm): δ* 149.0, 144.7, 131.5, 120.4, 116.3, 114.7, 96.6, 36.8, 9.86. ESI-MS *m/z* 161.8$[M+H]^+$.

***N*-(1-Methyl-1*H*-indazol-6-yl)acetamide (20)**. Prepared from compound **16** following the general procedure 4 to afford a white solid, yield 91.4%. mp 126-128 °C. *^{1}H NMR (500 MHz, $CDCl_3$, ppm): δ* 8.13 (s, 1H), 7.88 (s, 1H), 7.59 (d, *J* = 8.50 Hz, 1H), 7.40 (br, 1H), 6.78 (d, *J* = 8.45 Hz, 1H), 4.02 (s, 3H), 2.21 (s, 3H). *^{13}C NMR (125 MHz,* $CDCl_3$*, ppm): δ* 168.6, 140.4, 136.4, 132.5, 121.4, 120.7, 114.2, 99.3, 35.5, 24.7. ESI-MS *m/z* 190.06 $[M+H]^+$.

***N*-(1,3-Dimethyl-1*H*-indazol-6-yl)acetamide (21)**. Prepared from compound **17** following the general procedure 4 to afford a white solid, yield 89.3%. mp 122-124°C. *^{1}H NMR (300 MHz, $CDCl_3$, ppm): δ* 8.03 (s, 1H), 7.50 (d, *J* = 8.43 Hz, 1H), 7.47 (br, 1H), 6.76 (dd, *J* = 8.43, 1.47 Hz, 1H), 3.93 (s, 3H), 2.50 (s, 3H), 2.20 (s, 3H). *^{13}C NMR (125 MHz,* $CDCl_3$*, ppm): δ* 168.5, 141.3, 141.1, 136.4, 120.7, 120.1, 113.2, 99.2, 35.1, 24.7, 11.7. ESI-MS *m/z* 204.08 $[M+H]^+$.

***N*-(2-Methyl-2*H*-indazol-6-yl)acetamide (22)**. Prepared from compound **18** following the general procedure 4 to afford a white solid, yield 90.3%. mp 118-120°C. *IR (KBr, cm^{-1}):* 3242 (NH

amide); 3099 (CH aromatic); 1658 (C=O amide); 1643 (C=N); 1575, 1506 (C=C aromatic). *^{1}H NMR (500 MHz, CD_3OD, ppm): δ* 8.10 (s, 1H), 8.03 (s, 1H), 7.60 (d, *J* = 8.95 Hz, 1H), 7.08 (dd, *J* = 8.95, 1.65 Hz, 1H), 4.15 (s, 3H), 2.14 (s, 3H). *^{13}C NMR (125 MHz,* $CDCl_3$*, ppm): δ* 168.4, 149.1, 135.8, 123.6, 120.5, 119.5, 117.3, 106.2, 45.8, 24.6. ESI-MS *m/z* 190.04 $[M+H]^+$.

***N*-(2,3-Dimethyl-2*H*-indazol-6-yl)acetamide (23)**. Prepared from compound **19** following the general procedure 4 to afford a white solid, yield 92.4%. mp 115-117^{o}C. *^{1}H NMR (300 MHz, $CDCl_3$, ppm): δ* 7.76 (s, 1H), 7.47 (d, *J* = 8.79 Hz, 1H), 7.17 (d, *J* = 8.79 Hz, 1H), 4.06 (s, 3H), 2.57 (s, 3H), 2.19 (s, 3H). *^{13}C NMR (125 MHz,* $CDCl_3$*, ppm): δ* 16.3, 147.7, 140.3, 131.6, 120.2, 115.9, 105.8, 110.8, 37.2, 24.6, 9.9. ESI-MS *m/z* 204.06 $[M+H]^+$.

***N*-Isopropyl-1-methyl-1*H*-indazol-6-amine (24)**. Prepared from compound **16** and acetone following the general procedure 3 to afford a reddish solid, yield 91.5%. mp 78-80 ^{o}C. *IR (KBr, cm^{-1}):* 3265 (NH amine); 3064 (CH aromatic); 1625 (C=N); 1573, 1436 (C=C aromatic). *^{1}H NMR (300 MHz, $CDCl_3$, ppm): δ* 7.74 (d, *J* = 0.72 Hz, 1H), 7.42 (d, *J* = 8.43 Hz, 1H), 6.45 (dd, *J* = 8.58, 1.83 Hz, 1H), 6.33 (s, 1H), 3.93 (s, 3H), 3.69 (hep, *J* = 6.24 Hz, 1H), 1.25 (d, *J* = 6.24 Hz, 6H). *^{13}C NMR (125 MHz,* $CDCl_3$*, ppm): δ* 146.2, 141.9, 132.7, 121.7, 117.1, 112.7, 88.6, 44.8, 35.2, 22.6. ESI-MS *m/z* 190.10 $[M+H]^+$.

***N*-Cyclopentyl-1-methyl-1*H*-indazol-6-amine (25)**. Prepared from compound **16** and cyclopentanone following the general procedure 3 to afford a pink solid, yield 90.7%. mp 93-95 ^{o}C. *IR (KBr, cm^{-1}):* 3309 (NH amin); 3099 (CH aromatic); 1625 (C=N); 1573, 1435 (C=C aromatic). *^{1}H NMR (300 MHz, $CDCl_3$, ppm): δ* 7.69 (d, *J* = 0.75 Hz, 1H), 7.35 (d, *J* = 8.61 Hz, 1H), 6.39 (dd, *J* = 8.61, 2.01 Hz, 1H), 6.25 (s, 1H), 3.88 (s, 3H), 3.84-3.75 (m, 1H), 2.05-1.93 (m, 2H), 1.72-1.44 (m, 6H). *^{13}C NMR (125 MHz,* $CDCl_3$*, ppm): δ* 146.6, 141.8, 132.7, 121.6, 117.1,112.7, 88.8, 55.3, 35.2, 33.3, 24.1. ESI-MS *m/z* 216.15 $[M+H]^+$.

***N*-Cyclohexyl-1-methyl-1*H*-indazol-6-amine (26)**. Prepared from compound **16** and cyclohexanone following the general procedure 3 to afford a reddish solid, yield 90.3%. mp 101–103 ^{o}C. *IR (KBr, cm^{-1}):* 3331 (NH amin); 3099 (CH aromatic); 1625 (C=N); 1573, 1436 (C=C aromatic). *^{1}H NMR (300 MHz, $CDCl_3$, ppm): δ* 7.68 (s, 1H), 7.36 (d, *J* = 8.79 Hz, 1H), 6.39 (dd, *J* = 8.58, 1.65 Hz, 1H), 6.23 (s, 1H), 3.87 (s, 3H), 3.71 (br, 1H), 3.31-3.25 (m, 1H), 2.06-2.03 (m, 2H), 1.75-1.70 (m, 2H), 1.63-1.55 (m, 1H), 1.42-1.30 (m, 2H), 1.25-1.08 (m, 3H). *^{3}C NMR (125 MHz,* $CDCl_3$*, ppm): δ* 145.6, 141.8, 132.7, 121.7, 117.4, 112.7, 89.3, 35.3, 32.9, 25.8 (2C), 24.9 (2C). ESI-MS *m/z* 230.16 $[M+H]^+$.

***N*-Benzyl-1-methyl-1H-indazol-6-amine (27)**. Prepared from compound **16** and benzaldehyde following the general producer 3 to afford a reddish solid, yield 94.1%. mp 106-108 ^{o}C. *IR (KBr, cm^{-1}):* 3414 (NH amin); 3290 (CH aromatic); 1625 (C=N); 1571, 1436 (C=C aromatic). *^{1}H NMR (300 MHz,*

$CDCl_3$, ppm): δ 7.70 (s, 1H), 7.39 (d, *J* = 8.79 Hz, 1H), 7.36-7.20 (m, 5H), 6.47 (dd, *J* = 8.58, 1.83 Hz, 1H), 6.30 (s, 1H), 4.33 (s, 2H), 4.21 (br, 1H), 3.84 (s, 3H). *^{13}C NMR (125 MHz,* $CDCl_3$*, ppm): δ* 147.3, 141.8, 138.7, 132.7, 128.8, 127.7, 127.5, 121.7, 117.3, 112.2, 88.1, 48.6, 35.2. ESI-MS *m/z* 238.17 $[M+H]^+$.

1-Methyl-*N*-(pyridin-3-ylmethyl)-1*H*-indazol-6-amine (28). Prepared from compound **16** and 3-pyridinecarboxaldehyde following the general procedure 3 to afford a red solid, yield 94.3%. mp 117-119 °C. *^{1}H NMR (300 MHz, $CDCl_3$, ppm): δ* 8.61 (s, 1H), 8.49 (d, *J* = 3.66 Hz, 1H), 7.71 (s, 1H), 7.67 (d, *J* = 7.89 Hz, 1H), 7.41 (d, *J* = 8.61 Hz, 1H), 7.22 (dd, *J* = 7.68, 4.77 Hz, 1H), 6.48 (dd, *J* = 8.61, 1.83 Hz, 1H), 6.25 (s, 1H), 4.37 (s, 2H), 4.26 (br, 1H), 3.83 (s, 3H). *^{13}C NMR (125 MHz,* $CDCl_3$*, ppm): δ* 149.0, 148.7, 146.9, 141.6, 135.3, 134.5, 132.7, 123.7, 121.8, 117.4, 112.0, 88.1, 45.9, 35.2. ESI-MS *m/z* 239.17 $[M+H]^+$.

***N*-(4-Fluorobenzyl)-1-methyl-1*H*-indazol-6-amine (29)**. Prepared from compound **16** and 4-fluorobenzaldehyde following the general procedure 3 to afford a red solid, yield 95.1%. mp 118-120 °C. *IR (KBr, cm^{-1}):* 3414 (NH amine); 3300 (CH aromatic); 1625 (C=N); 1571, 1436 (C-C aromatic); 1226 (C-F). *^{1}H NMR (300 MHz, $CDCl_3$, ppm): δ* 7.71 (s, 1H), 7.39 (d, *J* = 8.61 Hz, 1H), 7.30 (dd, *J* = 8.43, 5.49 Hz, 2H), 6.98 (t, *J* = 8.61 Hz, 2H), 6.46 (dd, *J* = 8.61, 1.86 Hz, 1H), 6.25 (s, 1H), 4.30 (s, 2H), 4.19 (br, 1H), 3.84 (s, 3H). *^{13}C NMR (125 MHz,* $CDCl_3$*, ppm): δ* 163.2-161.2 (d, $^1J_{C-F}$ = 243.8 Hz), 146.8, 141.5, 133.8, 132.6, 129.4-129.4 (d, $^3J_{C-F}$ = 7.5 Hz), 121.8, 115.6-115.5 (d, $^2J_{C-F}$ = 21.3 Hz), 112.4, 92.0, 48.4, 35.2. ESI-MS *m/z* 256.20 $[M+H]^+$.

***N*-(3-Fluorobenzyl)-1-methyl-1*H*-indazol-6-amine (30)**. Prepared from compound **16** and 3-fluorobenzaldehyde following the general procedure 3 to afford a pink solid, yield 95.4%. mp 115-118 °C. *IR (KBr, cm^{-1}):* 3414 (NH amine); 2985 (CH aromatic); 1627 (C=N); 1575, 1481 (C-C aromatic); 1226 (C-F). *^{1}H NMR (300 MHz, $CDCl_3$, ppm): δ* 7.76 (d, *J* = 0.72 Hz, 1H), 7.44 (d, *J* = 8.61 Hz, 1H), 7.30 (dt, *J* = 5.85, 7.86 Hz, 1H), 7.17 (d, *J* = 7.50 Hz, 1H), 7.10 (d, *J* = 9.69 Hz, 1H), 6.96 (td, *J* = 8.61, 2.58 Hz, 1H), 6.52 (dd, *J* = 8.79, 2.04 Hz, 1H), 6.29 (s, 1H), 4.40 (s, 2H), 4.32 (br, 1H), 3.80 (s, 3H). *^{13}C NMR (125 MHz,* $CDCl_3$*, ppm): δ* 164.1-162.2 (d, $^1J_{C-F}$ = 245 Hz), 146.8; 141.5-141.4 (d, $^3J_{C-F}$ = 7.5 Hz), 132.7, 130.2-130.2 (d, $^3J_{C-F}$ = 8.8 Hz),122.9-122.9 (d, $^4J_{C-F}$ = 2.5 Hz), 121.8, 117.4, 114.4-114.2 (d, $^2J_{C-F}$ = 22.5 Hz, 2C), 112.1, 48.1, 35.2. ESI-MS *m/z* 256.20 $[M+H]^+$.

***N*-Isopropyl-1,3-dimethyl-2*H*-indazol-6-amine (31)**. Prepared from compound **17** and acetone following the general procedure 3 to afford a reddish solid, yield 89.7%. mp 119-221°C. *^{1}H NMR (300 MHz, $CDCl_3$, ppm): δ* 7.33 (d, *J* = 8.61 Hz, 1H), 6.39 (dd, *J* = 8.58, 1.83 Hz, 1H), 6.23 (d, *J* = 1.83 Hz, 1H), 3.85 (s, 3H), 3.69 (hep, *J* = 6.21 Hz, 1H), 3.67 (br, 1H), 2.44 (s, 3H), 1.24 (d, *J* = 6.21 Hz, 6H). *^{13}C NMR (125 MHz,* $CDCl_3$*, ppm): δ* 146.4, 142.8, 141.2, 121.0, 116.4, 111.5, 88.5, 44.7, 34.8, 22.7,

11.7. ESI-MS *m/z* 2204.10 $[M+H]^+$.

***N*-Cyclopentyl-1,3-dimethyl-1*H*-indazol-6-amine (32)**. Prepared from compound **17** and cyclopentanone following the general procedure 3 to afford a reddish solid, yield 94.3%. mp 125-127°C. *^{1}H NMR (500 MHz, $CDCl_3$, ppm): δ* 7.32 (d, *J* = 8.60 Hz, 1H), 6.40 (dd, *J* = 8.65, 1.75 Hz, 1H), 6.24 (d, *J* = 1.30 Hz, 1H), 3.85-3.81 (m, 5H), 2.44 (s, 3H), 2.06 (hex, *J* = 6.20 Hz, 2H), 1.77-1.70 (m, 2H), 1.68-1.62 (m, 2H), 1.54-1.48 (m, 2H). *^{13}C NMR (125 MHz,* $CDCl_3$*, ppm): δ* 147.2, 142.8, 141.1, 120.9, 116.2, 111.5, 88.2, 54.9, 34.8, 33.4, 24.1, 11.7. ESI-MS *m/z* 256.20 $[M+H]^+$.

***N*-Cyclohexyl-1,3-dimethyl-1*H*-indazol-6-amine (33)**. Prepared from compound **17** and cyclohexanone following the general procedure 3 to afford a reddish solid, yield 87.3%. mp 120-122°C. *^{1}H NMR (300 MHz, $CDCl_3$, ppm): δ* 7.34 (d, *J* = 8.61 Hz, 1H), 6.47 (d-like, 1H), 6.35 (s, 1H), 3.85 (s, 3H), 3.35-3.25 (m, 1H), 2.44 (s, 3H), 2.15-2.05 (m, 2H), 1.76-1.60 (m, 3H), 1.40-1.24 (m, 5H). *^{13}C NMR (125 MHz,* $CDCl_3$*, ppm): δ* 146.5, 142.8, 141.1, 121.0, 116.3, 111.4, 88.2, 70.3, 35.5, 33.2, 24.9, 24.1, 11.7. ESI-MS *m/z* 244.10 $[M+H]^+$.

***N*-Benzyl-1,3-dimethyl-1*H*-indazol-6-amine (34)**. Prepared from compound **17** and benzaldehyde following the general procedure 3 to afford a reddish solid, yield 92.1%. mp 127-129°C. *^{1}H NMR (300 MHz, $CDCl_3$, ppm): δ* 7.40-7.28 (m, 6H), 6.50 (dd, *J* = 8.61, 1.83 Hz, 1H), 6.27 (d, *J* = 1.83 Hz, 1H), 4.38 (s, 2H), 3.83 (s, 3H), 2.46 (s, 3H). *^{13}C NMR (125 MHz,* $CDCl_3$*, ppm): δ* 147.6, 142.7, 141.2, 138.9, 128.7, 127.6, 127.4, 121.0, 116.5, 111.0, 87.9, 48.5, 34.8, 11.7. ESI-MS *m/z* 252.10 $[M+H]^+$.

1,3-Dimethyl-*N*-(pyridin-3-ylmethyl)-1*H*-indazol-6-amine (35). Prepared from compound **17** and 3-pyridinecarboxaldehyde following the general procedure 3 to afford a reddish solid, yield 81.5%. mp 107-109°C. *^{1}H NMR (300 MHz, $CDCl_3$, ppm): δ* 8.60 (d, *J* = 2.01 Hz, 1H), 8.48 (d, *J* = 3.30 Hz, 1H), 7.66 (d, *J* = 7.86 Hz, 1H), 7.33 (d, *J* = 8.67 Hz, 1H), 7.22 (dd, *J* = 7.89, 4.77 Hz, 1H), 6.44 (dd, *J* = 8.43 Hz, 1.86 Hz, 1H), 6.20 (d, *J* = 1.83 Hz, 1H), 4.37 (s, 2H), 4.22 (br, 1H), 3.77 (s, 3H), 2.40 (s, 3H). *^{13}C NMR (125 MHz,* $CDCl_3$*, ppm): δ* 148.9, 148.6, 146.9, 142.5, 141.2, 135.3, 134.6, 123.7, 121.2, 116.8, 110.9, 88.2, 45.9, 34.8, 11.7. ESI-MS *m/z* 256.20 $[M+H]^+$.

***N*-(4-Fluorobenzyl)-1,3-dimethyl-1*H*-indazol-6-amine (36)**. Prepared from compound **17** and 4-fluorobenzaldehyde following the general procedure 3 to afford a reddish solid, yield 90.7%. mp 123-125°C. *^{1}H NMR (500 MHz, $CDCl_3$, ppm): δ* 7.38-7.33 (m, 3H), 7.03 (t, *J* = 8.60 Hz, 2H), 6.48 (dd, *J* = 8.60, 1.75 Hz, 1H), 6.25 (d, *J* = 1.35 Hz, 1H), 4.35 (s, 2H), 4.23 (bs, 1H), 3.82 (s, 3H), 2.46 (s, 3H). *^{13}C NMR (125 MHz,* $CDCl_3$*, ppm): δ* 163.1-161.1 (d, $^1J_{C\text{-}F}$ = 243.9 Hz), 147.3, 142.6, 141.2, 134.6-134.5 (d, $^4J_{C\text{-}F}$ = 3.3 Hz), 129.1-129.1 (d, $^3J_{C\text{-}F}$ = 7.9 Hz), 121.1, 116.6, 115.6-115.5 (d, $^2J_{C\text{-}F}$ = 21.4 Hz), 110.9, 88.0, 47.8, 34.9, 11.8. ESI-MS *m/z* 270.20 $[M+H]^+$.

***N*-(3-Fluorobenzyl)-1,3-dimethyl-1*H*-indazol-6-amine (37)**. Prepared from compound **17** and 3-fluorobenzaldehyde following the general procedure 3 to afford a reddish solid, yield 87.9%. mp 122-124°C. *^{1}H NMR (500 MHz, $CDCl_3$, ppm): δ* 7.37 (d, *J* = 8.95 Hz, 1H), 7.30 (td, *J* = 7.85, 6.20 Hz, 1H), 7.16 (d, *J* = 7.60 Hz, 1H), 7.09 (d, *J* = 9.65 Hz, 1H), 6.96 (td, *J* = 8.40, 2.50 Hz, 1H), 6.50 (dd, *J* = 8.60, 1.75 Hz, 1H), 6.23 (d, *J* = 1.25 Hz, 1H), 4.30 (s, 2H), 3.82 (s, 3H), 2.46 (s, 3H). *^{13}C NMR (125 MHz,* DMSO*, ppm): δ* 163.7–161.8 (d, $^{1}J_{C\text{-}F}$ = 241.8 Hz), 148.2, 143.8-143.8 (d, $^{3}J_{C\text{-}F}$ = 6.8 Hz), 143.0, 140.1, 130.7-130.6 (d, $^{3}J_{C\text{-}F}$ = 8.3 Hz), 123.8-123.8 (d, $^{4}J_{C\text{-}F}$ = 2.7 Hz), 120.8, 115.7, 114.4-114.3 (d, $^{2}J_{C\text{-}F}$ = 21.3 Hz), 113.9-113.8 (d, $^{2}J_{C\text{-}F}$ = 20.9 Hz), 111.5, 87.6, 46.5, 34.9, 11.9. ESI-MS *m/z* 270.20 $[M+H]^+$.

***N*-Isopropyl-2-methyl-2*H*-indazol-6-amine (38)**. Prepared from compound **18** and acetone following the general procedure 3 to afford a red solid, yield 96.1%. mp 114-116°C. *^{1}H NMR (500 MHz, $CDCl_3$, ppm): δ* 7.66 (s, 1H), 7.36 (d, *J* = 8.85 Hz, 1H), 6.62 (s, 1H), 6.46 (dd, *J* = 8.90, 1.55 Hz, 1H), 4.08 (s, 3H), 3.65 (hep, *J* = 6.25 Hz, 1H), 1.23 (d, *J* = 6.20 Hz, 6H). *^{13}C NMR (125 MHz,* $CDCl_3$*, ppm): δ* 151.0, 145.6, 123.5, 120.4, 116.6, 116.2, 92.9, 44.3, 39.7, 22.7. ESI-MS *m/z* 190.10 $[M+H]^+$.

***N*-Cyclopentyl-2-methyl-2*H*-indazol-6-amine (39)**. Prepared from compound **18** and cyclopentanone following the general procedure 3 to afford a reddish solid, yield 88.9%. mp 116-118°C. *IR (KBr, cm^{-1}):* 3286 (NH amin); 3080 (CH aromatic); 1631 (C=N); 1564, 1496 (C=C aromatic). *^{1}H NMR (300 MHz, $CDCl_3$, ppm): δ* 7.60 (s, 1H), 7.31 (d, *J* = 8.79 Hz, 1H), 6.54 (s, 1H), 6.40 (dd, *J* = 8.79, 2.01 Hz, 1H), 4.03 (s, 3H), 3.81-3.71 (m, 1H), 2.03-1.96 (m, 2H), 1.69-1.43 (m, 6H). *^{13}C NMR (125 MHz,* DMSO*, ppm): δ* 150.7, 146.7, 124.1, 120.4, 116.5, 115.6, 91.2, 54.1, 39.5, 32.8, 24.3. ESI-MS *m/z* 216.10 $[M+H]^+$.

***N*-Cyclohexyl-2-methyl-2*H*-indazol-6-amine (40)**. Prepared from compound **18** and cyclohexanone following the general procedure 3 to afford a reddish solid, yield 87.0%. mp 120-122°C. *IR (KBr, cm^{-1}):* 3271 (NH amin); 3115 (CH aromatic); 1635 (C=N); 1562, 1494 (C=C aromatic). *^{1}H NMR (300 MHz, $CDCl_3$, ppm): δ* 7.67 (s, 1H), 7.38 (d, *J* = 8.97 Hz, 1H), 6.71 (s, 1H), 6.53 (d, *J* = 9.15 Hz, 1H), 4.09 (s, 3H), 3.38-3.28 (m, 1H), 2.13-2.09 (m, 2H), 1.72-1.61 (m, 3H), 1.37-1.18 (m, 5H). *^{13}C NMR (125 MHz,* DMSO*, ppm): δ* 150.8, 146.0, 124.1, 120.6, 116.5, 115.6, 90.9, 51.1, 39.5, 32.8, 26.2, 25.0. ESI-MS *m/z* 230.10 $[M+H]^+$.

***N*-Benzyl-2-methyl-2*H*-indazol-6-amine (41)**. Prepared from compound **18** and benzaldehyde following the general procedure 3 to afford a reddish solid, yield 79.8%. mp 124-126°C. *IR (KBr, cm^{-1}):* 3309 (NH amin); 3118 (CH aromatic); 1635 (C=N); 1562, 1494 (C=C aromatic). *^{1}H NMR (300 MHz, $CDCl_3$, ppm): δ* 7.61 (s, 1H), 7.35-7.19 (m, 6H), 6.56 (s, 1H), 6.48 (dd, *J* = 8.79, 2.01 Hz, 1H), 4.29 (s, 2H), 4.02 (s, 3H). *^{13}C NMR (125 MHz,* $CDCl_3$*, ppm): δ* 150.7, 146.4, 139.1, 128.6, 127.7, 127.2, 123.5, 120.4, 116.4, 116.1, 92.9, 48.5, 39.7. ESI-MS *m/z* 238.17 $[M+H]^+$.

2-Methyl-*N*-(pyridin-3-ylmethyl)-2*H*-indazol-6-amine (42). Prepared from compound **18** and 3-pyridinecarboxaldehyde following the general procedure 3 to afford a reddish solid, yield 76.9%. mp 109-111°C. *^{1}H NMR (500 MHz, $CDCl_3$, ppm): δ* 8.65 (s, 1H), 8.51 (d, *J* = 3.00 Hz, 1H), 7.73 (d, *J* = 7.50 Hz, 1H), 7.69 (s, 1H), 7.43 (d, *J* = 9.00 Hz, 1H), 7.25 (dd, *J* = 5.50, 2.50 Hz, 1H), 6.59 (s, 1H), 6.57 (dd, *J* = 9.00, 2.00 Hz, 1H), 4.40 (s, 2H), 4.08 (s, 3H). *^{13}C NMR (125 MHz,* $CDCl_3$*, ppm): δ* 150.6, 149.2, 148.6, 145.9, 135.2, 134.6, 123.6, 123.5, 120.7, 116.6, 115.9, 93.3, 46.0, 39.8. ESI-MS *m/z* 238.17 $[M+H]^+$.

***N*-(4-Fluorobenzyl)-2-methyl-2*H*-indazol-6-amine (43)**. Prepared from compound **18** and 4-fluorobenzaldehyde following the general procedure 3 to afford a reddish solid, yield 78.9%. mp 114-116°C. *IR (KBr, cm^{-1}):* 3261 (NH amine); 3120 (CH aromatic); 1633 (C=N); 1562, 1502 (C=C aromatic); 1222 (C-F aromatic). *^{1}H NMR (500 MHz, $CDCl_3$, ppm): δ* 7.66 (s, 1H), 7.39 (d, *J* = 8.85 Hz, 1H), 7.34 (dd, *J* = 8.30, 5.60 Hz, 2H), 6.99 (t, *J* = 8.65 Hz, 2H), 6.57 (s, 1H), 6.53 (dd, *J* = 8.95, 1.90 Hz, 1H), 4.31 (s, 2H), 4.01 (s, 3H). *^{13}C NMR (125 MHz,* DMSO*, ppm): δ* 162.5-160.6 (d, $^1J_{C\text{-}F}$ = 240 Hz), 150.5, 146.6, 136.7-136.6 (d, $^4J_{C\text{-}F}$ = 2.9 Hz), 129.6-129.5 (d, $^3J_{C\text{-}F}$ = 8.0 Hz), 124.3, 120.7, 116.2, 115.9, 115.5-115.3 (d, $^2J_{C\text{-}F}$ = 21.0 Hz), 91.6, 46.4. ESI-MS *m/z* 256.19 $[M+H]^+$.

***N*-(3-Fluorobenzyl)-2-methyl-2*H*-indazol-6-amine (44)**. Prepared from compound **18** and 3-fluorobenzaldehyde following the general procedure 3 to afford a reddish solid, yield 75.7%. mp 123-125°C. *^{1}H NMR (300 MHz, $CDCl_3$, ppm): δ* 7.61 (s, 1H), 7.25 (d, *J* = 9.33 Hz, 1H), 7.20 (dt, *J* = 5.85, 7.86 Hz, 1H), 7.09 (d, *J* = 7.68 Hz, 1H), 7.03 (d, *J* = 9.54 Hz, 1H), 6.86 (td, *J* = 8.25, 2.19 Hz, 1H), 6.51-6.47 (m, 2H), 4.30 (s, 2H), 4.14 (br, 1H), 4.00 (s, 3H). *^{13}C NMR (125 MHz,* $CDCl_3$*, ppm): δ* 164.1-162.1 (d, $^1J_{C\text{-}F}$ = 245.0 Hz), 150.6, 146.2, 142.0-142.0 (d, $^3J_{C\text{-}F}$ = 6.8 Hz), 130.1-130.1 (d, $^3J_{C\text{-}F}$ = 8.1 Hz), 123.7, 122.9-122.7 (d, $^4J_{C\text{-}F}$ = 2.9 Hz), 120.6, 116.5, 116.1, 114.3-14.2 (d, $^2J_{C\text{-}F}$ = 21.6 Hz), 114.1-114.0 (d, $^2J_{C\text{-}F}$ = 21.1 Hz), 93.1, 47.9 (d, $^4J_{C\text{-}F}$ = 1.6 Hz), 39.8.. ESI-MS *m/z* 256.19 $[M+H]^+$.

***N*-Isopropyl-2,3-dimethyl-2*H*-indazol-6-amine (45)**. Prepared from compound **19** and acetone following the general procedure 3 to afford a pink solid, yield 95.6%. mp 116-118°C. *^{1}H NMR (300 MHz, $CDCl_3$, ppm): δ* 7.27 (d, *J* = 8.79 Hz, 1H), 6.51 (d, *J* = 1.47 Hz, 1H), 6.39 (dd, *J* = 8.79, 1.83 Hz, 1H), 3.95 (s, 3H), 3.65 (hep, *J* = 6.24 Hz, 1H), 3.49 (br, 1H), 2.50 (s, 3H), 1.22 (d, *J* = 6.24 Hz, 6H). *^{13}C NMR (125 MHz,* $CDCl_3$*, ppm): δ* 149.4, 145.8, 131.4, 120.1, 115.4, 115.3, 92.7, 44.3, 36.6, 22.7, 9.8. ESI-MS *m/z* 204.10 $[M+H]^+$.

***N*-Cyclopentyl-2,3-dimethyl-2*H*-indazol-6-amine (46)**. Prepared from compound **19** and cyclopentanone following the general procedure 3 to afford a reddish solid, yield 83.8%. mp 117-119°C. *IR (KBr, cm^{-1}):* 3263 (NH amin); 3084 (CH aromatic); 1631 (C=N); 1562, 1450 (C=C aromatic). *^{1}H NMR (500 MHz, $CDCl_3$, ppm): δ* 7.25 (d, *J* = 8.95 Hz, 1H), 6.52 (d, *J* = 1.40 Hz, 1H), 6.40 (dd, *J* =

8.85, 1.80 Hz, 1H), 3.96 (s, 3H), 3.81 (quintet, *J* = 5.45 Hz, 1H), 3.68 (br, 1H), 2.5 (s, 3H), 2.04 (hex, *J* = 6.45 Hz, 2H), 1.73-1.67 (m, 2H), 1.64-1.60 (m, 2H), 1.53-1.49 (m, 2H). *^{13}C NMR (125 MHz,* $CDCl_3$*, ppm): δ* 149.3, 146.5, 131.4, 119.9, 115.4, 115.3, 92.7, 54.7, 36.6, 33.4, 24.2, 9.8. ESI-MS *m/z* 230.19 $[M+H]^+$.

***N*-Cyclohexyl-2,3-dimethyl-2*H*-indazol-6-amine (47)**. Prepared from compound **19** and cyclohexanone following the general procedure 3 to afford a reddish solid, yield 91.2%. mp 116-118°C. *IR (KBr, cm^{-1}):* 3290 (NH amin); 3018 (CH aromatic); 1633 (C=N); 1560, 1448 (C=C aromatic). *^{1}H NMR (300 MHz, $CDCl_3$, ppm): δ* 7.21 (d, *J* = 8.97 Hz, 1H), 6.47 (d, *J* = 1.65 Hz, 1H), 6.35 (dd, *J* = 8.97, 2.01 Hz, 1H), 3.90 (s, 3H), 3.27-3.20 (m, 1H), 2.43 (s, 3H), 2.09-2.05 (m, 2H), 1.71-1.59 (m, 3H), 1.38-1.26 (m, 2H), 1.21-1.13 (m, 3H). *^{13}C NMR (125 MHz,* $CDCl_3$*, ppm): δ* 149.4, 145.7, 131.4, 120.1, 115.4, 115.3, 92.6, 51.9, 36.6, 33.1, 26.0, 25.0, 9.8. ESI-MS *m/z* 244.1 $[M+H]^+$.

***N*-Benzyl-2,3-dimethyl-2*H*-indazol-6-amine (48)**. Prepared from compound **19** and benzaldehyde following the general procedure 3 to afford a red solid, yield 87.5%. mp 123-125°C. *IR (KBr, cm^{-1}):* 3246 (NH amin); 3022 (CH aromatic); 1635 (C=N); 1562, 1448 (C=C aromatic). *^{1}H NMR (300 MHz, $CDCl_3$, ppm): δ* 7.35-7.19 (m, 6H), 6.49 (d, *J* = 1.83 Hz, 1H), 6.42 (dd, *J* = 8.97, 2.01 Hz, 1H), 4.29 (s, 2H), 4.00 (br, 1H), 3.90 (s, 3H), 2.43 (s, 3H). *^{13}C NMR (125 MHz,* $CDCl_3$*, ppm): δ* 149.2, 146.6, 139.2, 131.5, 128.6, 127.7, 127.2, 120.1, 115.6, 114.8, 92.6, 48.5, 36.7, 9.8. ESI-MS *m/z* 252.09 $[M+H]^+$.

2,3-Dimethyl-*N*-(pyridin-3-ylmethyl)-2*H*-indazol-6-amine (49). Prepared from compound **19** and 3-pyridinecarboxaldehyde following the general procedure 3 to afford a red solid, yield 73.6%. mp 112-114°C. *^{1}H NMR (300MHz, $CDCl_3$, ppm): δ* 8.66 (s, 1H), 8.51 (d, *J* = 4.77 Hz, 1H), 7.73 (d, *J* = 7.68 Hz, 1H), 7.33 (d, *J* = 8.61 Hz, 1H), 7.26-7.23 (m, 1H), 6.53-6.50 (m, 2H), 4.40 (s, 2H), 4.12 (br, 1H), 3.97 (s, 3H), 2.51 (s, 3H). *^{13}C NMR (125 MHz,* DMSO*, ppm): δ* 149.4, 148.9, 148.3, 146.6, 135.9, 135.5, 131.3, 123.8, 120.5, 115.3, 114.9, 91.5, 44.8, 36.9, 9.7. ESI-MS *m/z* 253.19 $[M+H]^+$.

***N*-(4-Fluorobenzyl)-2,3-dimethyl-2*H*-indazol-6-amine (50)**. Prepared from compound **19** and 4-fluorobenzaldehyde following the general procedure 3 to afford a reddish solid, yield 88.9%. mp 116-118°C. *IR (KBr, cm^{-1}):* 3257 (NH amin); 3070 (CH aromatic); 1637 (C=N); 1562, 1450 (C=C aromatic); 1224 (C-F aromatic). *^{1}H NMR (500MHz, DMSO, ppm): δ* 7.42 (m, 2H), 7.31 (d, *J* = 9.00 Hz, 1H), 7.14 (t, *J* = 9.00 Hz, 2H), 6.55 (dd, *J* = 9.00, 2.00 Hz, 1H), 6.13 (s, 1H), 4.26 (d, *J* = 6.00 Hz, 2H), 3.85 (s, 3H), 2.51 (s, 3H). *^{13}C NMR (125 MHz,* DMSO*, ppm): δ* 162.5-160.5 (d, $^1J_{C\text{-}F}$ = 253.8 Hz), 149.0, 146.8, 136.7-136.7 (d, $^4J_{C\text{-}F}$ = 2.5 Hz), 129.5-129.5 (d, $^3J_{C\text{-}F}$ = 7.5 Hz), 120.4, 115.5-115.3 (d, $^1J_{C\text{-}F}$ = 21.5 Hz), 115.3, 115.0, 91.4, 46.5, 36.9, 9,7. ESI-MS *m/z* 270.18 $[M+H]^+$.

***N*-(3-Fluorobenzyl)-2,3-dimethyl-2*H*-indazol-6-amine (51)**. Prepared from compound **19** and

3-fluorobenzaldehyde following the general procedure 3 to afford a pink solid, yield 79.7%. mp 127-129°C. *^{1}H NMR (500 MHz, $CDCl_3$, ppm): δ* 7.30 (d, *J* = 8.75 Hz, 1H), 7.26 (dt, *J* = 6.15, 7.85 Hz, 1H), 7.15 (d, *J* = 7.60 Hz, 1H), 7.08 (d, *J* = 9.75 Hz, 1H), 6.91 (td, *J* = 8.55, 2.25 Hz, 1H), 6.50-6.48 (m, 2H), 4.35 (s, 2H), 4.13 (br, 1H), 3.94 (s, 3H), 2.48 (s, 3H). *^{13}C NMR (125 MHz,* $CDCl_3$*, ppm): δ* 164.1-162.2 (d, $^{1}J_{C\text{-}F}$ = 245.0 Hz), 149.0, 146.3, 142.1-142.0 (d, $^{3}J_{C\text{-}F}$ = 6.9 Hz), 131.7, 130.1-130.0 (d, $^{3}J_{C\text{-}F}$ = 8.1 Hz), 123.0-122.9 (d, $^{4}J_{C\text{-}F}$ = 2.8 Hz), 120.3, 115.7, 114.8, 114.3-114.2 (d, $^{2}J_{C\text{-}F}$ = 21.1 Hz), 141.0-113.9 (d, $^{2}J_{C\text{-}F}$ = 21.0 Hz), 92.7, 47.9-47.9 (d, $^{4}J_{C\text{-}F}$ = 1.6 Hz), 36.7, 9.8. ESI-MS *m/z* 270.20 $[M+H]^+$.

Docking simulation analysis of IDO1 and its inhibitors

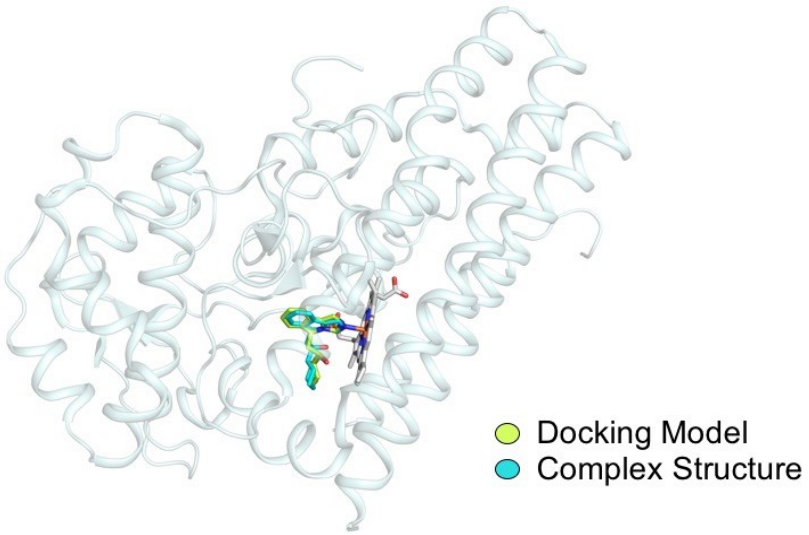


Fig S1. The crystal structure and a docking model of IDO1-5PK. 5PK in the complex structure and the docking model are shown with yellow green and cyan stick models, respectively. Hem ion is shown in grey stick. Oxygen atoms are colored in red.

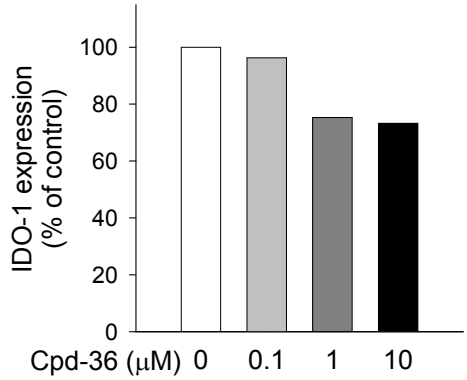
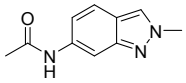
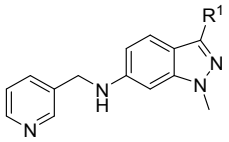
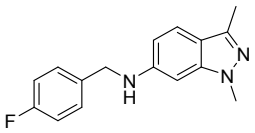
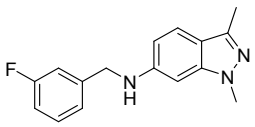


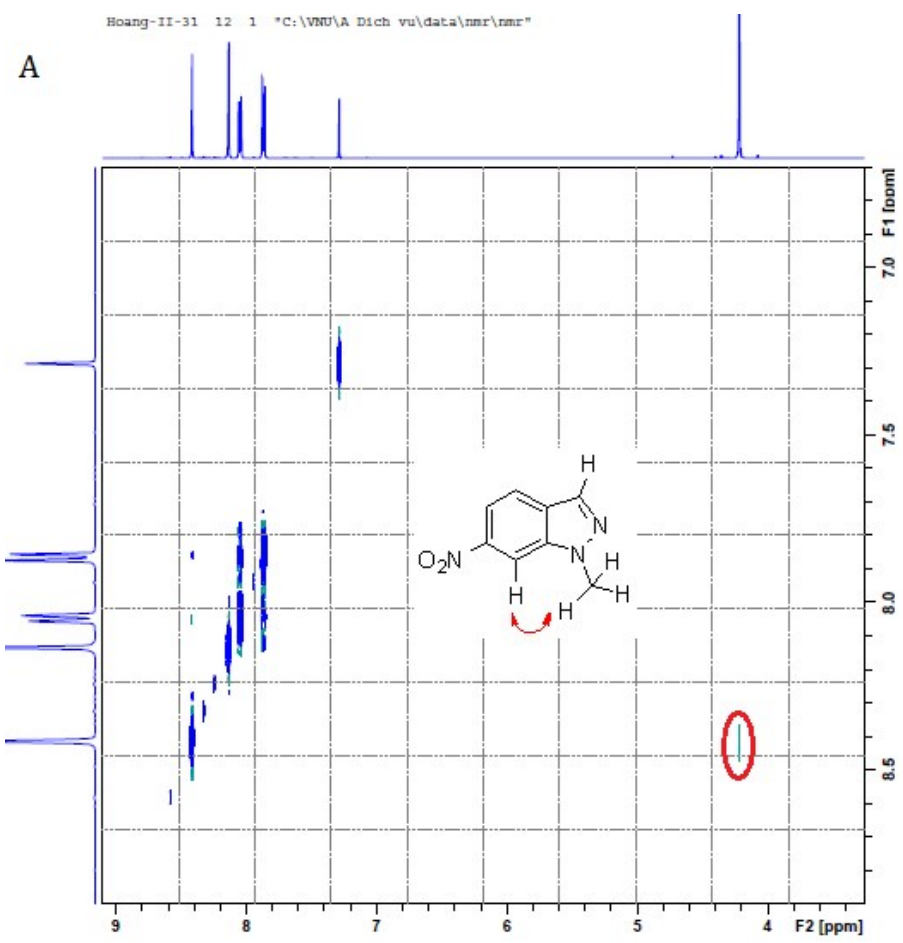
Fig S2. Effect of compound **36** on IDO1 expression in HCT116 cells: HCT116 cells were treated with indicated concentration of compound **36**. IDO1 expression was determined using Western blotting.

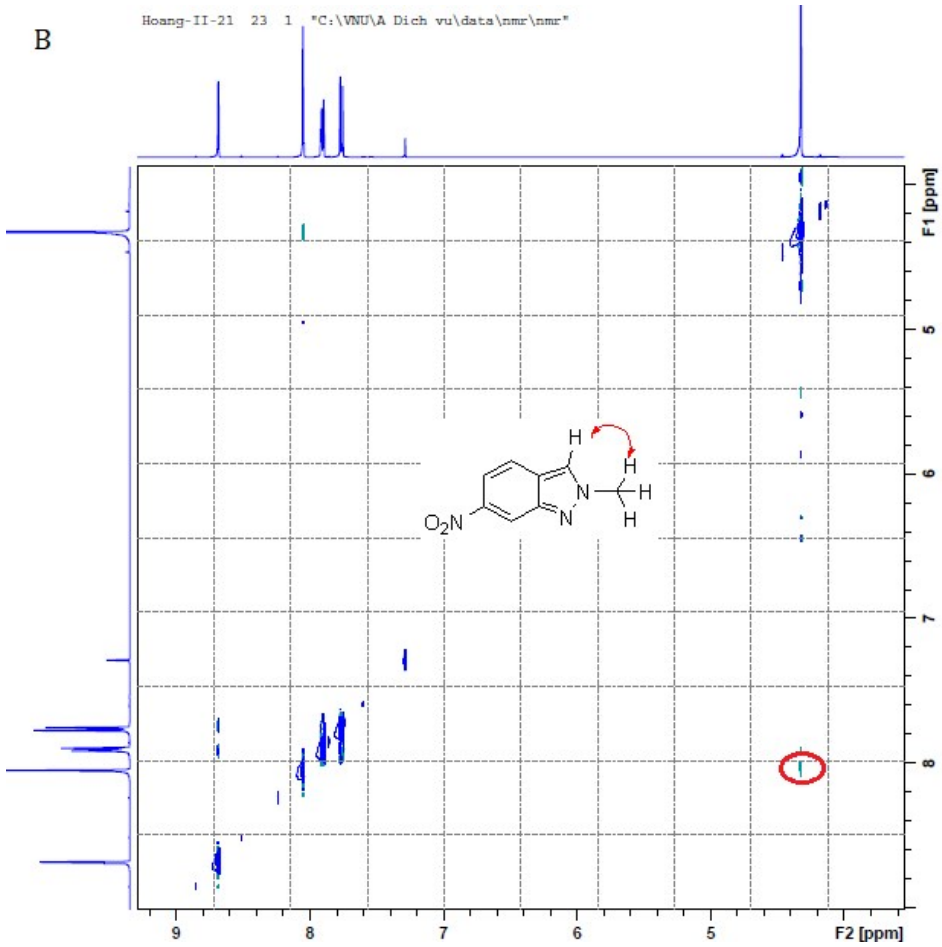
Table S1. IC_{50} of compounds **22, 35-37** on MRC5 cells

Compounds	Structure	IC_{50}[a] (μM)
22		3.7±1.0
35		9.4±4.1
36		11.81±2.9
37		2.6±0.3

[a] IC_{50}: The concentration (μM) of compounds that produces a 50% reduction cell growth. All the data were calculated from the experiments conducted in triplicate and repeated for at least three times. Data represents mean ± SD.

2D Spectra of compounds 12 -15





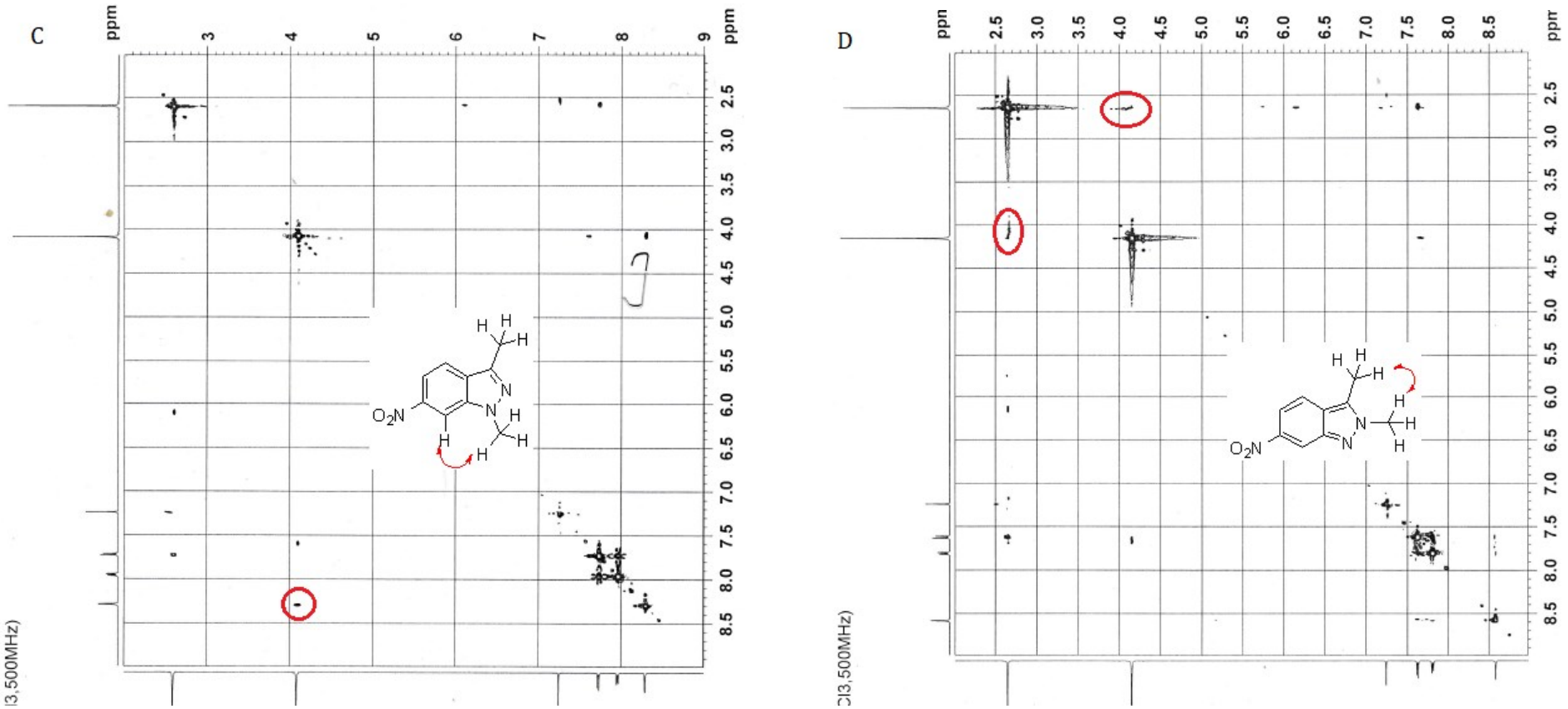
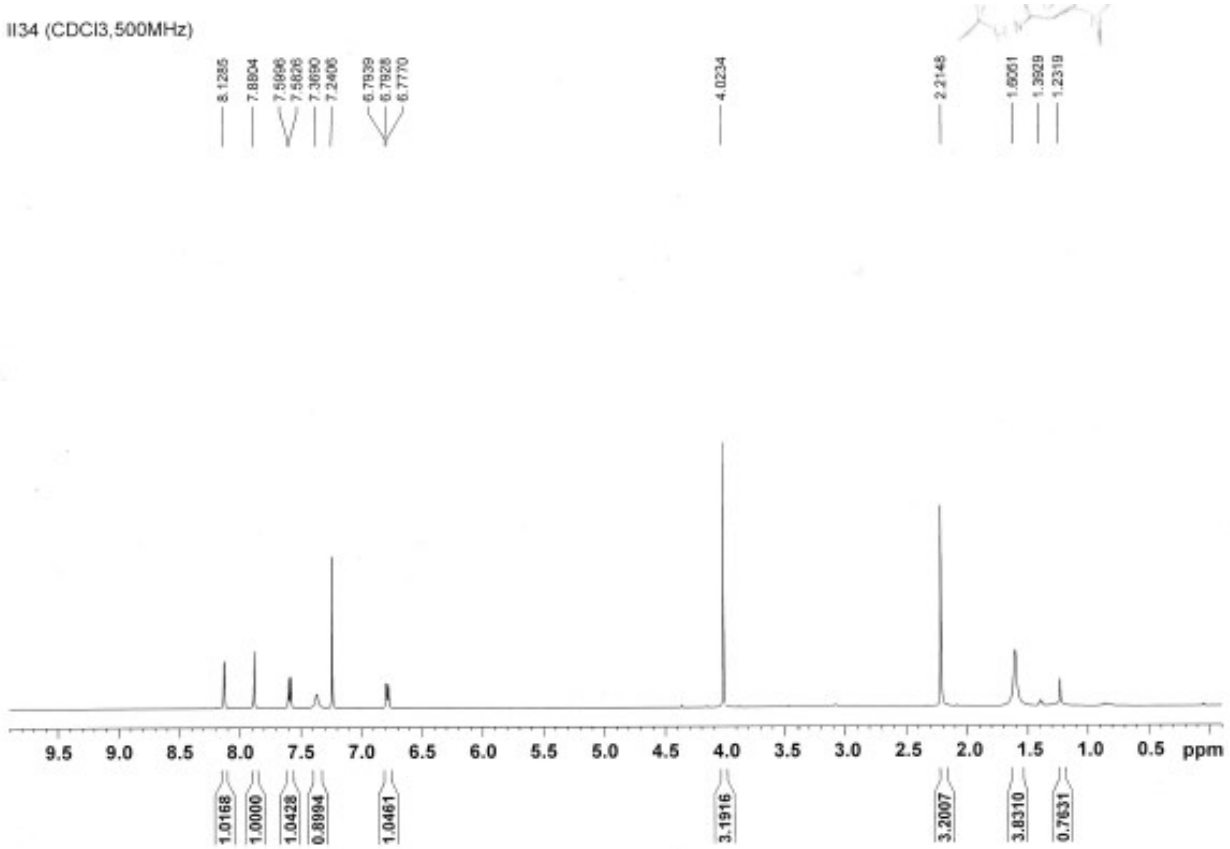


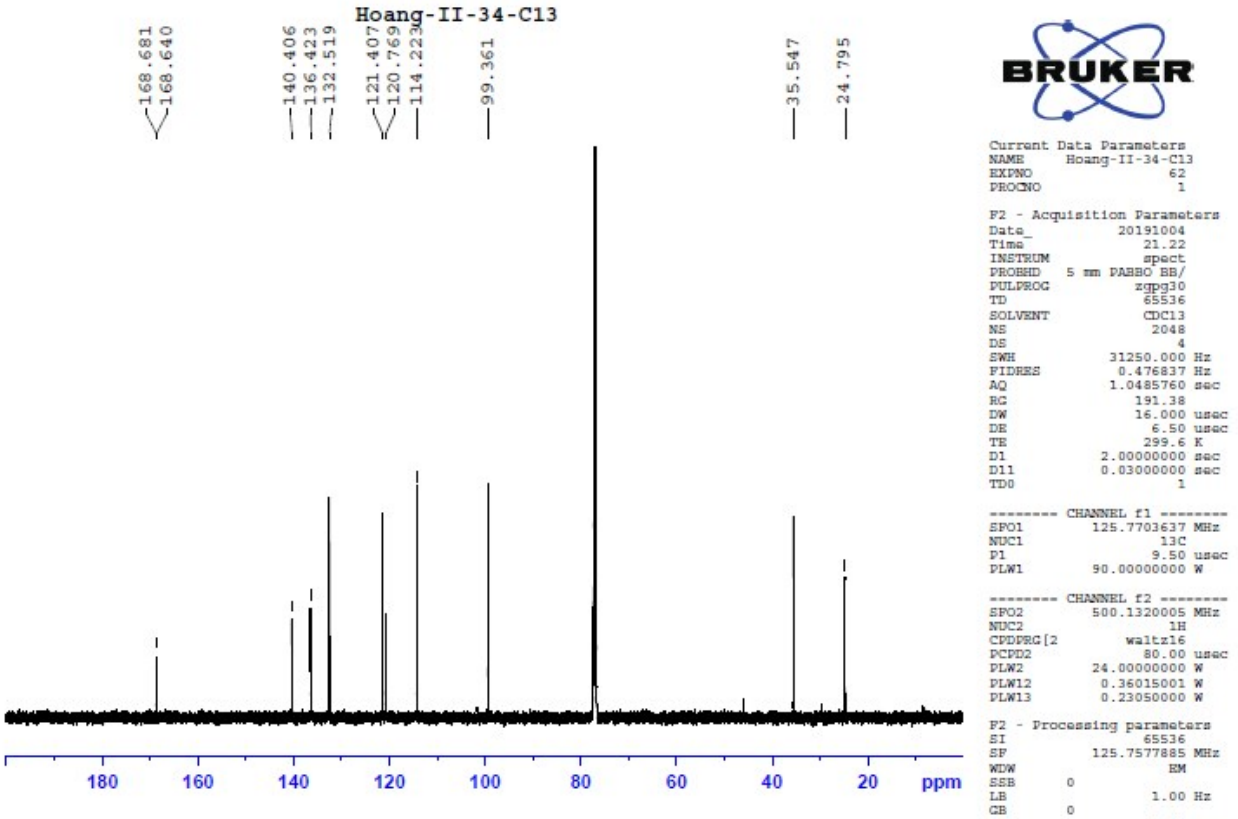
Fig S3. NOESY spectra of **12-15.** (A) NOESY correlation between proton signal from N-CH_3 (4.12 ppm) and H-7 (8.31 ppm) of compound **12**; (B) NOESY correlation between proton signal from N-CH_3 (4.23 ppm) and H-3 (7.95 ppm) of compound **14**. (C) NOESY correlation between proton signal from N-CH_3 (4.16 ppm) and H-7 (8.58 ppm) of compound **13**; NOESY correlation between proton signal from N-CH_3 (4.18 ppm) and 3-CH_3 (2.64 ppm) of compound **15**.

ALL ^{1}H NMR, ^{13}C NMR & MS SPECTRA OF THE FINAL COMPOUNDS

^{1}H NMR of compound 20



^{13}C NMR of compound 20

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Current Data Parameters
NAME      Hoang-II-34-C13
EXPNO                  62
PROCNO                  1

F2 - Acquisition Parameters
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PULPROG         zgpg30
TD                65536
SOLVENT           CDCl3
NS                 2048
DS                    4
SWH           31250.000 Hz
FIDRES        0.476837 Hz
AQ            1.0485760 sec
RG               191.38
DW            16.000 usec
DE             6.50 usec
TE               299.6 K
D1          2.00000000 sec
D11         0.03000000 sec
TD0                   1

======== CHANNEL f1 ========
SFO1        125.7703637 MHz
NUC1              13C
P1              9.50 usec
PLW1       90.00000000 W

======== CHANNEL f2 ========
SFO2        500.1320005 MHz
NUC2              1H
CPDPRG[2       waltz16
PCPD2          80.00 usec
PLW2       24.00000000 W
PLW12       0.36015001 W
PLW13       0.23050000 W

F2 - Processing parameters
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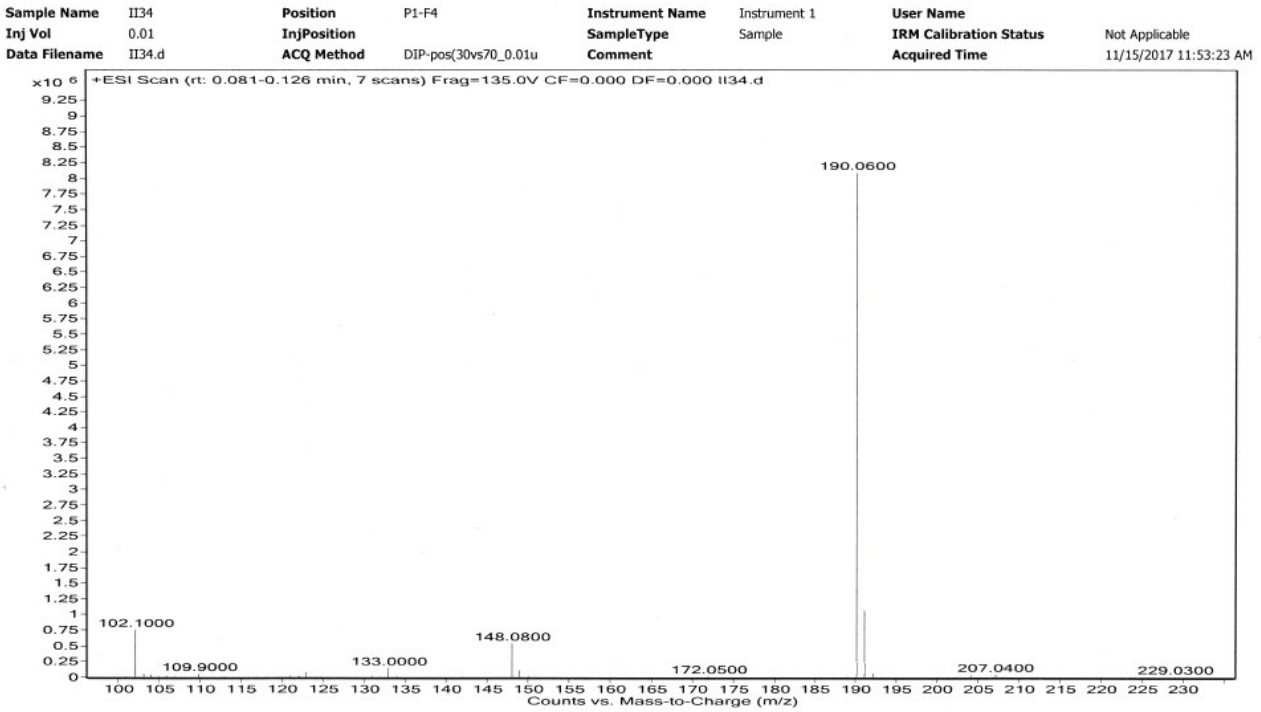
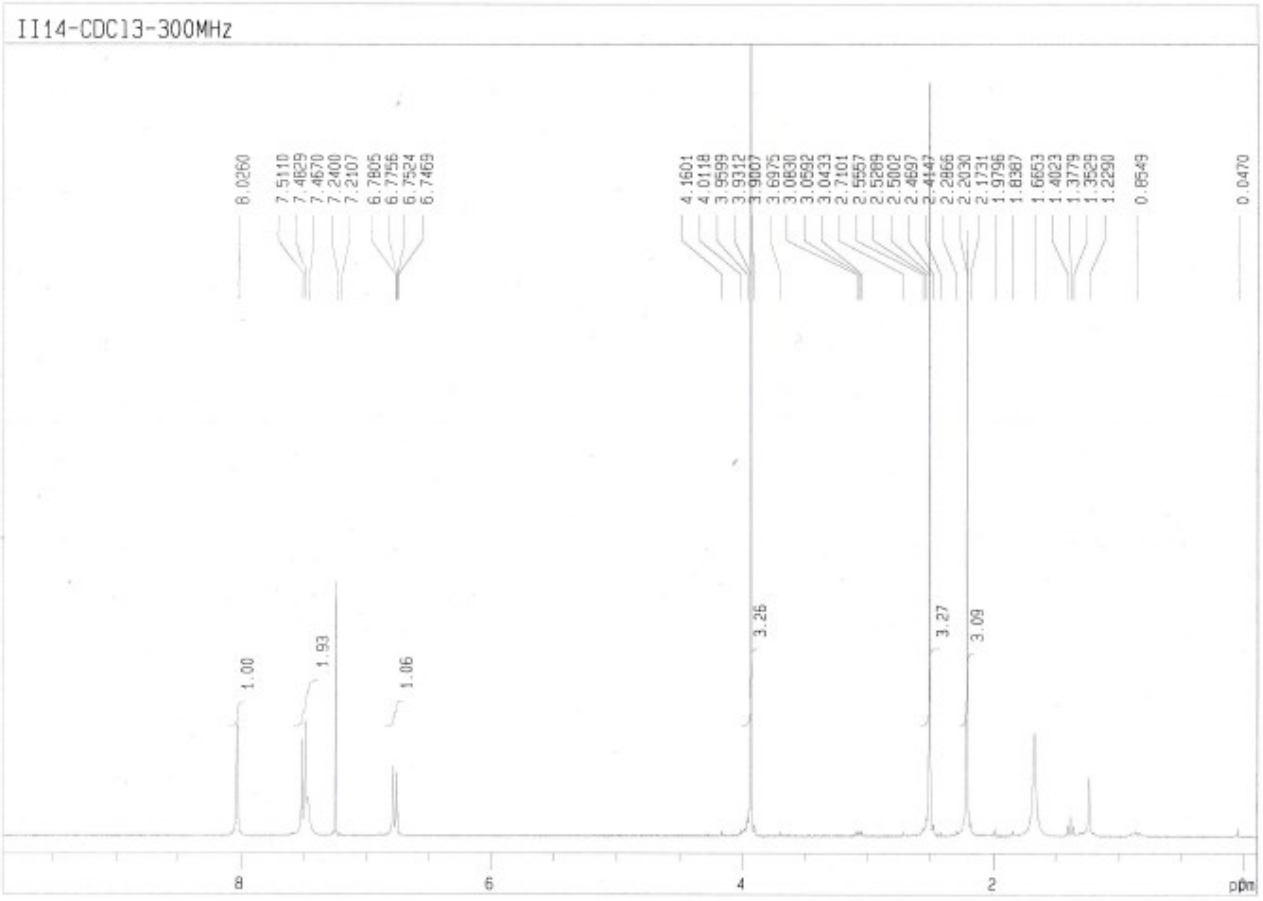
WDW                 EM
SSB       0
LB                1.00 Hz
GB        0
PC                1.40
```

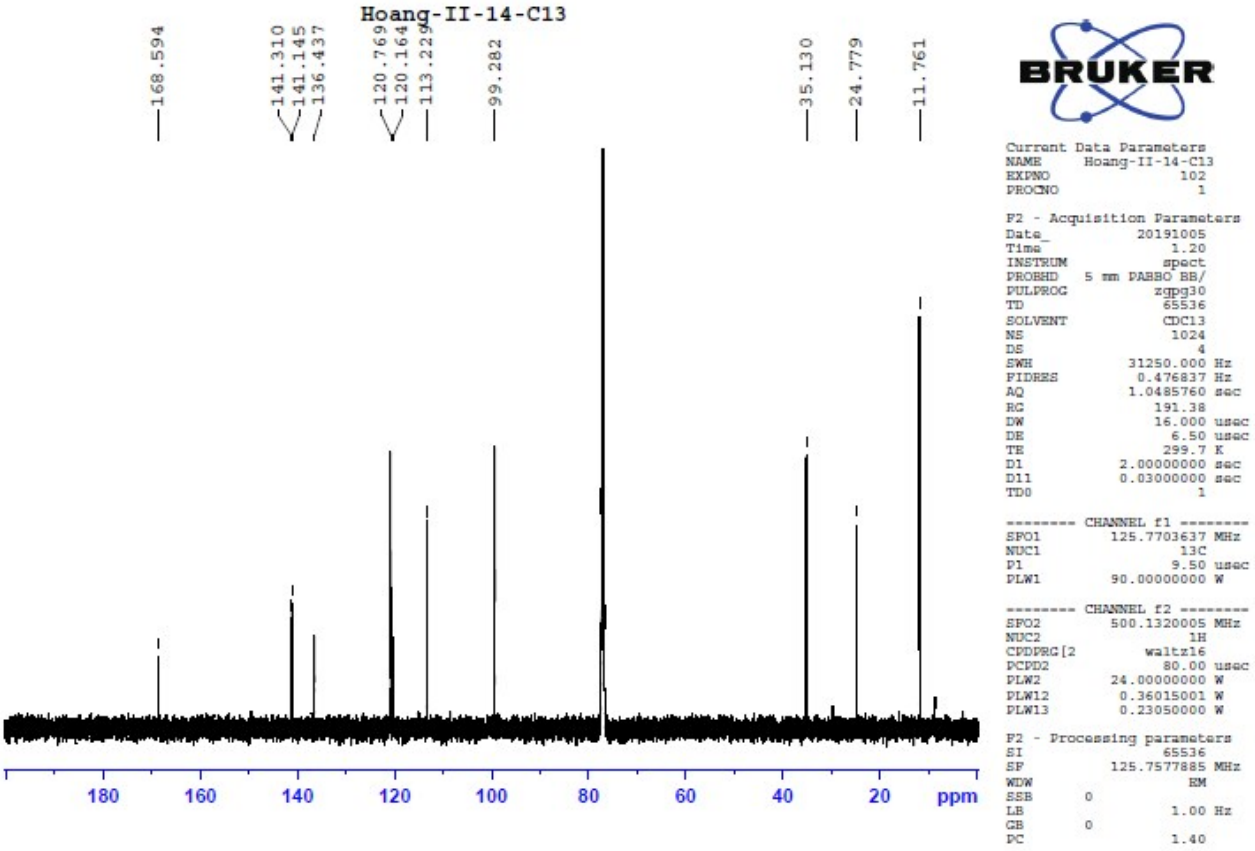
MS of compound 20



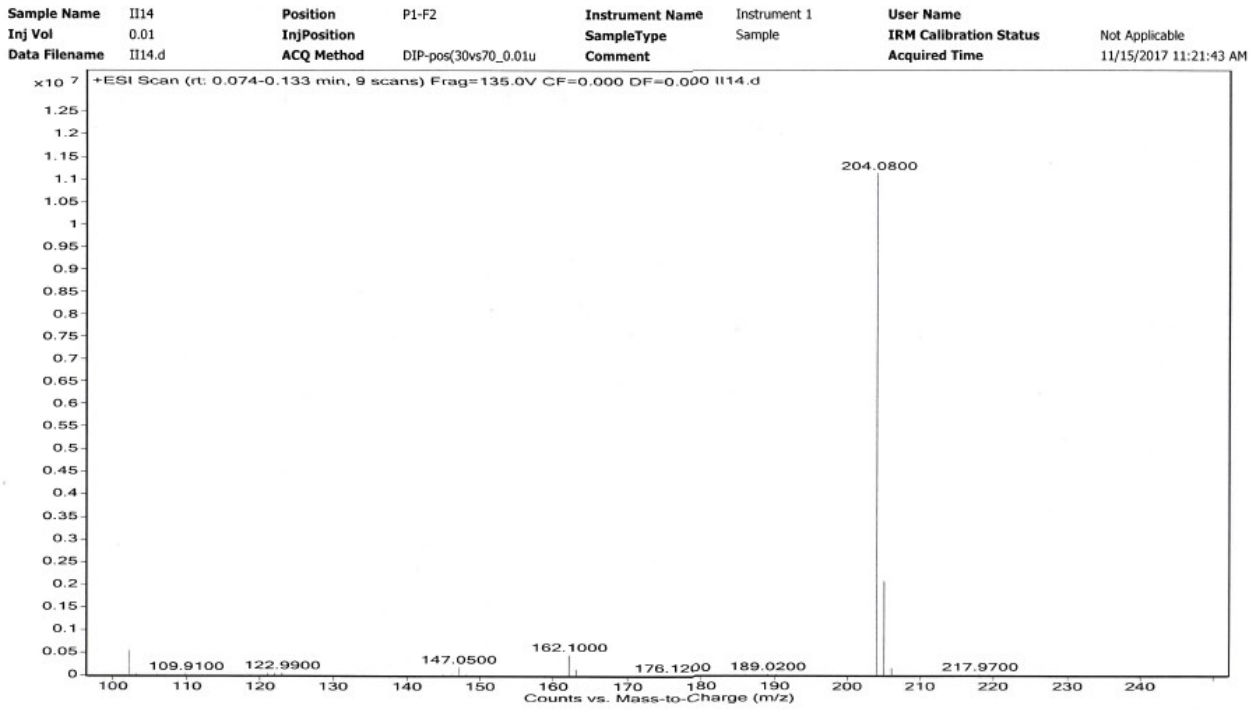
^{1}H NMR of compound 21



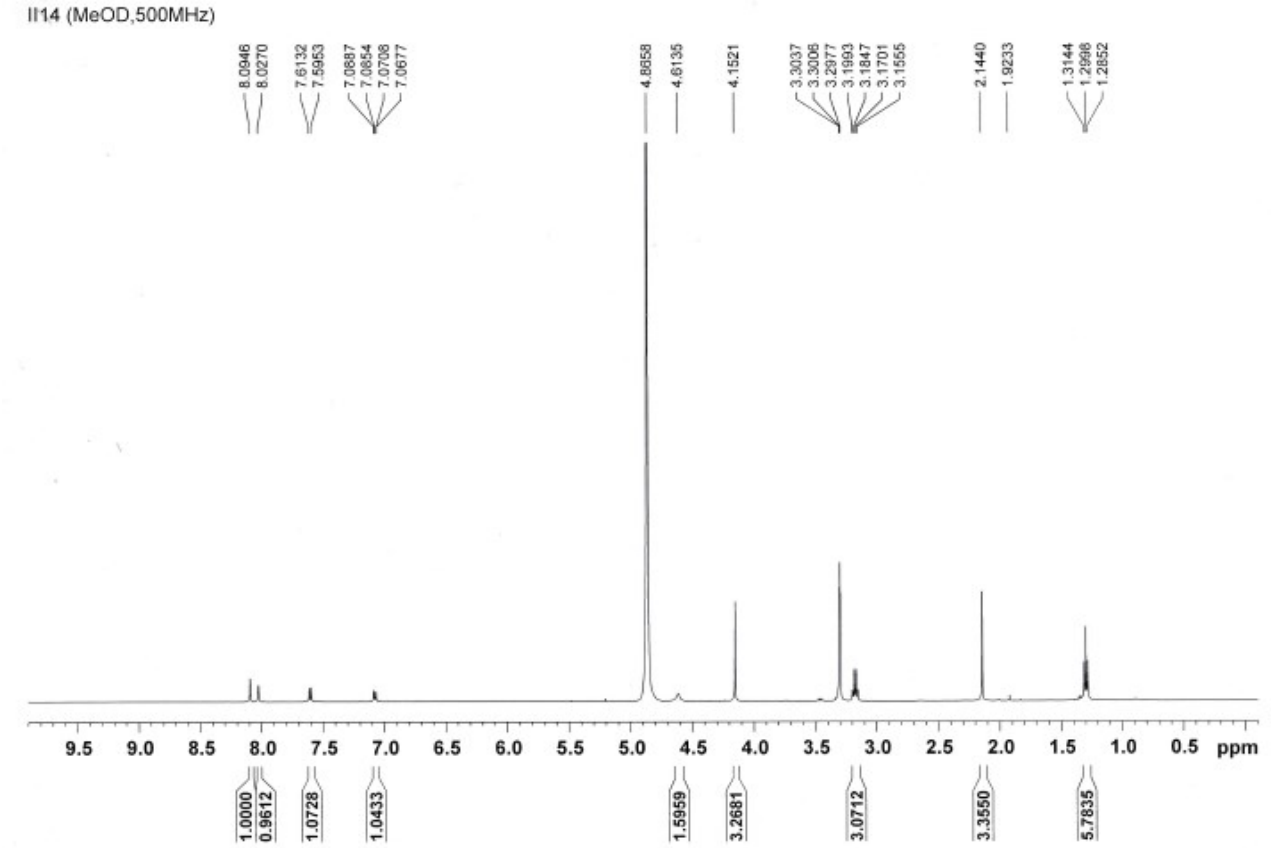
^{13}C NMR of compound 21



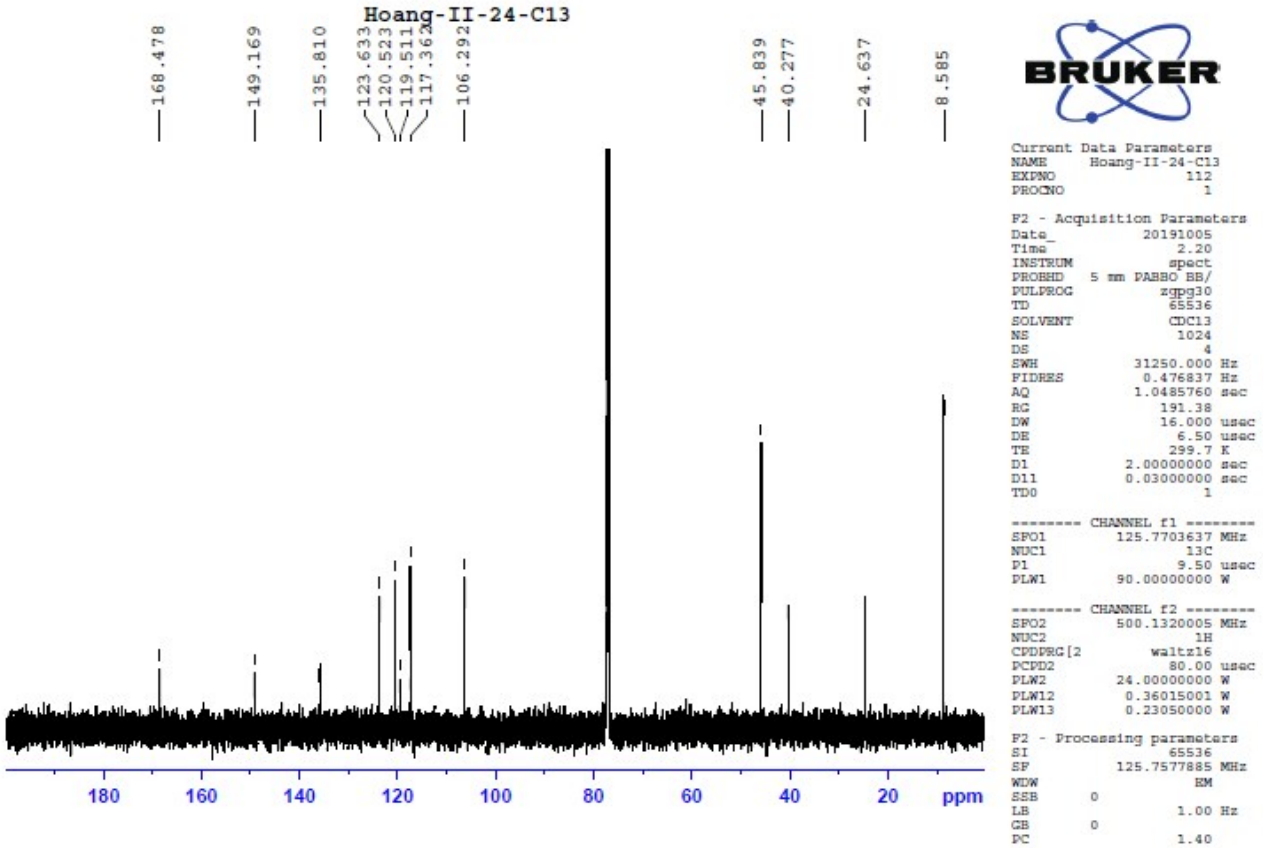
MS of compound 21



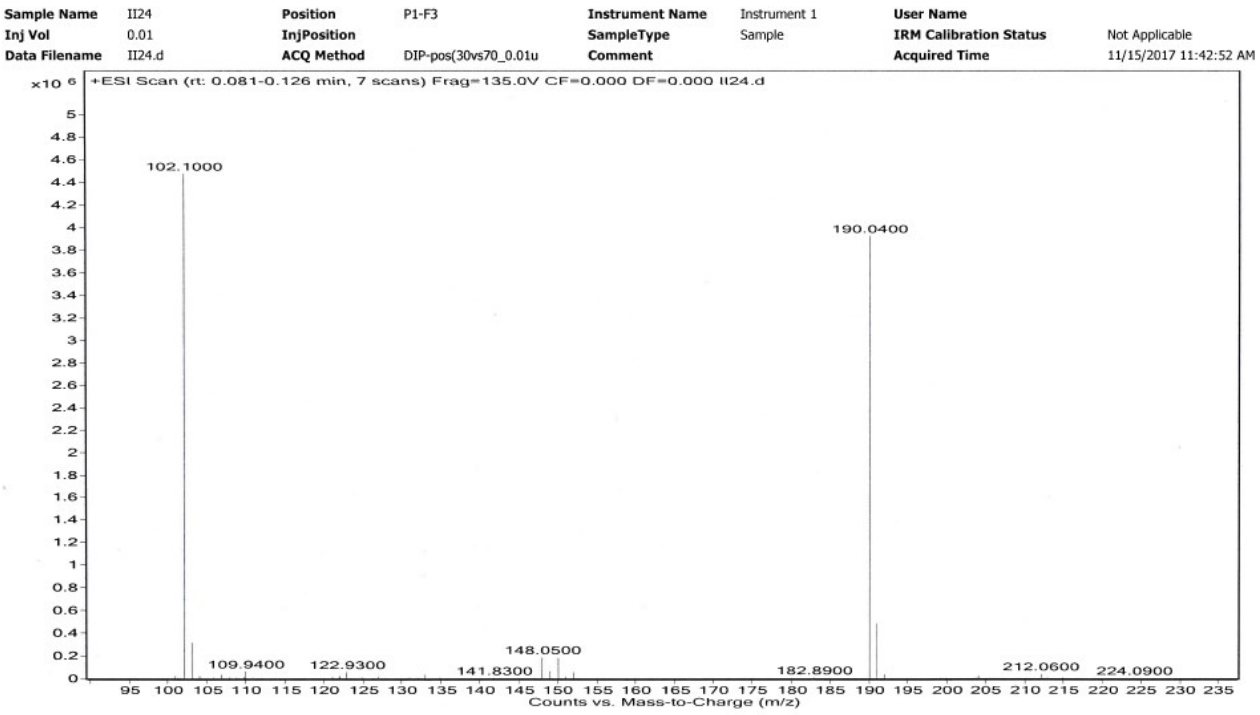
^{1}H NMR of compound 22



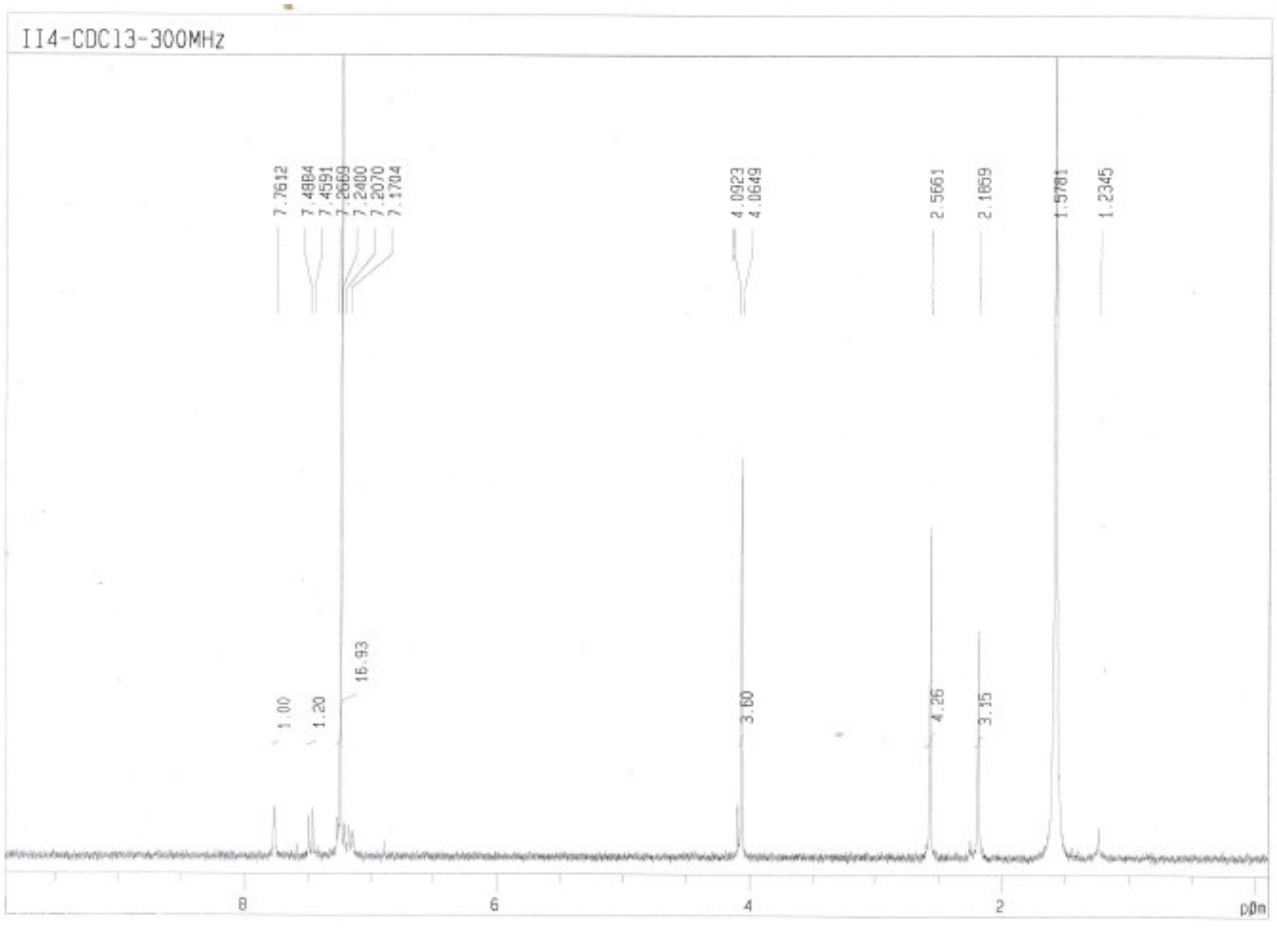
^{13}C NMR of compound 22



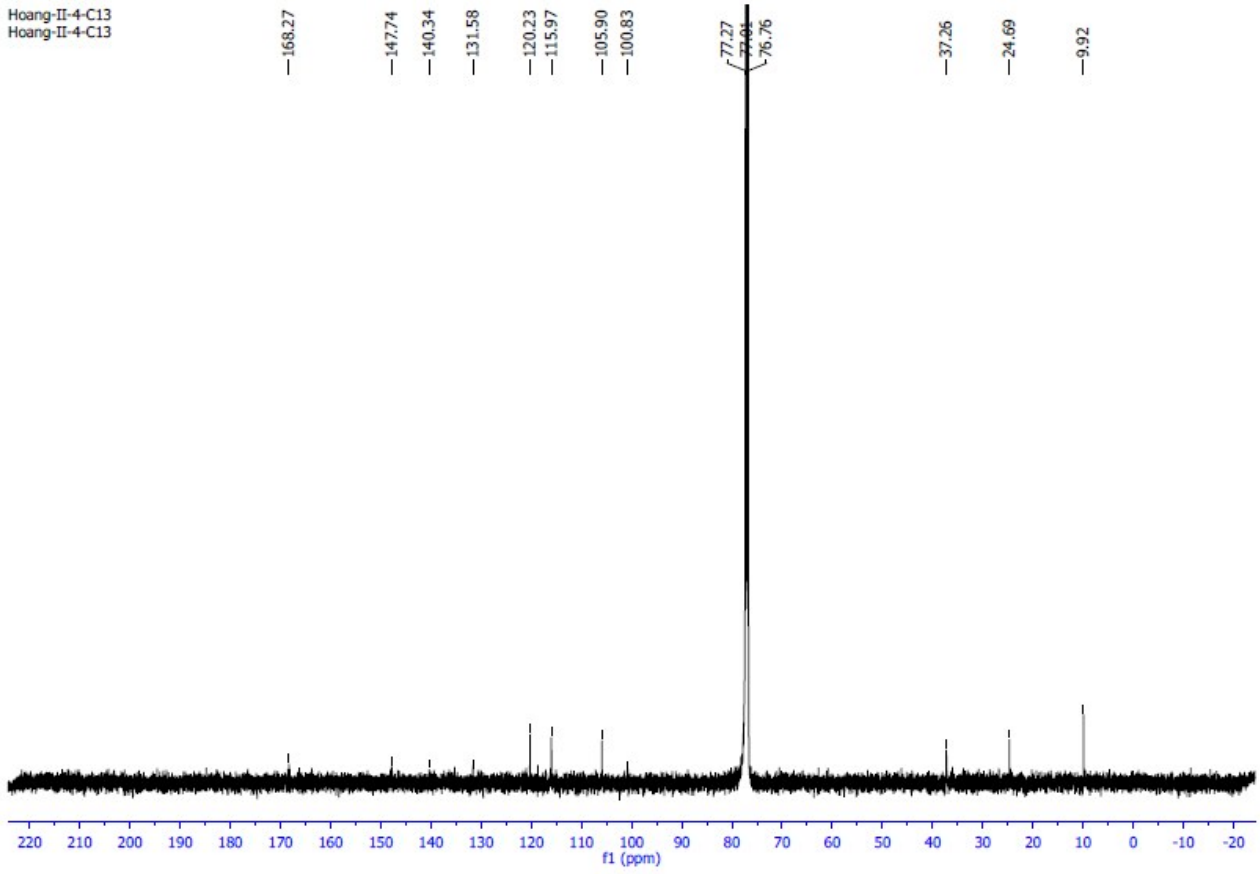
MS of compound 22



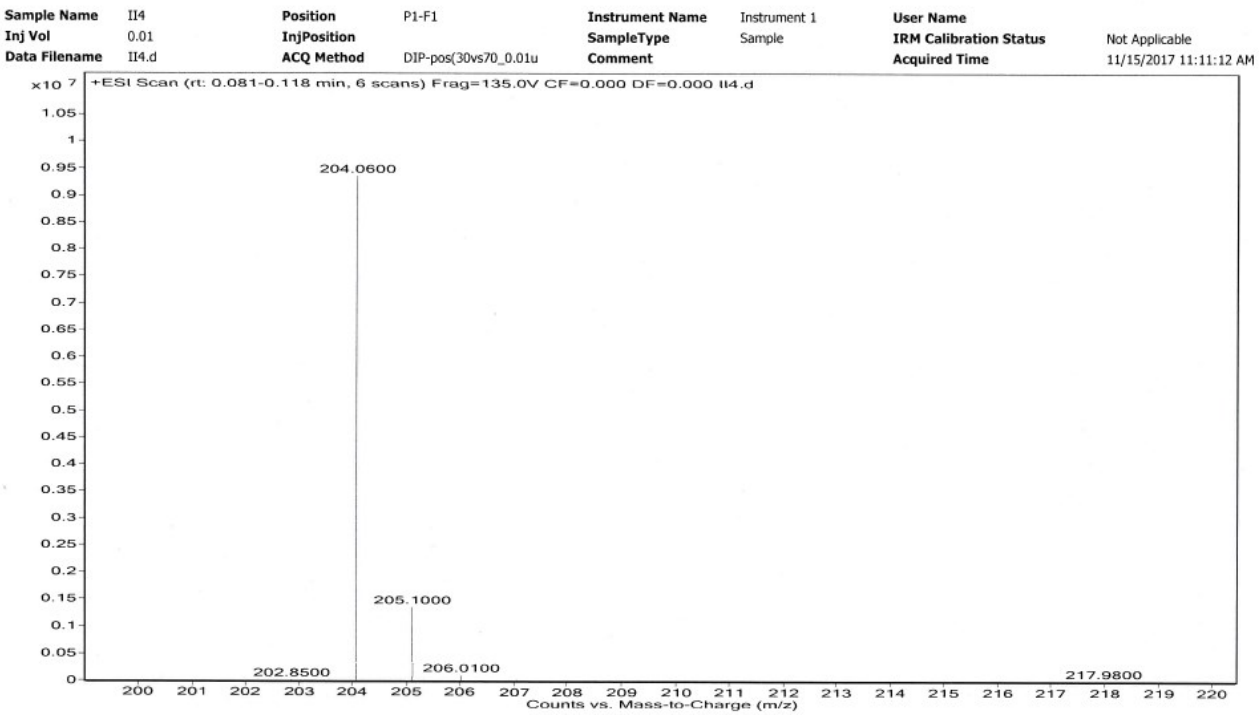
^{1}H NMR of compound 23



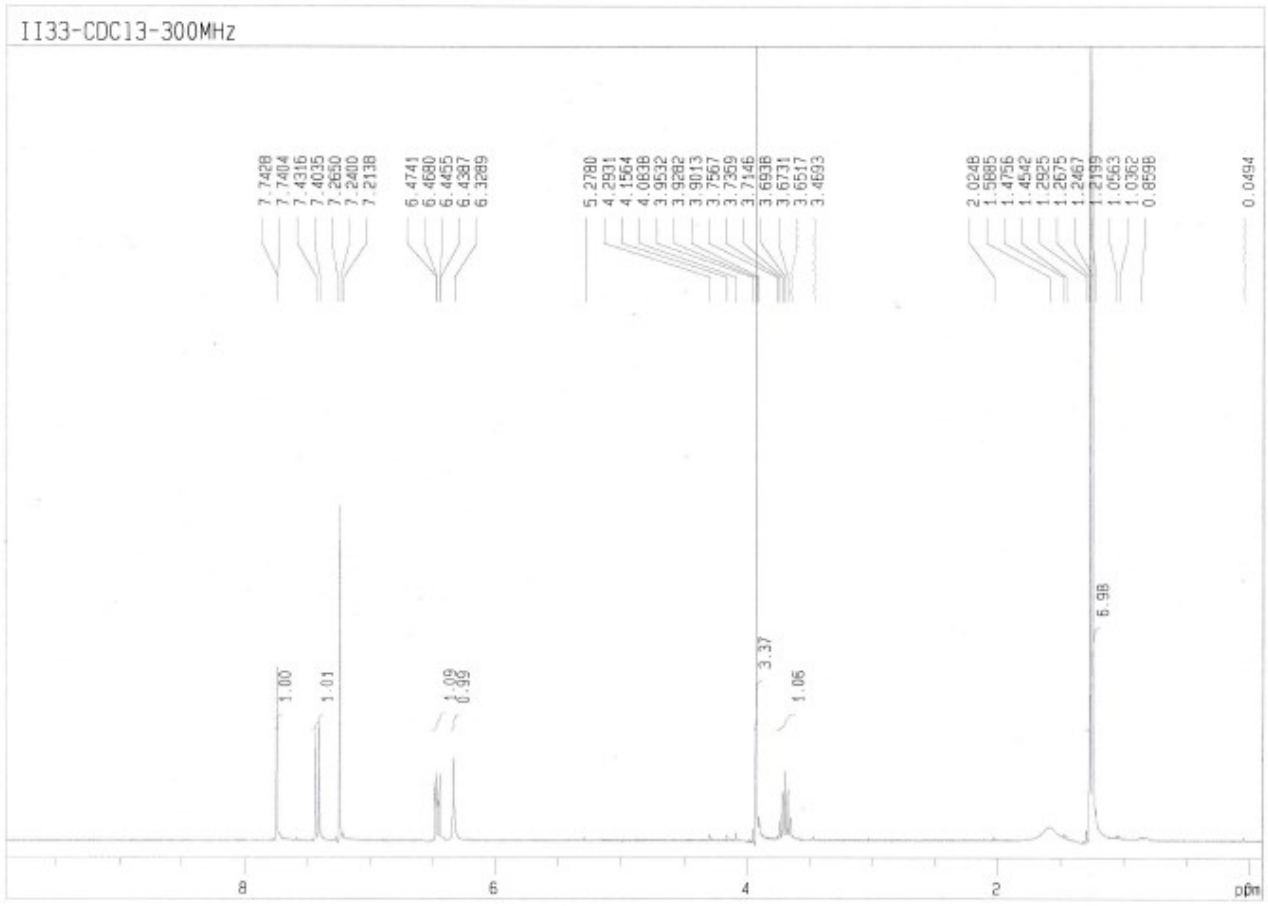
^{13}C NMR of compound 23



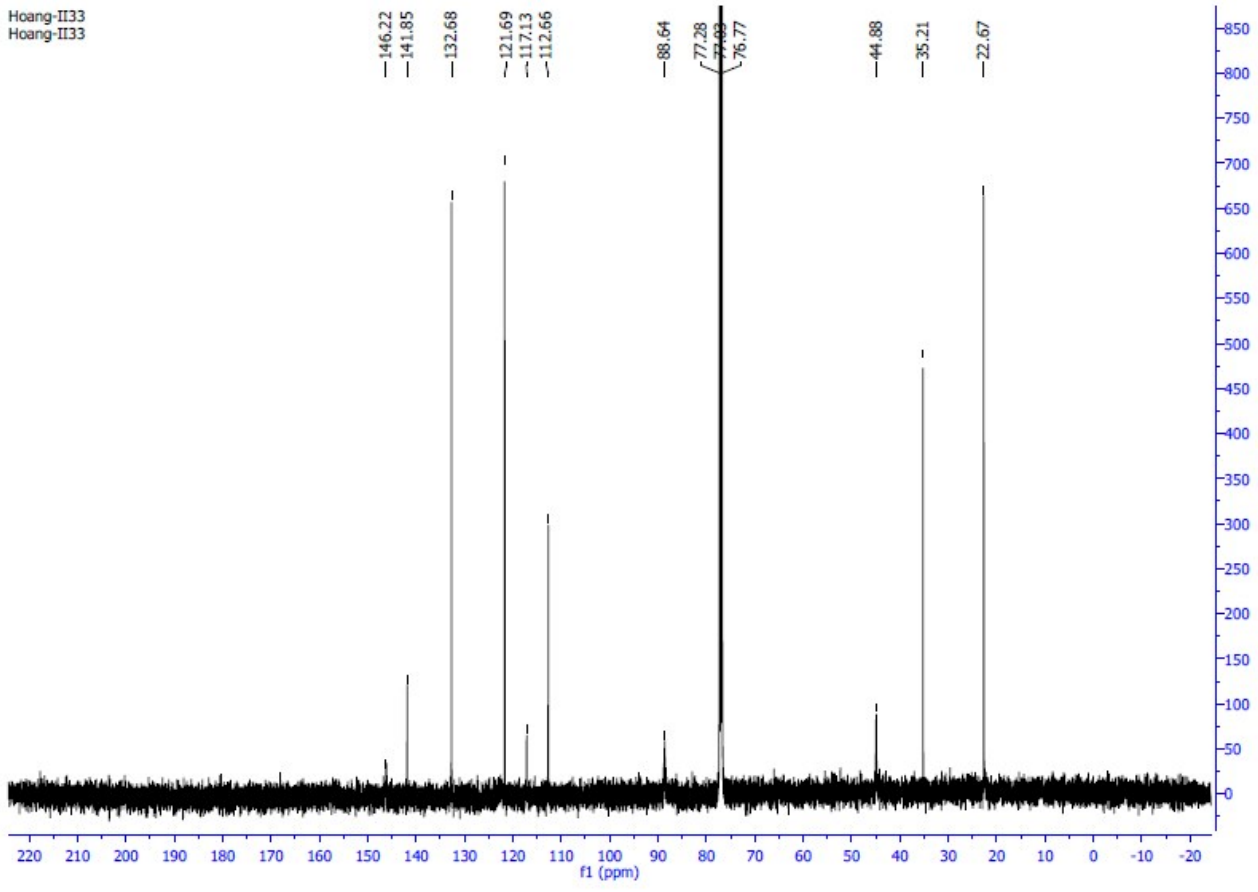
MS of compound 23



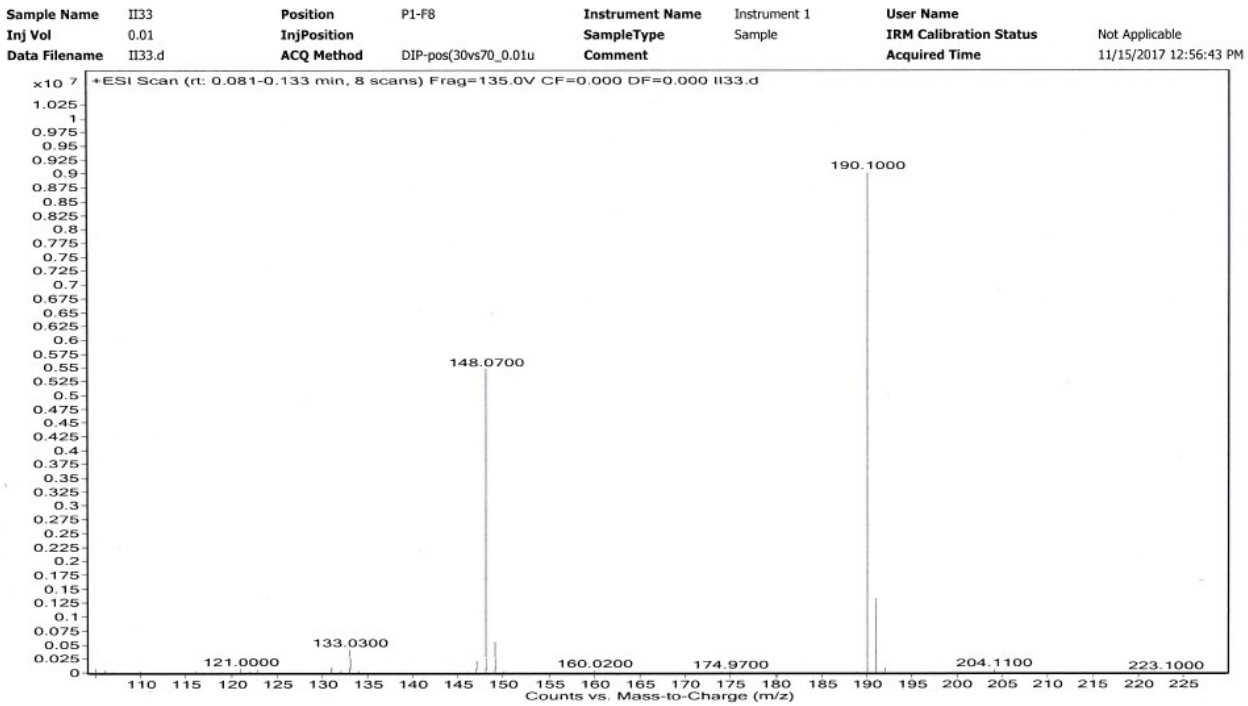
^{1}H NMR of compound 24



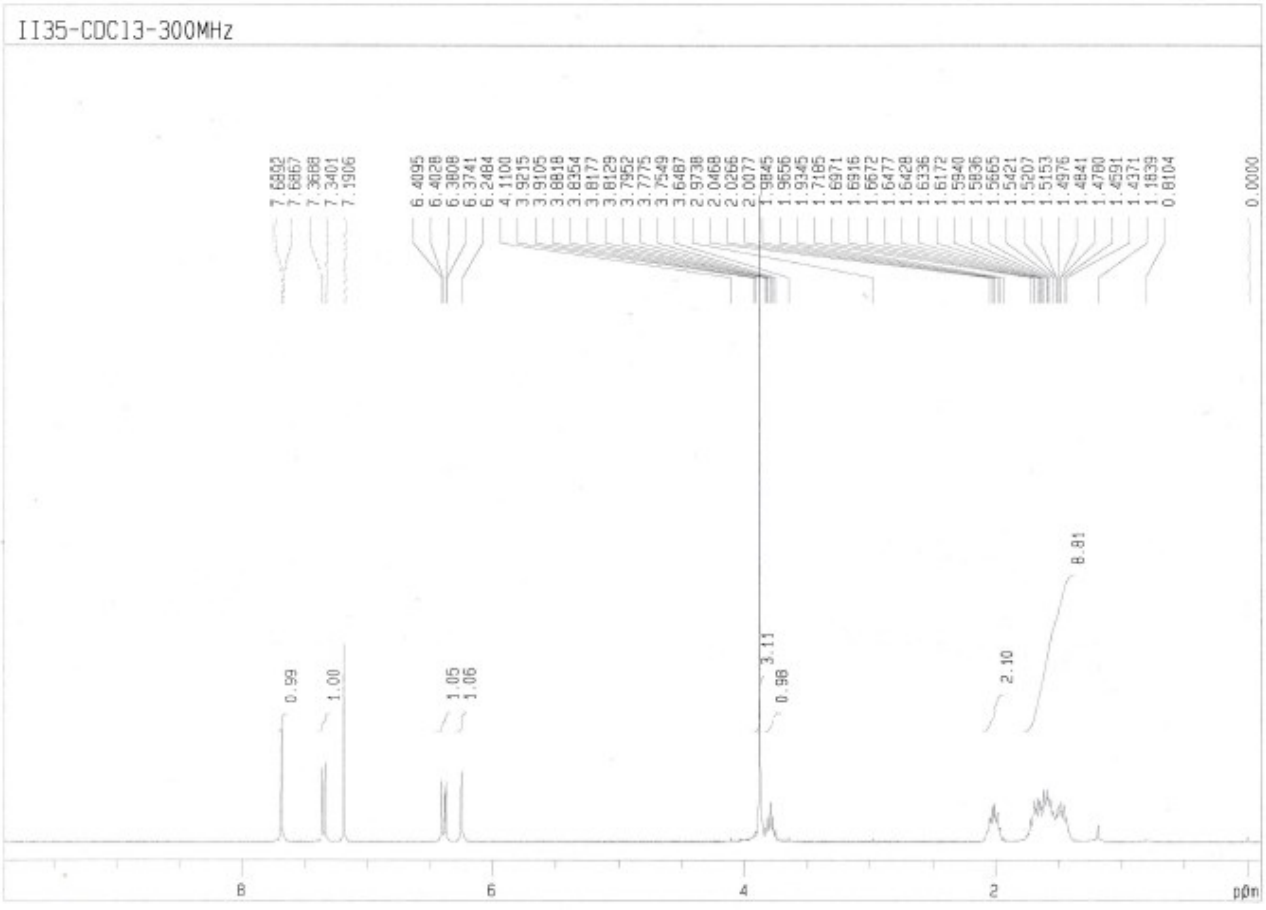
^{13}C NMR of compound 24



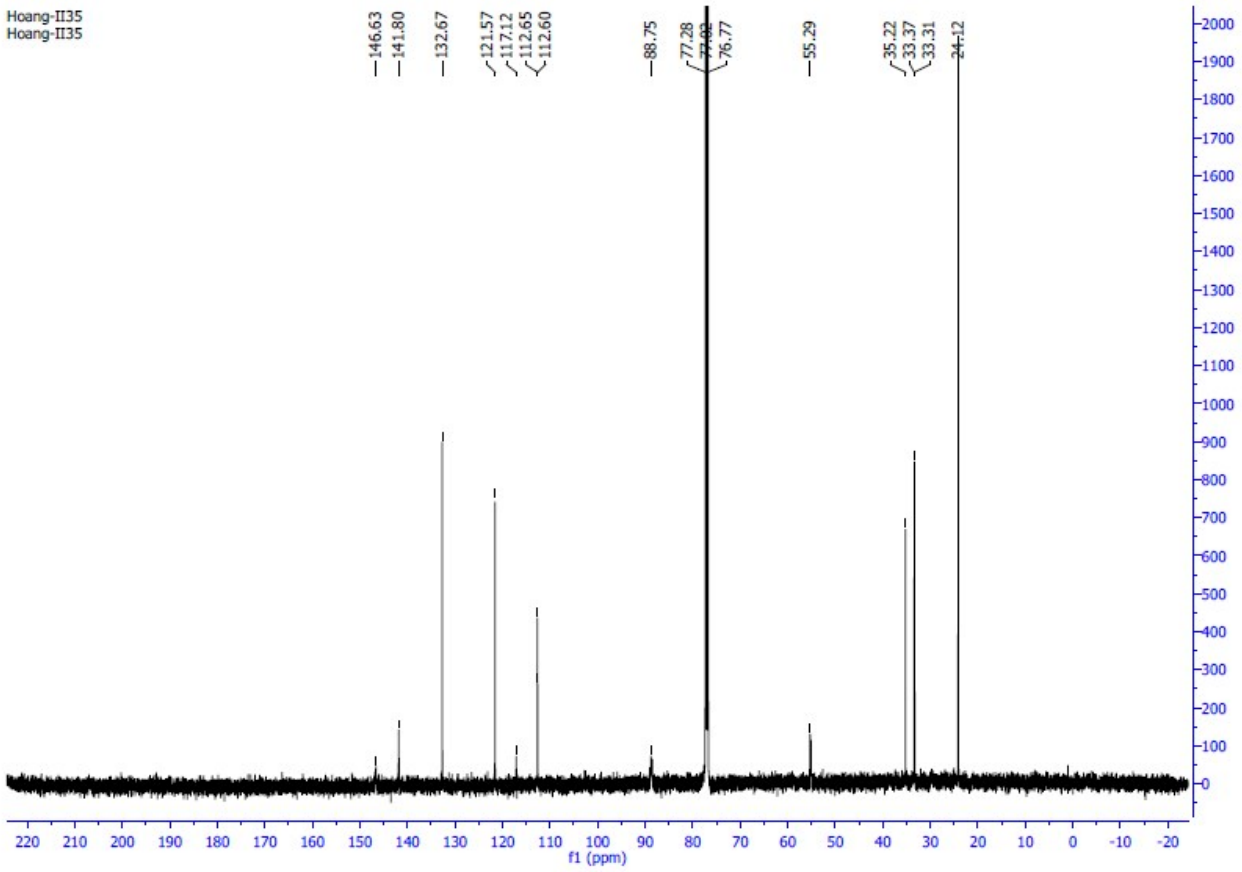
MS of compound 24



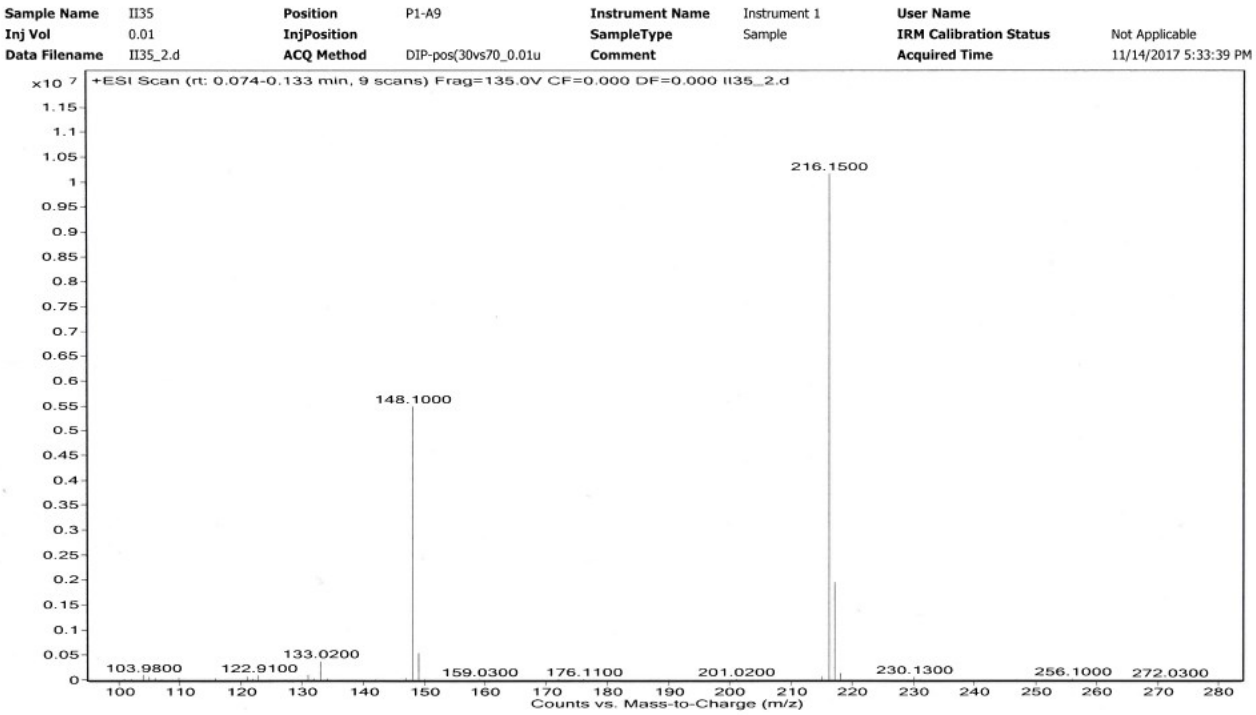
^{1}H NMR of compound 25



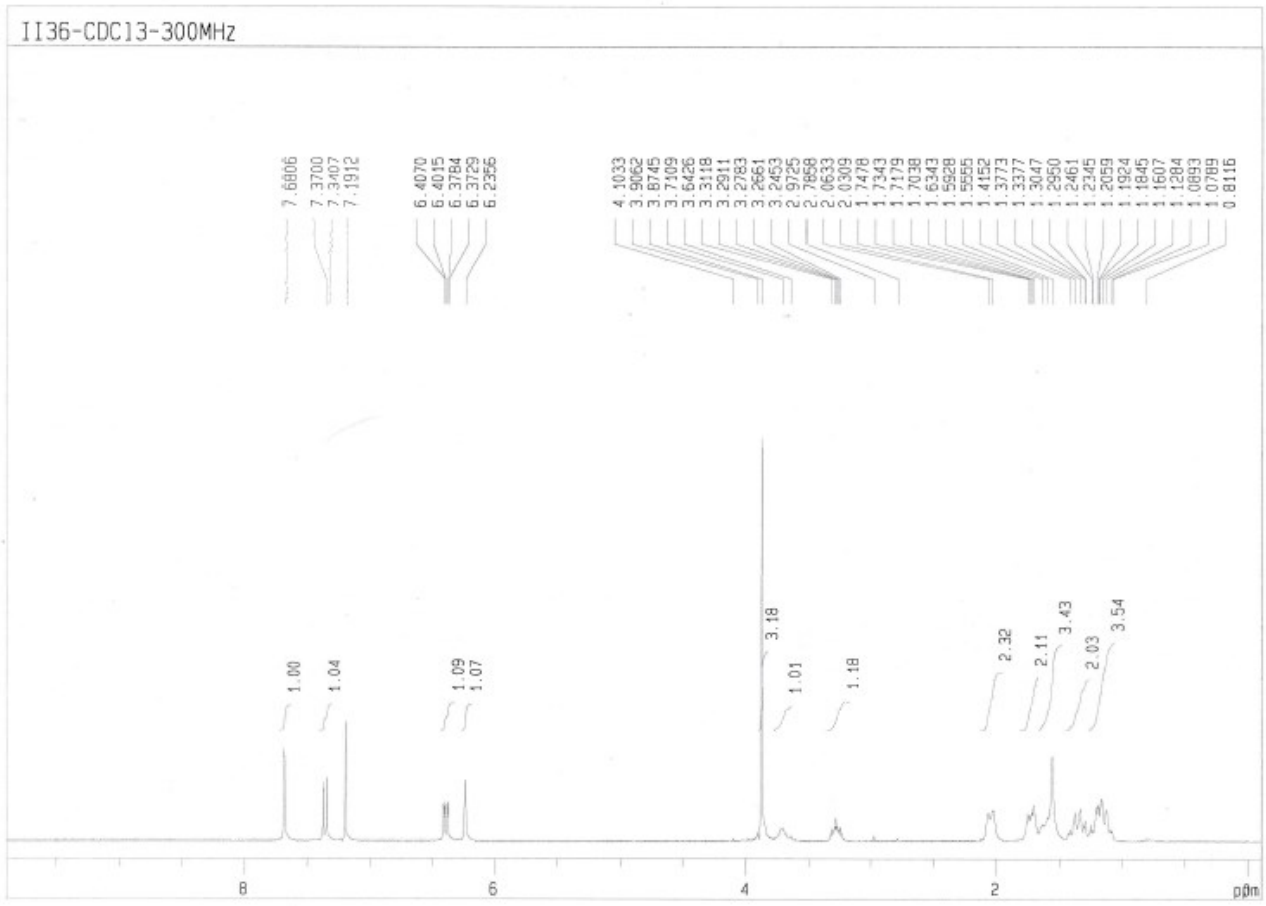
^{13}C NMR of compound 25



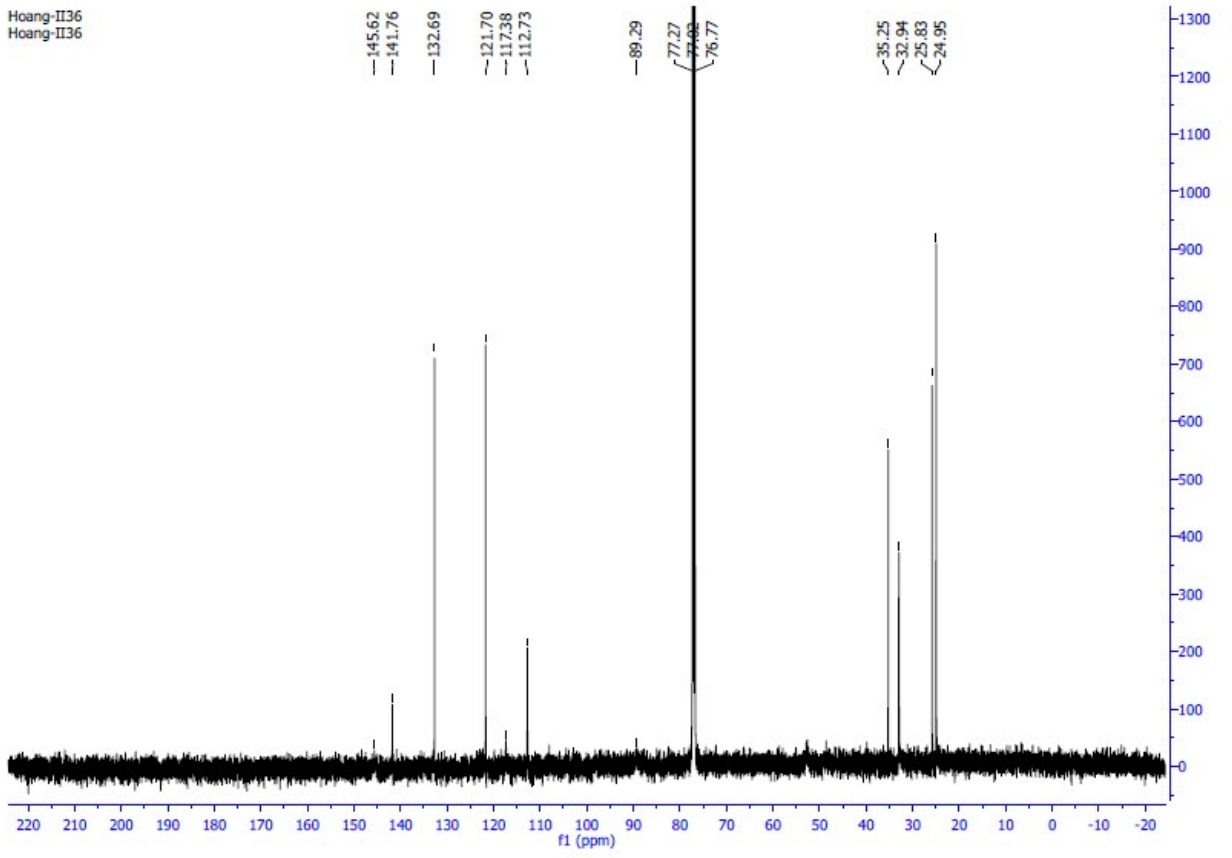
MS of compound 25



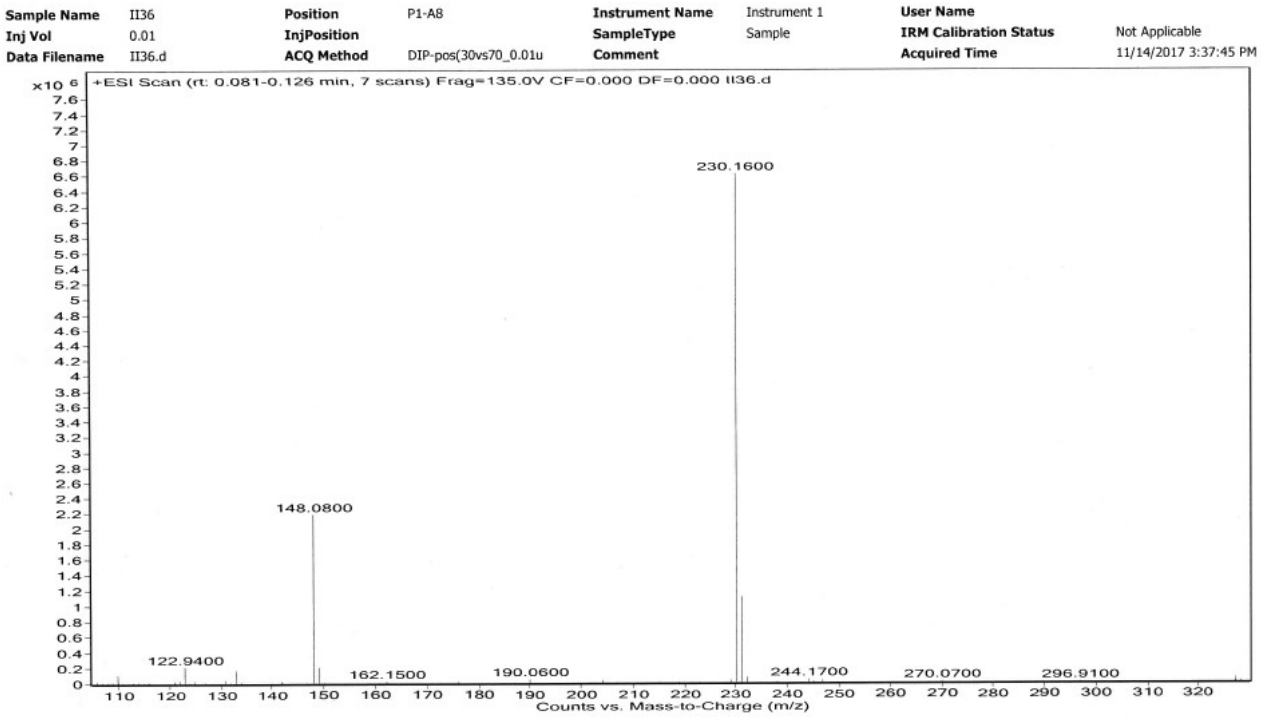
^{1}H NMR of compound 26



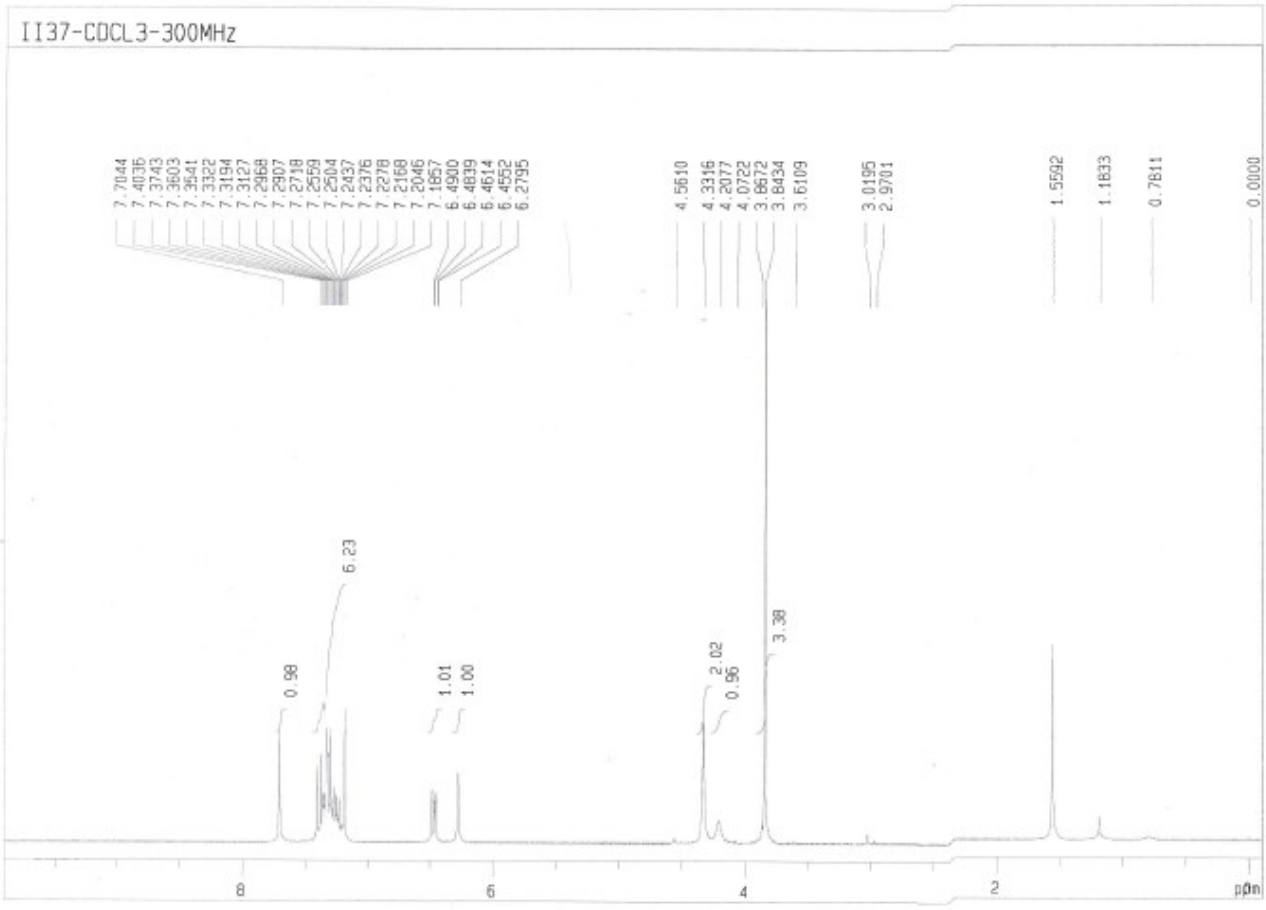
^{13}C NMR of compound 26



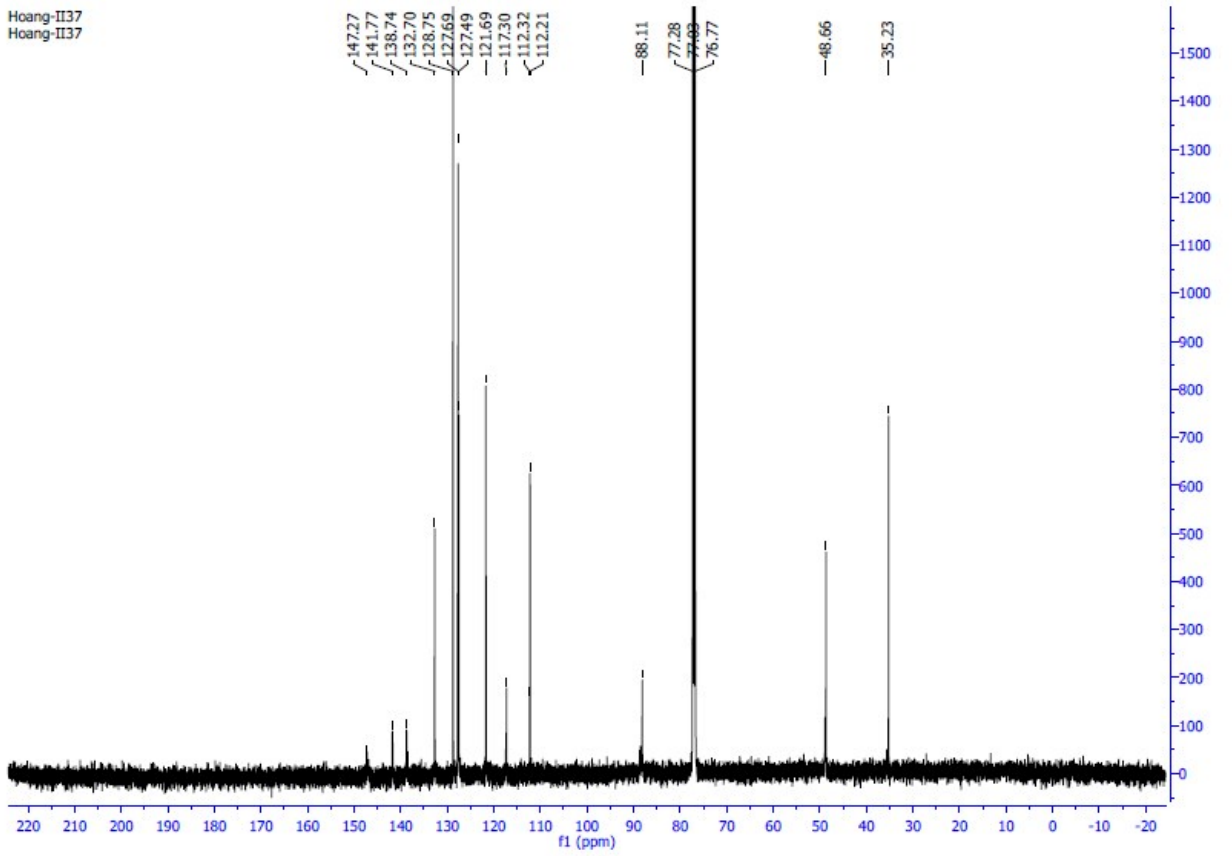
MS of compound 26



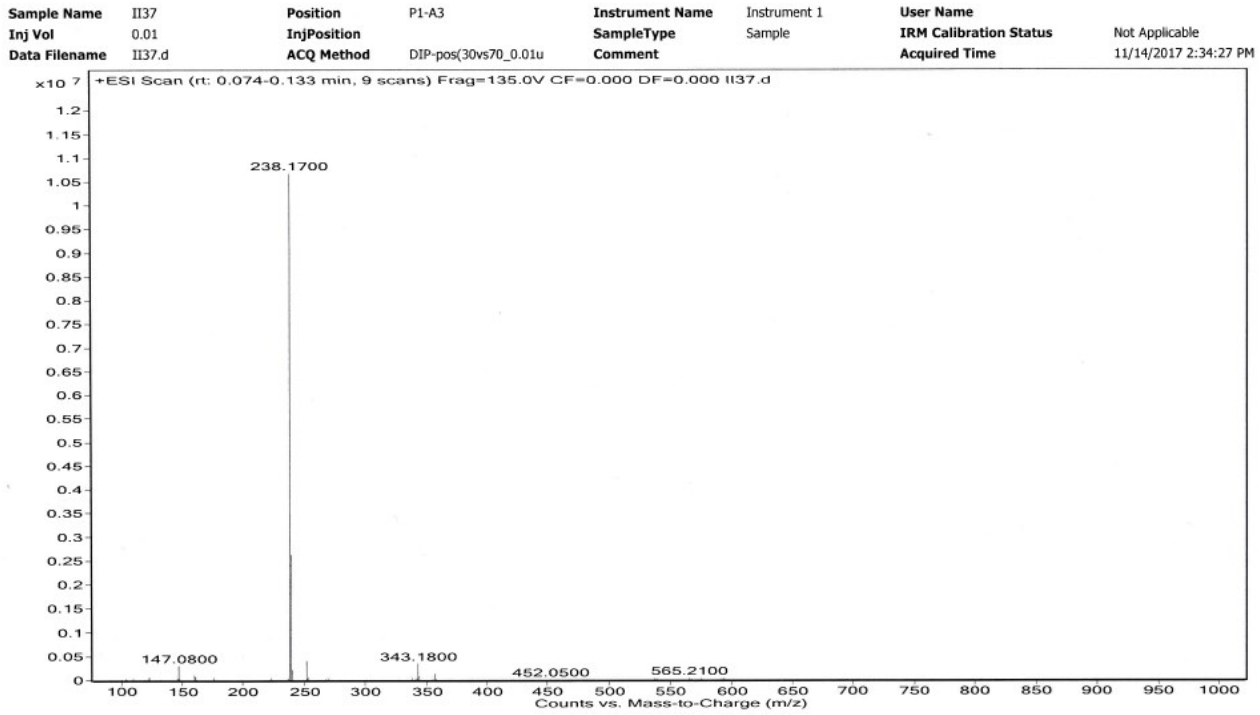
^{1}H NMR of compound 27



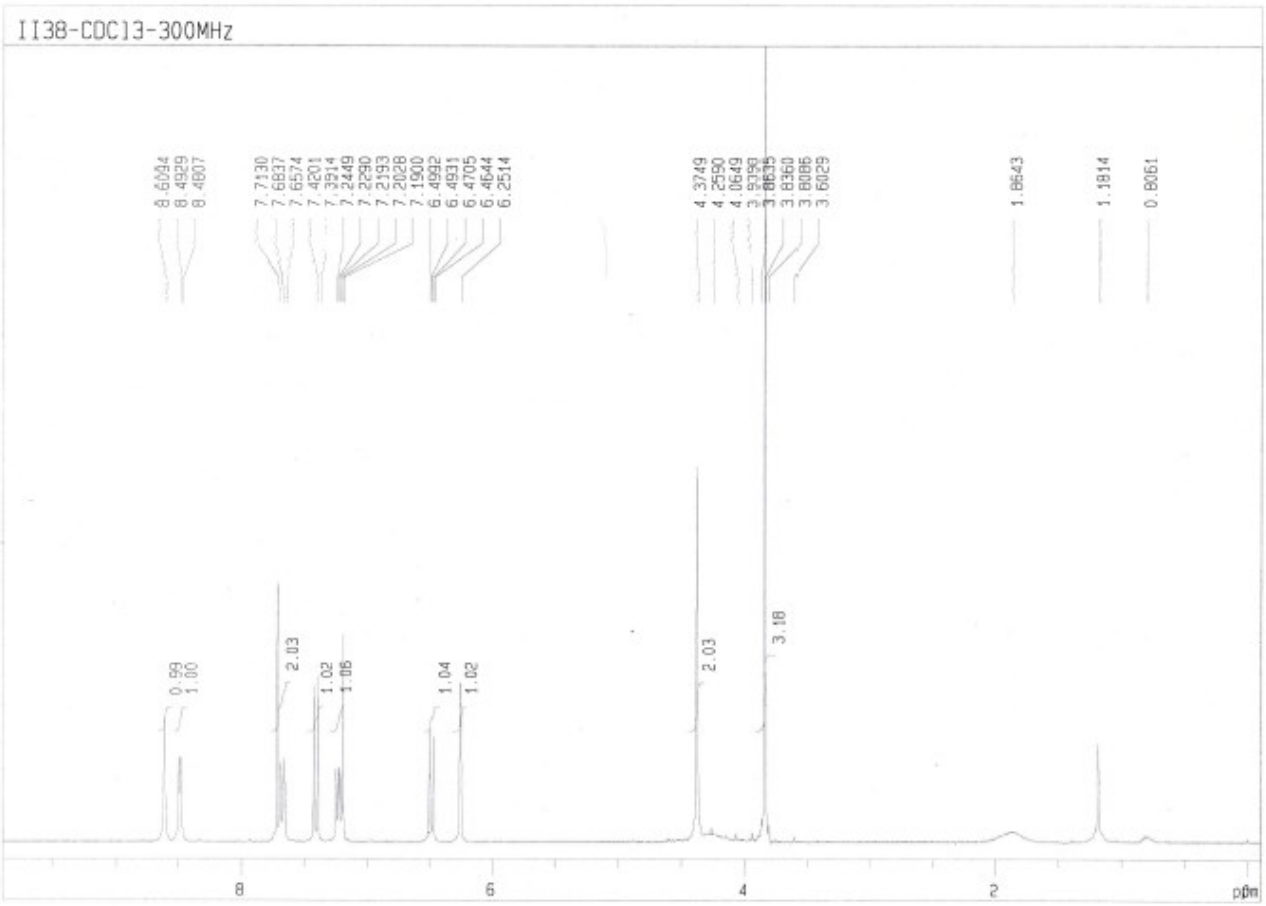
^{13}C NMR of compound 27



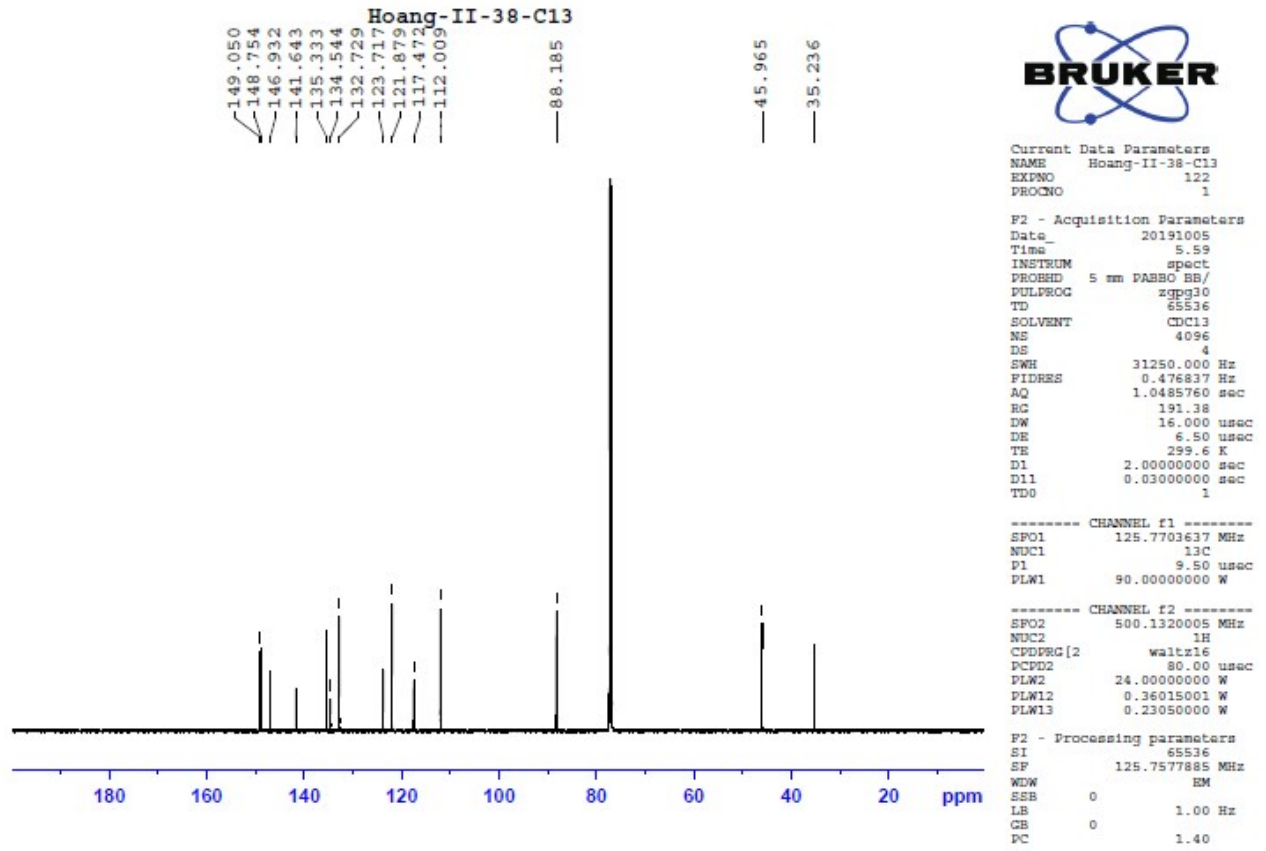
MS of compound 27



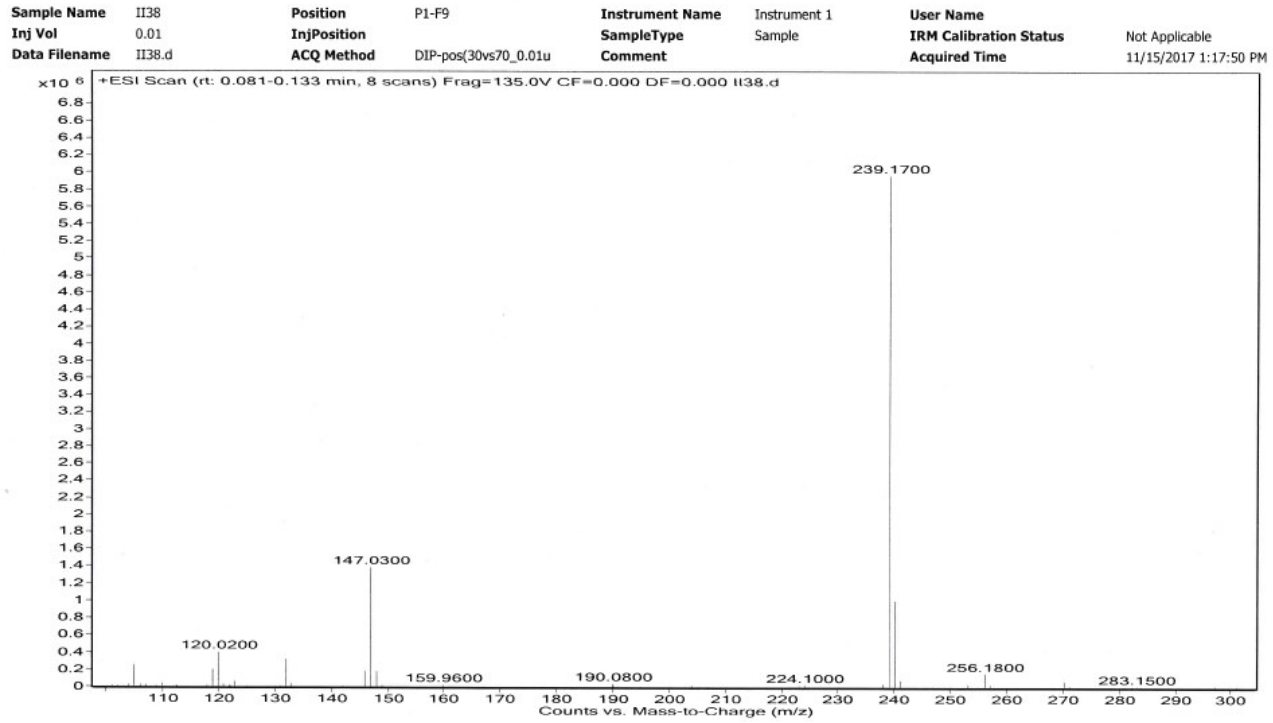
H NMR of compound 28



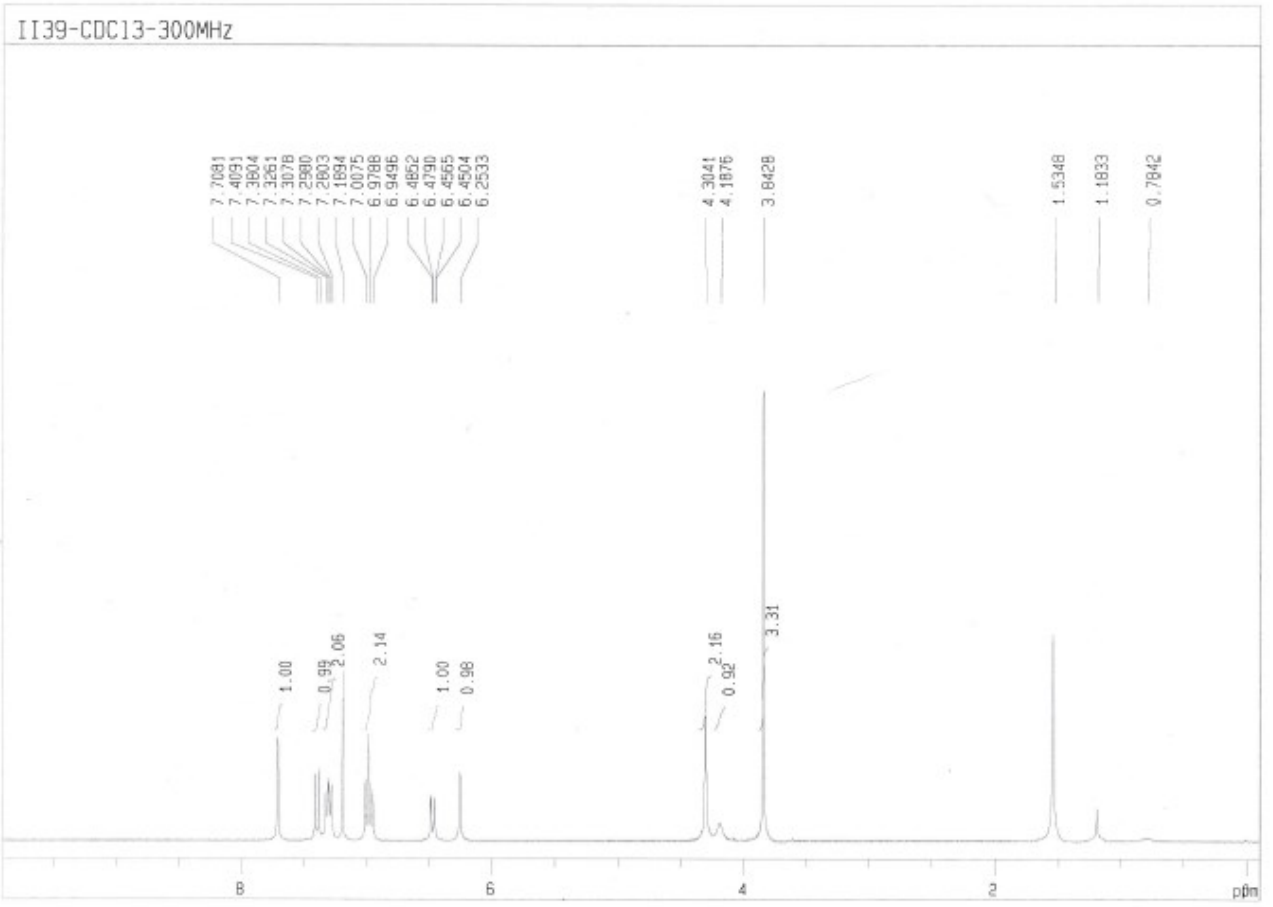
^{13}C NMR of compound 28



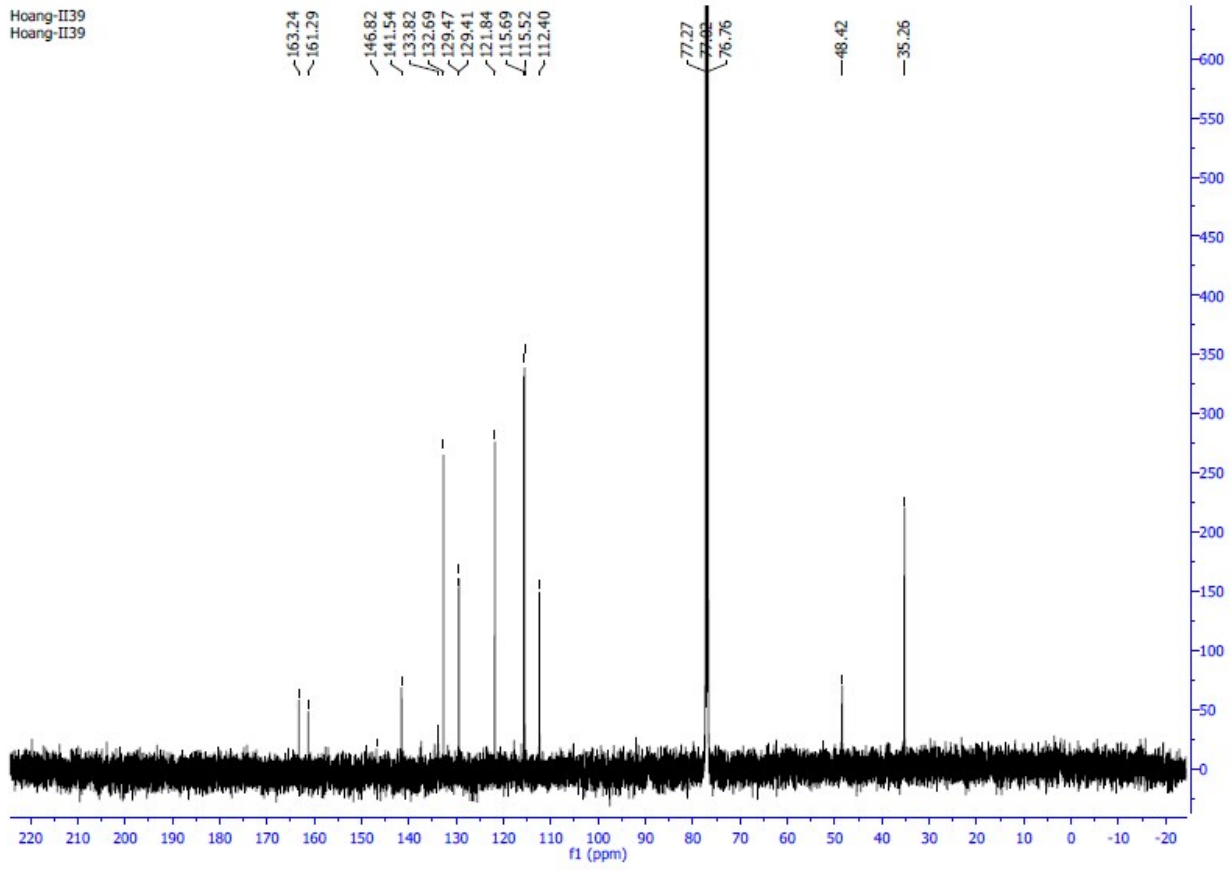
MS of compound 28



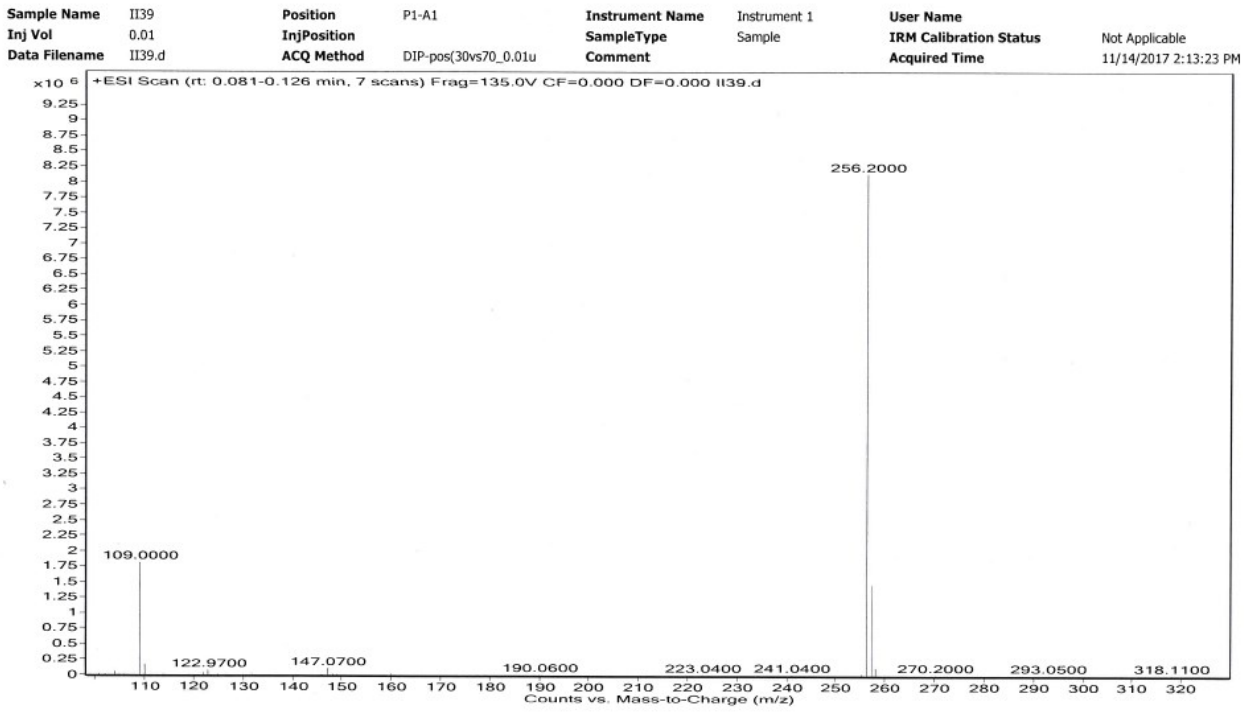
^{1}H NMR of compound 29



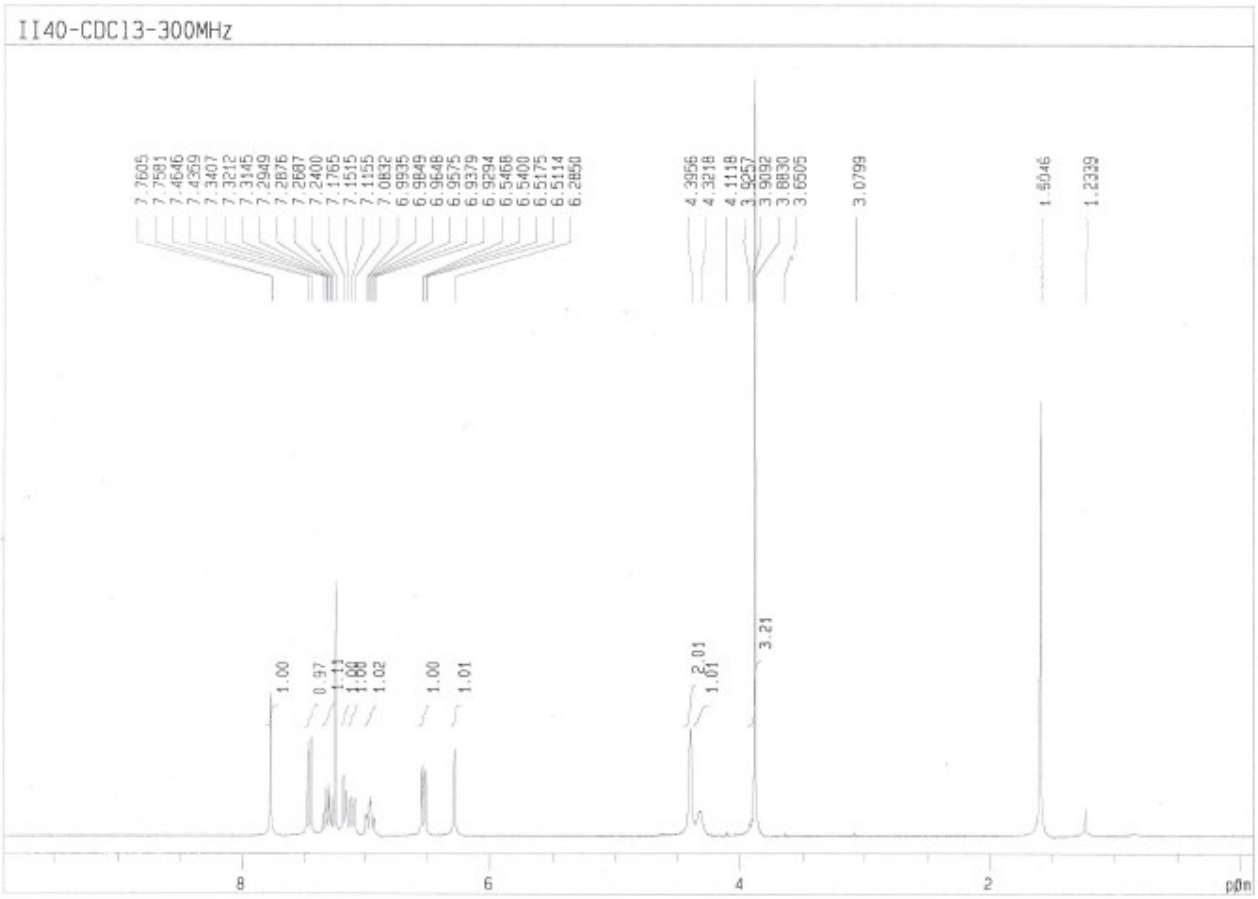
^{13}C NMR of compound 29



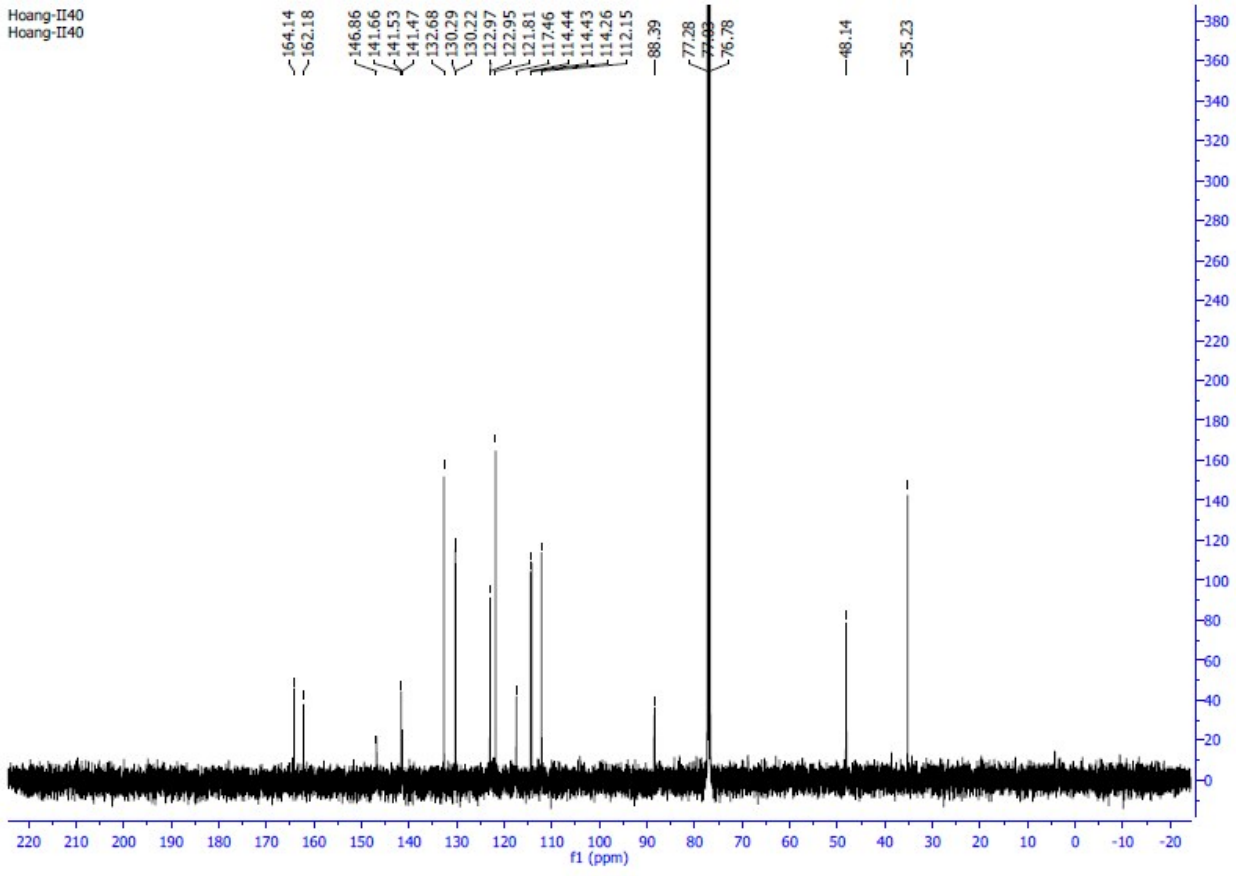
MS of compound 29



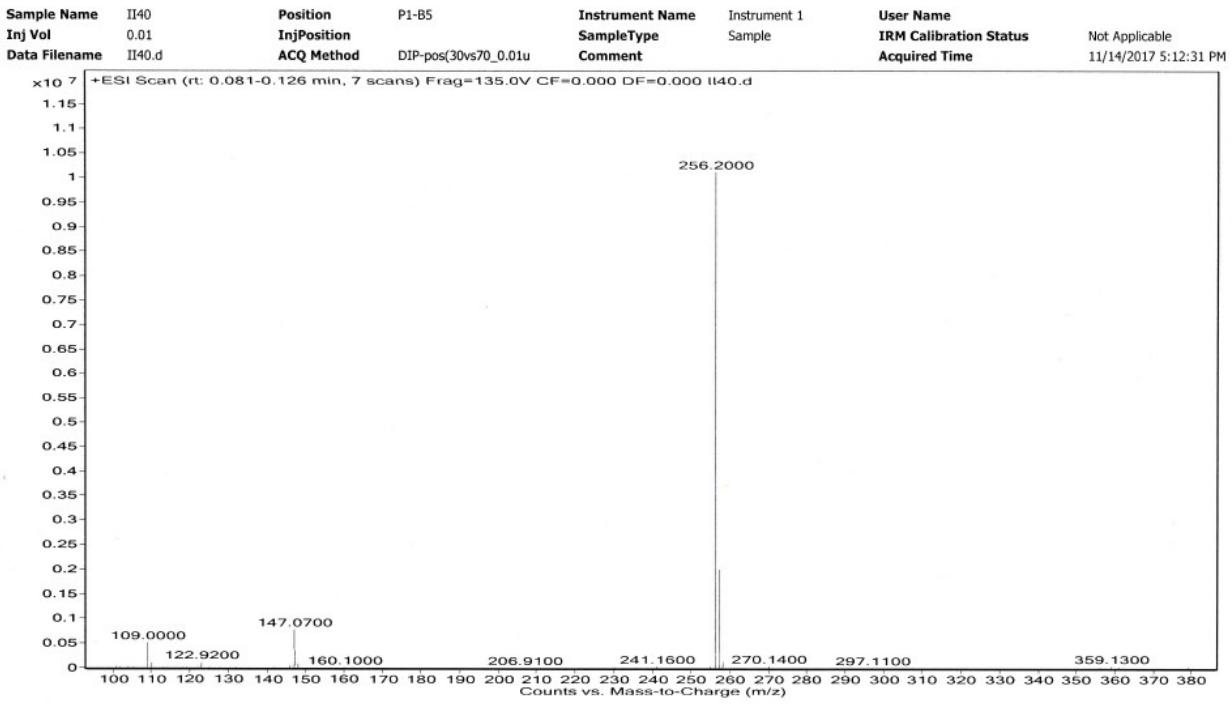
^{1}H NMR of compound 30



^{13}C NMR of compound 30

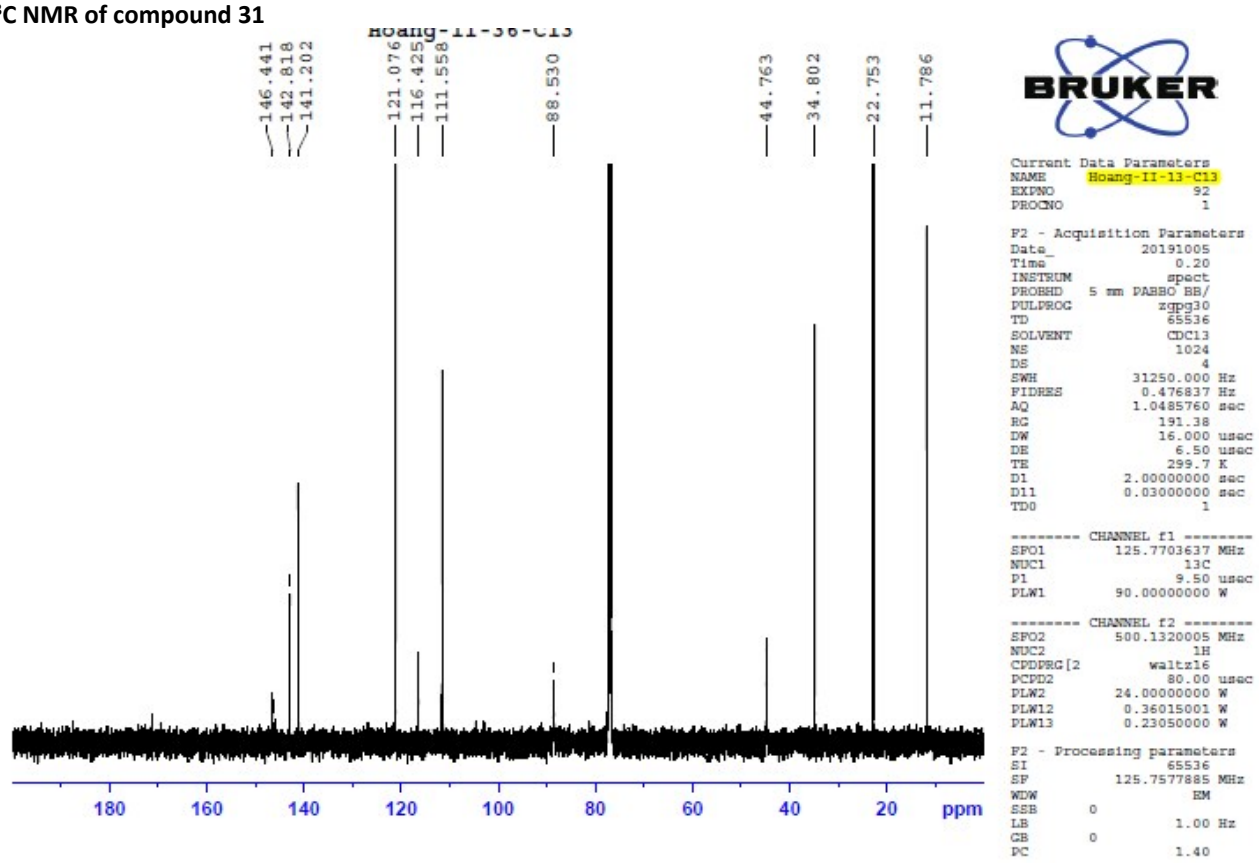


MS of compound 30

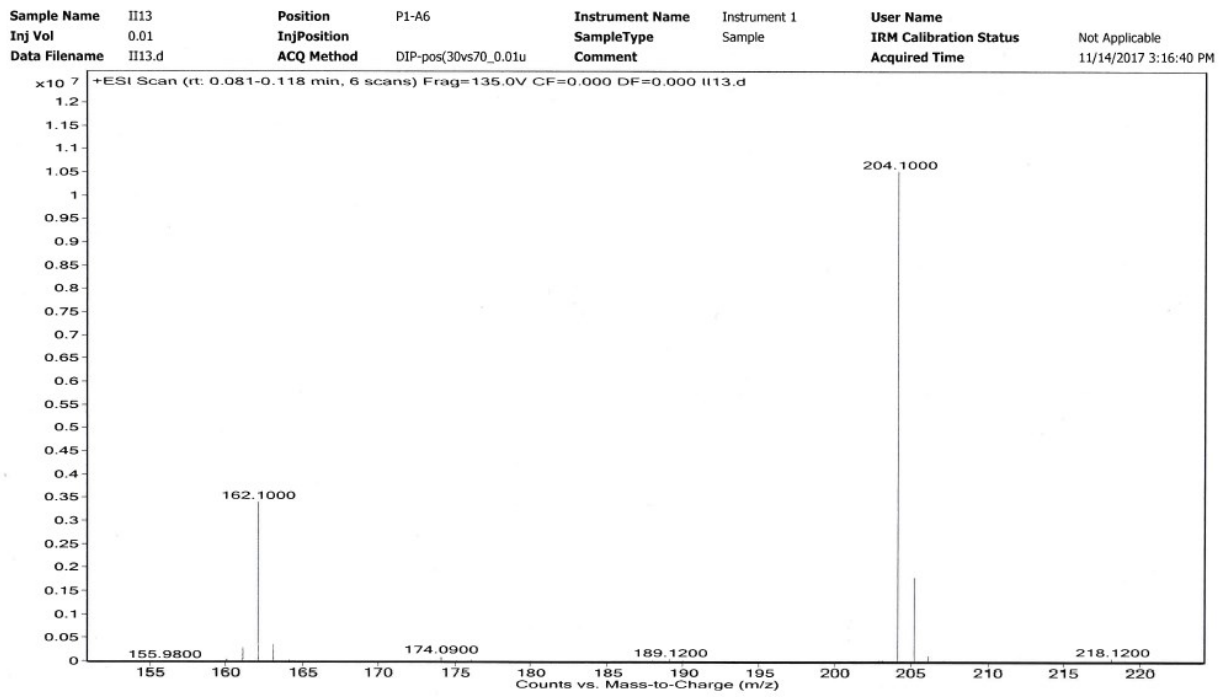


^{1}H NMR of compound 31

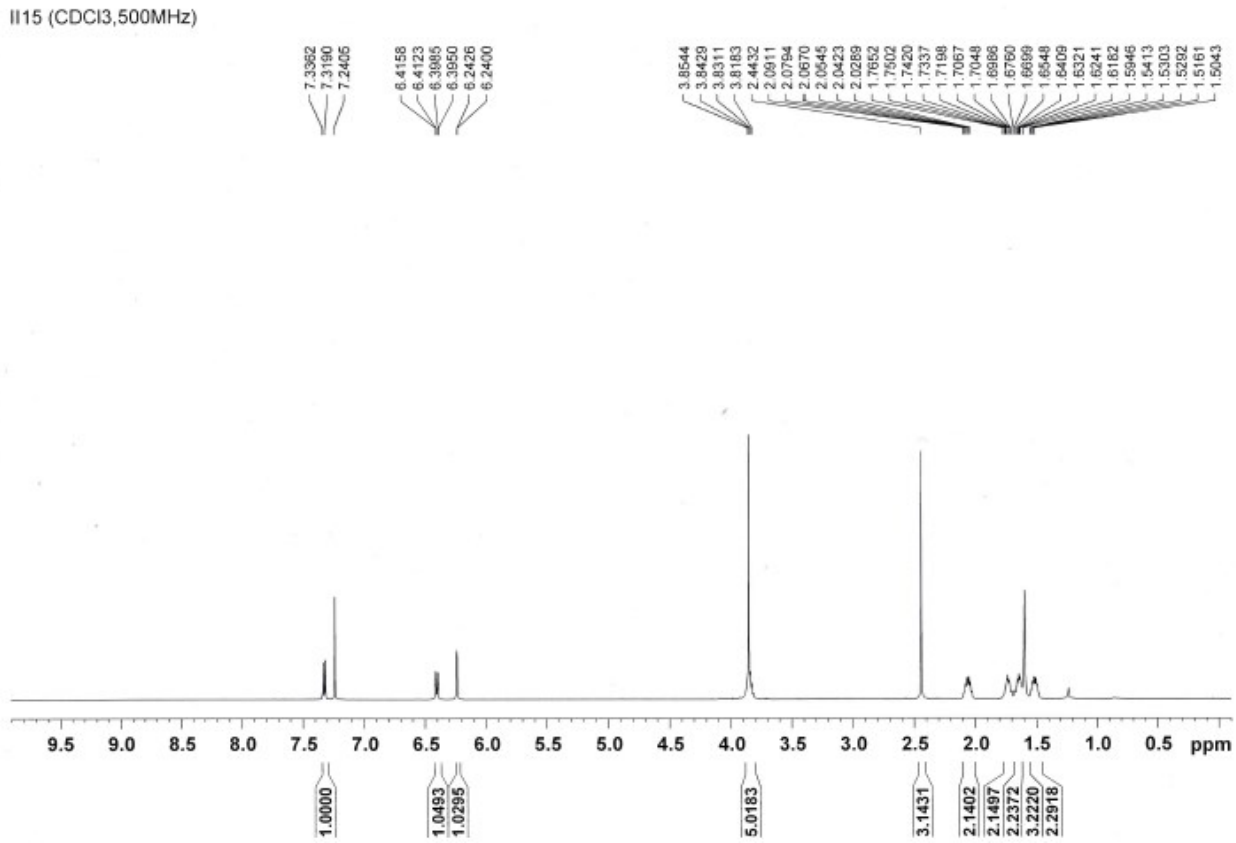
^{13}C NMR of compound 31



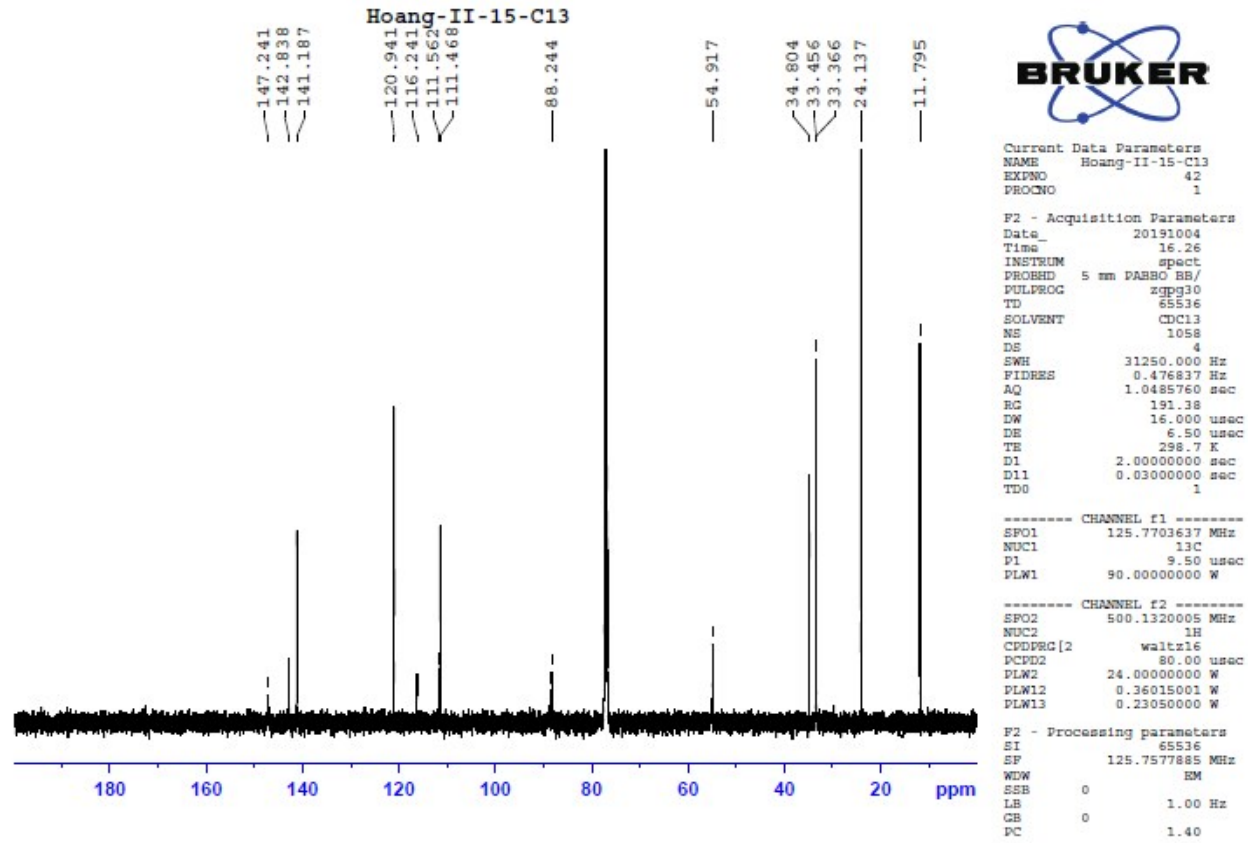
MS of compound 31



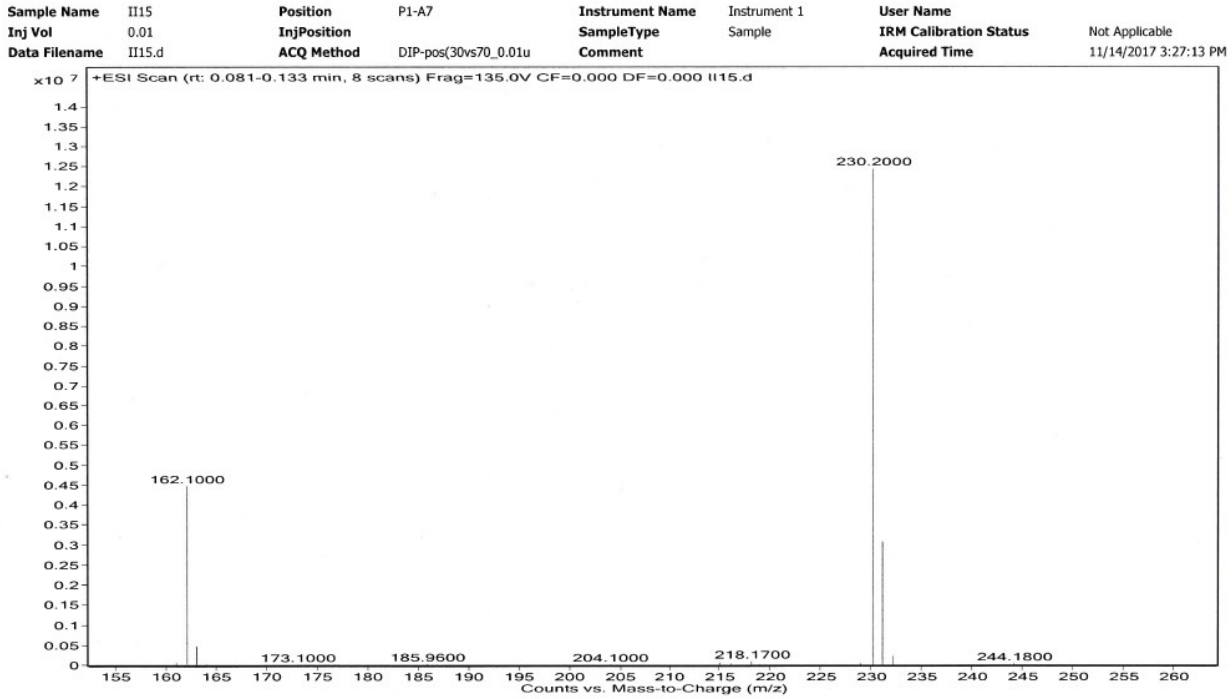
^{1}H NMR of compound 32



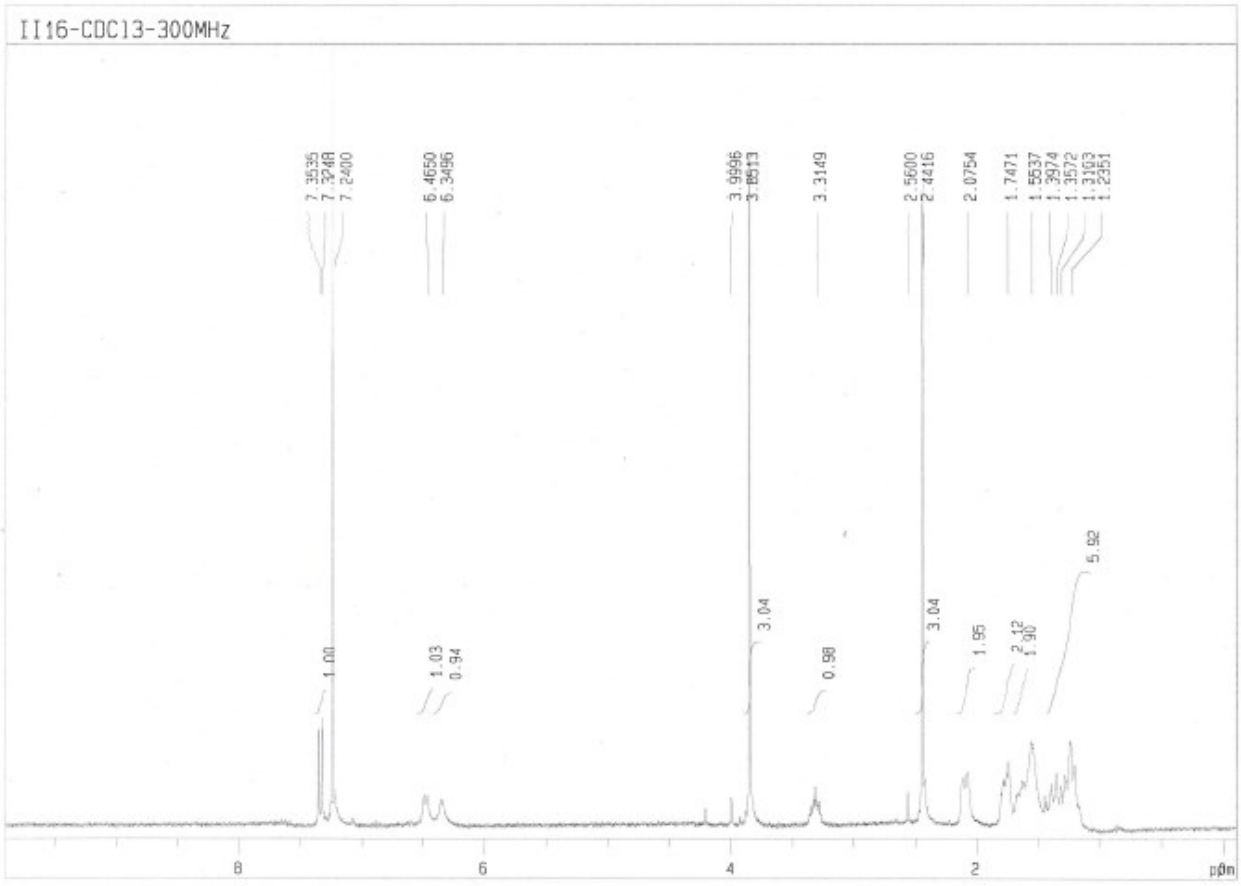
^{13}C NMR of compound 32



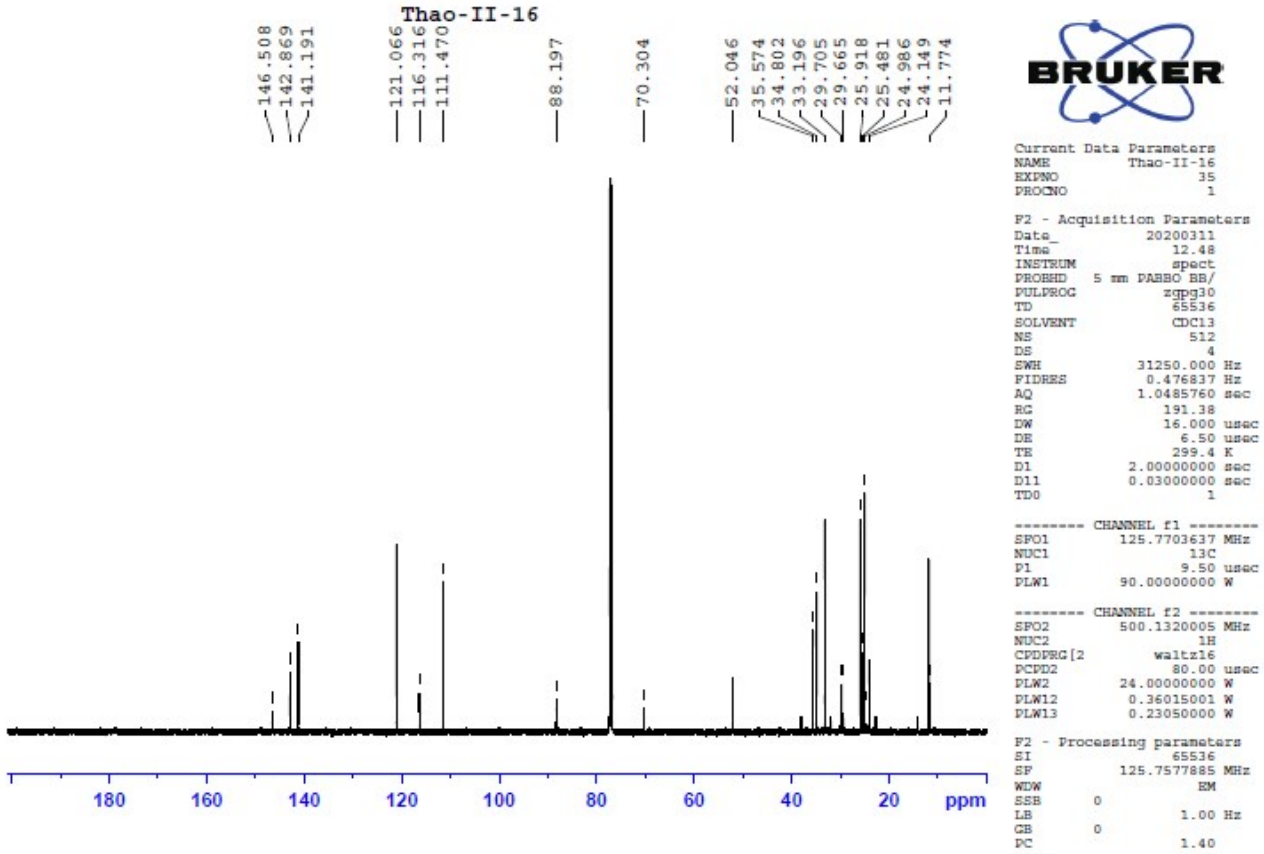
MS of compound 32



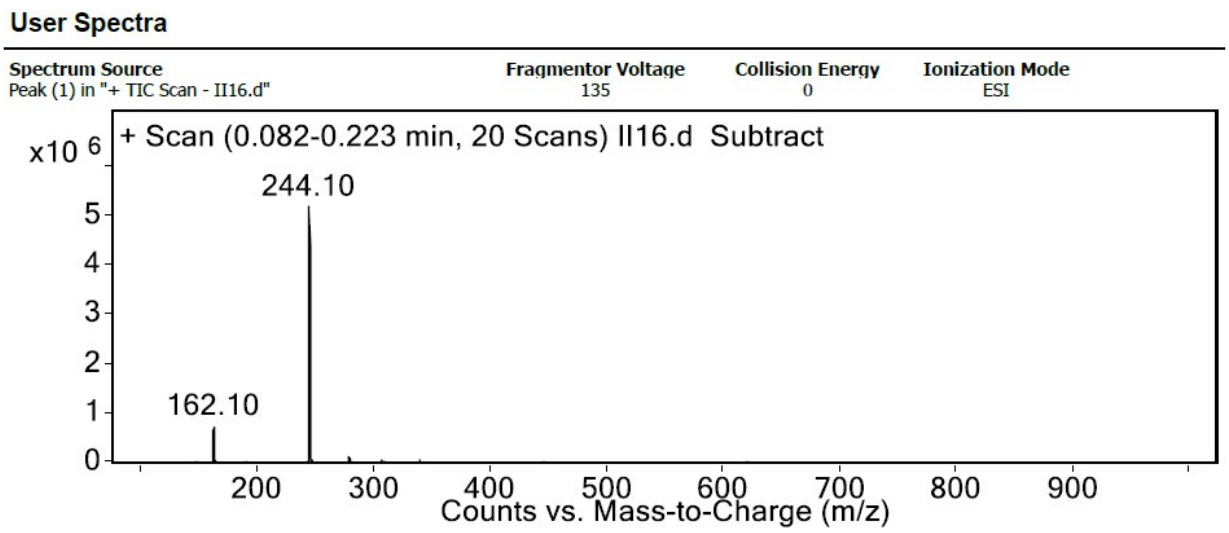
^{1}H NMR of compound 33



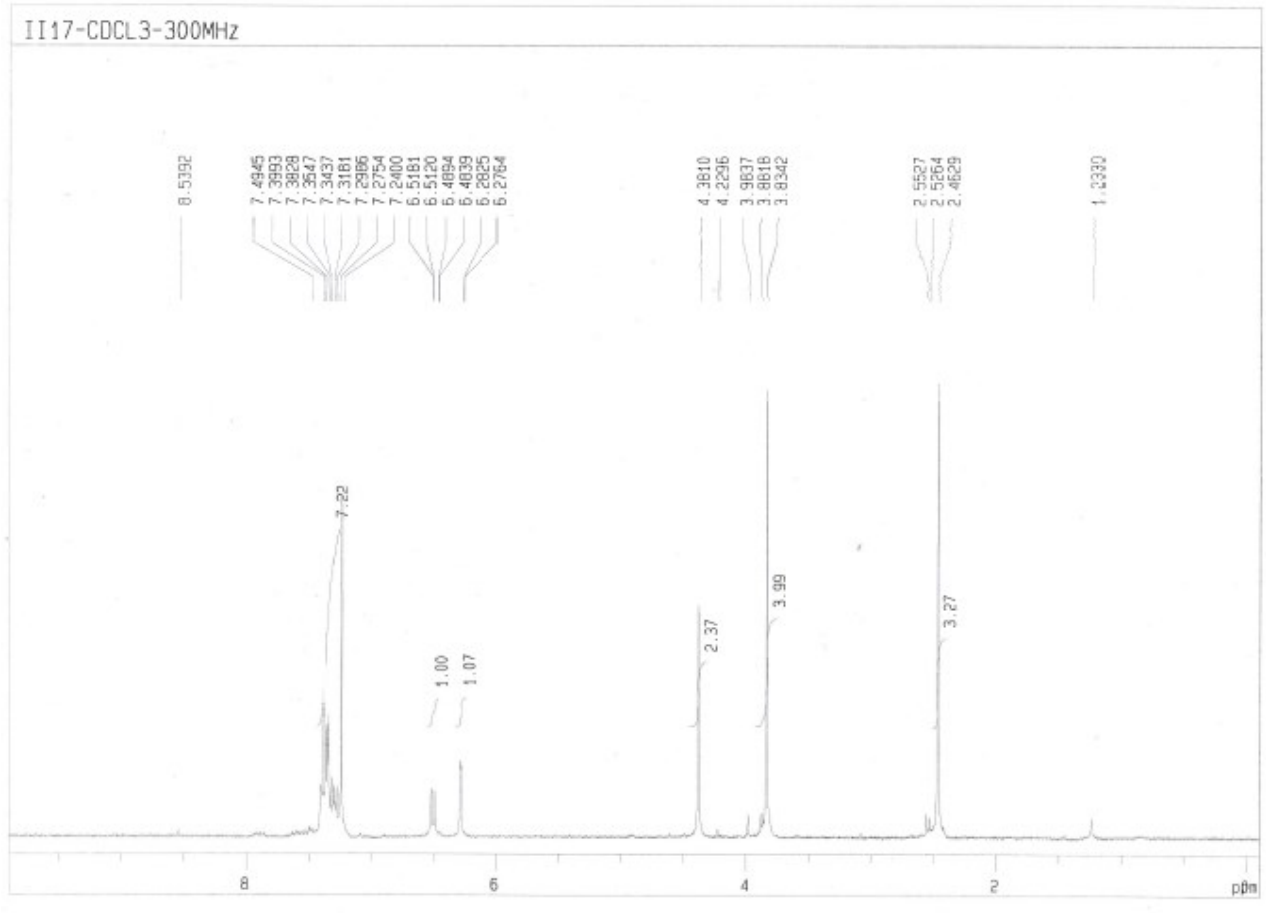
^{13}C NMR of compound 33



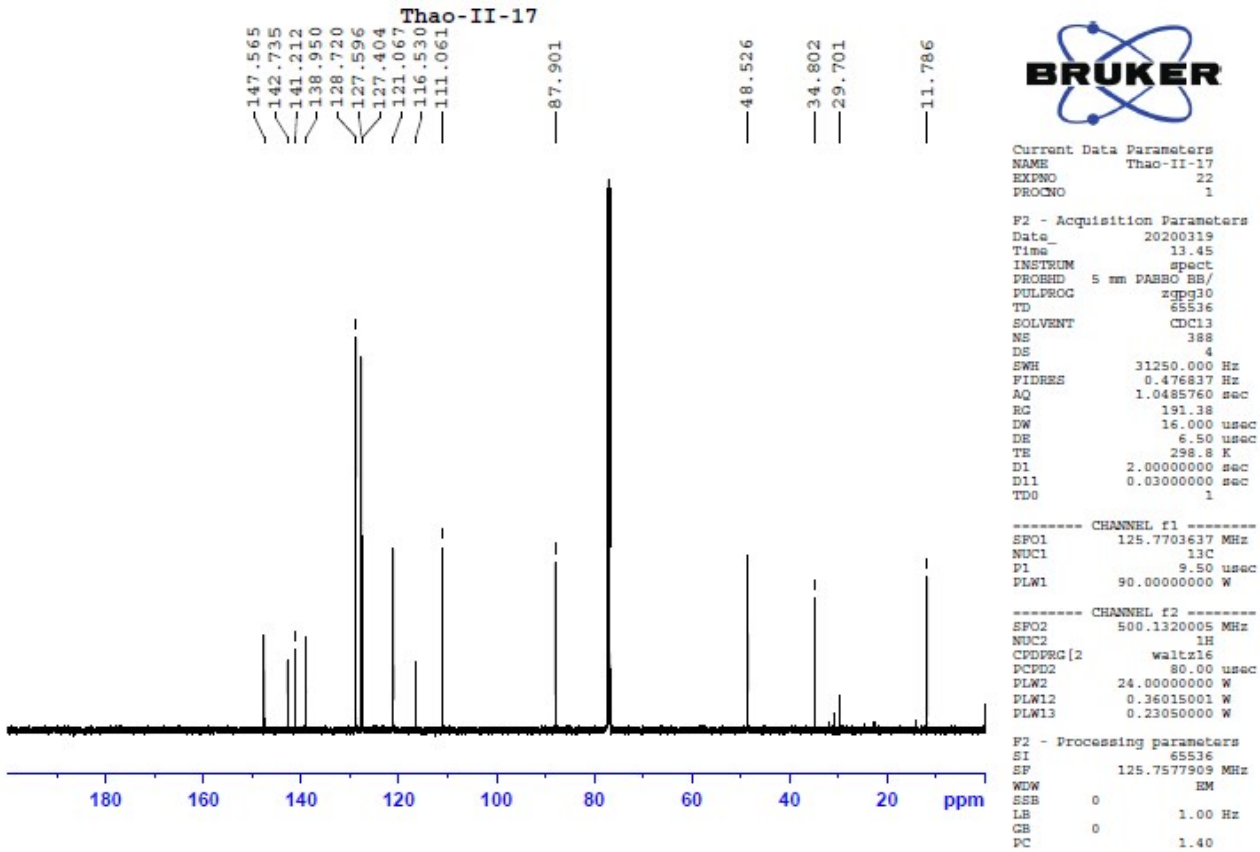
MS of compound 33



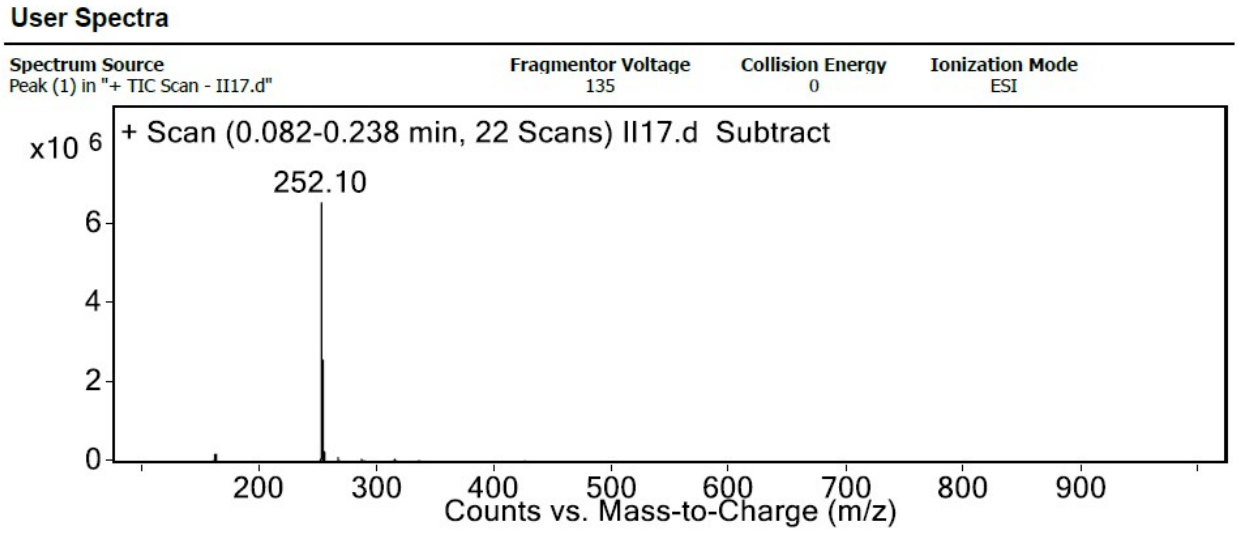
^{1}H NMR of compound 34



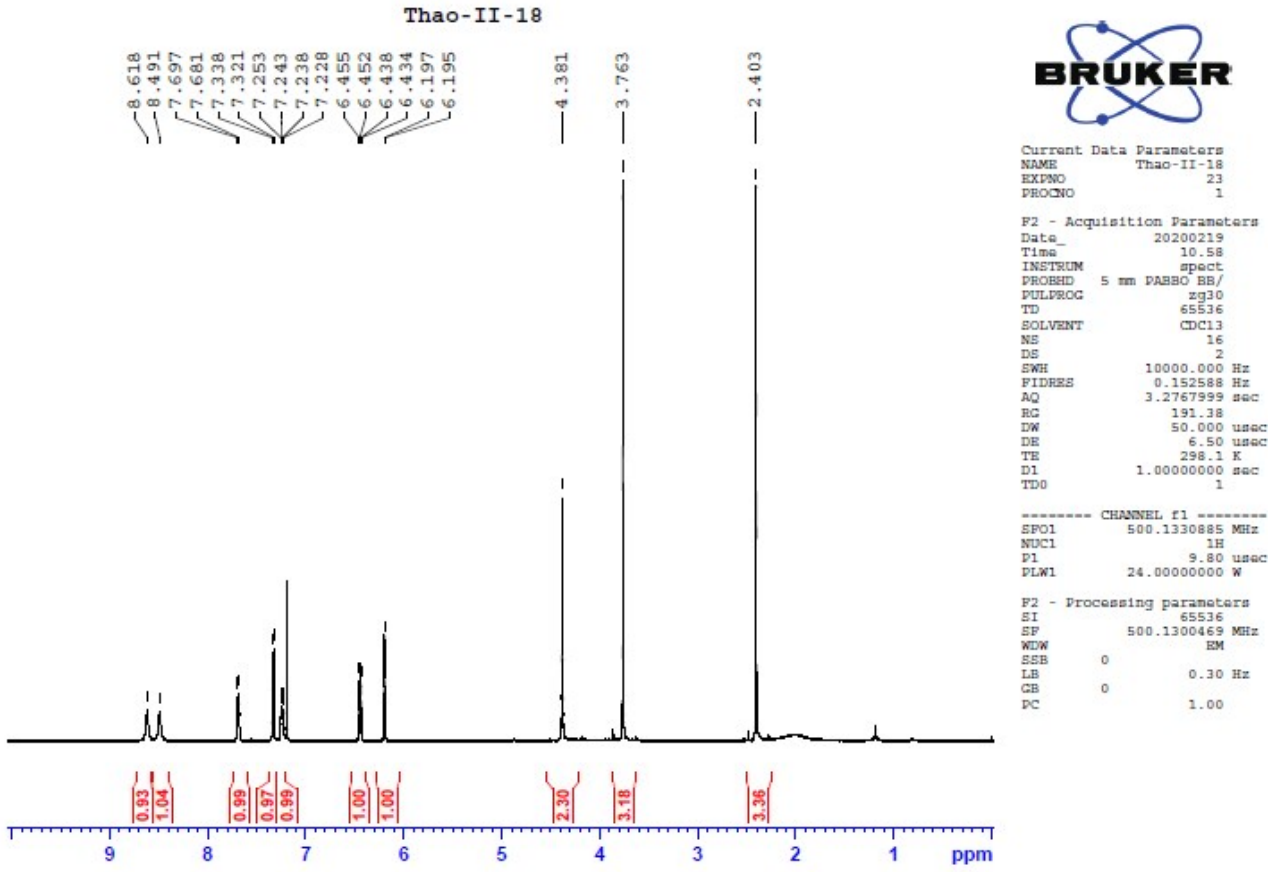
^{13}C NMR of compound 34



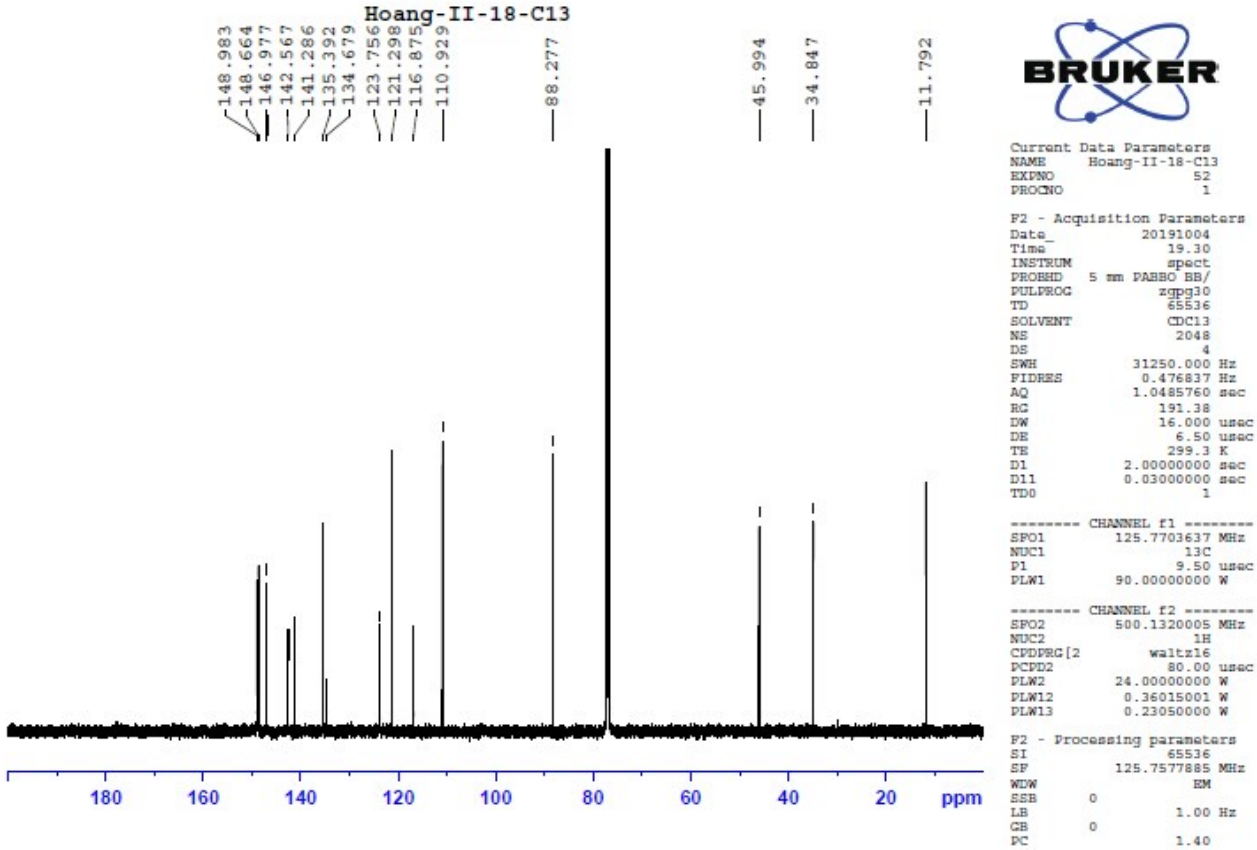
MS of compound 34



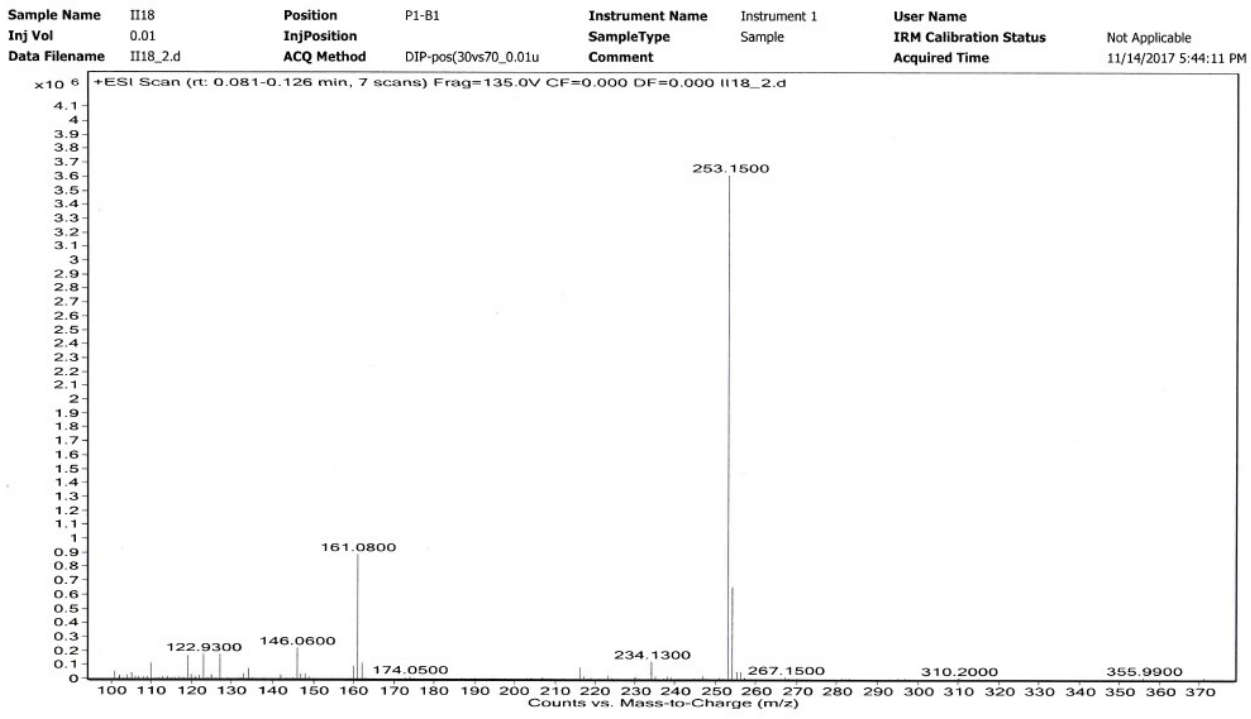
^{1}H NMR of compound 35



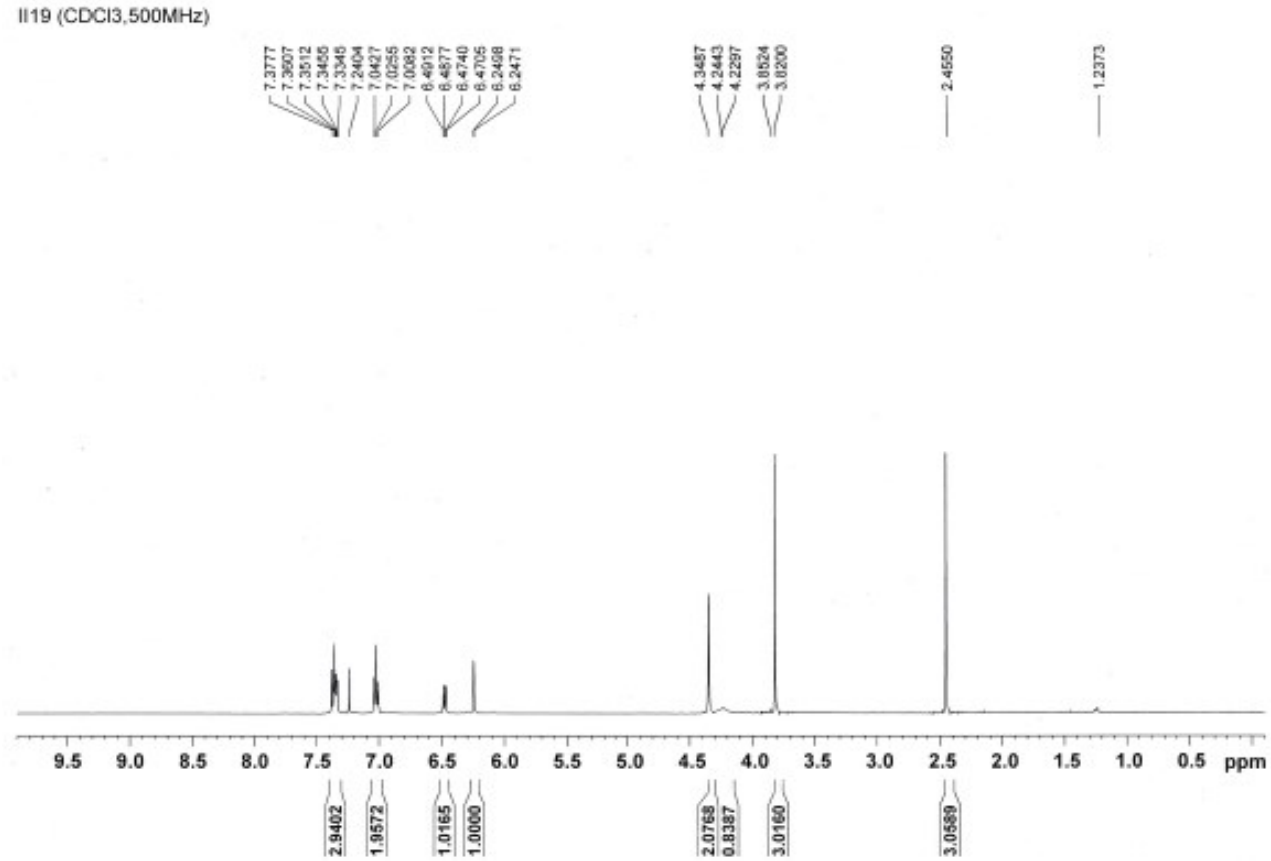
^{13}C NMR of compound 35



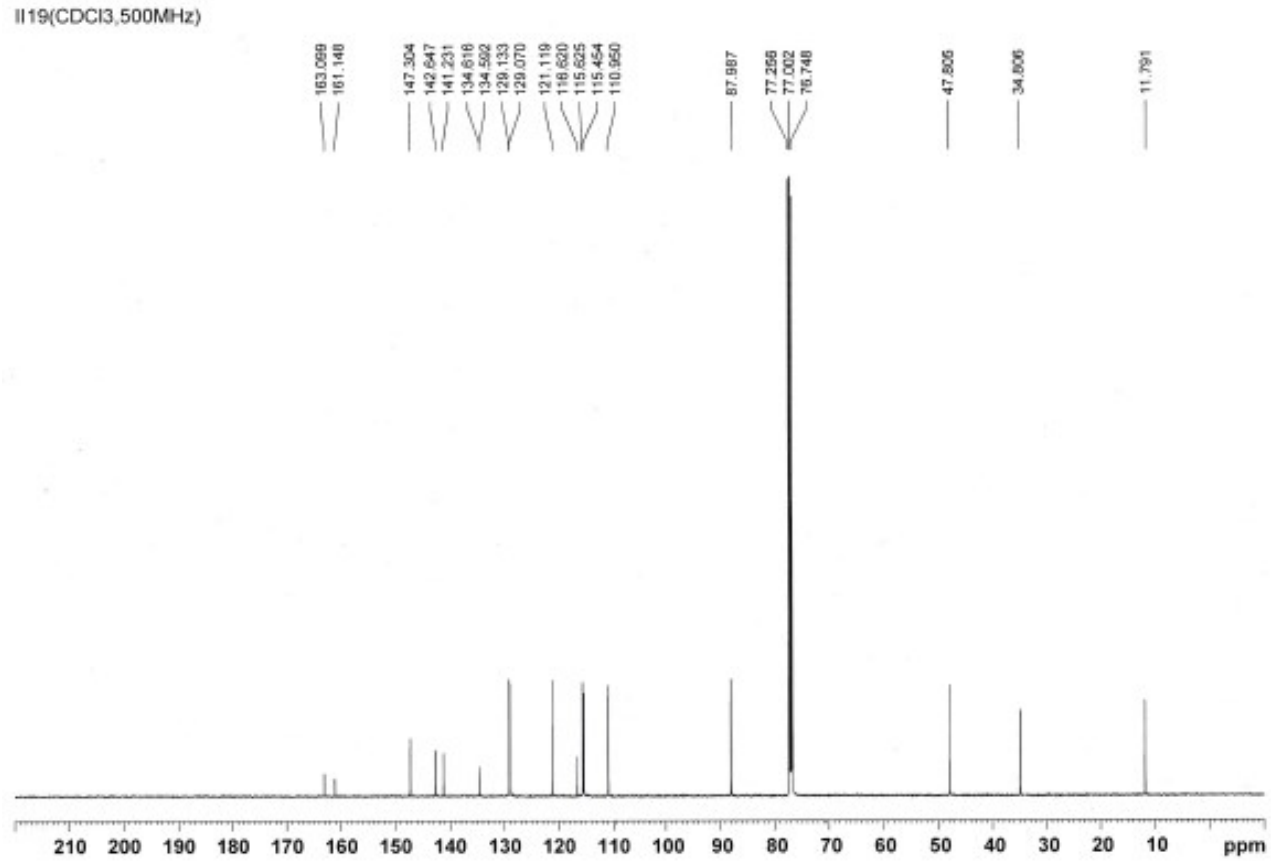
MS of compound 35



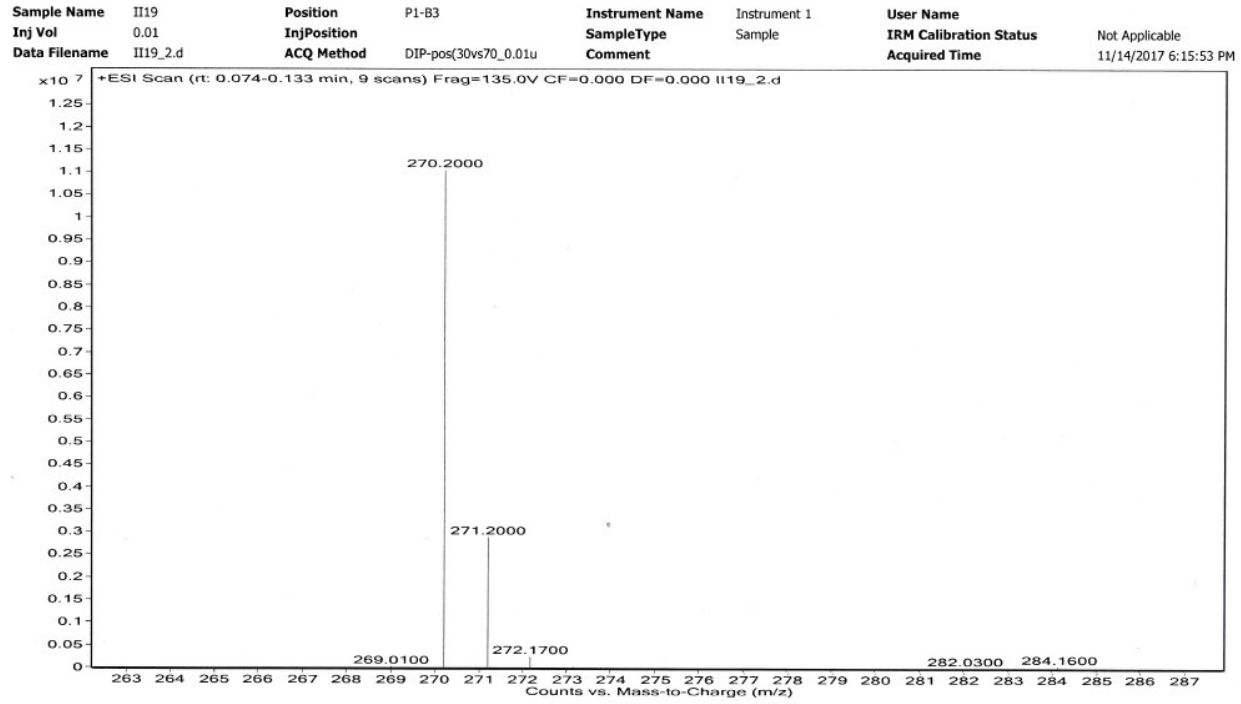
H NMR of compound 36



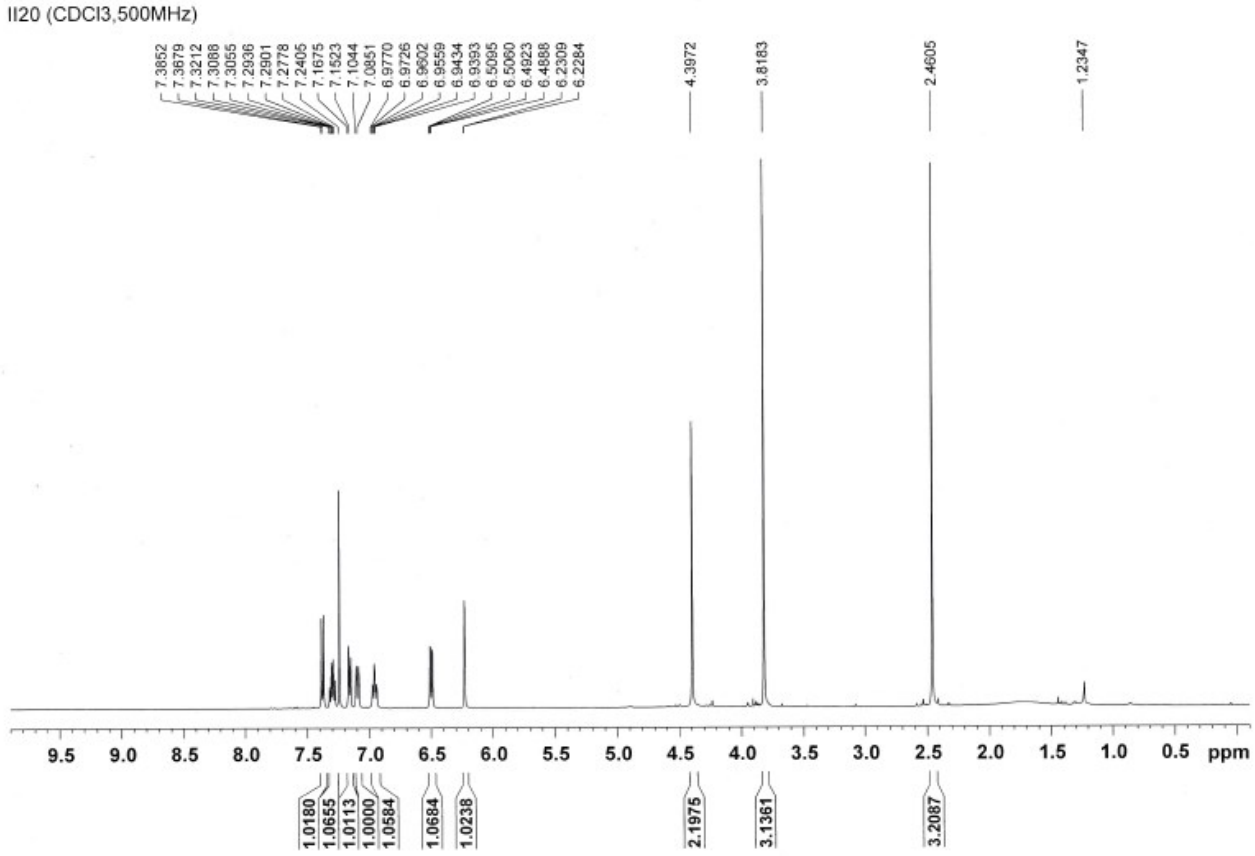
^{13}C NMR of compound 36



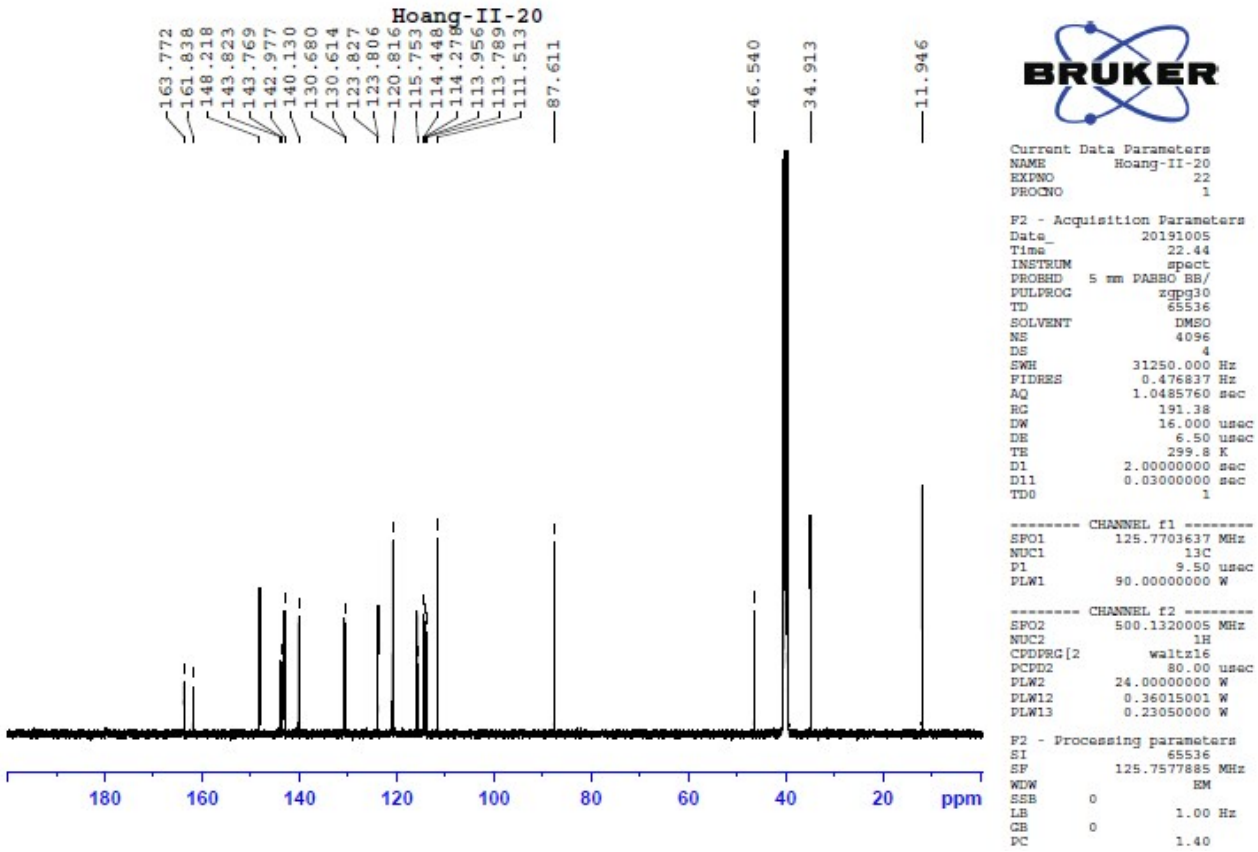
MS of compound 36



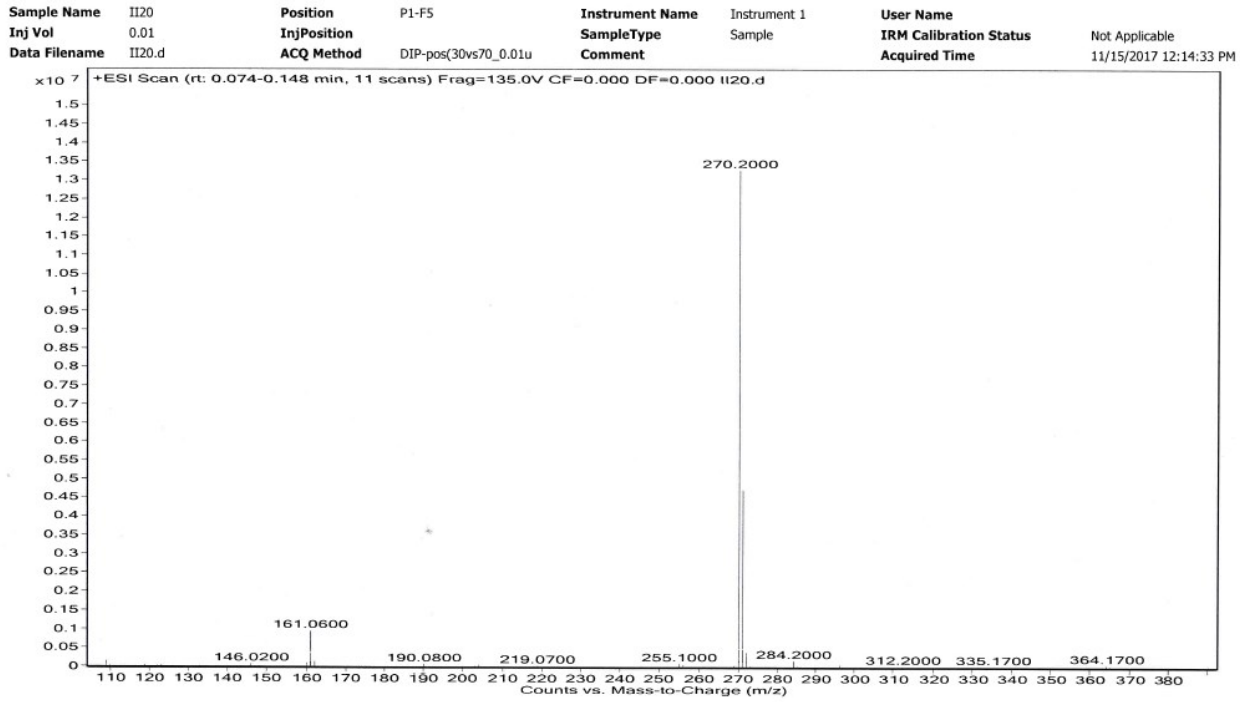
^{1}H NMR of compound 37



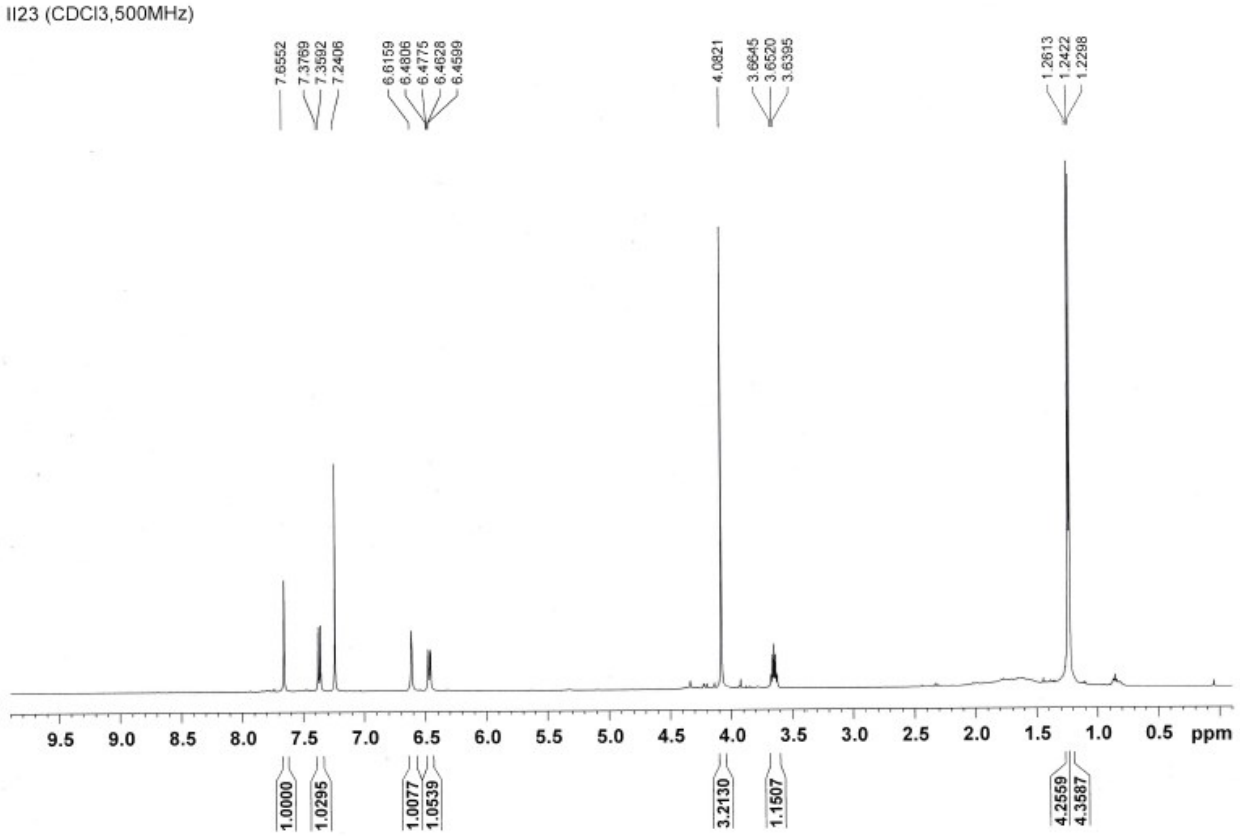
^{13}C NMR of compound 37



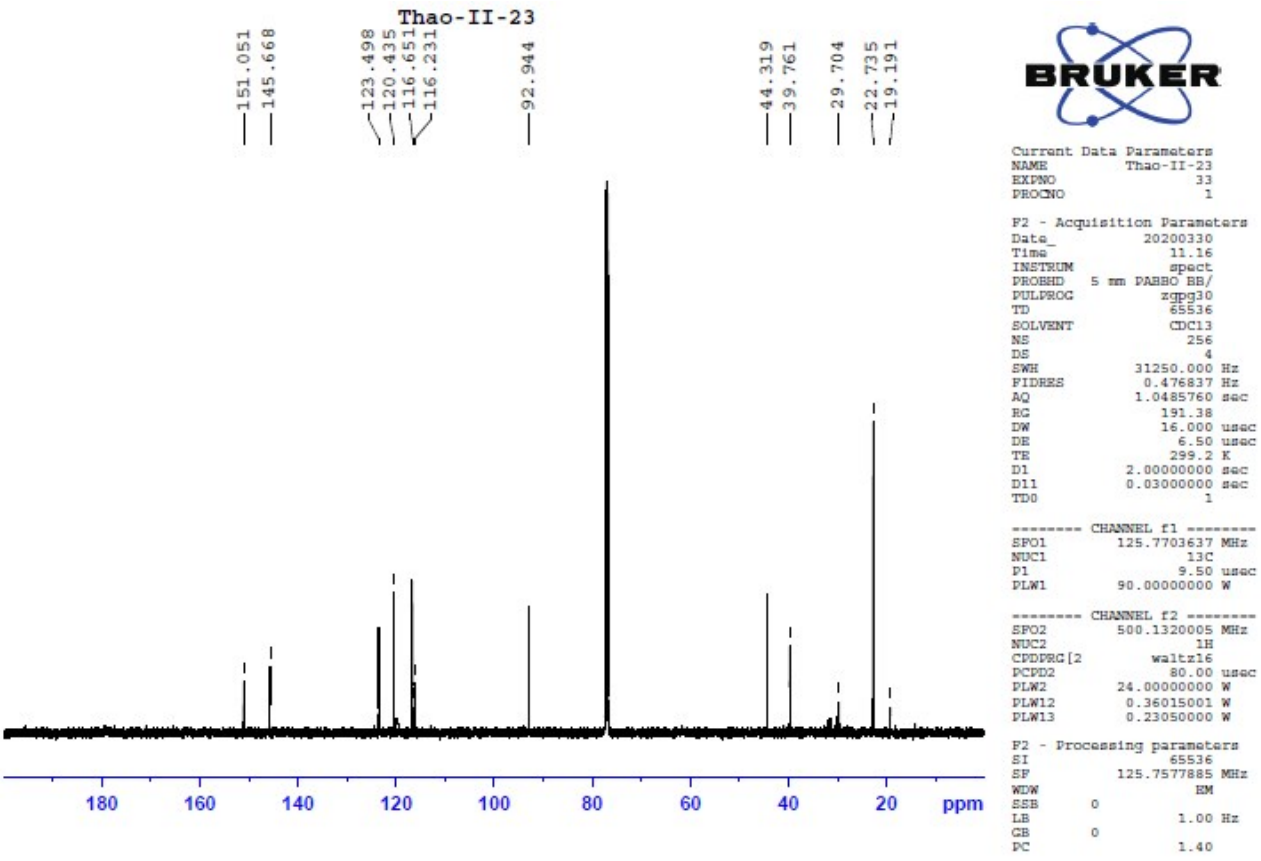
MS of compound 37



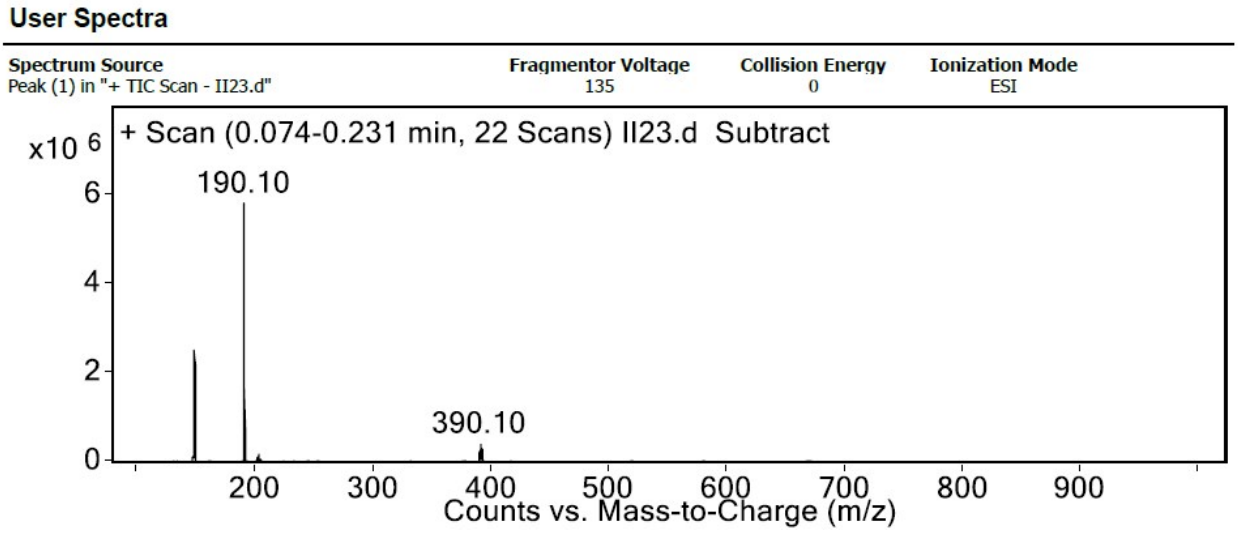
^{1}H NMR of compound 38



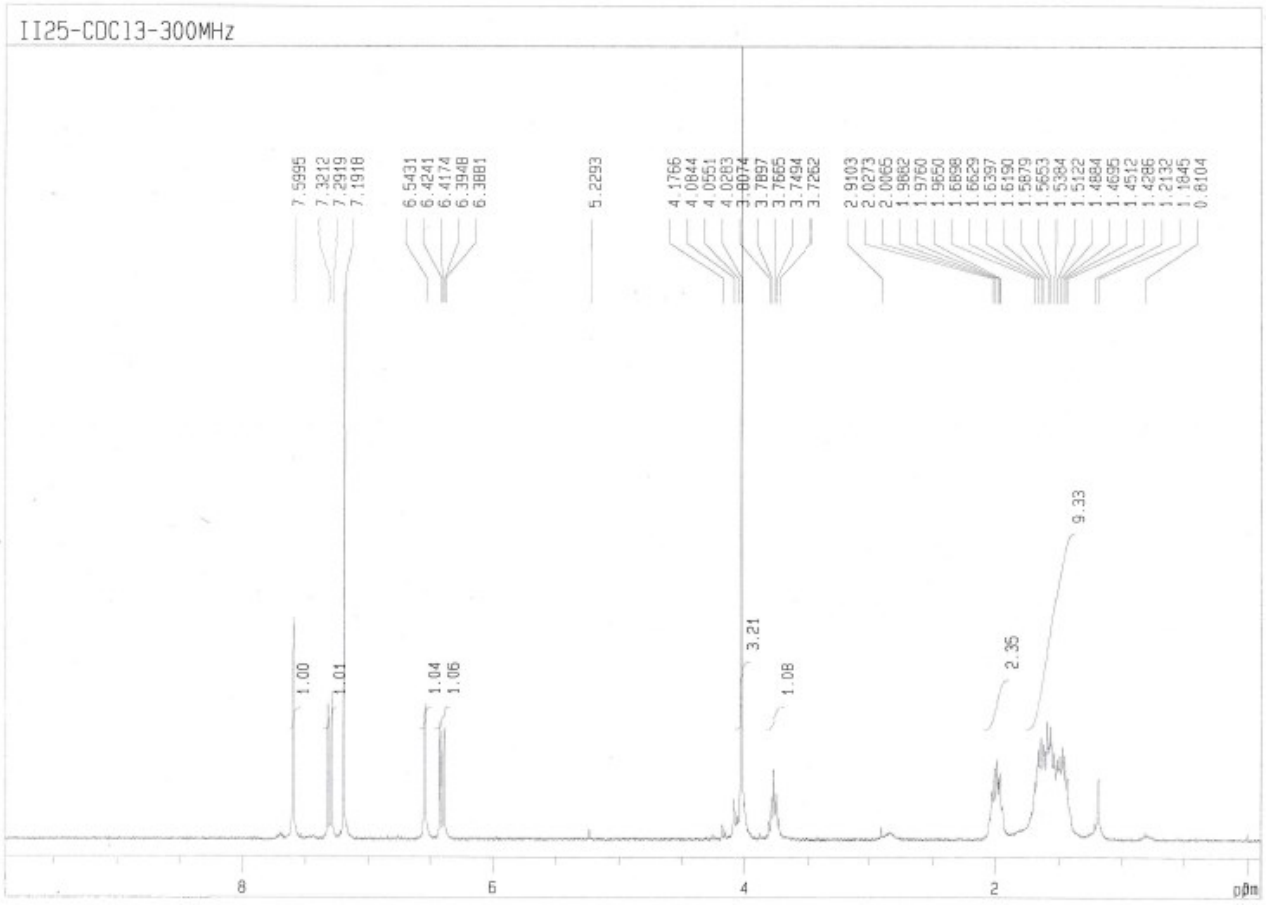
^{13}C NMR of compound 38



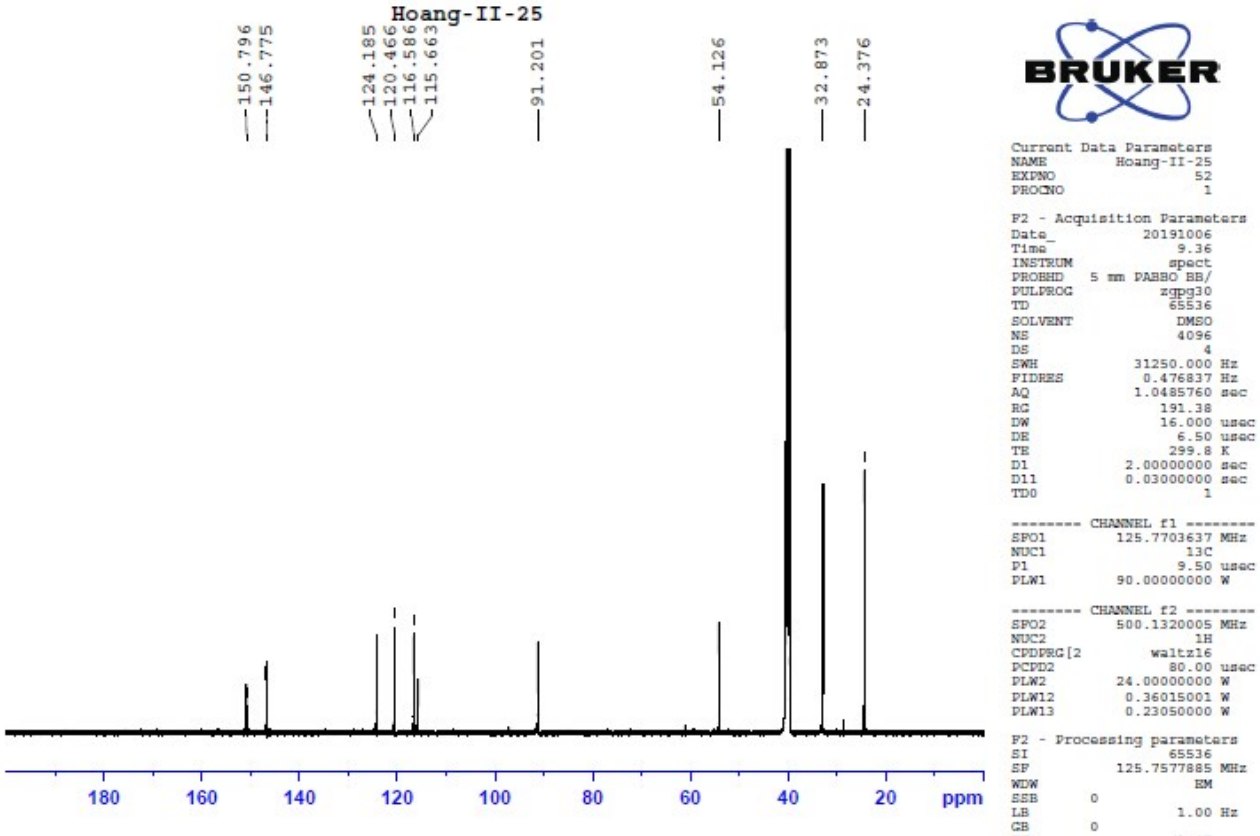
MS of compound 38



^{1}H NMR of compound 39

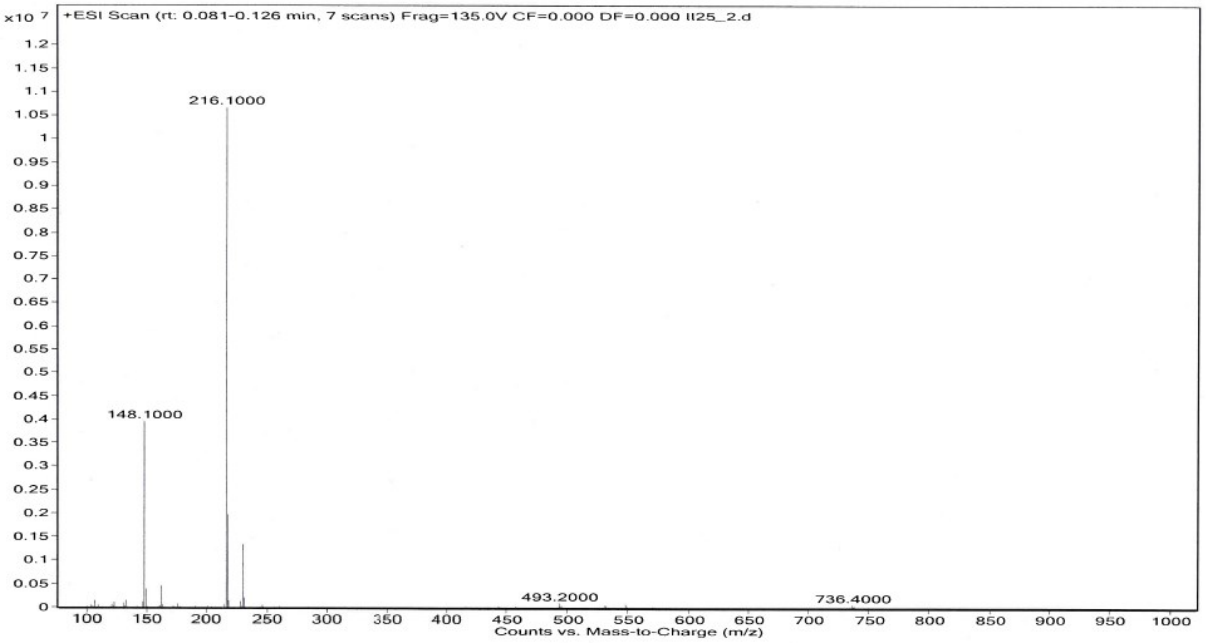


^{13}C NMR of compound 39

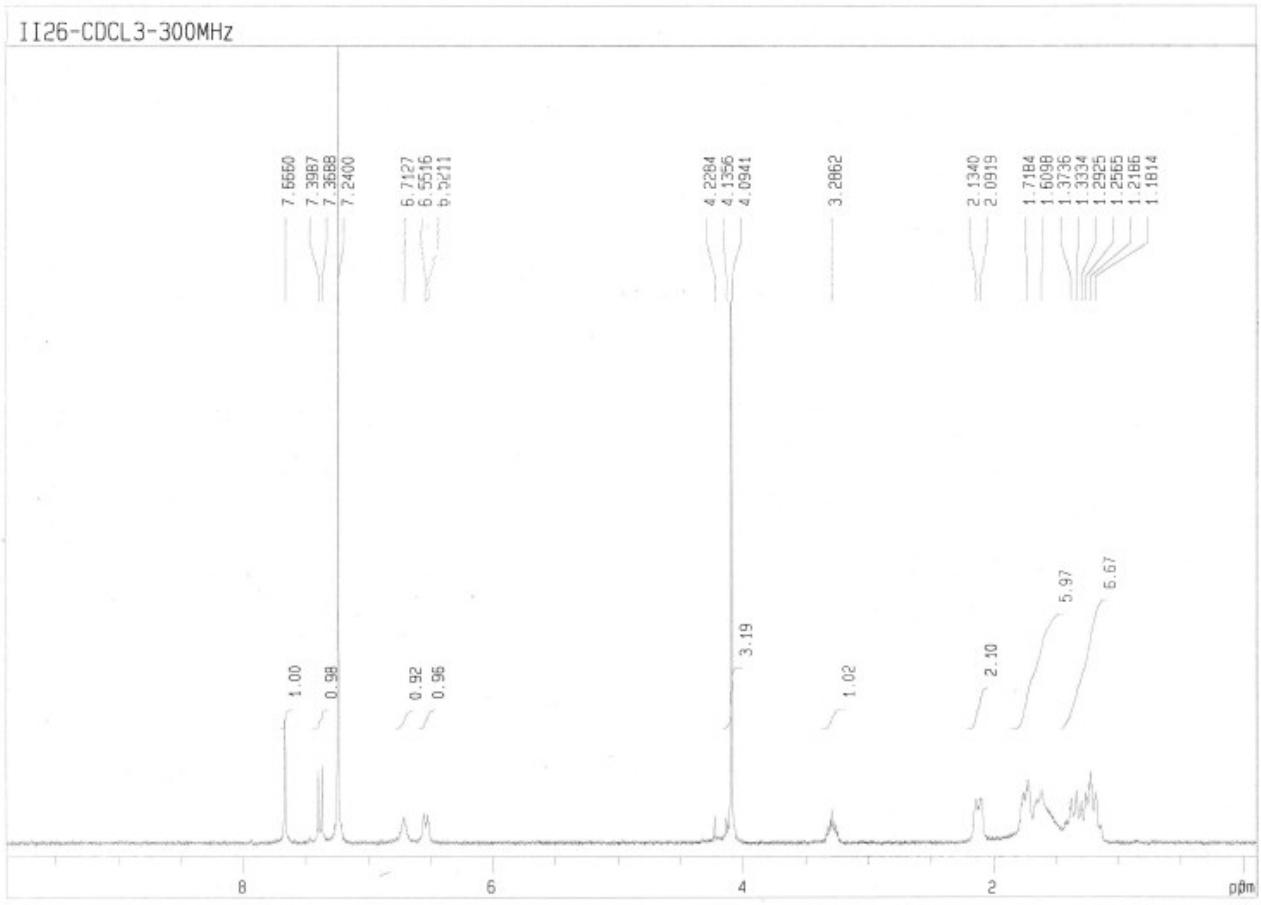


MS of compound 39

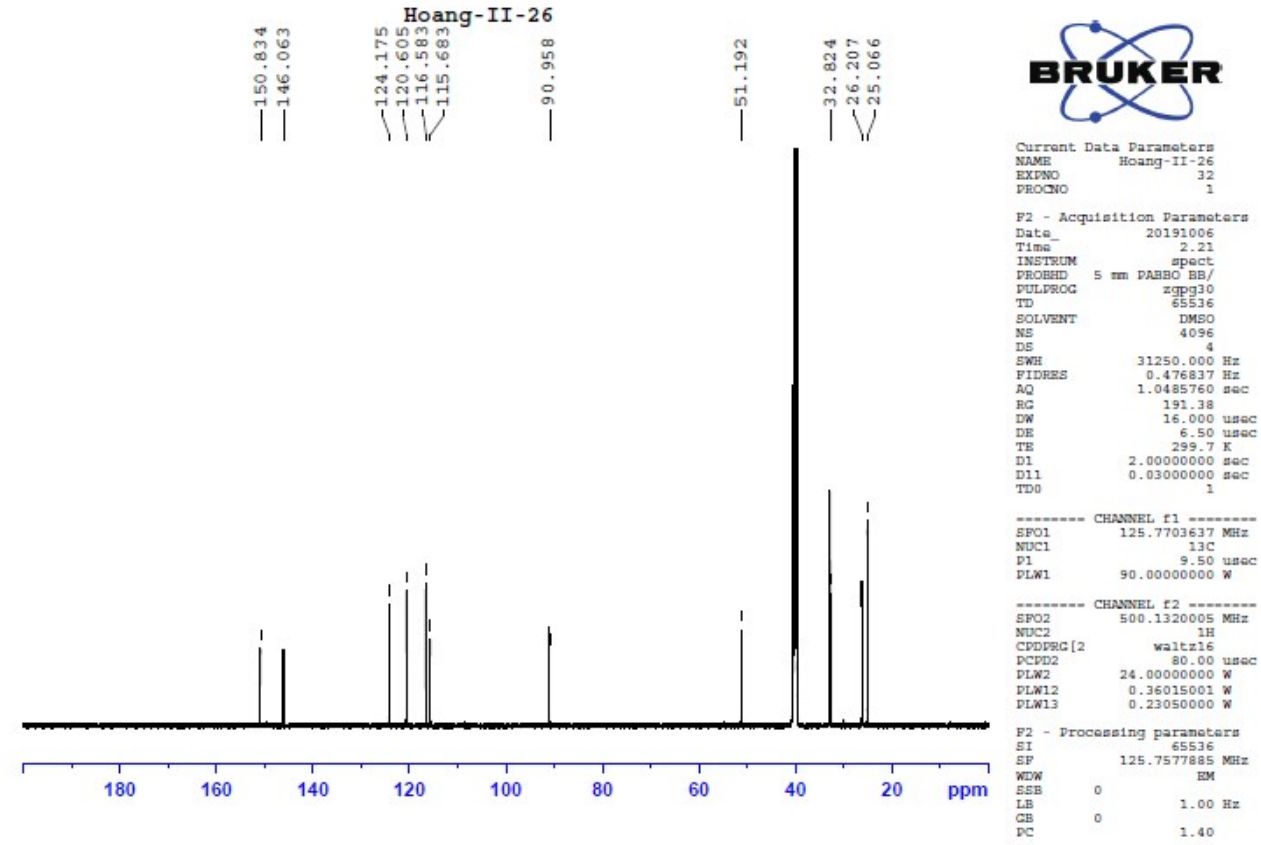
Sample Name	II25	**Position**	P1-B2	**Instrument Name**	Instrument 1	**User Name**	
Inj Vol	0.01	**InjPosition**		**SampleType**	Sample	**IRM Calibration Status**	Not Applicable
Data Filename	II25_2.d	**ACQ Method**	DIP-pos(30vs70_0.01u	**Comment**		**Acquired Time**	11/14/2017 5:54:43 PM



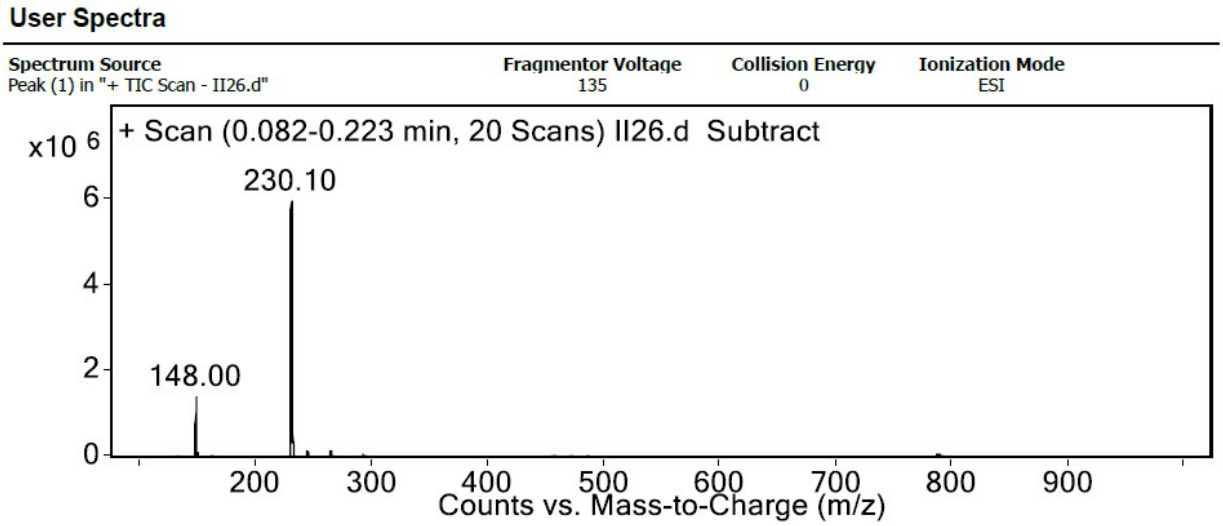
^{1}H NMR of compound 40



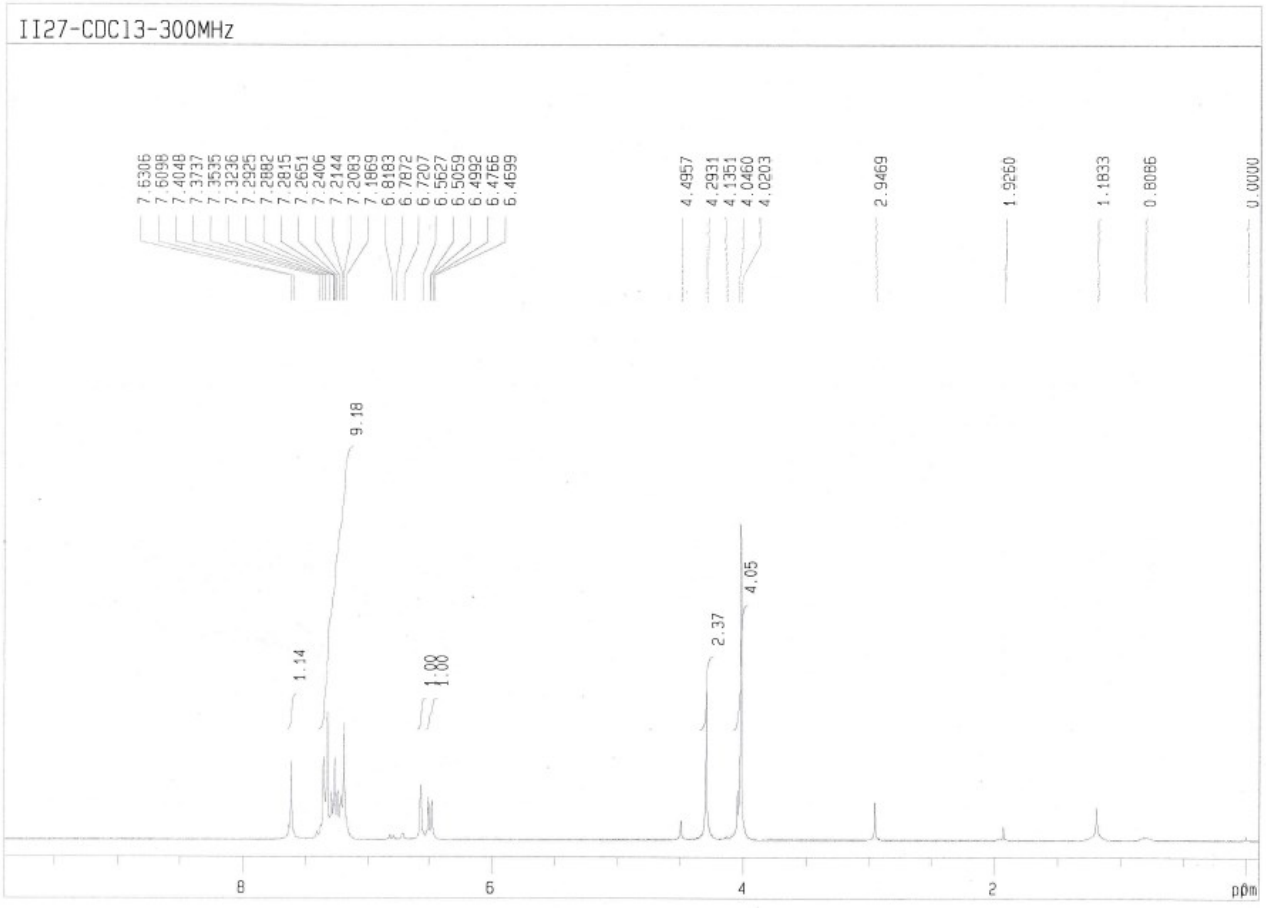
^{13}C NMR of compound 40



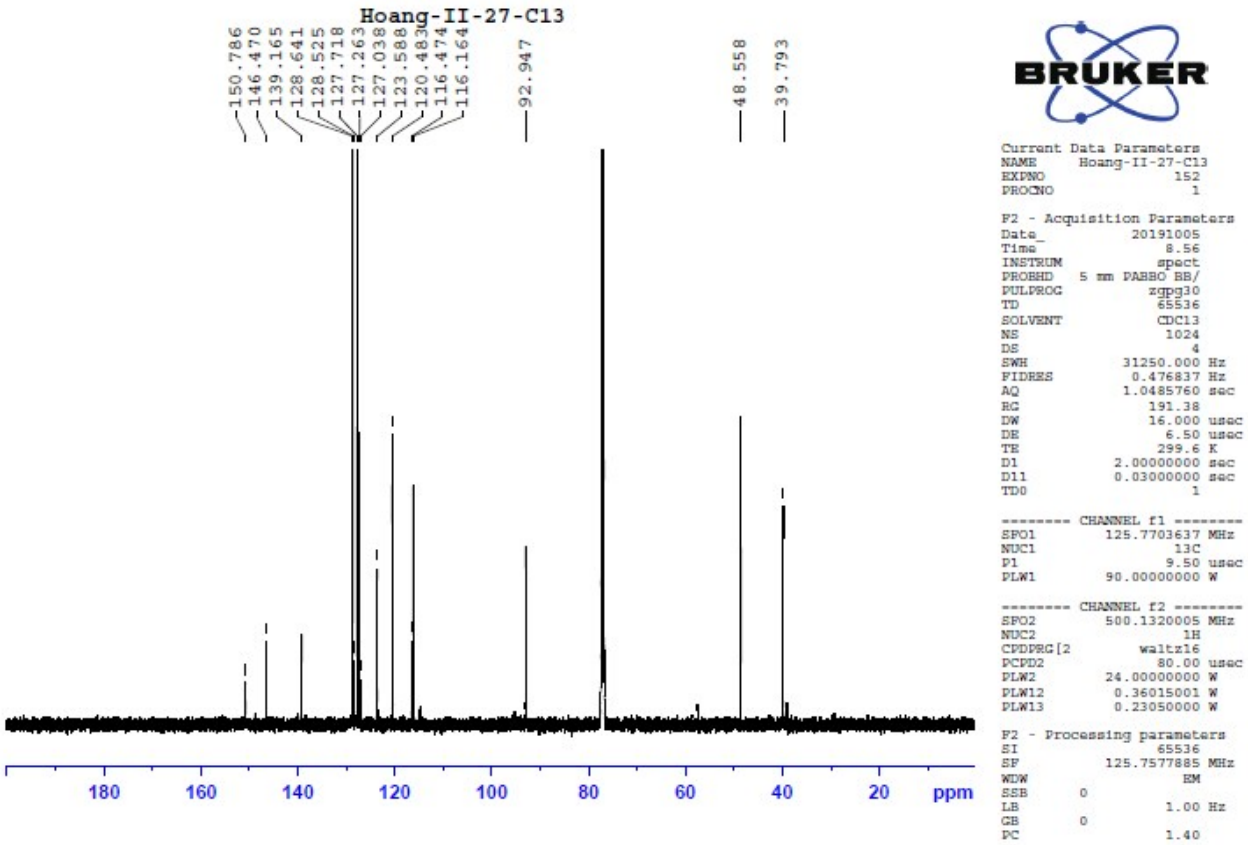
MS of compound 40



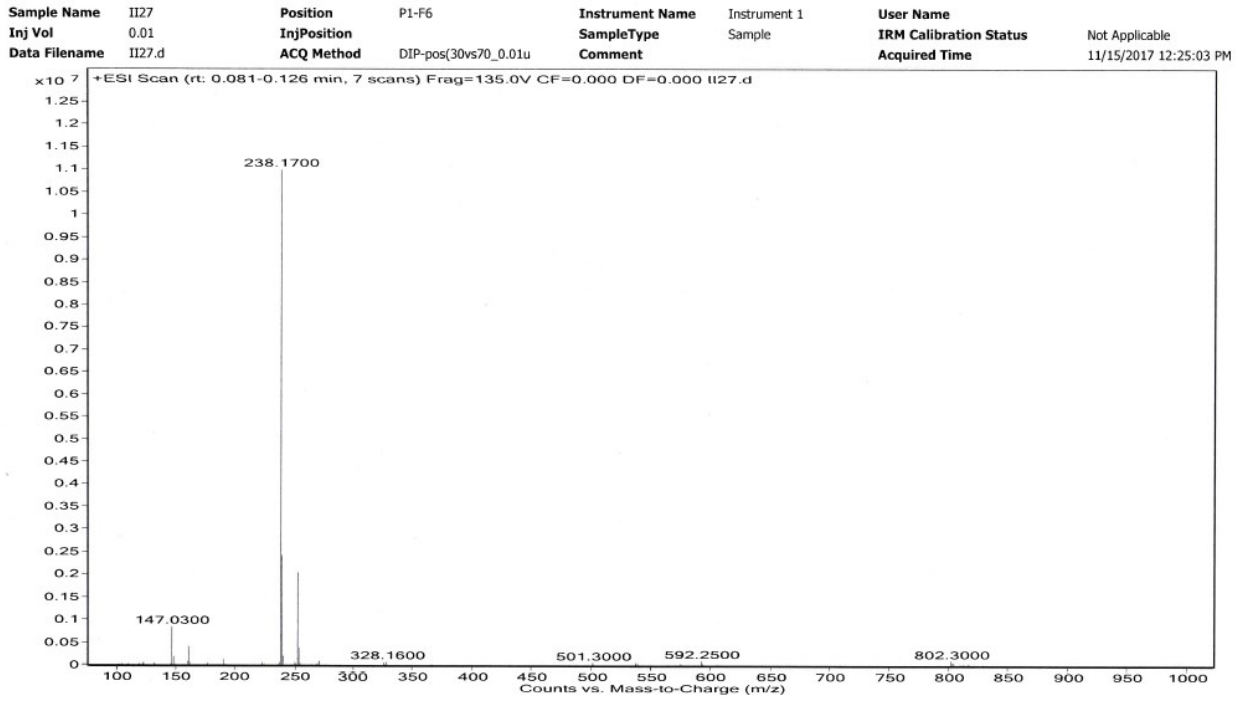
[1]H NMR of compound 41



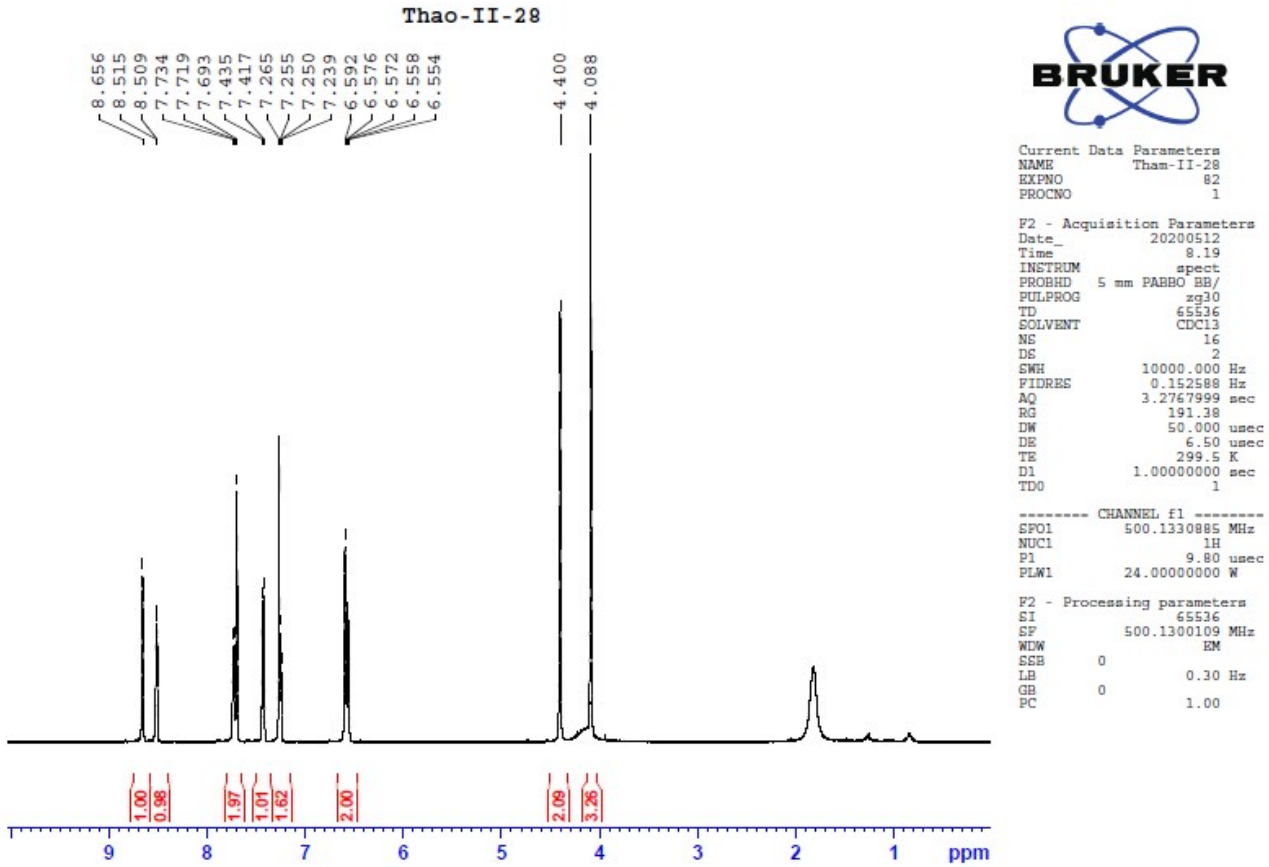
[13]C NMR of compound 41



MS of compound 41



^{1}H NMR of compound 42



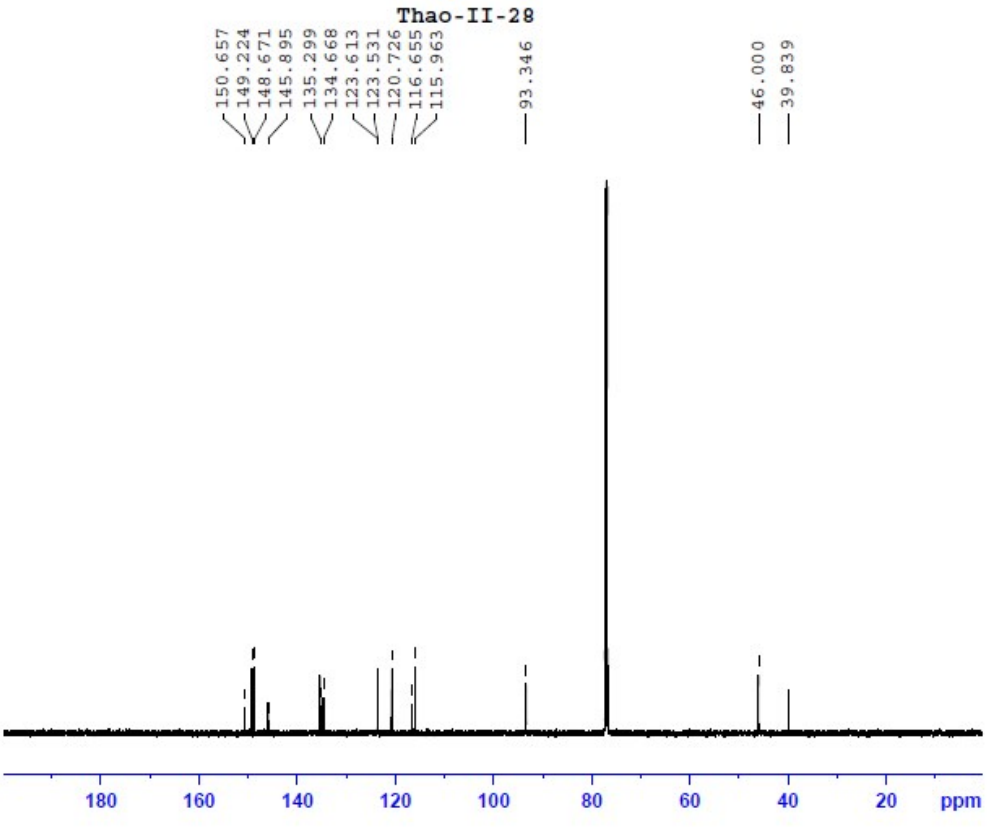

```
Current Data Parameters
NAME            Tham-II-28
EXPNO                   82
PROCNO                   1

F2 - Acquisition Parameters
Date_             20200512
Time                  8.19
INSTRUM              spect
PROBHD   5 mm PABBO BB/
PULPROG               zg30
TD                   65536
SOLVENT              CDCl3
NS                      16
DS                       2
SWH           10000.000 Hz
FIDRES        0.152588 Hz
AQ            3.2767999 sec
RG                  191.38
DW                50.000 usec
DE                 6.50 usec
TE                299.5 K
D1            1.00000000 sec
TD0                      1

======== CHANNEL f1 ========
SFO1          500.1330885 MHz
NUC1                    1H
P1                   9.80 usec
PLW1         24.00000000 W

F2 - Processing parameters
SI                   65536
SF            500.1300109 MHz
WDW                     EM
SSB                  0
LB                   0.30 Hz
GB                   0
PC                   1.00
```

^{13}C NMR of compound 42




```
Current Data Parameters
NAME            Tham-II-28
EXPNO                   83
PROCNO                   1

F2 - Acquisition Parameters
Date_             20200512
Time                  8.48
INSTRUM              spect
PROBHD   5 mm PABBO BB/
PULPROG           zgpg30
TD                   65536
SOLVENT              CDCl3
NS                     533
DS                       4
SWH           31250.000 Hz
FIDRES        0.476837 Hz
AQ            1.0485760 sec
RG                  191.38
DW                16.000 usec
DE                 6.50 usec
TE                300.2 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0                      1

======== CHANNEL f1 ========
SFO1          125.7703637 MHz
NUC1                   13C
P1                   9.50 usec
PLW1         90.00000000 W

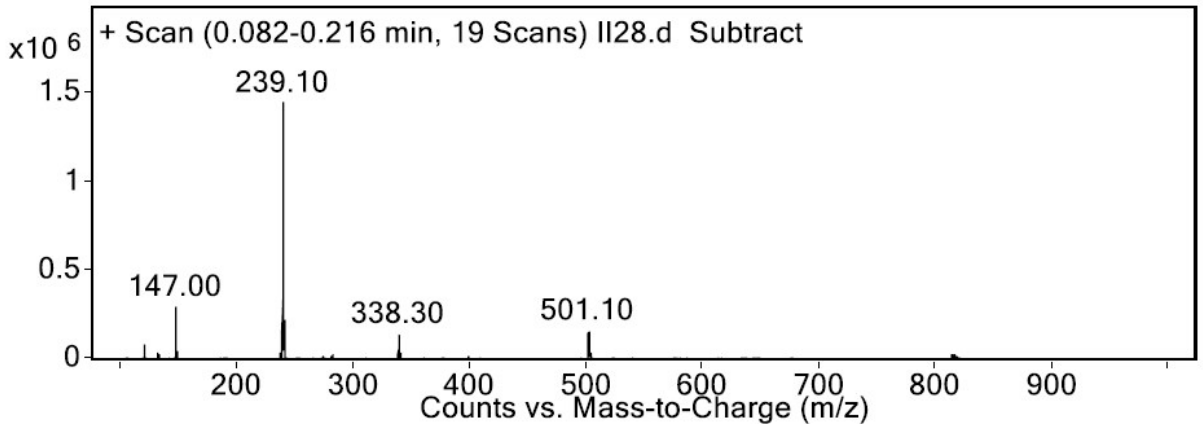
======== CHANNEL f2 ========
SFO2          500.1320005 MHz
NUC2                    1H
CPDPRG[2          waltz16
PCPD2               80.00 usec
PLW2         24.00000000 W
PLW12         0.36015001 W
PLW13         0.23050000 W

F2 - Processing parameters
SI                   65536
SF            125.7577885 MHz
WDW                     EM
SSB                  0
LB                   1.00 Hz
GB                   0
PC                   1.40
```

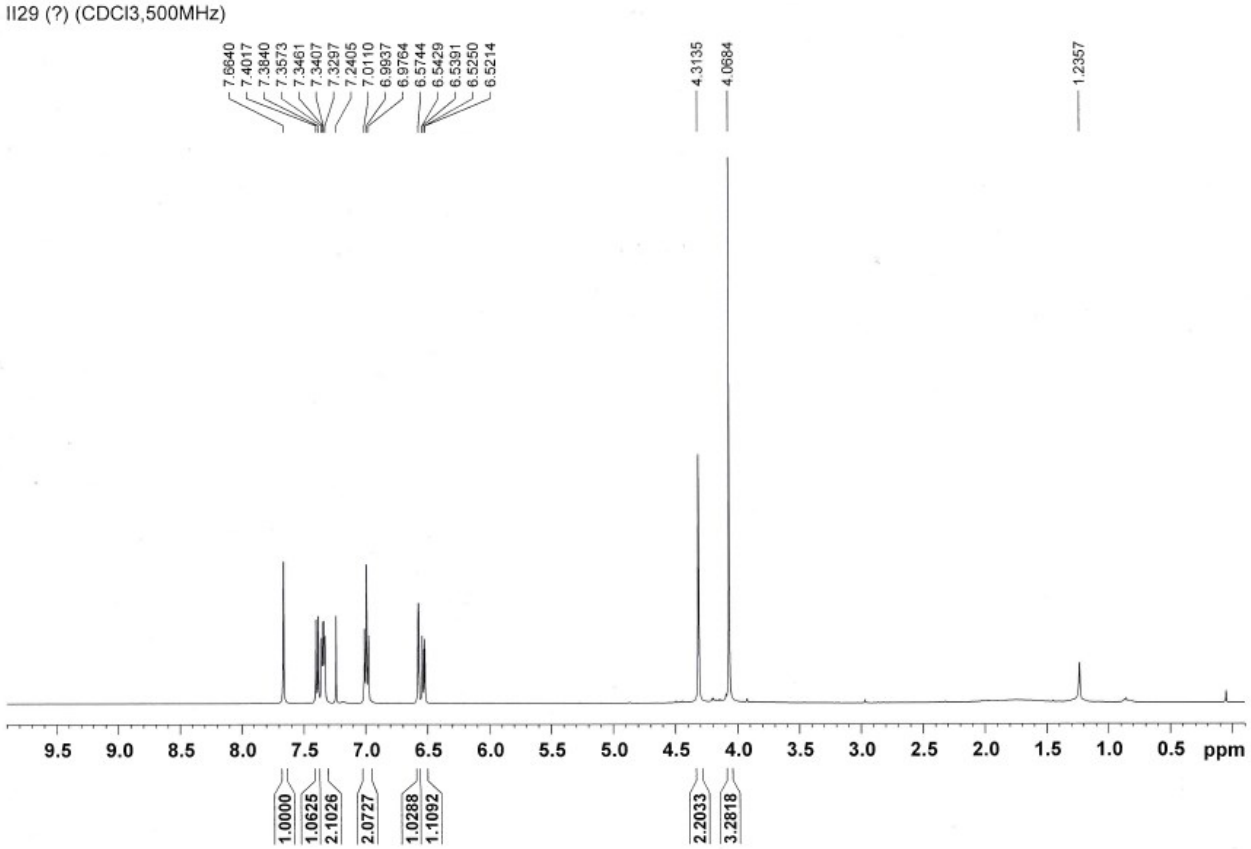
MS of compound 42

User Spectra

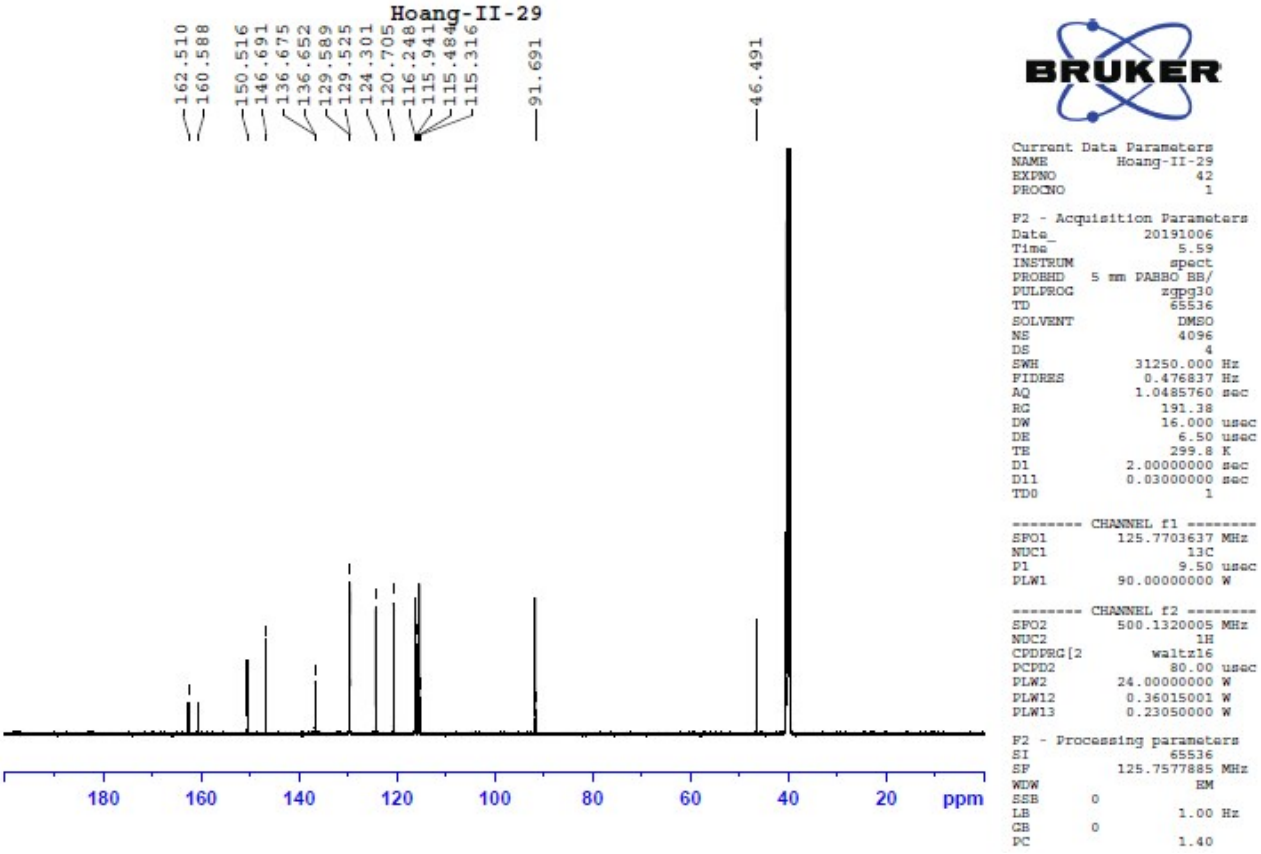
Spectrum Source	Fragmentor Voltage	Collision Energy	Ionization Mode
Peak (1) in "+ TIC Scan - II28.d"	135	0	ESI



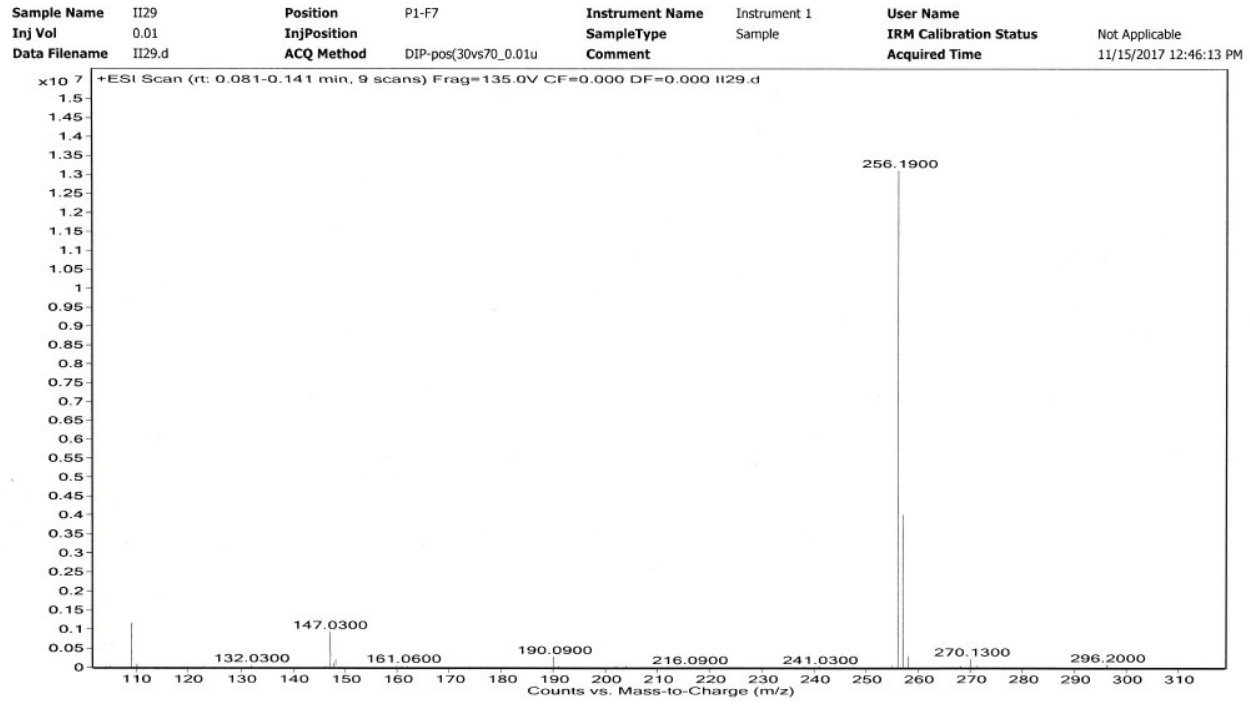
^{1}H NMR of compound 43



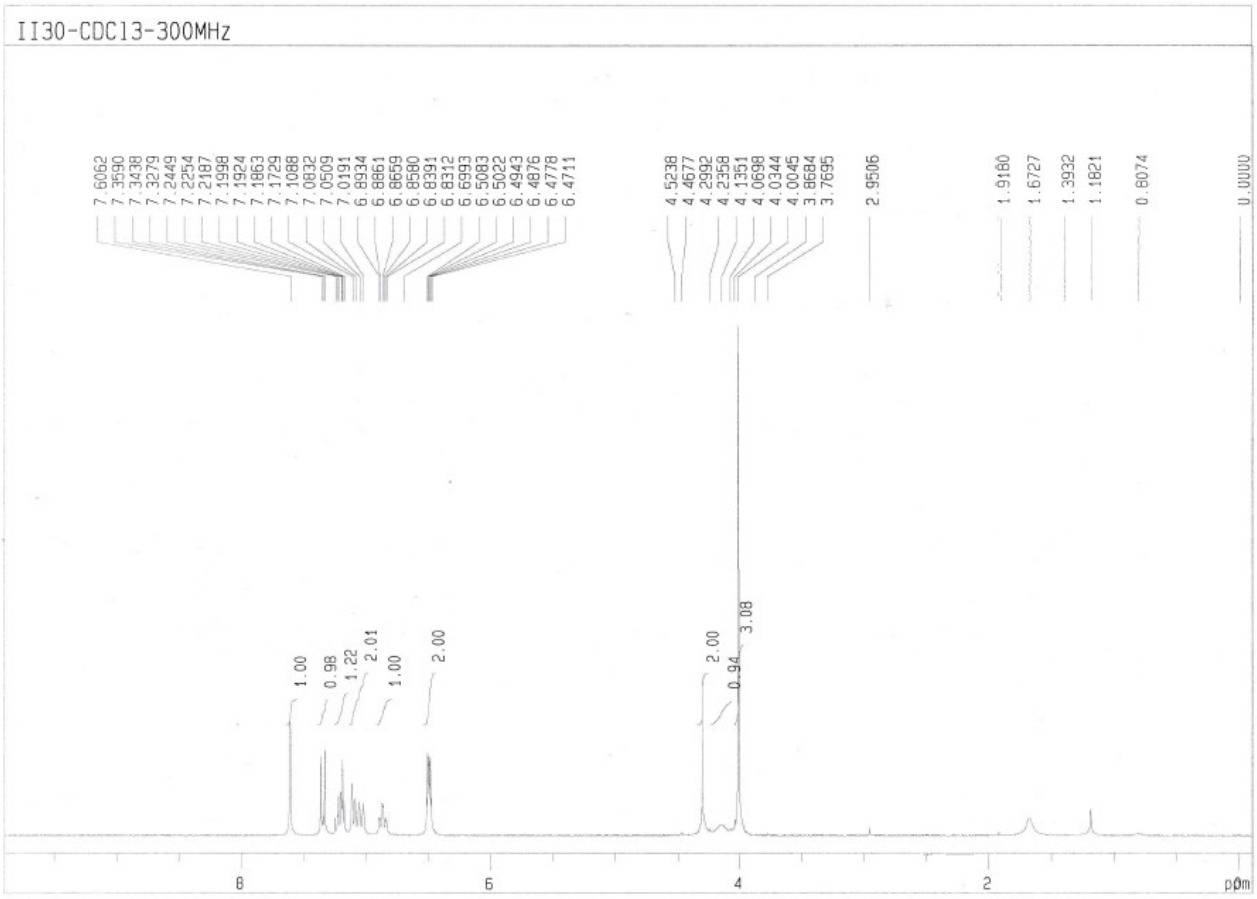
^{13}C NMR of compound 43



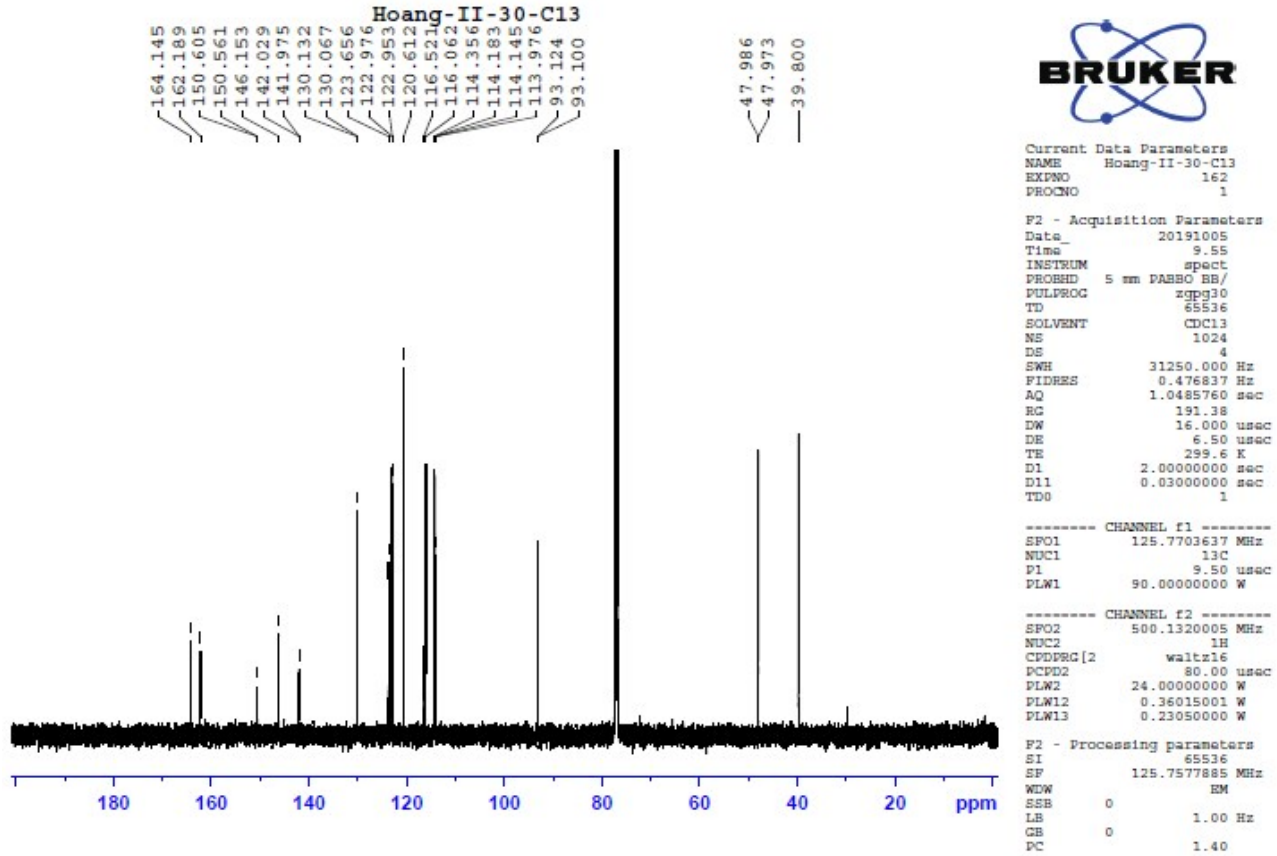
MS of compound 43



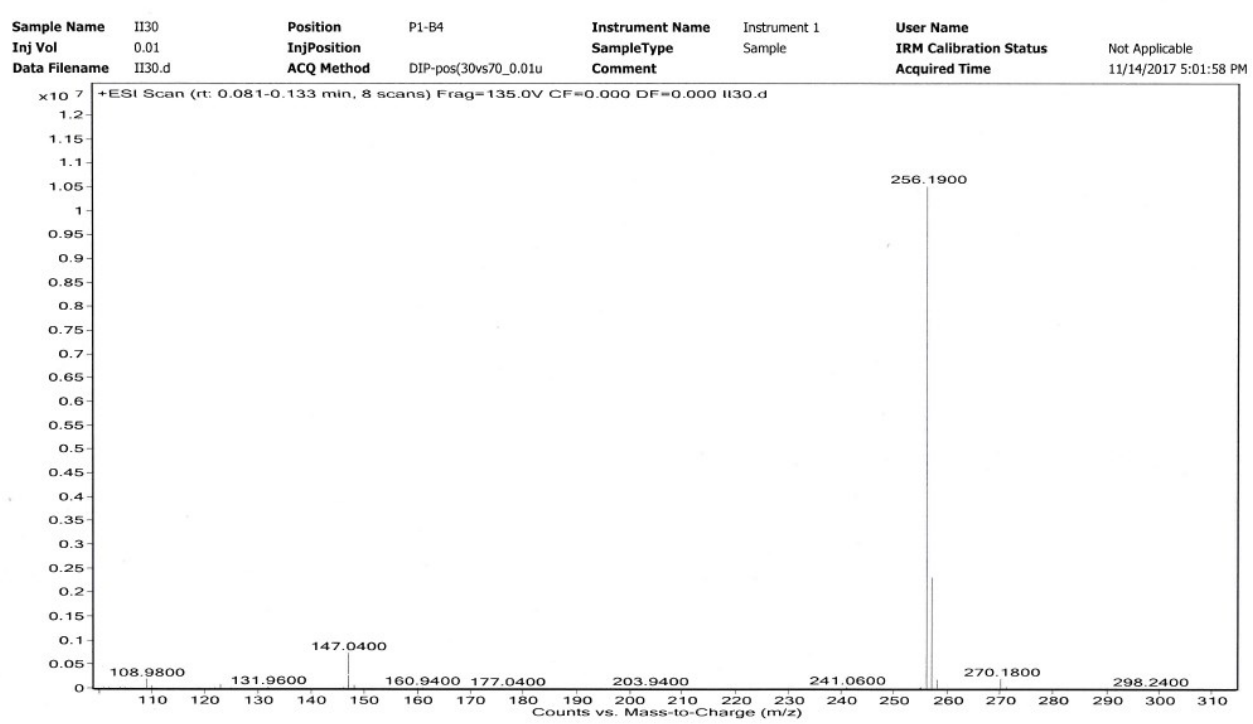
^{1}H NMR of compound 44



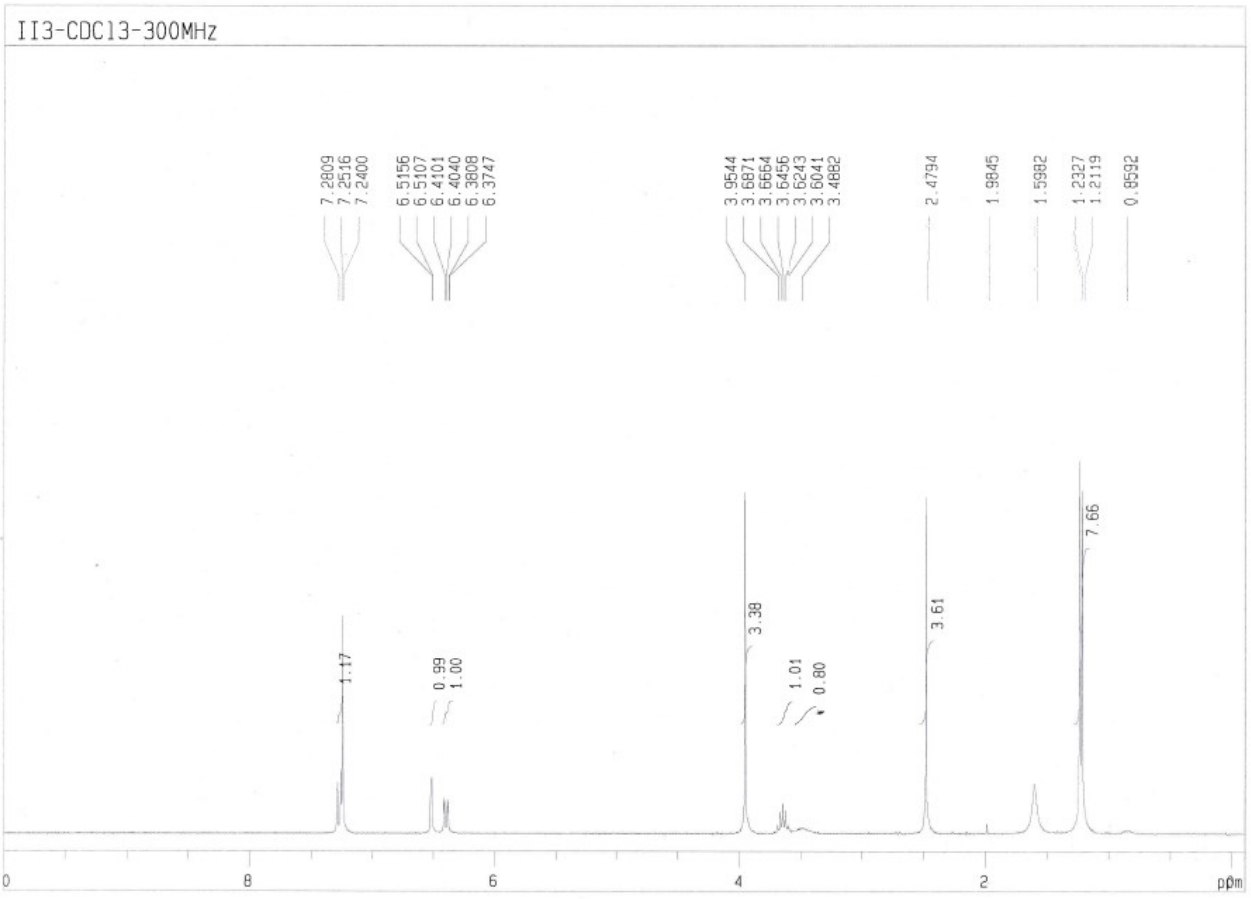
^{13}C NMR of compound 44



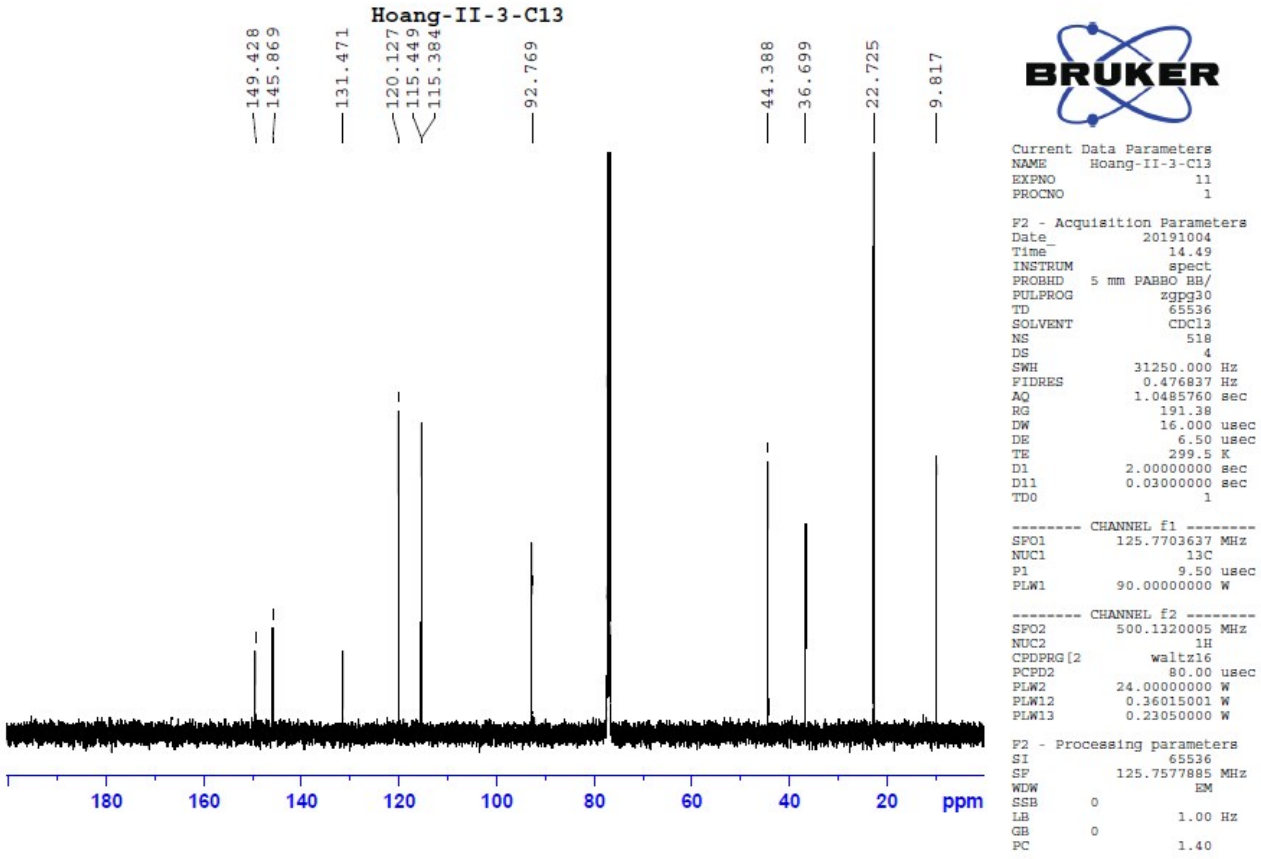
MS of compound 44



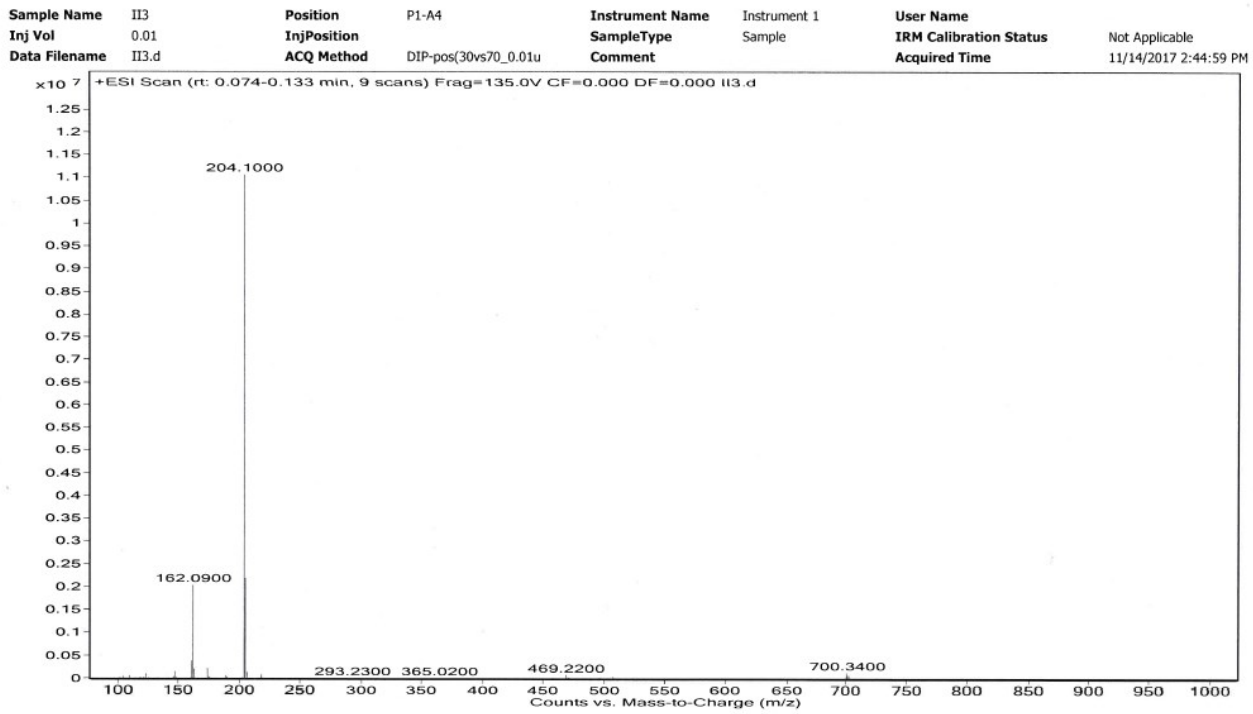
^{1}H NMR of compound 45



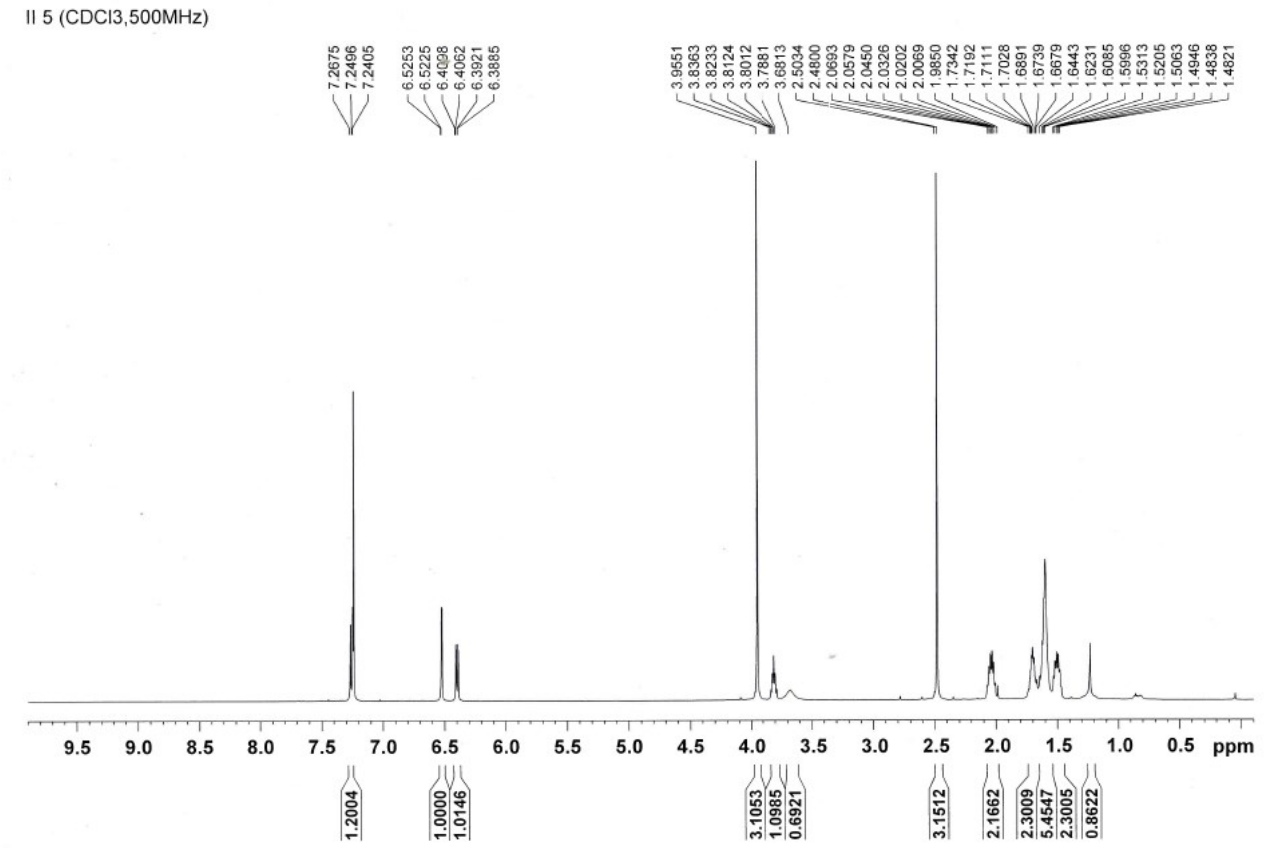
^{13}C NMR of compound 45



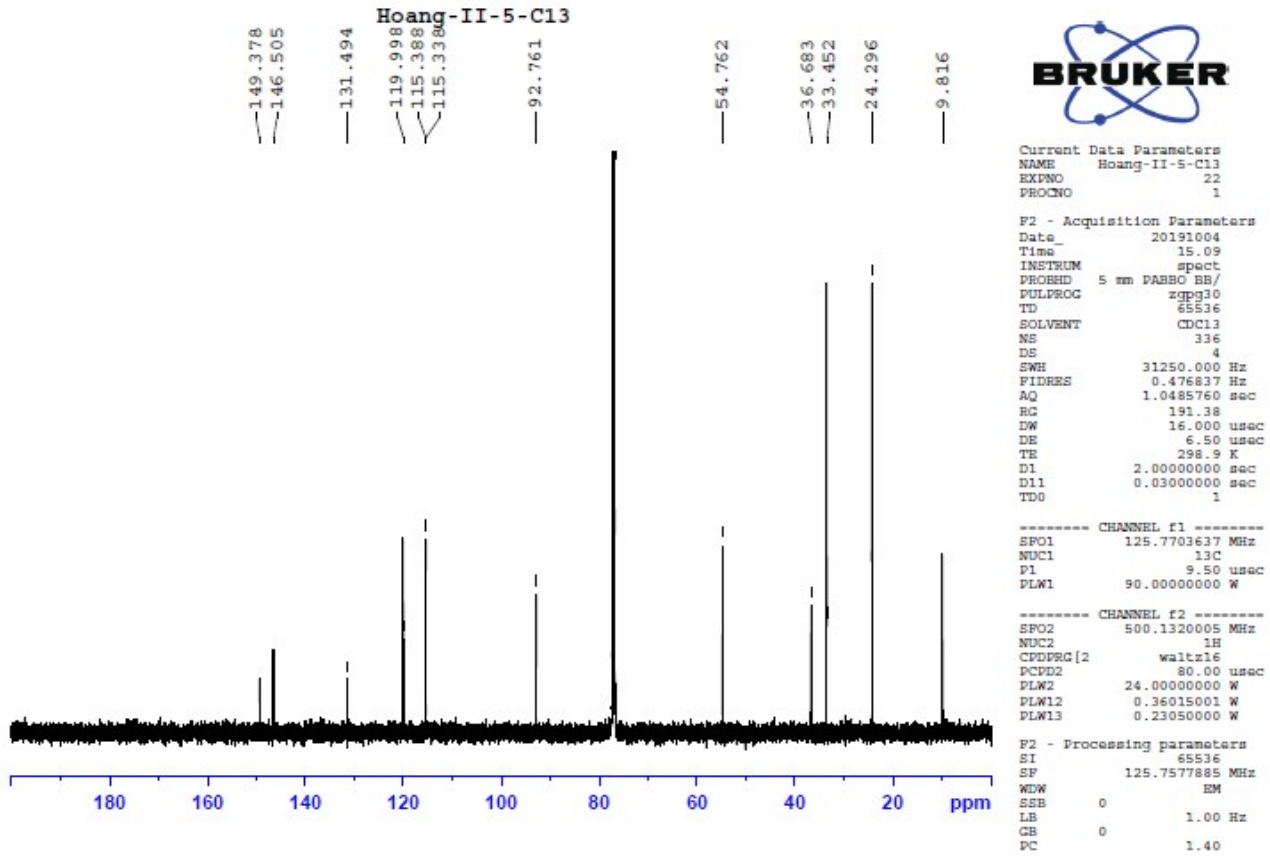
MS of compound 45



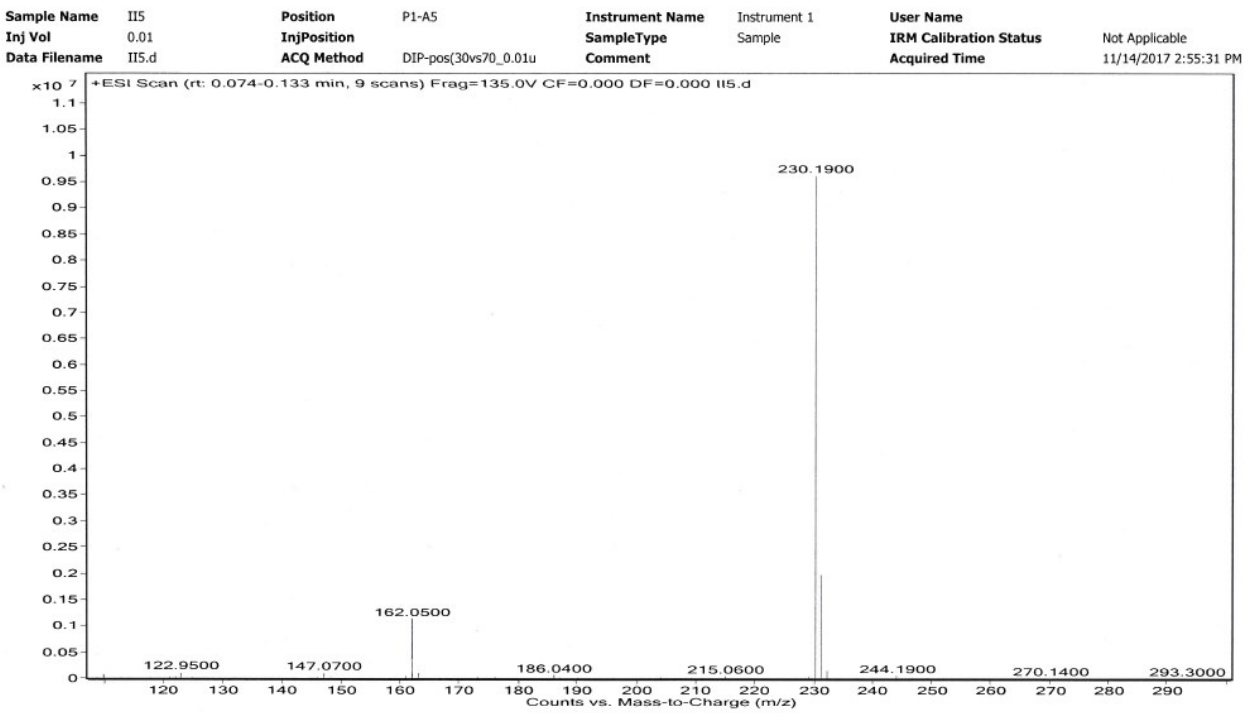
^{1}H NMR of compound 46



^{13}C NMR of compound 46

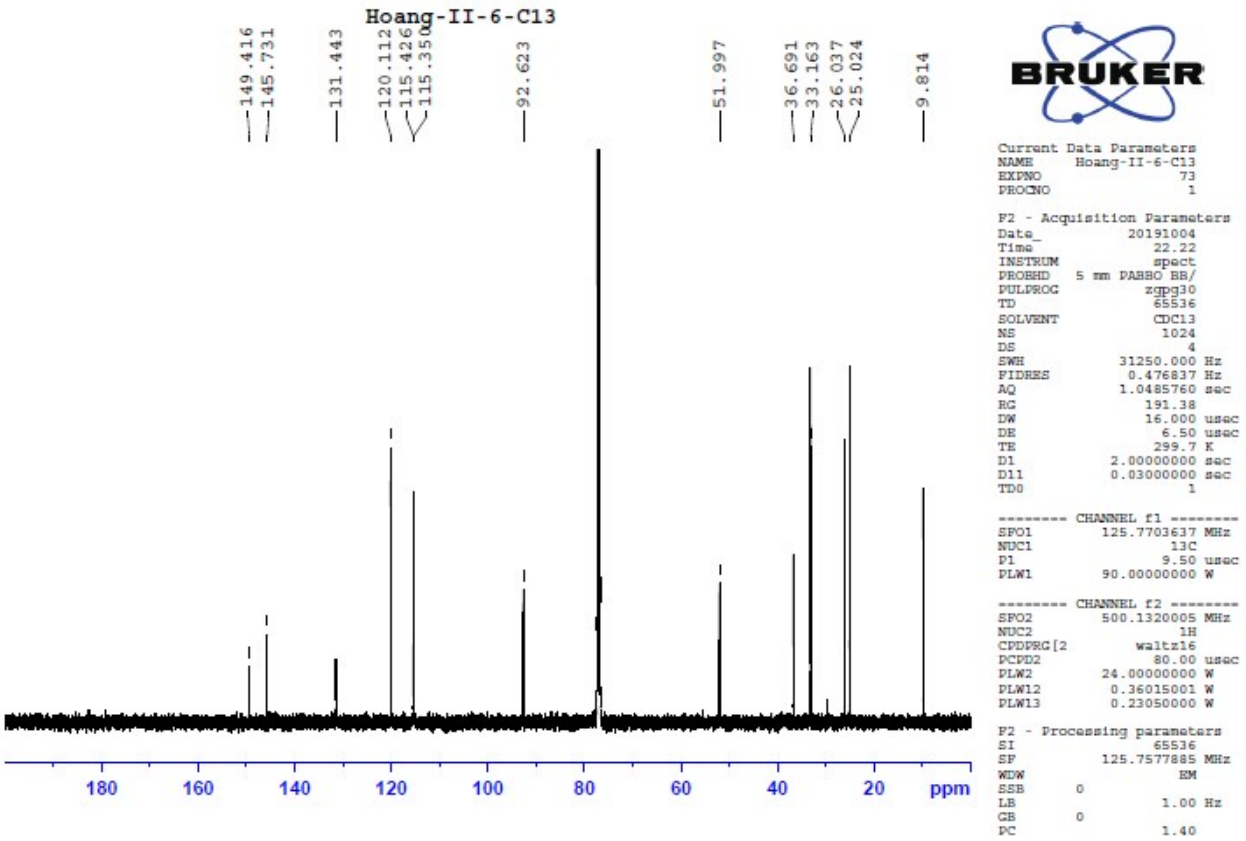


MS of compound 47

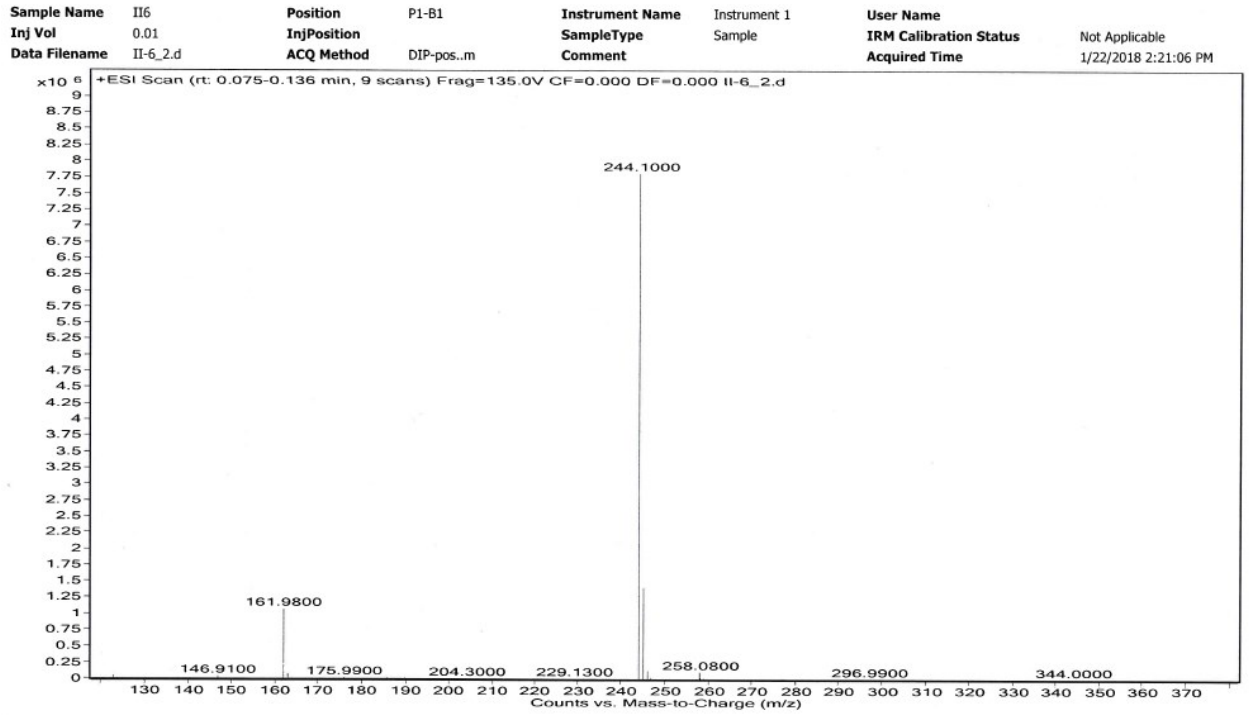


^{1}H NMR of compound 47

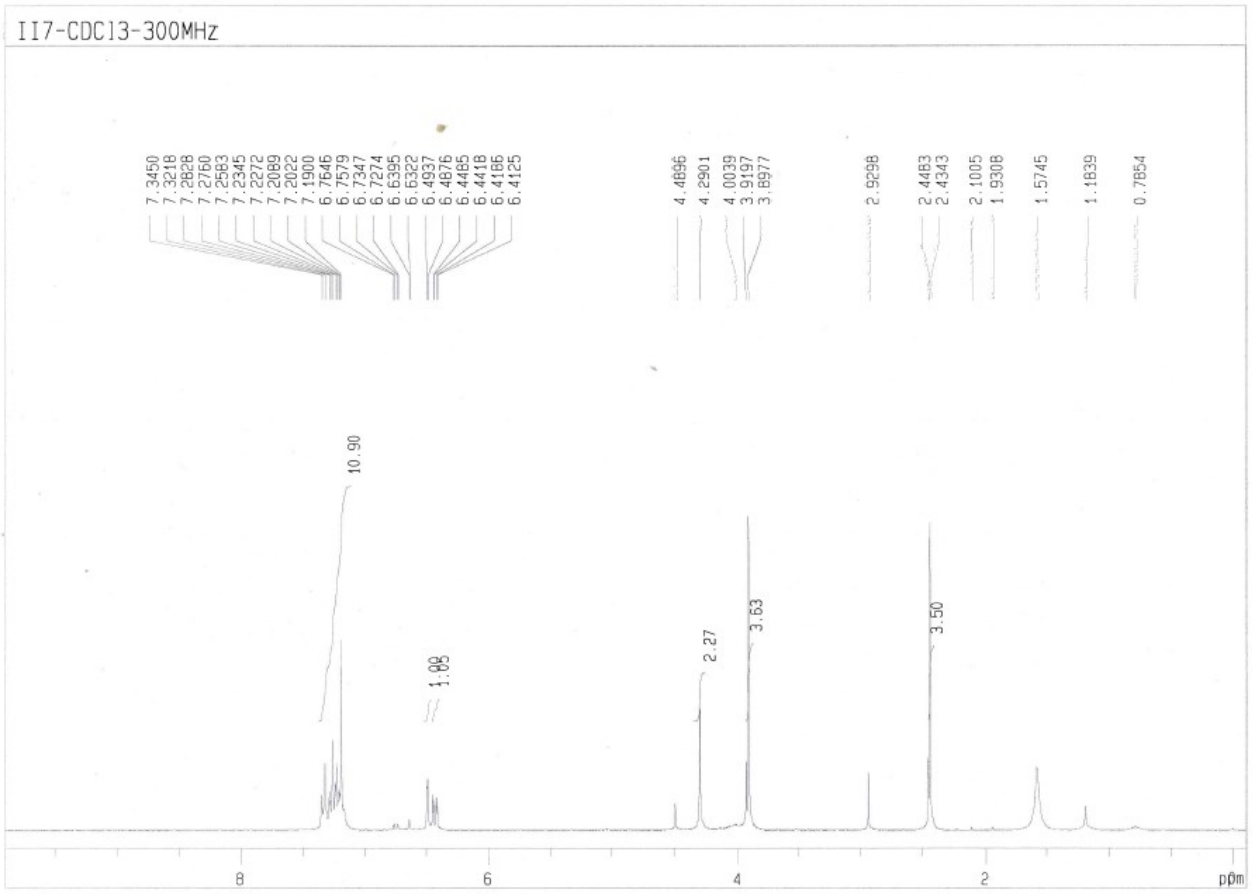
^{13}C NMR of compound 47



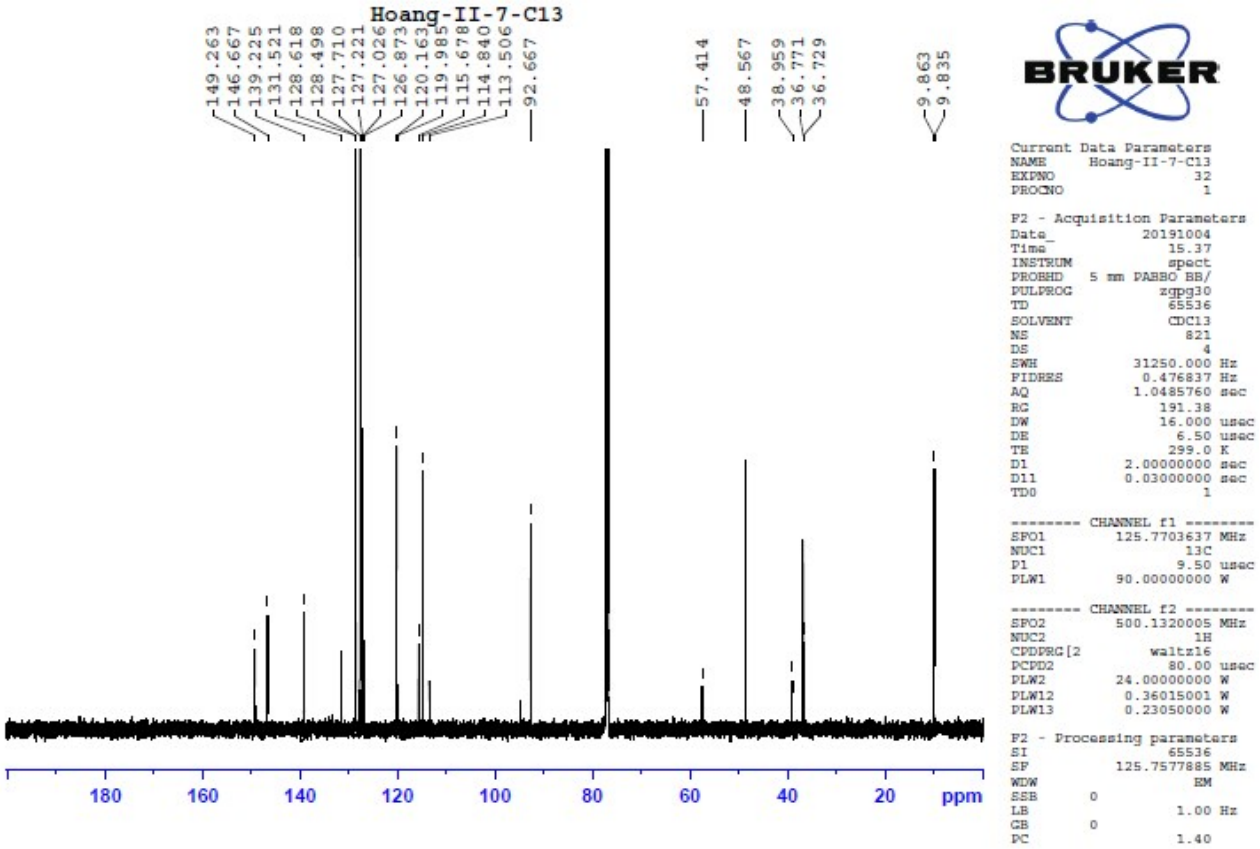
MS of compound 47



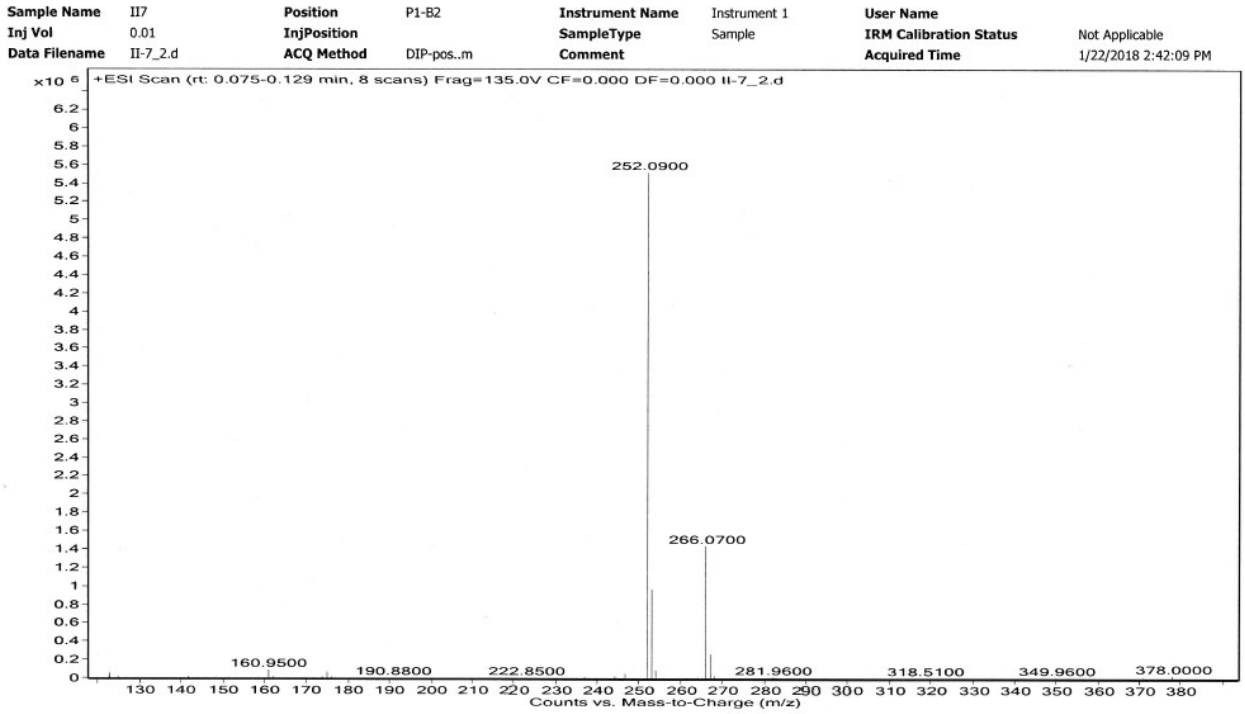
^{1}H NMR of compound 48



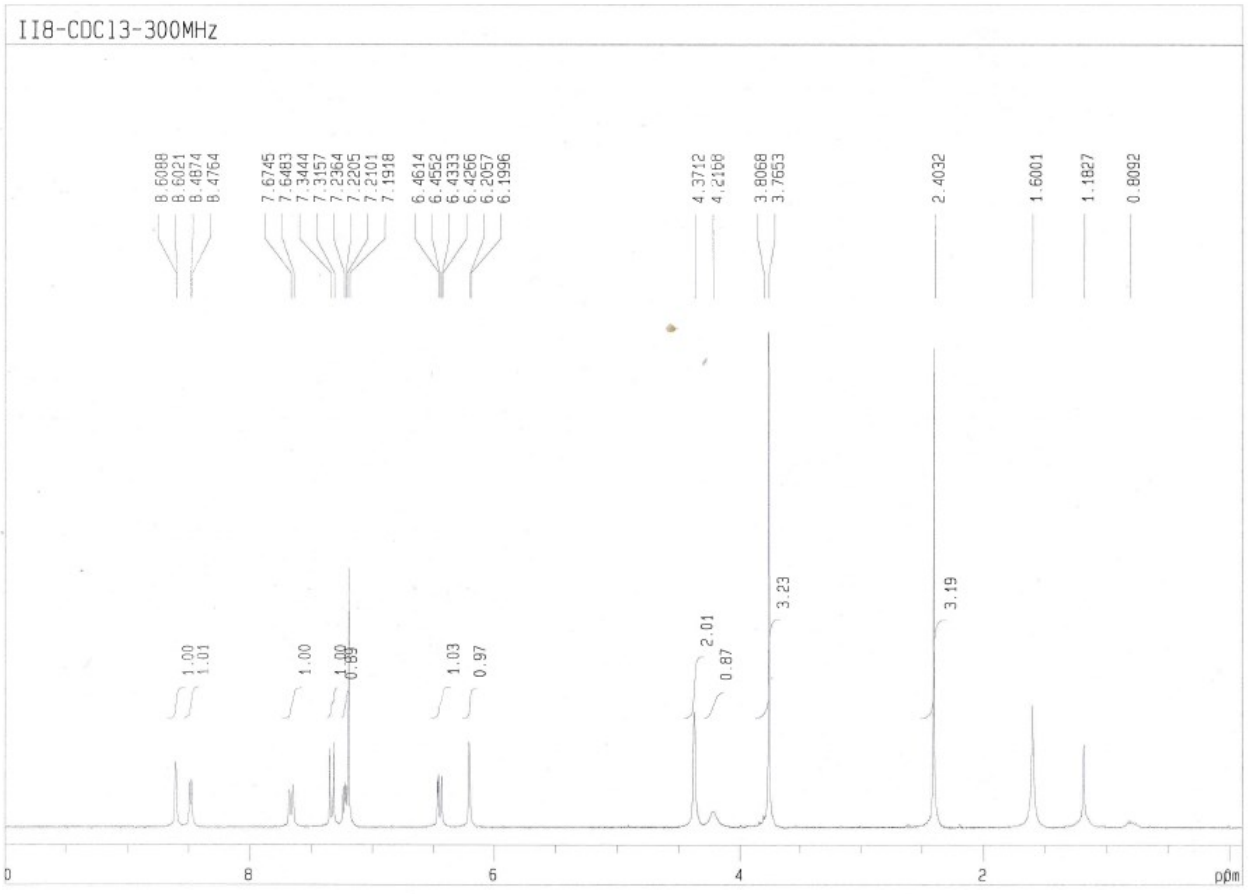
^{13}C NMR of compound 48



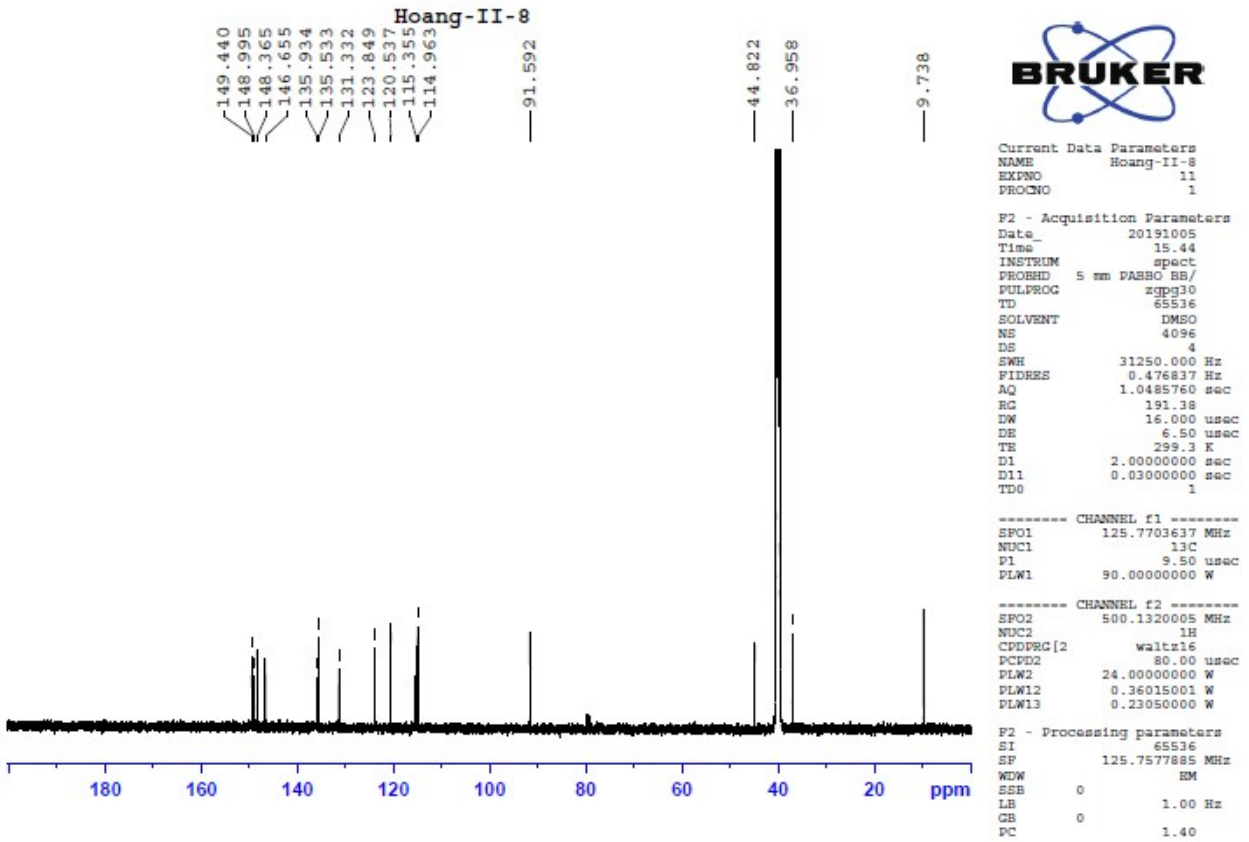
MS of compound 48



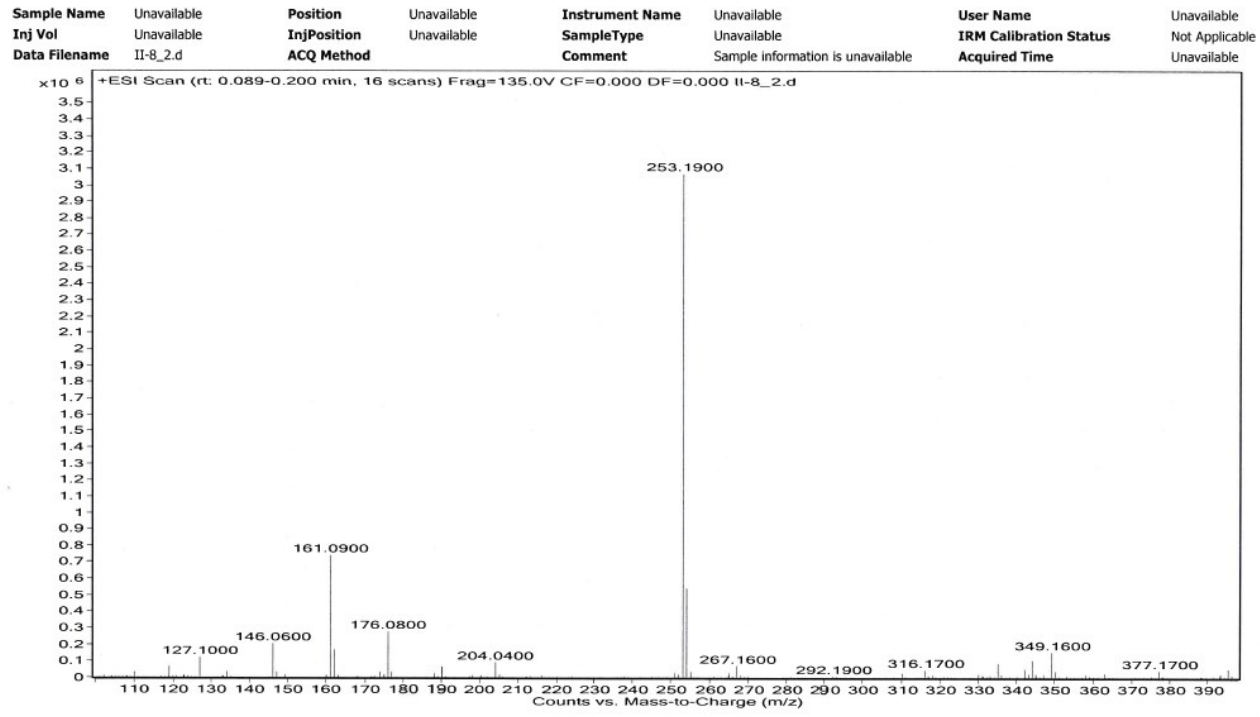
^{1}H NMR of compound 49



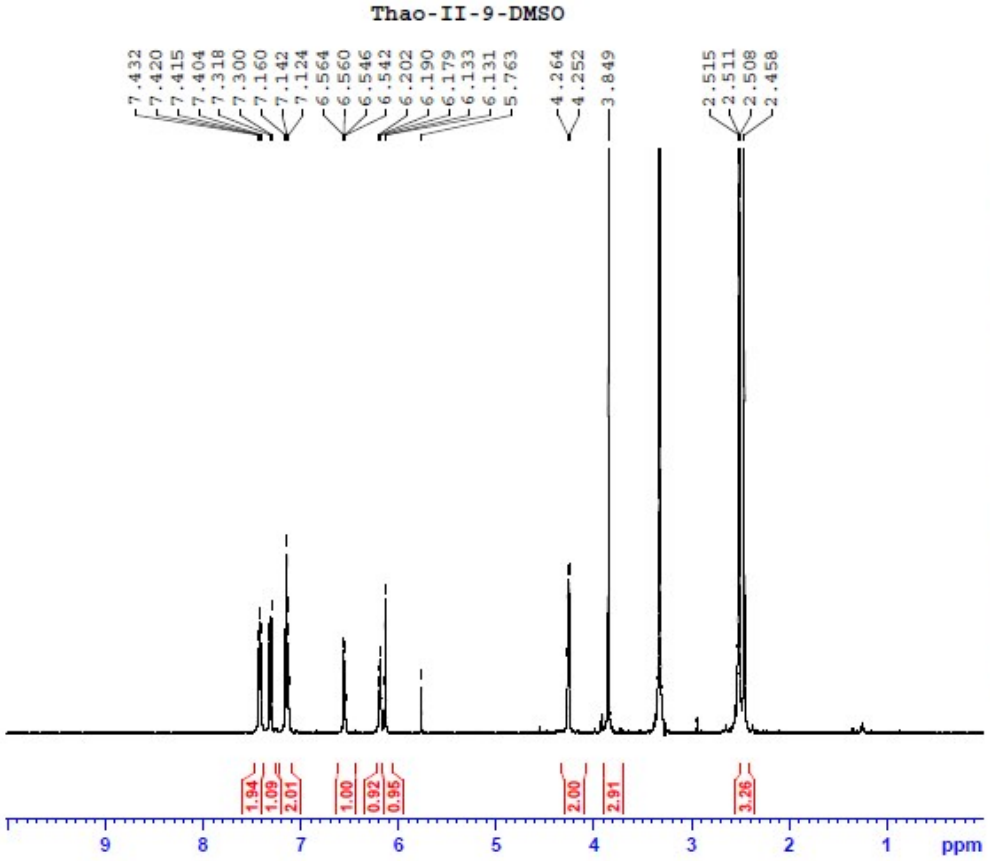
^{13}C NMR of compound 49



MS of compound 49



^{1}H NMR of compound 50



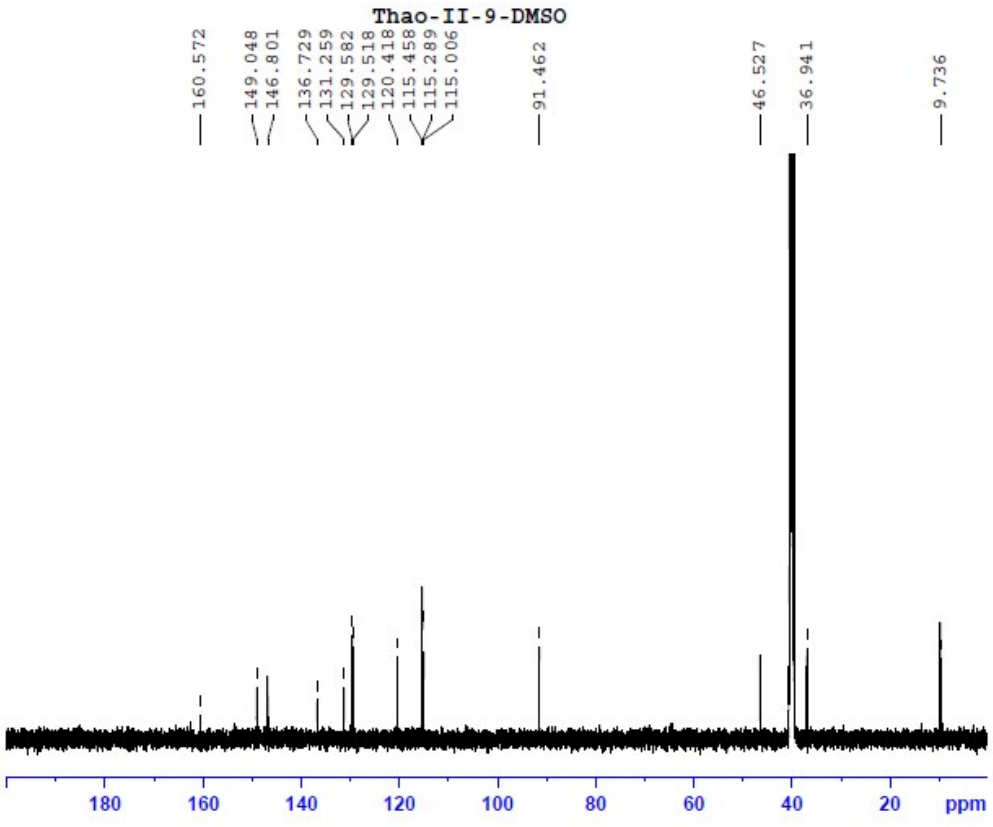

```
Current Data Parameters
NAME      Thao-II-9-DMSO
EXPNO                 20
PROCNO                 1

F2 - Acquisition Parameters
Date_           20200323
Time              11.39
INSTRUM           spect
PROBHD   5 mm PABBO BB/
PULPROG           zg30
TD               65536
SOLVENT           DMSO
NS                   16
DS                    2
SWH           10000.000 Hz
FIDRES            0.152588 Hz
AQ             3.2767999 sec
RG                191.38
DW                50.000 usec
DE                 6.50 usec
TE                300.4 K
D1             1.00000000 sec
TD0                   1

======== CHANNEL f1 ========
SFO1          500.1330885 MHz
NUC1                  1H
P1                 9.80 usec
PLW1          24.00000000 W

F2 - Processing parameters
SI                 65536
SF            500.1300000 MHz
WDW                   EM
SSB       0
LB                 0.30 Hz
GB        0
PC                 1.00
```

^{13}C NMR of compound 50




```
Current Data Parameters
NAME      Thao-II-9-DMSO
EXPNO                 21
PROCNO                 1

F2 - Acquisition Parameters
Date_           20200323
Time              13.01
INSTRUM           spect
PROBHD   5 mm PABBO BB/
PULPROG         zgpg30
TD               65536
SOLVENT           DMSO
NS                 1132
DS                    4
SWH           31250.000 Hz
FIDRES            0.476837 Hz
AQ             1.0485760 sec
RG                191.38
DW                16.000 usec
DE                 6.50 usec
TE                299.8 K
D1             2.00000000 sec
D11            0.03000000 sec
TD0                   1

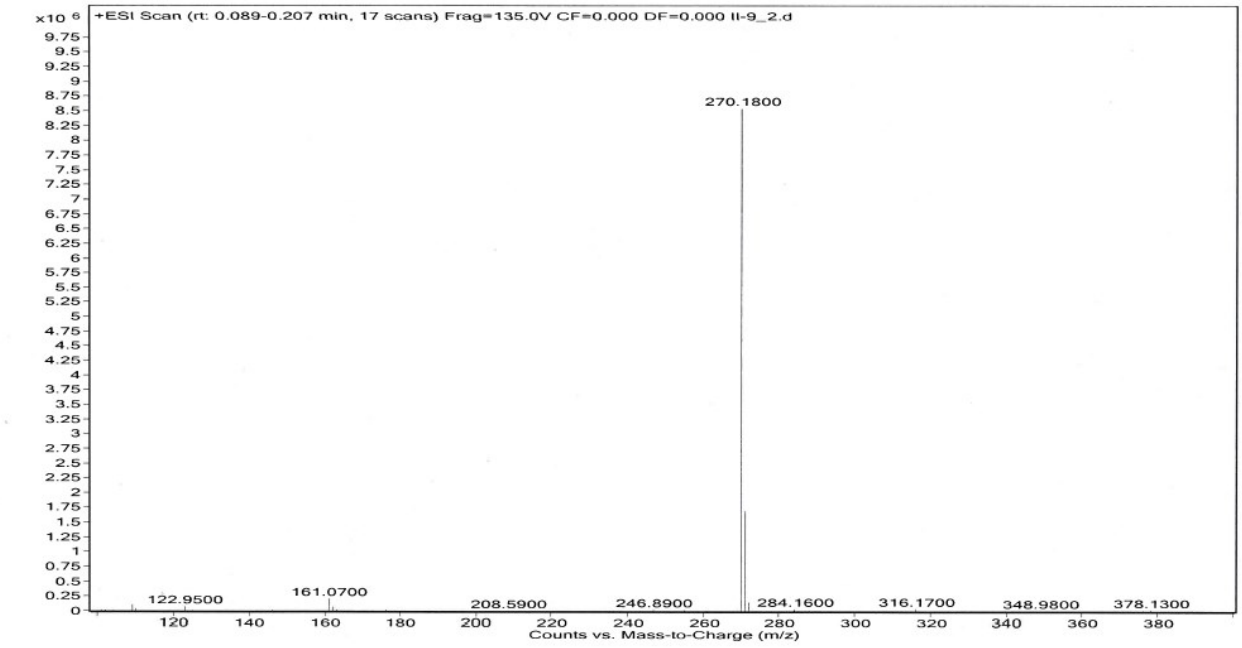
======== CHANNEL f1 ========
SFO1          125.7703637 MHz
NUC1                  13C
P1                 9.50 usec
PLW1          90.00000000 W

======== CHANNEL f2 ========
SFO2          500.1320005 MHz
NUC2                  1H
CPDPRG[2          waltz16
PCPD2              80.00 usec
PLW2          24.00000000 W
PLW12          0.36015001 W
PLW13          0.23050000 W

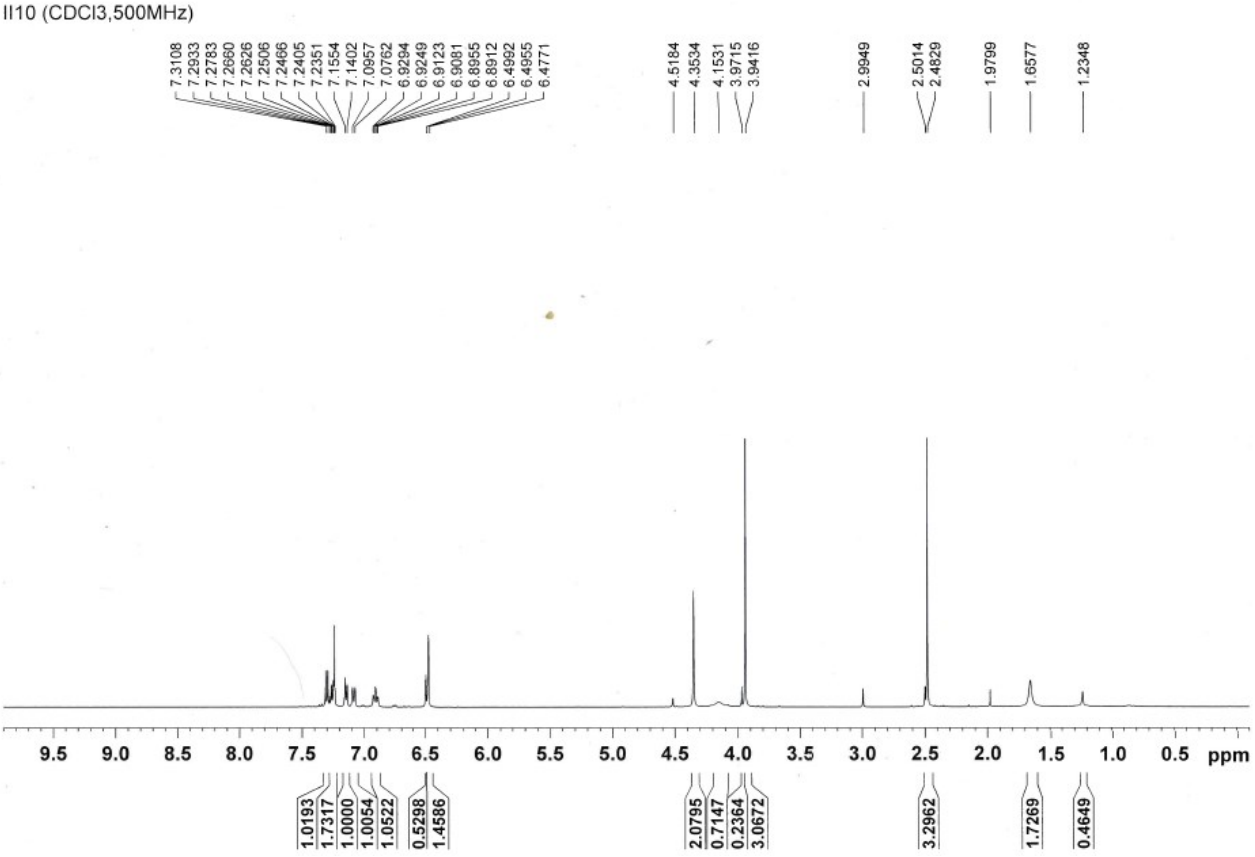
F2 - Processing parameters
SI                 65536
SF            125.7577885 MHz
WDW                   EM
SSB       0
LB                 1.00 Hz
GB        0
PC                 1.40
```

MS of compound 50

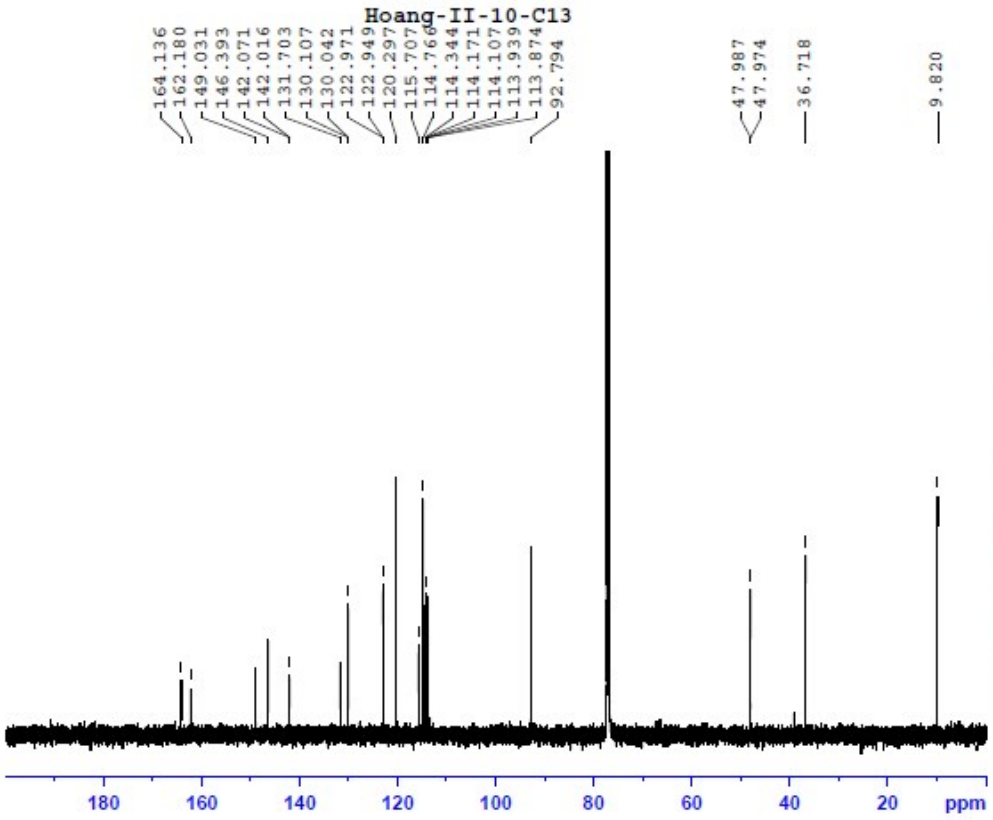
Sample Name	Unavailable	**Position**	Unavailable	**Instrument Name**	Unavailable	**User Name**	Unavailable
Inj Vol	Unavailable	**InjPosition**	Unavailable	**SampleType**	Unavailable	**IRM Calibration Status**	Not Applicable
Data Filename	II-9_2.d	**ACQ Method**		**Comment**	Sample information is unavailable	**Acquired Time**	Unavailable



^{1}H NMR of compound 51



^{13}C NMR of compound 51




```
Current Data Parameters
NAME      Hoang-II-10-C13
EXPNO                  82
PROCNO                  1

F2 - Acquisition Parameters
Date_           20191004
Time              23.21
INSTRUM           spect
PROBHD   5 mm PABBO BB/
PULPROG         zgpg30
TD               65536
SOLVENT          CDCl3
NS                1024
DS                   4
SWH          31250.000 Hz
FIDRES        0.476837 Hz
AQ            1.0485760 sec
RG               191.38
DW               16.000 usec
DE                6.50 usec
TE               299.6 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0                  1

======== CHANNEL f1 ========
SFO1        125.7703637 MHz
NUC1               13C
P1                9.50 usec
PLW1        90.00000000 W

======== CHANNEL f2 ========
SFO2        500.1320005 MHz
NUC2               1H
CPDPRG[2        waltz16
PCPD2             80.00 usec
PLW2        24.00000000 W
PLW12        0.36015001 W
PLW13        0.23050000 W

F2 - Processing parameters
SI               65536
SF          125.7577885 MHz
WDW                EM
SSB       0
LB                1.00 Hz
GB        0
PC                1.40
```

MS of compound 51

Sample Name	II10	**Position**	P1-A2	**Instrument Name**	Instrument 1	**User Name**	
Inj Vol	0.01	**InjPosition**		**SampleType**	Sample	**IRM Calibration Status**	Not Applicable
Data Filename	II10.d	**ACQ Method**	DIP-pos(30vs70_0.01u	**Comment**		**Acquired Time**	11/14/2017 2:23:55 PM