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# Supplementary Information

## Regiospecific Synthesis of New Fatty *N*-Acyl Trihalomethylated Pyrazoline Derivatives from Fatty Acid Methyl Esters (FAMEs)

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## Experimental

### General remarks

All reagents and solvents were obtained from the best known commercial sources and were used without further purification. Melting points were recorded in open capillaries and are uncorrected. $^1$H and $^{13}$C NMR spectra were collected at 300 K using a Bruker 5 mm dual probe on a Bruker DPX 400 spectrometer (Universidade Federal de Santa Maria, UFSM/Brazil) ($^1$H at 400.13 MHz, $^{13}$C at 100.62 MHz) in 0.02 mol L$^{-1}$ $CDCl_3$/TMS solutions. Chemical shifts ($\delta$) are quoted in ppm from TMS, and coupling constants ($J$) are given in Hz. Mass spectra were registered in an HP 5973 MSD connected to an HP 6890 GC and interfaced with a Pentium PC (Universidade Federal de Santa Maria, UFSM/Brazil). The CG was equipped with a split-splitless injector, an autosampler and a cross-linked HP-5 capillary column (30 m, 0.32 mm i.d.); helium was used as the carrier gas. The analyses of IR spectra were performed on an IR Prestige-21 model spectrometer (Universidade Federal do Rio Grande, UFRG/Brazil) and are reported in wavenumbers (cm$^{-1}$). All reactions were monitored by TLC. 4-Methoxy-1,1,1-trihalo-3-alken-2-ones **4**-**9** were synthesized according to the acetal acylation method according to the literature[1,2] and purified by distillation.

### General procedure

#### FAMEs **2a**-**c**[15]

A solution of fatty acid (25 mmol) in 15 mL of methanol and $H_2SO_4$ (1 mmol) was added to a flask. The mixture was stirred for 4 h at 65 °C. The reaction was washed with distilled water, the organic layer was dried with magnesium sulfate, the solvent was evaporated, and high-purity products were obtained. The reaction was monitored by silica gel TLC with 9:1 hexane:ethyl acetate as the eluent.

#### Fatty hydrazide **3a**-**c** from hydrazine hydrochloridrate

Sodium hydroxide (3 mmol) in methanol was added to a flask. The mixture was stirred at 65 °C until the solubilization of sodium hydroxide. Hydrazine monochloridrate (3 mmol) and the corresponding methyl ester fatty acid **2a**-**c** (1 mmol) were added to the reaction mixture, which was maintained under constant stirring at 65 °C for 48 h. After completion of the reaction, as observed by silica gel TLC, the mixture was evaporated, washed with distilled water and recrystallized in methanol.

#### Fatty hydrazide **3a**-**c** from hydrazine dihydrochloride

The corresponding methyl ester fatty acid **2a**-**c** (1 mmol) in methanol was added to a flask. The mixture was kept at 65 °C and stirred until solubilization of the methyl ester fatty acid. Hydrazine dihydrochloride (3 mmol) and sodium methoxide (9 mmol) were then added to the reaction, which was maintained under constant stirring at 65 °C for 24 h. After completion of the reaction, as observed by silica gel TLC, the mixture was evaporated, washed with distilled water and recrystallized in methanol.

#### N-Hexadecanehydrazide (**3a**)

$C_{16}H_{34}N_2O$; MW 270.45 g mol$^{-1}$; yield 0.21 g, 80%; mp 109-111 °C,[3] mp 109-111 °C; IR (KBr) $\nu_{max}$/cm$^{-1}$ 3315, 3178 (N-H), 2918, 2848 (C-H), 1627 (C=O). GC/MS *m/z* 270 (M$^+$, 5), 269 (6), 239 (100).

#### N-Octadecanehydrazide (**3b**)

$C_{18}H_{38}N_2O$; MW 298.51 g mol$^{-1}$; yield 0.23 g, 80%; mp 113-114 °C,[3] mp 112-114 °C; IR (KBr) $\nu_{max}$/cm$^{-1}$

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3315, 3178 (N-H), 2918, 2848 (C-H), 1627 (C=O). GC/MS *m/z* 298 ($M^+$, 5), 297 (6), 267 (100).

9-Cis-octadecenehydrazide (**3c**)

$C_{18}H_{36}N_2O$; MW 296.49 g $mol^{-1}$; yield 0.2 g, 69%; mp 110-112 °C,[3] mp 110-112 °C; IR (KBr) $\nu_{max}$/$cm^{-1}$ 3317, 3178 (N-H), 2918, 2848 (C-H), 1629 (C=O). GC/MS *m/z* 296 ($M^+$, 23), 295 (100).

Compounds **10**-**14a-c** and **15a**: general procedure

It was added the corresponding enone (1.3 mmol) and a catalytic amount of $BF_3$.MeOH (4 drops) to a flask, and maintained the mixture at 25 °C for 30 min. Next, the fatty hydrazide (1 mmol) in 5 mL of methanol was added dropwise to the mixture, which was stirred for 24 h at 65 °C. After the reaction was complete, the precipitate that formed was filtered and dried under vacuum.

1-[3-(4-Methylphenyl)-5-hydroxy-5-(trichloromethyl)-4,5-dihydropyrazol-1-yl]hexadecan-1-one (**10a**)

$C_{27}H_{41}Cl_3N_2O_2$; MW 531.99 g $mol^{-1}$; yield 0.46 g, 87%; white solid; mp 55-58 °C; IR (KBr) $\nu_{max}$/$cm^{-1}$ 3504, 3261 (O-H, C-H aromatic), 2920, 2846 (C-H aliphatic), 1660 (C=O), 817 (C-Cl); $^1$H NMR (400 MHz, $CDCl_3$) $\delta$/ppm 0.89 (s, 3H, $CH_3$), 1.25 (m, 24H, $12CH_2$), 1.74 (m, 2H, $CH_2\beta$), 2.4 (s, 3H, $CH_3$-Ar), 2.72 (m, 1H, $CH_2\alpha$), 2.91 (m, 1H, $CH_2\alpha$) 3.6 (d, 1H, *J* 18.5 Hz, H4a ), 3.91 (d, 1H, *J* 18.5 Hz, H4b), 7.24 (d, 2H, *J* 8.5 Hz, 2CH-Ar), 7.61 (d, 2H, *J* 8.5 Hz, 2CH-Ar), 7.7 (s, 1H, OH); $^{13}$C NMR (100 MHz, $CDCl_3$) $\delta$/ppm 13.7 (C20), 15.3 ($CH_3$-Ar), 22.6 (C19), 24.6 (C7), 29.1-29.7 (C8-C17), 31.9 (C18), 35.3 (C6), 46.6 (C4), 102 (C5), 103.8 ($CCl_3$), 126-141 (C-Ar), 154.6 (C3), 177.7 (C=O).

1-[3-(4-Methylphenyl)-5-hydroxy-5-(trichloromethyl)-4,5-dihydropyrazol-1-yl]octadecan-1-one (**10b**)

$C_{29}H_{45}Cl_3N_2O_2$; MW 560.04 g $mol^{-1}$; yield 0.48 g, 87%; white solid; mp 59-62 °C; IR (KBr) $\nu_{max}$/$cm^{-1}$ 3458 (O-H, C-H aromatic), 2920, 2848 (C-H aliphatic), 1658 (C=O), 1465, 1425, 1396 (C=C aromatic ring), 819 (C-Cl); $^1$H NMR (400 MHz, $CDCl_3$) $\delta$/ppm 0.89 (t, 3H, $CH_3$), 1.27-1.43 (m, 24H, $12CH_2$), 1.72 (m, 2H, $CH_2\beta$), 2.41 (s, 3H, $CH_3$-Ar), 2.72 (m, 1H, $CH_2\alpha$), 2.9 (m, 1H, $CH_2\alpha$), 3.6 (d, 1H, *J* 18.5 Hz, H4a), 3.9 (d, 1H, *J* 18.5 Hz, H4b), 7.24 (d, 2H, *J* 8 Hz, 2CH-Ar), 7.61 (d, 2H, *J* 8 Hz, 2CH-Ar), 7.7 (s, 1H, OH); $^{13}$C NMR (100 MHz, $CDCl_3$) $\delta$/ppm 14.1 (C20), 21.5 ($OCH_3$), 22.7 (C21), 24.7 (C7), 29.1-29.7 (C8-C19), 31.9 (C20), 35.6 (C6), 46.6 (C4), 102 (C5), 103.8 ($CCl_3$), 126.6-141.5 (C-Ar), 154.7 (C3), 177.7 (C=O).

(Z)-1-[3-(4-Methylphenyl)-5-hydroxy-5-(trichloromethyl)-4,5-dihydropyrazol-1-yl]octadec-9-en-1-one (**10c**)

$C_{29}H_{43}Cl_3N_2O_2$; MW 558.02 g $mol^{-1}$; yield 0.44 g, 82%; white solid; mp 61-62 °C; IR (KBr) $\nu_{max}$/$cm^{-1}$ 3510, 3446, 3329 (O-H, C-H aromatic), 2920, 2848 (C-H aliphatic), 1660 (C=O), 1467, 1425, 1394 (C=C aromatic ring), 817 (C-Cl); $^1$H NMR (400 MHz, $CDCl_3$) $\delta$/ppm 0.89 (s, 3H, $CH_3$), 1.21-1.42 (m, 24H, $12CH_2$), 1.72 (m, 2H, $CH_2\beta$), 2 (m, 2H, $CH_2$), 2.4 (s, 3H, $CH_3$-Ar), 2.72 (m, 1H, $CH_2\alpha$), 2.91 (m, 1H, $CH_2\alpha$), 3.61 (d, 1H, *J* 18.5 Hz, H4a), 3.91 (d, 1H, *J* 18.5 Hz, H4b), 5.35 (s, 2H, 2H-C=C), 7.24 (d, 2H, *J* 8.7 Hz, H-Ar), 7.61 (d, 2H, *J* 8.7 Hz, H-Ar); $^{13}$C NMR (100 MHz, $CDCl_3$) $\delta$/ppm 13.7 (C20), 21.4 ($CH_3$-Ar), 22.6 (C19), 24.6 (C7), 29.1-29.71 (C8-C17), 31.9 (C18), 35.6 (C6), 46.6 (C4), 102 (C5), 103.8 ($CCl_3$), 126.6-141 (C-Ar, C=C), 154.6 (C3), 177.7 (C=O).

1-[3-(4-Bromophenyl)-5-hydroxy-5-(trichloromethyl)-4,5-dihydropyrazol-1-yl]hexadecan-1-one (**11a**)

$C_{26}H_{38}BrCl_3N_2O_2$; MW 596.86 g $mol^{-1}$; yield 0.51 g, 85%; white solid; mp 68-69 °C; IR (KBr) $\nu_{max}$/$cm^{-1}$ 3545, 3406, 3234 (O-H, C-H aromatic), 2918, 2848 (C-H aliphatic), 1664 (C=O), 1591, 1417, 1402, 1386 (C=C aromatic ring), 823 (C-Cl); $^1$H NMR (400 MHz, $CDCl_3$) $\delta$/ppm 0.87 (s, 3H, $CH_3$), 1.26-1.41 (m, 24H, $12CH_2$), 1.71 (m, 2H, $CH_2\beta$), 2.7 (m, 1H, $CH_2\alpha$), 2.88 (m, 1H, $CH_2\alpha$), 3.58 (d, 1H, *J* 18.6 Hz, H4a), 3.87 (d, 1H, *J* 18.6 Hz, H4b), 7.59 (m, 4H, 4CH-Ar); $^{13}$C NMR (100 MHz, $CDCl_3$) $\delta$/ppm 14.1 (C20), 22.7 (C19), 24.6 (C7), 29.1-29.7 (C8-C17), 31.9 (C18), 35.6 (C6), 46.4 (C4), 102.2 (C5), 103.7 ($CCl_3$), 125.5-132.2 (C-Ar), 153.5 (C3), 177.7 (C=O).

1-[3-(4-Bromophenyl)-5-hydroxy-5-(trichloromethyl)-4,5-dihydropyrazol-1-yl]octadecan-1-one (**11b**)

$C_{28}H_{42}BrCl_3N_2O_2$; MW 624.91 g $mol^{-1}$; yield 0.52 g, 85%; white solid; mp 74-77 °C; IR (KBr) $\nu_{max}$/$cm^{-1}$ 3549, 3471, 3412 (O-H, C-H aromatic), 2918, 2850 (C-H aliphatic), 1699 (C=O), 1616, 1413 (C=C aromatic), 821 (C-Cl); $^1$H NMR (400 MHz, $CDCl_3$) $\delta$/ppm 0.87 (s, 3H, $CH_3$), 1.25-1.41 (m, 28H, $14CH_2$), 1.7 (m, 2H, $CH_2\beta$), 2.69 (m, 1H, $CH_2\alpha$), 2.89 (m, 1H, $CH_2\alpha$), 3.6 (d, 1H, *J* 18.6 Hz, H4a), 3.9 (d, 1H, *J* 18.6 Hz, H4b), 7.57 (m, 4H, 4CH-Ar);$^{13}$C NMR (100 MHz, $CDCl_3$) $\delta$/ppm 14.1 (C22), 22.6 (C21), 24.6 (C7), 29.1-29.7 (C8-C19), 31.9 (C20), 35.6 (C6), 46.4 (C4), 102.2 (C5), 103.6 ($CCl_3$), 125.5-132-2 (C-Ar), 153.5 (C3), 177.7 (C=O).

(Z)-1-[3-(4-Bromophenyl)-5-hydroxy-5-(trichloromethyl)-4,5-dihydropyrazol-1-yl]octadec-9-en-1-one (**11c**)

$C_{28}H_{40}BrCl_3N_2O_2$; MW 622.89 g $mol^{-1}$; yield 0.49 g, 80%; white solid; mp 72-73 °C; IR (KBr) $\nu_{max}$/$cm^{-1}$ 3549,

3475, 3414, 3294 (O-H, C-H aromatic), 2918, 2846 (C-H aliphatic), 1664 (C=O), 1593, 1421, 1398 (C=C aromatic ring), 823 (C-Cl); $^1$H NMR (400 MHz, $CDCl_3$) $\delta$/ppm 0.89 (s, 3H, $CH_3$), 1.26-1.42 (m, 24H, $12CH_2$), 1.72 (m, 2H, $CH_2\beta$), 2 (m, 2H, $CH_2$), 2.69 (m, 1H, $CH_2\alpha$), 2.89 (m, 1H, $CH_2\alpha$), 3.6 (d, 1H, *J* 18.6 Hz, H4a), 3.89 (d, 1H, *J* 18.6 Hz, H4b), 5.34 (s, 2H, 2 H-C=C), 7.57 (m, 4H, H-Ar); $^{13}$C NMR (100 MHz, $CDCl_3$) $\delta$/ppm 13.7 (C20), 22.3 (C19), 24.6 (C7), 29.1-29.8 (C8-C17), 31.9 (C18), 35.6 (C6), 46.4 (C4), 102.2 (C5), 103.7 ($CCl_3$), 125.6-132.2 (C-Ar, C=C), 153.5 (C3), 177.7 (C=O).

1-[3-(4-Chlorophenyl)-5-hydroxy-5-(trichloromethyl)-4,5-dihydro-1H-pyrazole]hexadecan-1-one (**12a**)

$C_{26}H_{38}Cl_4N_2O_2$; MW 552.4 g mol$^{-1}$; yield 0.48 g, 87%; white solid; mp 57-60 °C; IR (KBr) $\nu_{max}$/cm$^{-1}$ 3512, 3446 (C-H aromatic), 3311 (O-H), 2918, 2846 (C-H aliphatic), 1664 (C=O), 1597, 1423, 1404, 1388 (C=C aromatic ring), 823 (C-Cl); $^1$H NMR (400 MHz, $CDCl_3$) $\delta$/ppm 0.8 (s, 3H, $CH_3$), 1.18-1.33 (m, 24H, $12CH_2$), 1.65 (m, 2H, $CH_2\beta$), 2.62 (m, 1H, $CH_2\alpha$), 2.83 (m, 1H, $CH_2\alpha$), 3.53 (d, 1H, *J* 18.6 Hz, H4a), 3.82 (d, 1H, *J* 18.6 Hz, H4b), 7.34 (d, 2H, *J* 8.5 Hz, 2CH-Ar), 7.56 (d, 2H, *J* 8.5 Hz, 2CH-Ar), 7.59 (s, 1H, OH); $^{13}$C NMR (100 MHz, $CDCl_3$) $\delta$/ppm 14.1 (C20), 22.6 (C19), 24.6 (C7), 29.1-29.6 (C8-C17), 31.9 (C18), 35.6 (C6), 46.4 (C4), 102.1 (C5), 103.6 ($CCl_3$), 127.8-137.2 (C-Ar), 153.4 (C3), 177.7 (C=O).

1-[3-(4-Chlorophenyl)-5-hydroxy-5-(trichloromethyl)-4,5-dihydropyrazol-1-yl]octadecan-1-one (**12b**)

$C_{28}H_{42}Cl_4N_2O_2$; MW 580.46 g mol$^{-1}$; yield 0.49 g, 85%; white solid; mp 66-68 °C; IR (KBr) $\nu_{max}$/cm$^{-1}$ 3292, 3211 (O-H, C-H aromatic), 2918, 2848 (C-H aliphatic), 1664 (C=O), 1597, 1469, 1404, 1388 (C=C aromatic ring), 823 (C-Cl); $^1$H NMR (400 MHz, $CDCl_3$) $\delta$/ppm 0.92 (s, 3H, $CH_3$), 1.14-1.43 (m, 28H, $14CH_2$), 1.74 (m, 2H, $CH_2\beta$), 2.72 (m, 1H, $CH_2\alpha$), 2.92 (m, 1H, $CH_2\alpha$), 3.62 (d, 1H, *J* 18.6 Hz, H4a), 3.92 (d, 1H, *J* 18.6 Hz, H4b), 7.43 (d, 2H, *J* 8.8 Hz, 2CH-Ar), 7.63 (s, 1H, OH), 7.67 (d, 2H, *J* 8.8 Hz, 2CH-Ar); $^{13}$C NMR (100 MHz, $CDCl_3$) $\delta$/ppm 14 (C22), 22.6 (C21), 24.6 (C7), 29-29.6 (C8-C19), 31.9 (C20), 35.6 (C6), 46.4 (C4), 102.1 (C5), 103.6 ($CCl_3$), 127.8-137.2 (C-Ar), 153.4 (C3), 177.7 (C=O).

(Z)-1-[3-(4-Chlorophenyl)-5-hydroxy-5-(trichloromethyl)-4,5-dihydropyrazol-1-yl]octadec-9-en-1-one (**12c**)

$C_{28}H_{40}Cl_4N_2O_2$; MW 578.44 g mol$^{-1}$; yield 0.46 g, 80%; white solid; mp 64-65 °C; IR (KBr) $\nu_{max}$/cm$^{-1}$ 3323, 3205 (O-H, C-H aromatic), 2916, 2848 (C-H aliphatic), 1685 (C=O), 1597, 1419 (C=C aromatic ring), 819 (C-Cl); $^1$H NMR (400 MHz, $CDCl_3$) $\delta$ 0.8 (t, 3H, $CH_3$), 1.18-1.33 (m, 24H, $12CH_2$), 1.63 (m, 2H, $CH_2\beta$), 1.9 (m, 2H, $CH_2$), 2.63 (m, 1H, $CH_2\alpha$), 2.81 (m, 1H, $CH_2\alpha$), 3.52 (d, 1H, *J* 18.5 Hz, H4a), 3.82 (d, 1H, *J* 18.5 Hz, H4b), 5.27 (s, 2H, 2 H-C=C), 7.33 (d, 2H, *J* 8.6 Hz, H-Ar), 7.57 (d, 2H, *J* 8.6 Hz, H-Ar); $^{13}$C NMR (100 MHz, $CDCl_3$) $\delta$/ppm 14 (C20), 22.6 (C19), 24.6 (C7), 25.3-29.7 (C8-C17), 31.9 (C18), 35.6 (C6), 46.4 (C4), 102.1 (C5), 103.6 ($CCl_3$), 126.8-137.2 (C-Ar, C=C), 153.4 (C3), 177.7 (C=O).

1-[3-(4-Fluorophenyl)-5-hydroxy-5-(trichloromethyl)-4,5-dihydropyrazol-1-yl]hexadecan-1-one (**13a**)

$C_{26}H_{38}Cl_3FN_2O_2$; MW 535.95 g mol$^{-1}$; yield 0.47 g, 88%; white solid; mp 64-66 °C; IR (KBr) $\nu_{max}$/cm$^{-1}$ 3473, 3414, 3238 (O-H, C-H aromatic), 2920, 2846 (C-H aliphatic), 1664 (C=O), 1602, 1423, 1423 (C=C aromatic ring), 812 (C-Cl); $^1$H NMR (400 MHz, $CDCl_3$) $\delta$/ppm 0.89 (s, 3H, $CH_3$), 1.26-1.42 (s, 24H, $12CH_2$), 1.71 (m, 2H, $CH_2\beta$), 2.69 (m, 1H, $CH_2\alpha$), 2.9 (m, 1H, $CH_2\alpha$), 3.6 (d, 1H, *J* 18.5 Hz, H4a), 3.9 (d, 1H, *J* 18.5 Hz, H4b), 7.12 (m, 2H, *J* 8.8 Hz, 2CH-Ar), 7.65 (s, 1H, OH), 7.71 (m, 2H, *J* 8.8 Hz, 2CH-Ar); $^{13}$C NMR (100 MHz, $CDCl_3$) $\delta$/ppm 14 (C20), 22.7 (C19), 24.7 (C7), 29.1-29.7 (C8-C17), 31.9 (C18), 35.7 (C6), 46.6 (C4), 102.2 (C5), 103.7 ($CCl_3$), 116-128.8 (C-Ar), 153.5 (C3), 163.2-165.7 (C-Ar), 177.7 (C=O).

1-[3-(4-Fluorophenyl)-5-hydroxy-5-(trichloromethyl)-4,5-dihydropyrazol-1-yl]octadecan-1-one (**13b**)

$C_{28}H_{42}Cl_3FN_2O_2$; MW 564 g mol$^{-1}$; yield 0.47 g, 85%; white solid; mp 66-68 °C; IR (KBr) $\nu_{max}$/cm$^{-1}$ 3469, 3414 (O-H, C-H aromatic), 2920, 2848 (C-H aliphatic), 1664 (C=), 1597, 1469, 1404, 1388 (C=C aromatic ring), 810 (C-Cl); $^1$H NMR (400 MHz, $CDCl_3$) $\delta$/ppm 0.89 (s, 3H, $CH_3$), 1.26-1.43 (s, 28H, $14CH_2$), 1.72 (m, 2H, $CH_2\beta$), 2.7 (m, 1H, $CH_2\alpha$), 2.91 (m, 1H, $CH_2\alpha$), 3.6 (d, 1H, *J* 18.5 Hz, H4a), 3.9 (d, 1H, *J* 18.5 Hz, H4b), 7.13 (m, 2H, *J* 8.8 Hz, 2CH-Ar), 7.65 (s, 1H, OH), 7.72 (m, 2H, *J* 8.8 Hz, 2CH-Ar); $^{13}$C NMR (100 MHz, $CDCl_3$) $\delta$/ppm 14.1 (C22), 22.7 (C21), 24.7 (C7), 29.1-29.7 (C8-C19), 31.9 (C20), 35.6 (C6), 46.6 (C4), 102.2 (C5), 103.7 ($CCl_3$), 116-128.8 (C-Ar), 153.5 (C3), 163.2-165.7 (C-Ar), 177.7 (C=O).

(Z)-1-[3-(4-Fluorophenyl)-5-hydroxy-5-(trichloromethyl)-4,5-dihydropyrazol-1-yl]octadec-9-en-1-one (**13c**)

$C_{29}H_{44}Cl_3FN_2O_2$; MW 561.99 g mol$^{-1}$; yield 0.44 g, 80%; white solid; mp 68-69 °C; IR (KBr) $\nu_{max}$/cm$^{-1}$ 3549, 3468, 3410, 3232 (O-H, C-H aromatic), 2920, 2848 (C-H aliphatic), 1664 (C=O), 1600, 1423, 1394 (C=C aromatic ring), 815 (C-Cl); $^1$H NMR (400 MHz, $CDCl_3$) $\delta$/ppm 0.89 (t, 3H, $CH_3$), 1.25-1.42 (m, 24H, $12CH_2$), 1.74 (m, 2H, $CH_2\beta$), 2 (m, 2H, $CH_2$), 2.7 (m, 1H, $CH_2\alpha$), 2.9 (m, 1H, $CH_2\alpha$), 3.61 (d, 1H, *J* 18.5 Hz, H4a), 3.9 (d, 1H,

*J* 18.5 Hz, H4b), 5.3 (s, 2H), 7.1 (t, 2H, *J* 8.8 Hz), 7.7 (m, 2H, *J* 8.8 Hz); $^{13}$C NMR (100 MHz, $CDCl_3$) $\delta$/ppm 14.1 (C20), 22.7 (C19), 24.6 (C7), 29.1-29.7 (C8-C17), 31.9 (C18), 35.6 (C6), 46.5 (C4), 102.1 (C5), 103.6 ($CCl_3$), 116-128.8 (C-Ar, C=C), 153.5 (C3), 163.1-165.6 (C-F), 177.7 (C=O).

1-[5-Hydroxy-3-(4-methoxyphenyl)-5-(trifluoromethyl)-4,5-dihydropyrazol-1-yl]hexadecan-1-one (**14a**)

$C_{27}H_{41}F_3N_2O_3$; MW 498.62 g mol$^{-1}$; yield 0.42 g, 85%; white solid; mp 65-66 °C; IR (KBr) $\nu_{max}$/cm$^{-1}$ 3475, 3414, 3255 (O-H, C-H aromatic), 2918, 2846 (C-H aliphatic), 1654 (C=O), 1608, 1516 (C=C aromatic ring), 1259, 1184 (C-F), 1039 (C-O-C); $^1$H NMR (400 MHz, $CDCl_3$) $\delta$/ppm 0.88 (s, 3H, $CH_3$), 1.26-1.39 (m, 24H, 12$CH_2$), 1.72 (m, 2H, $CH_2\beta$), 2.72 (m, 1H, $CH_2\alpha$), 2.8 (m, 1H, $CH_2\alpha$), 3.47 (d, 1H, *J* 18.4 Hz, H4a), 3.63 (d, 1H, *J* 18.4 Hz, H4b), 3.85 (s, 3H, $OCH_3$), 6.94 (d, 2H, *J* 8.8 Hz, 2CH-Ar), 7.64 (d, 2H, *J* 8.8 Hz, 2CH-Ar); $^{13}$C NMR (100 MHz, $CDCl_3$) $\delta$/ppm 14 (C20), 22.6 (C19), 24.4 (C7), 29.1-29.7 (C8-C17), 31.9 (C18), 34.8 (C6), 43.2 ($OCH_3$), 55.3 (C4), 91.3-92.3 (q, $^2J_{CF}$ 37 Hz, C5), 114.3 (C-Ar), 119.1-127.6 (q, $^1J_{CF}$ 287 Hz,$CF_3$), 121-128.2 (C-Ar), 152.4 (C3), 161.9 (C-$OCH_3$), 175.9 (C=O).

1-[5-Hydroxy-3-(4-methoxyphenyl)-5-(trifluoromethyl)-4,5-dihydropyrazol-1-yl]octadecan-1-one (**14b**)

$C_{29}H_{45}F_3N_2O_3$; MW 526.67 g mol$^{-1}$; yield 0.44 g, 85%; white solid; mp 69-72 °C; IR (KBr) $\nu_{max}$/cm$^{-1}$ 3475, 3298, 3213 (O-H, C-H aromatic), 2918, 2846 (C-H aliphatic), 1654 (C=O), 1608, 1517 (C=C aromatic ring), 1255, 1037 (C-O-C), 1037 (C-O-C); $^1$H NMR (400 MHz, $CDCl_3$) $\delta$/ppm 0.88 (s, 3H, $CH_3$), 1.27-1.4 (m, 28H, 14$CH_2$), 1.71 (m, 2H, $CH_2\beta$), 2.73 (m, 1H, $CH_2\alpha$), 2.81 (m, 1H, $CH_2\alpha$), 3.46 (d, 1H, *J* 18.4 Hz, H4a), 3.62 (d, 1H, *J* 18.4 Hz, H4b), 3.85 (s, 3H, $OCH_3$), 6.94 (d, 2H, *J* 8.8 Hz, 2CH-Ar), 7.64 (d, 2H, *J* 8.8 Hz, 2CH-Ar); $^{13}$C NMR (100 MHz, $CDCl_3$) $\delta$/ppm 14 (C22), 22.6 (C21), 24.4 (C7), 29.1-29.62 (C8-C19), 31.9 (C20), 34.8 (C6), 43.3 ($OCH_3$), 55.3 (C4), 91.3-92.3 (q, $^2J_{CF}$ 37 Hz, C5), 114-114.3 (C-Ar), 119.1-127.6 (q, $^1J_{CF}$ 287 Hz, $CF_3$), 128.2-130.5 (C-Ar), 152.4 (C3), 161.9 (C-$OCH_3$), 175.9 (C=O).

(Z)-1-[3-(4-Methoxyphenyl)-5-hydroxy-5-(trifluoromethyl)-4,5-dihydropyrazol-1-yl]octadec-9-en-1-one (**14c**)

$C_{29}H_{43}Cl_3N_2O_3$; MW 524.66 g mol$^{-1}$; yield 0.42 g, 81%; white solid; mp 69-71°C; IR (KBr) $\nu_{max}$/cm$^{-1}$ 3462, 3296, 3205 (O-H, C-H aromatic), 2918, 2846 (C-H aliphatic), 1656 (C=O), 1608, 1517 (C=C aromatic ring), 1259, 1184 (C-F), 1039 (C-O-C); $^1$H NMR (400 MHz, $CDCl_3$) $\delta$/ppm 0.87 (s, 3H, $CH_3$), 1.26-1.41 (m, 24H, 12$CH_2$), 1.72 (m, 2H, $CH_2\beta$), 2 (m, 2H, $CH_2$), 2.73 (m, 1H, $CH_2\alpha$), 2.81 (m, 1H, $CH_2\alpha$), 3.46 (d, 1H, *J* 18.4 Hz, H4a), 3.62 (d, 1H, *J* 18.4 Hz, H4b), 3.85 (s, 3H, $OCH_3$), 5.34 (s, 2H, 2 H-C=C), 6.9 (d, 2H, *J* 8.1 Hz, H-Ar), 7.63 (d, 2H, *J* 8.1 Hz, H-Ar); $^{13}$C NMR (100 MHz, $CDCl_3$) $\delta$/ppm 13.9 (C20), 22.5 (C19), 24.5 (C7), 29.1-29.8 (C8-C17), 31.9 (C18), 34.9 (C6), 43.3 ($OCH_3$), 55.4 (C4), 91.8 (q, $^2J_{CF}$ 37 Hz, C5), 114.3-161.8 (C-Ar, C=C), 122 (q, $^1J_{CF}$ 287 Hz, $CF_3$), 152.4 (C3), 175.9 (C=O).

1-[5-Hydroxy-3-methyl-5-(trichloromethyl)-4,5-dihydropyrazol-1-yl]hexadecan-1-one (**15a**)

$C_{21}H_{37}Cl_3N_2O_2$; MW 455.89 g mol$^{-1}$; yield 0.36 g, 90%; white solid; mp 54-55 °C; IR (KBr) $\nu_{max}$/cm$^{-1}$ 3180 (O-H, C-H aromatic), 2918, 2840 (C-H aliphatic), 1654 (C=O), 821 (C-Cl); $^1$H NMR (400 MHz, $CDCl_3$) $\delta$/ppm 0.91 (s, 3H, $CH_3$), 1.3-1.37 (m, 24H, 12$CH_2$), 1.66 (m, 2H, $CH_2\beta$), 2.05 (s, 3H, $CH_3$), 2.56 (m, 1H, $CH_2\alpha$), 2.76 (m, 1H, $CH_2\alpha$), 3.22 (d, 1H, *J* 19 Hz, H4a), 3.44 (d, 1H, *J* 19 Hz, H4b), 7.7 (s, 1H, OH); $^{13}$C NMR (100 MHz, $CDCl_3$) $\delta$/ppm 14 (C20), 15.6 ($CH_3$), 22.6 (C19), 24.5 (C7), 29.1-29.6 (C8-C17), 31.9 (C18), 35.5 (C6), 50 (C4), 101.7 (C5), 103.8 ($CCl_3$), 156.1 (C3), 177.4 (C=O).

## References

1. Nenajdenko, V. G.; Balenkova, E. S.; *ARKIVOC* **2011**, *i*, 246, and references cited herein.
2. Martins, M. A. P.; Cunico, W.; Pereira, C. M. P.; Flores, A. F. C.; Bonacorso, H. G.; Zanatta, N.; *Curr. Org. Synth.* **2004**, *1*, 391, and references cited herein.
3. Peng, Y.; Song, G.; *Green Chem.* **2001**, *3*, 302.

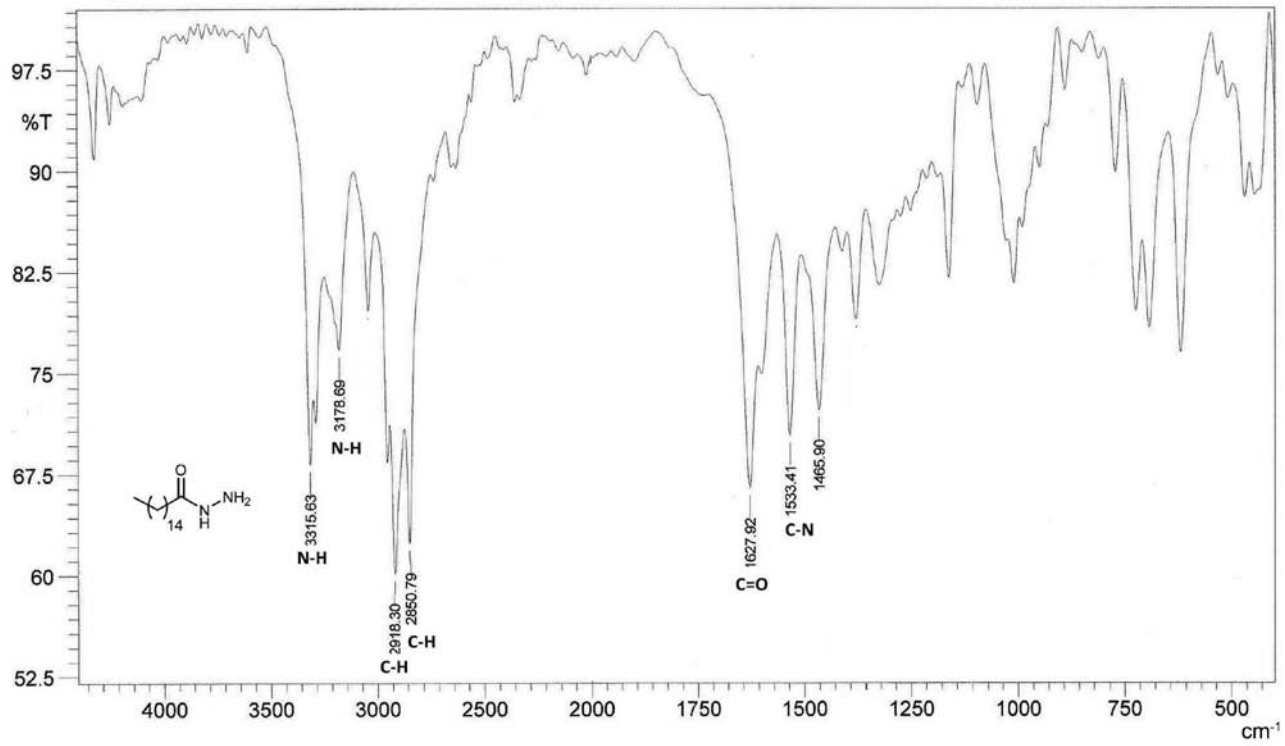


**Figure S1.** Infrared spectrum of compound **3a** (KBr).

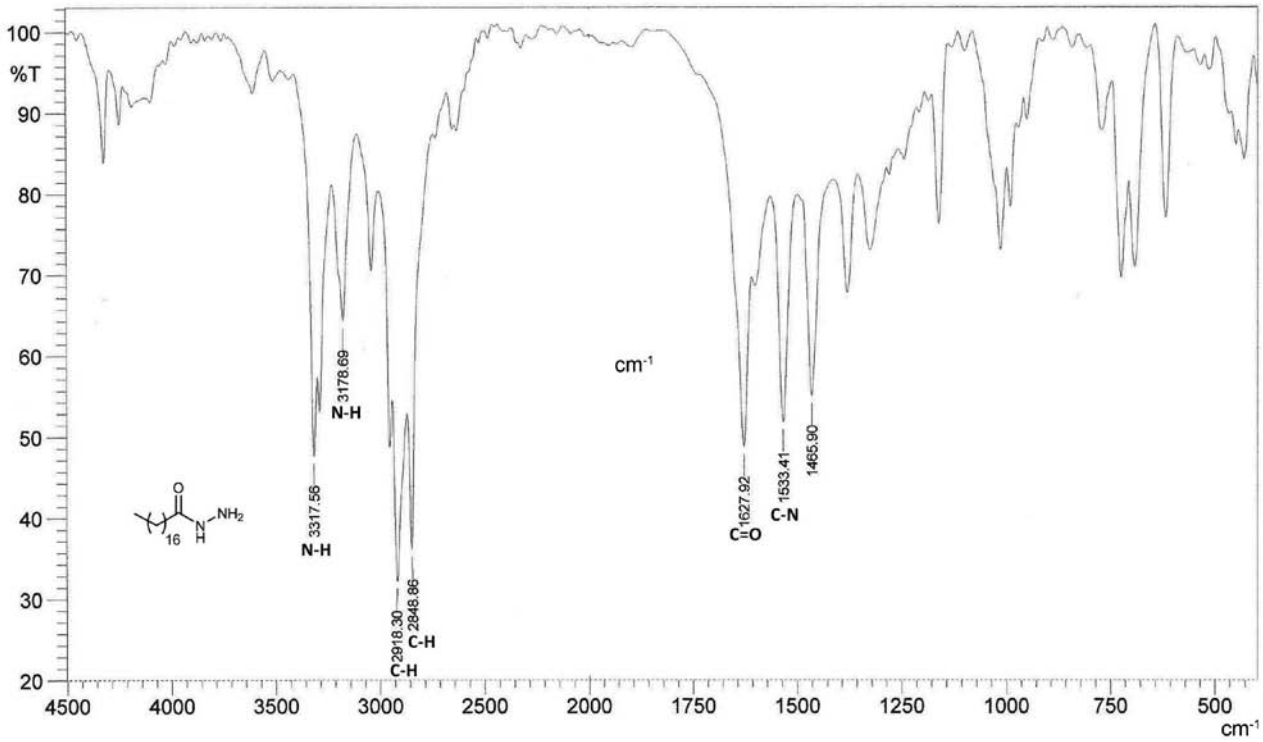


**Figure S2.** Infrared spectrum of compound **3b** (KBr).

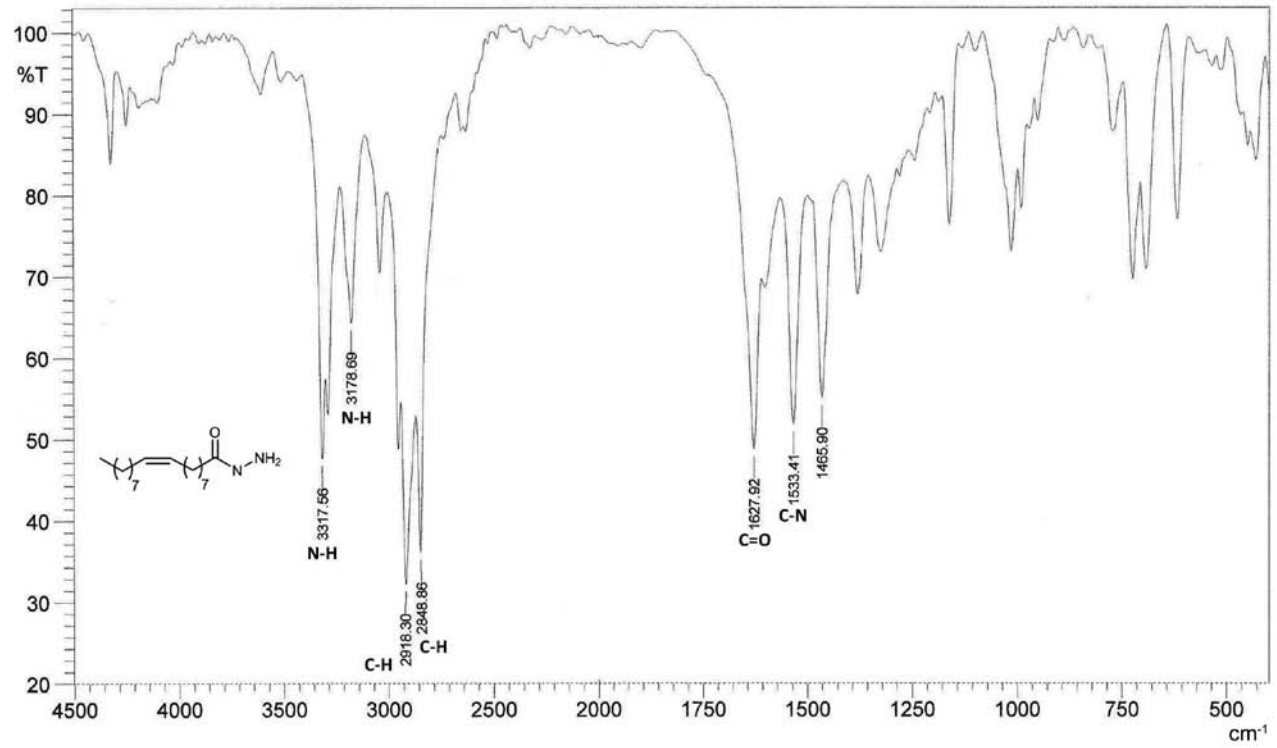


**Figure S3.** Infrared spectrum of compound **3c** (KBr).

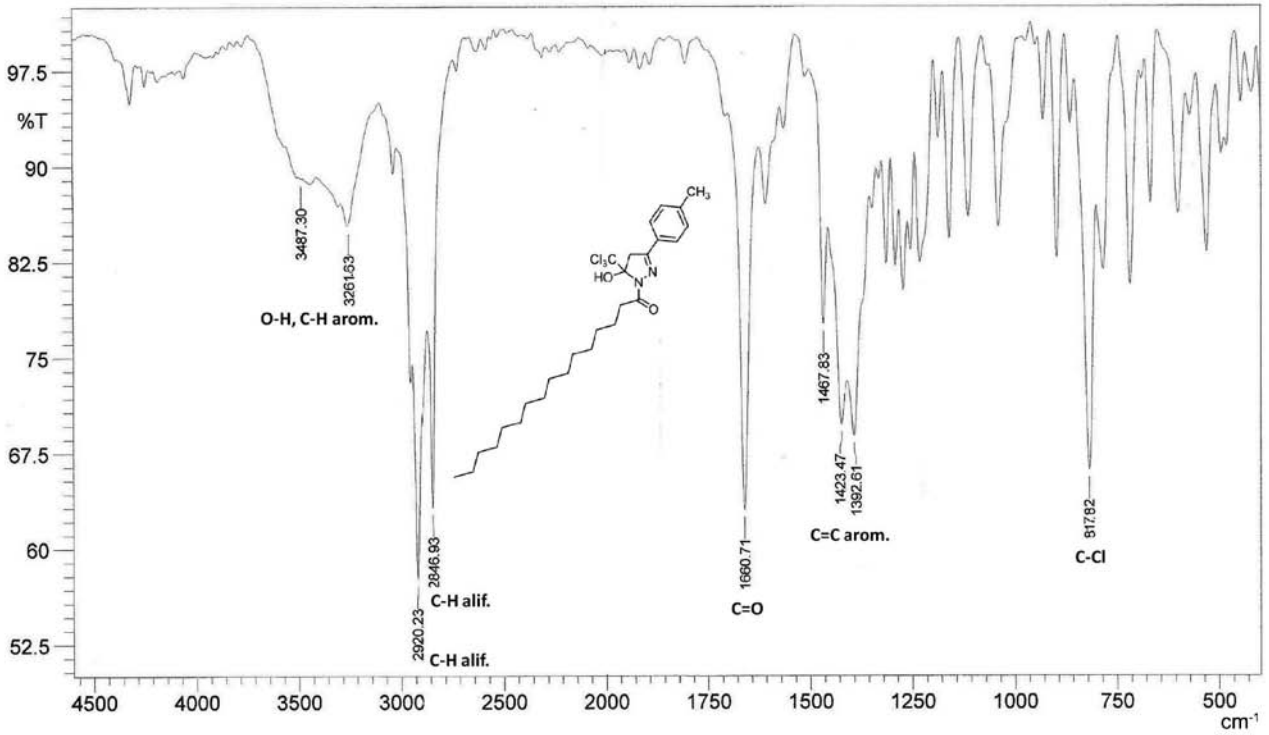


**Figure S4.** Infrared spectrum of compound **10a** (KBr).

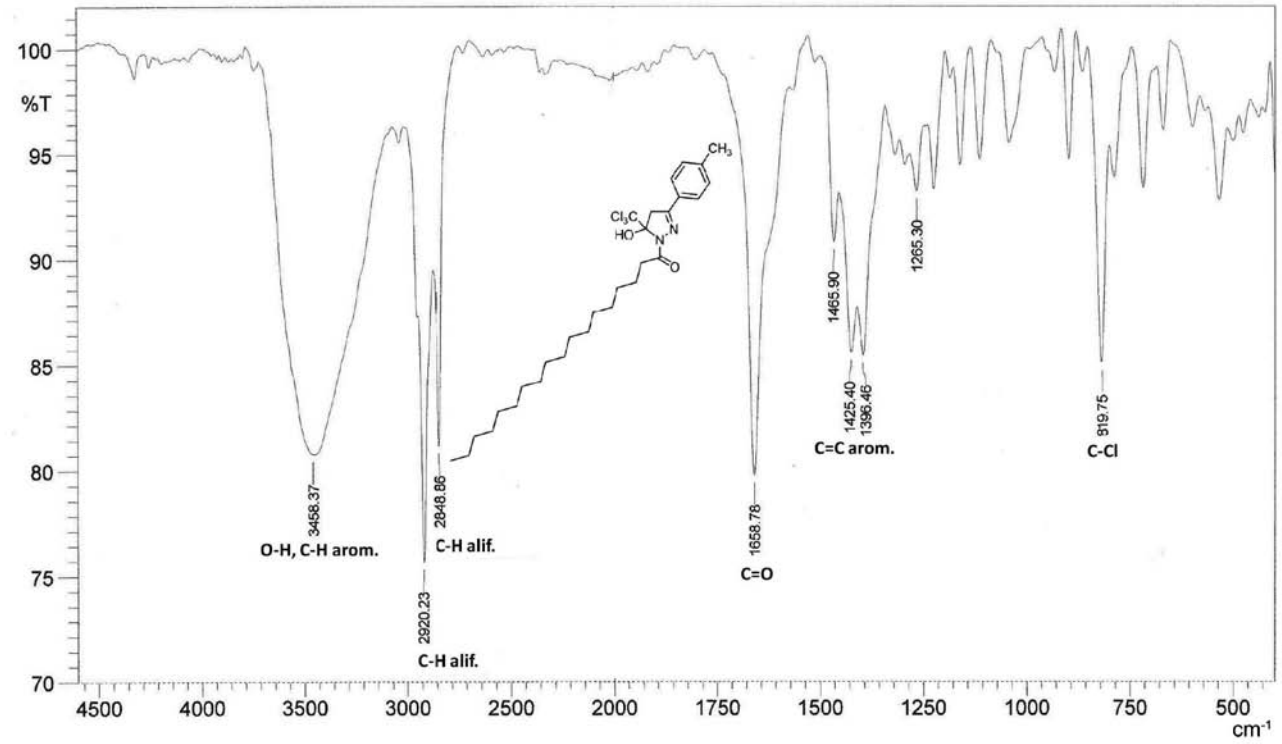


**Figure S5.** Infrared spectrum of compound **10b** (KBr).

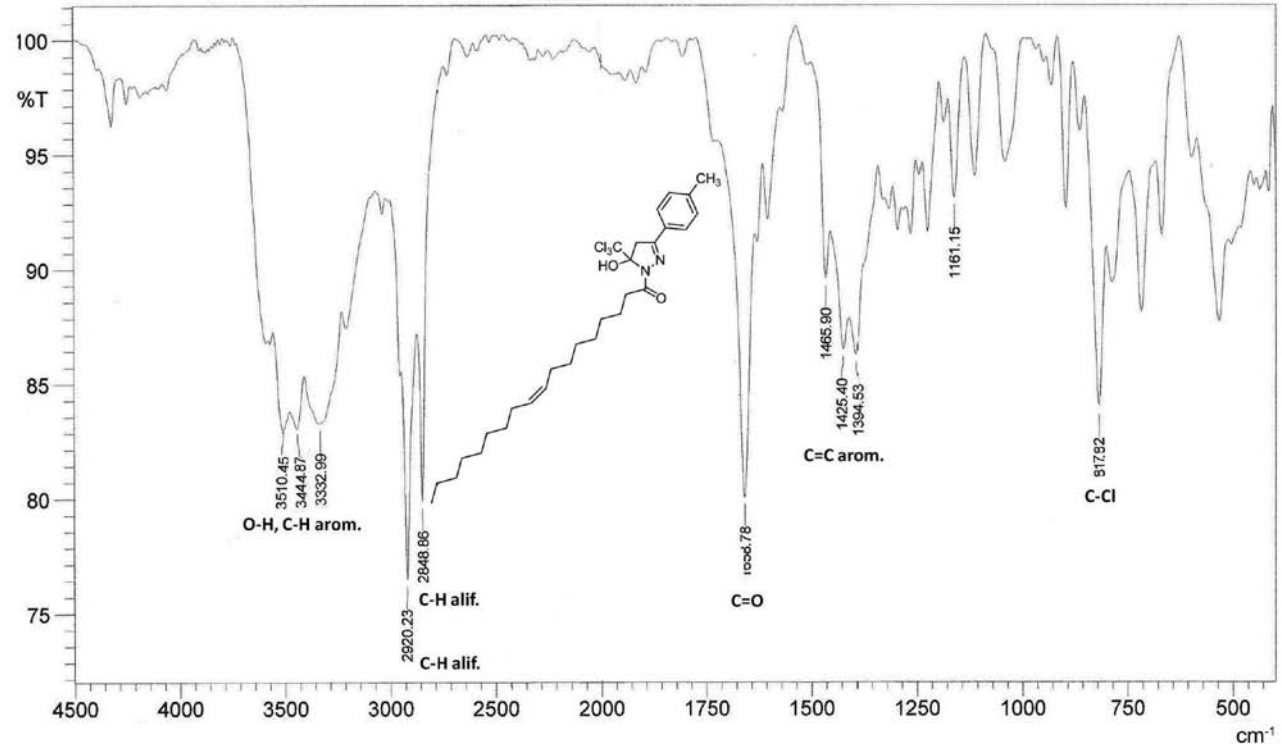


**Figure S6.** Infrared spectrum of compound **10c** (KBr).

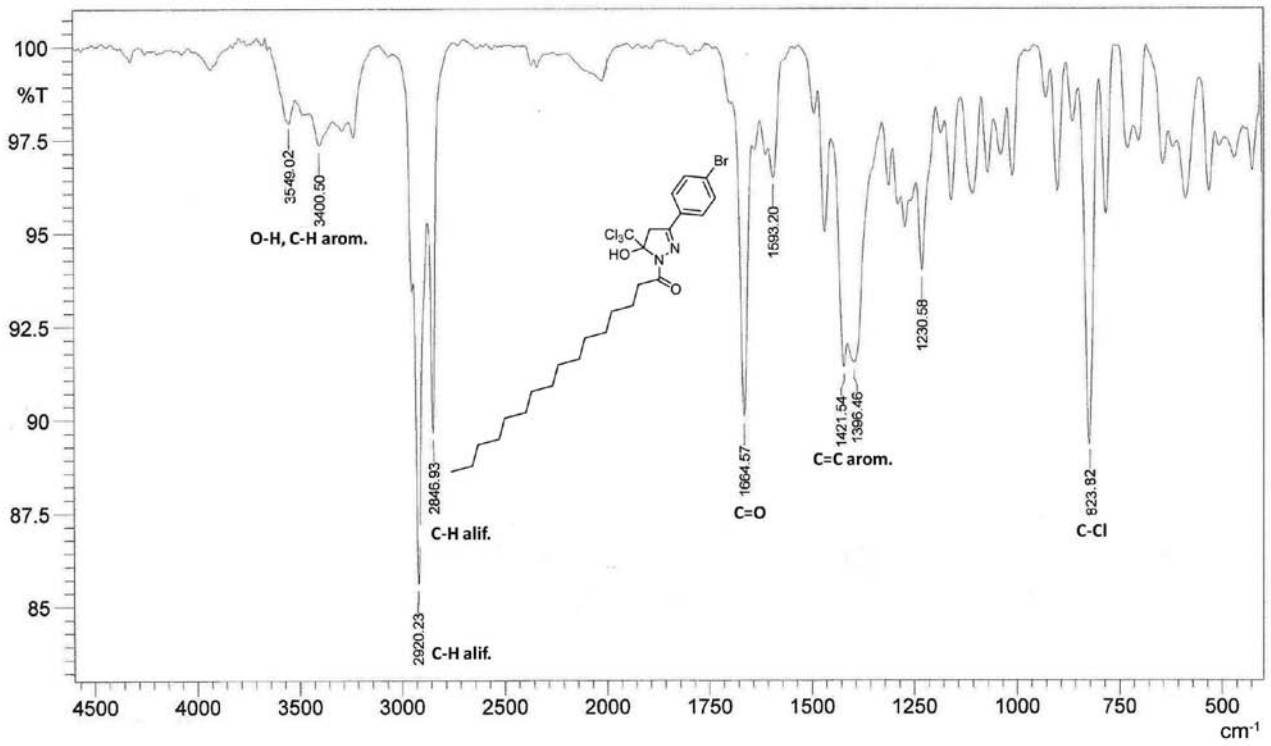


**Figure S7.** Infrared spectrum of compound **11a** (KBr).

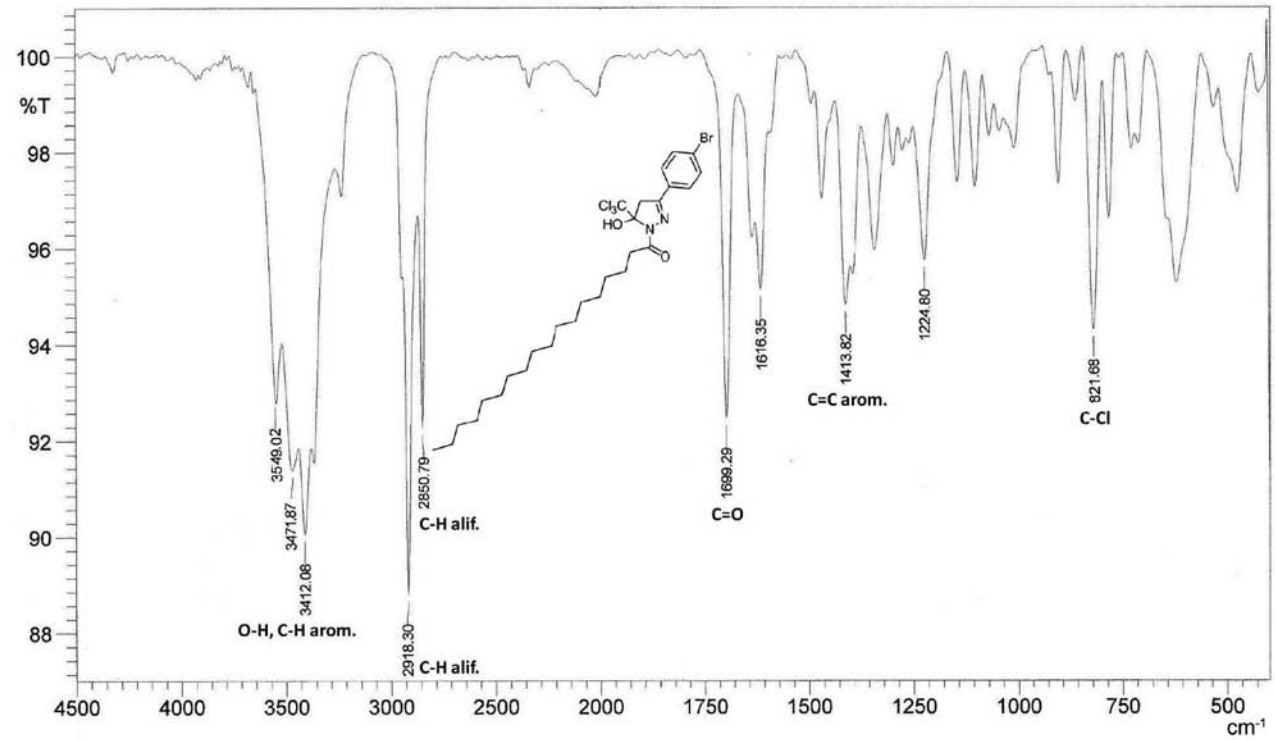


**Figure S8.** Infrared spectrum of compound **11b** (KBr).

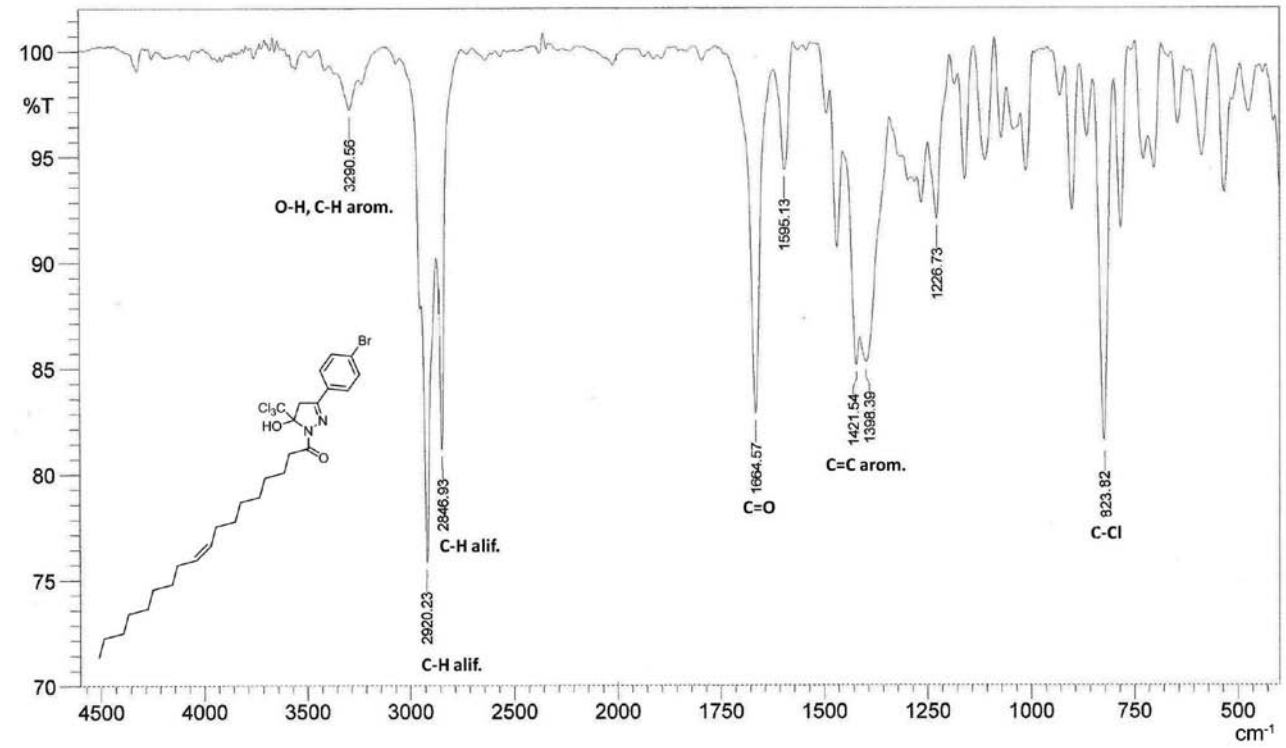


**Figure S9.** Infrared spectrum of compound **11c** (KBr).

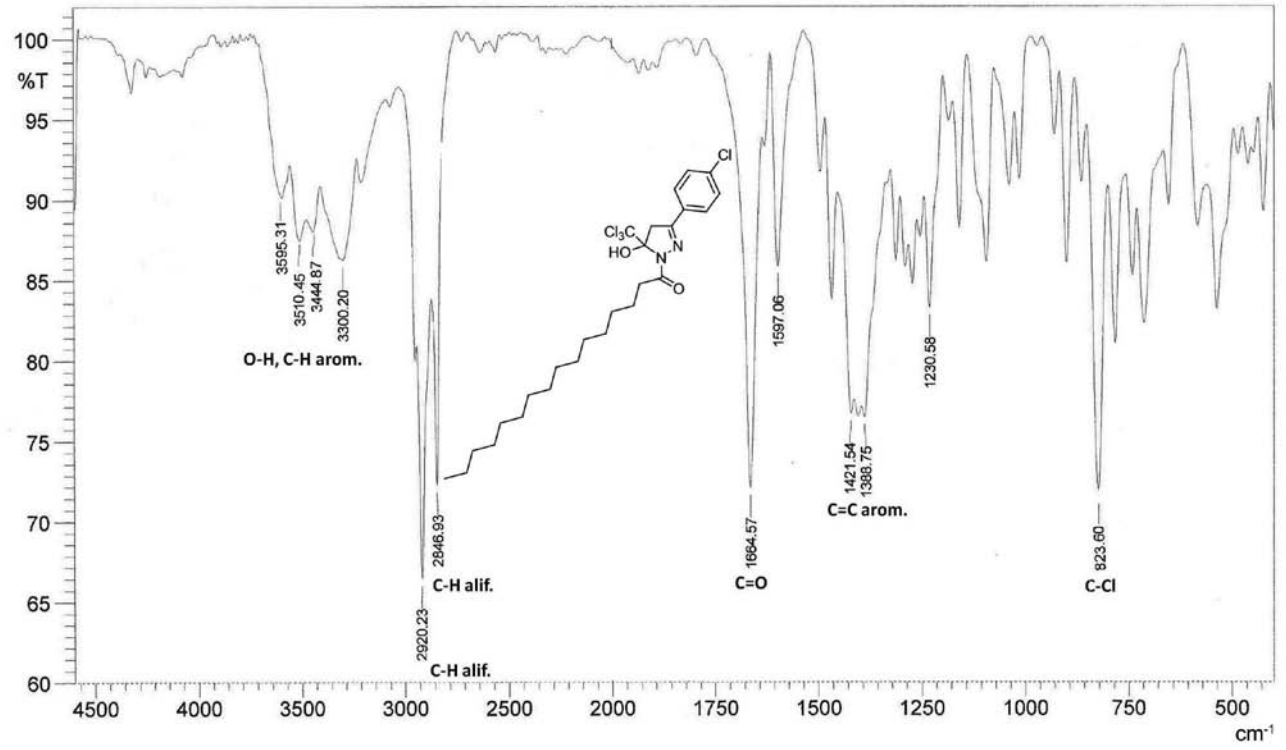


**Figure S10.** Infrared spectrum of compound **12a** (KBr).

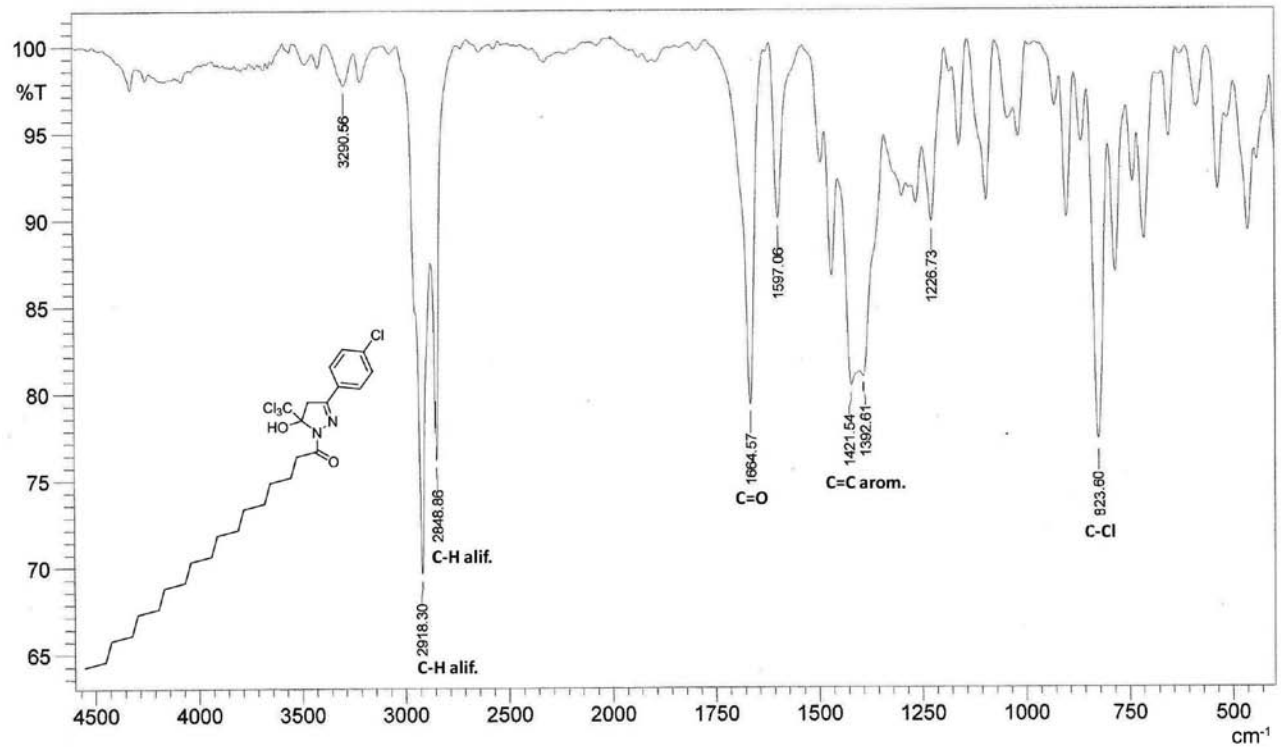


**Figure S11.** Infrared spectrum of compound **12b** (KBr).

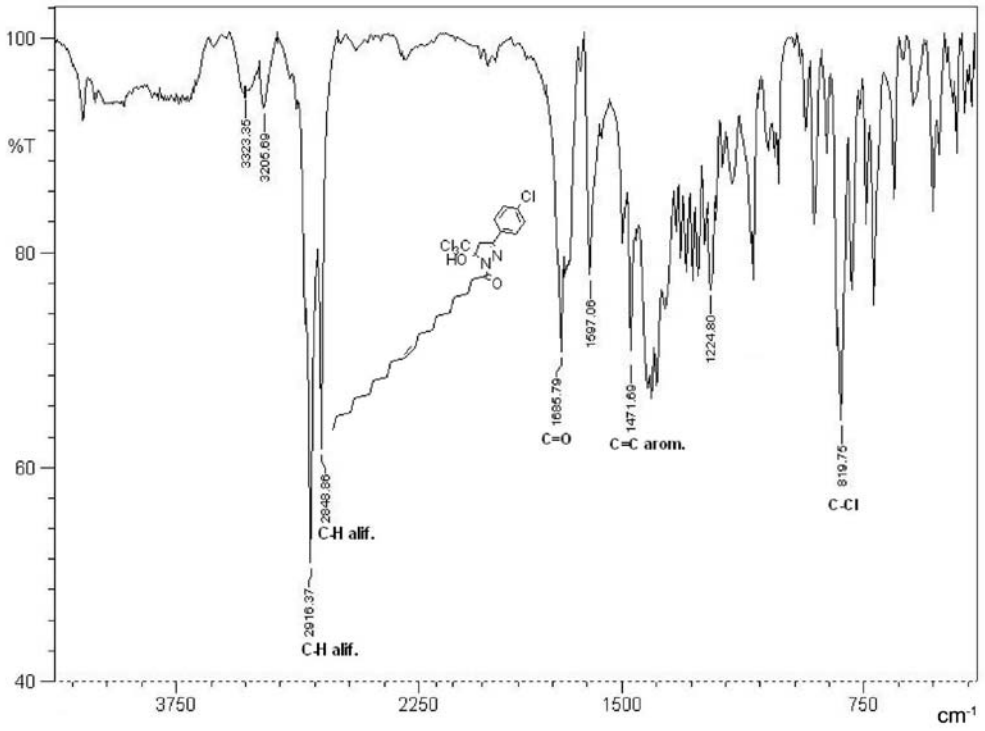


**Figure S12.** Infrared spectrum of compound **12c** (KBr).

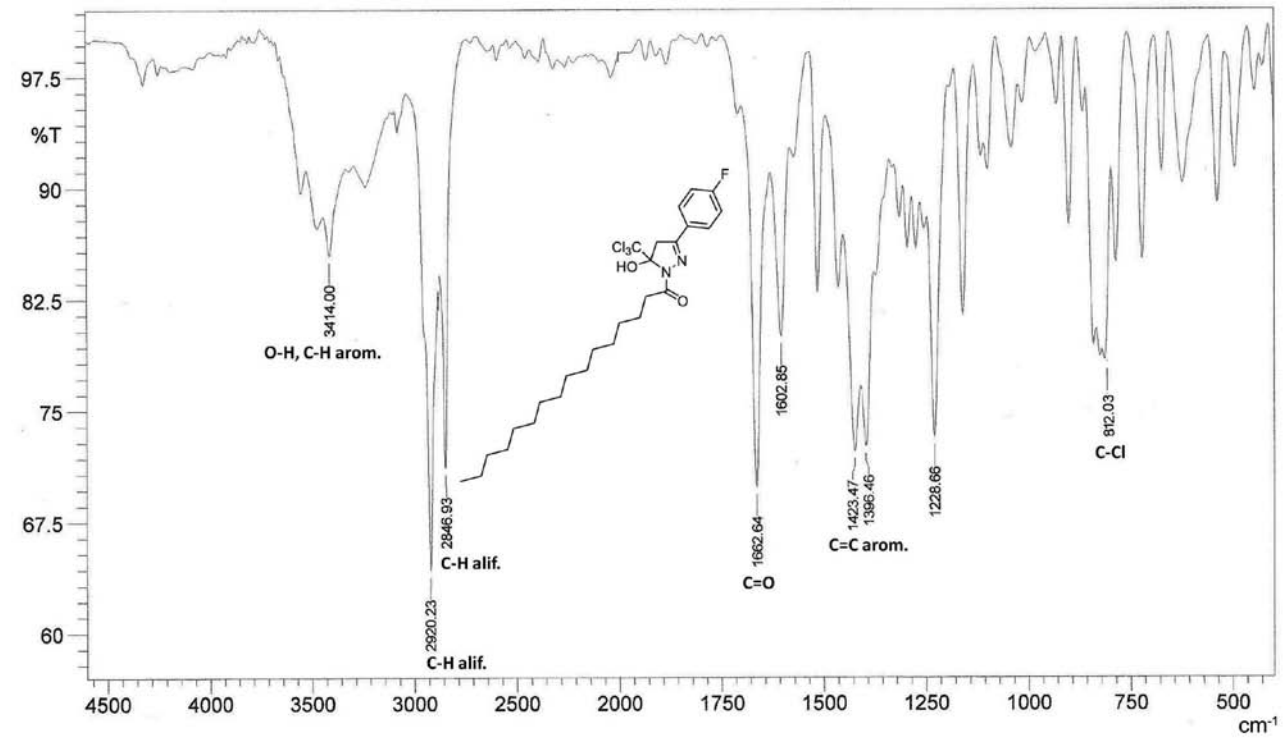


**Figure S13.** Infrared spectrum of compound **13a** (KBr).

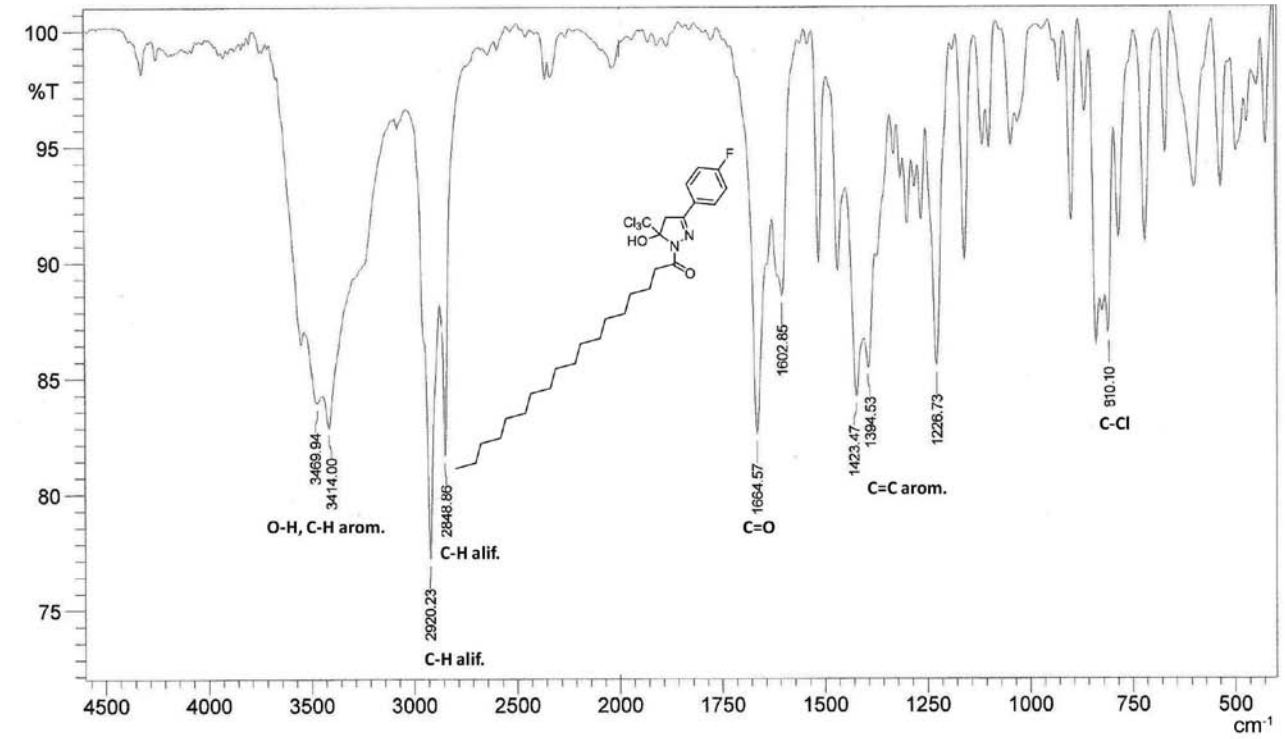


**Figure S14.** Infrared spectrum of compound **13b** (KBr).

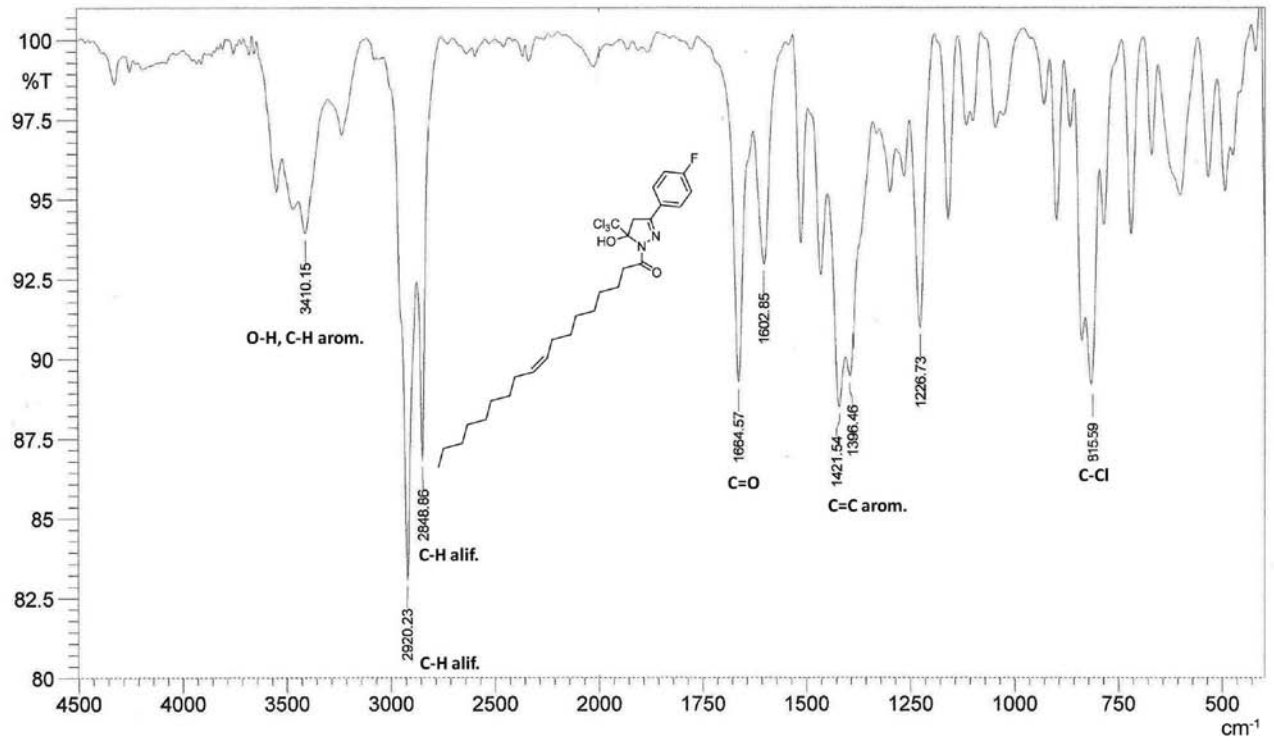


**Figure S15.** Infrared spectrum of compound **13c** (KBr).

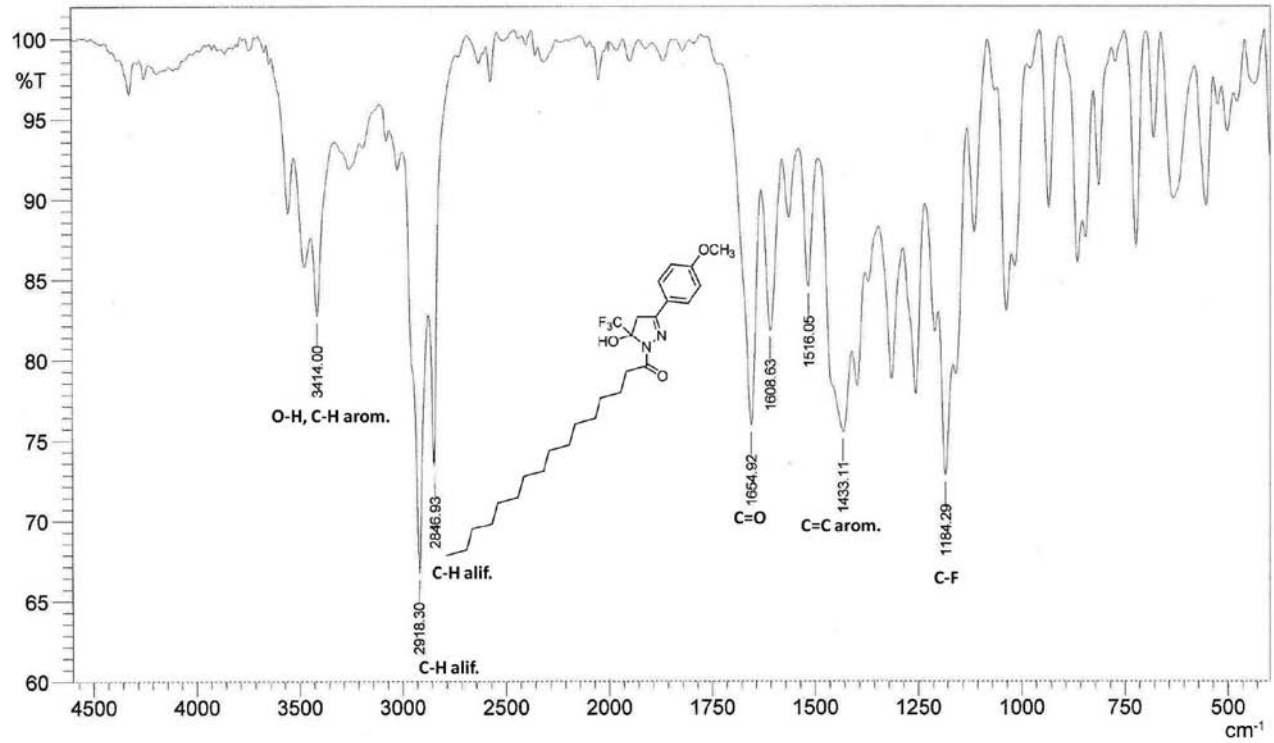


**Figure S16.** Infrared spectrum of compound **14a** (KBr).

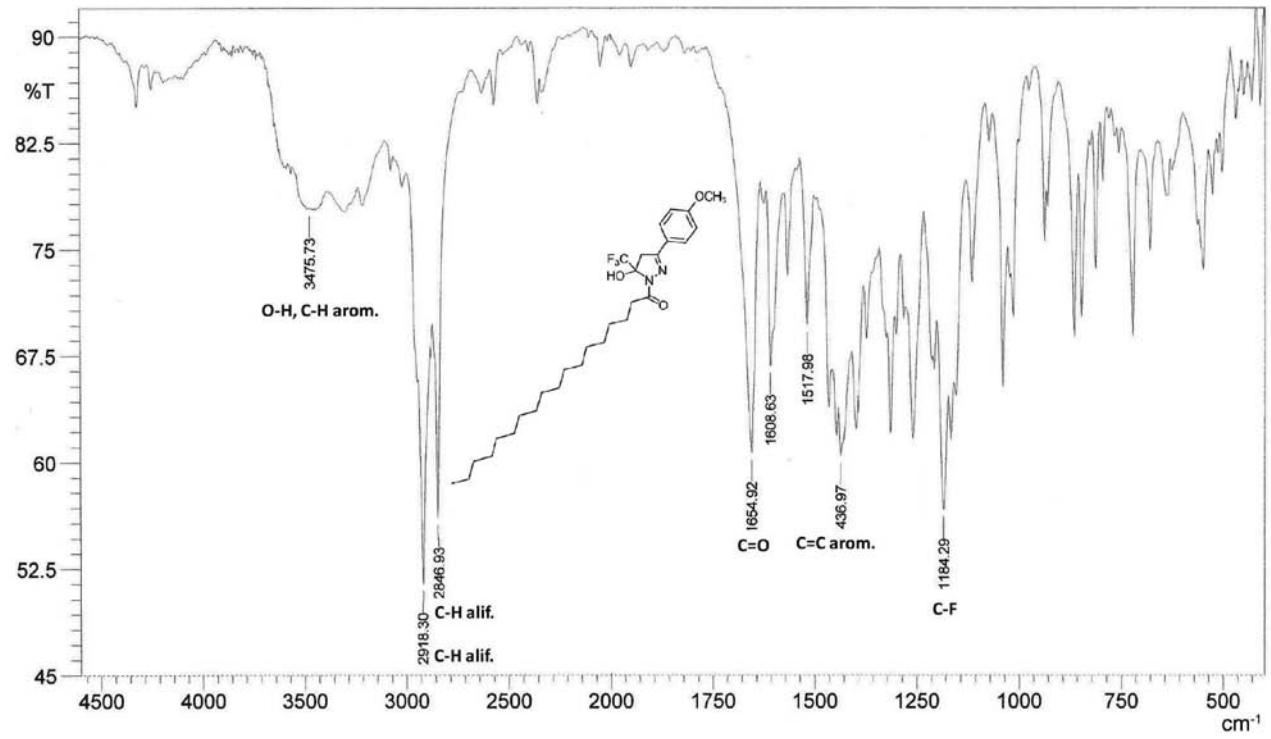


**Figure S17.** Infrared spectrum of compound **14b** (KBr).

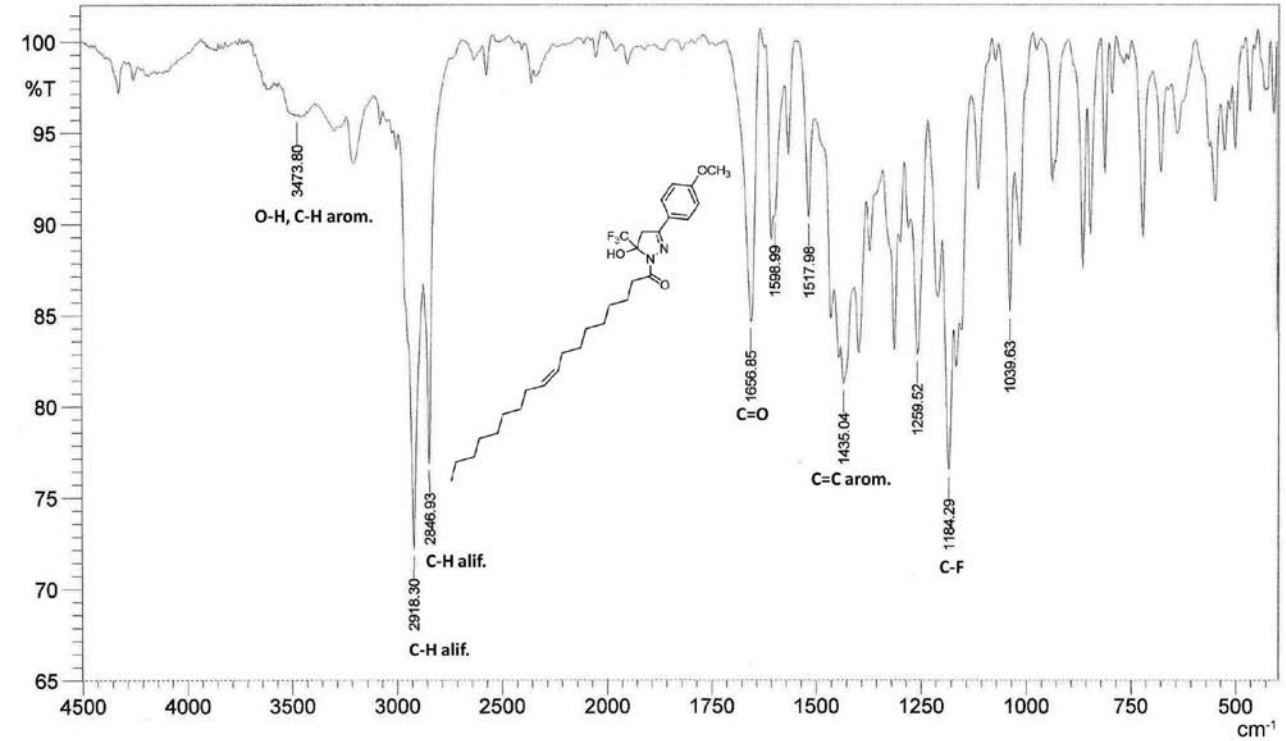


**Figure S18.** Infrared spectrum of compound **14c** (KBr).

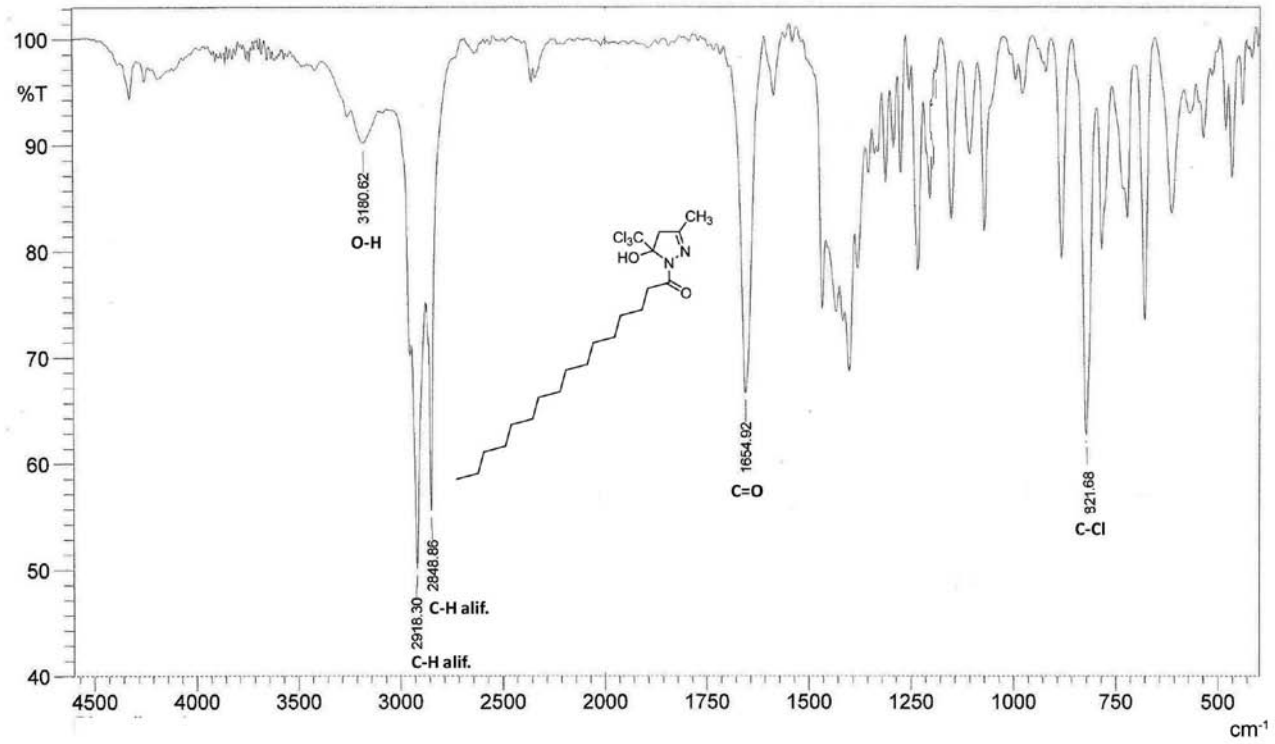


**Figure S19.** Infrared spectrum of compound **15a** (KBr).

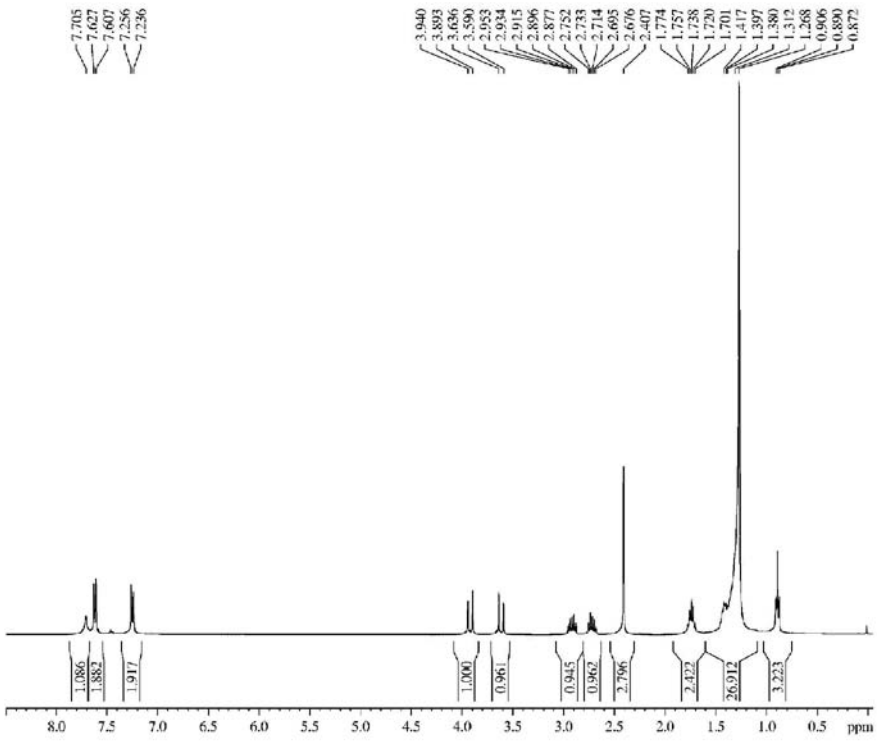


**Figure S20.** $^1$H NMR spectrum of compound **10a** ($CDCl_3$, 400 MHz).

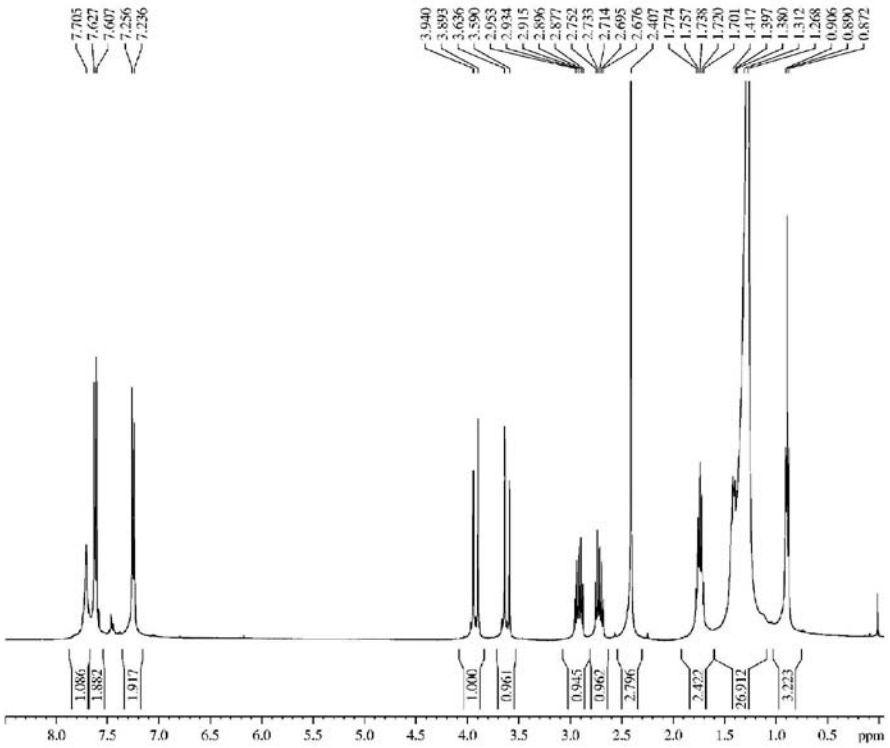


**Figure S21.** $^{1}$H NMR spectrum of compound **10a** ($CDCl_3$, 400 MHz).

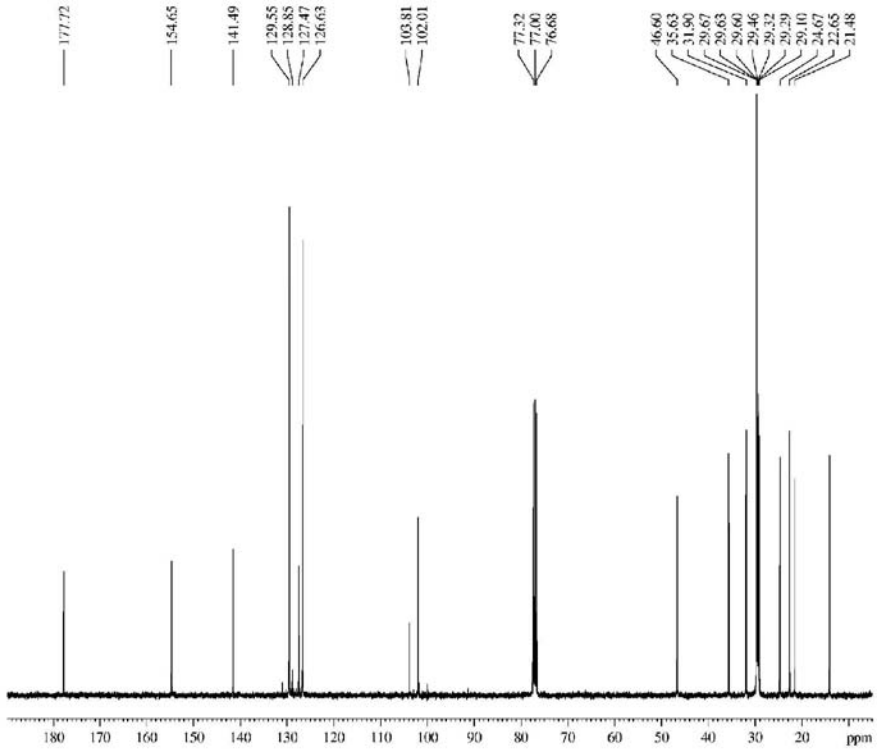


**Figure S22.** $^{13}$C NMR spectrum of compound **10a** ($CDCl_3$, 100 MHz).

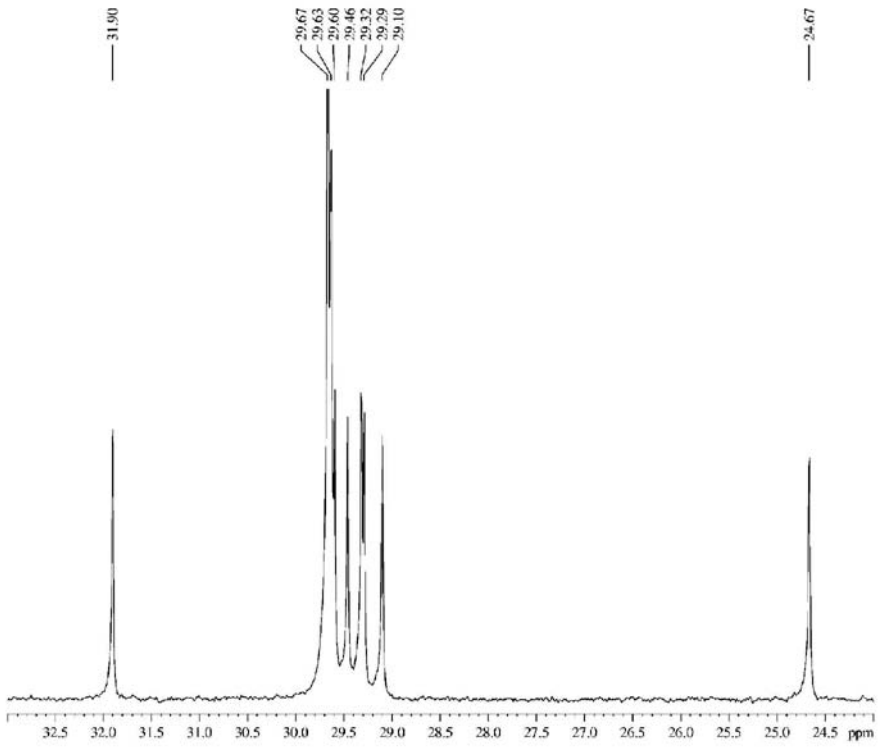


**Figure S23.** $^{13}C$ NMR spectrum of compound **10a** ($CDCl_3$, 100 MHz).

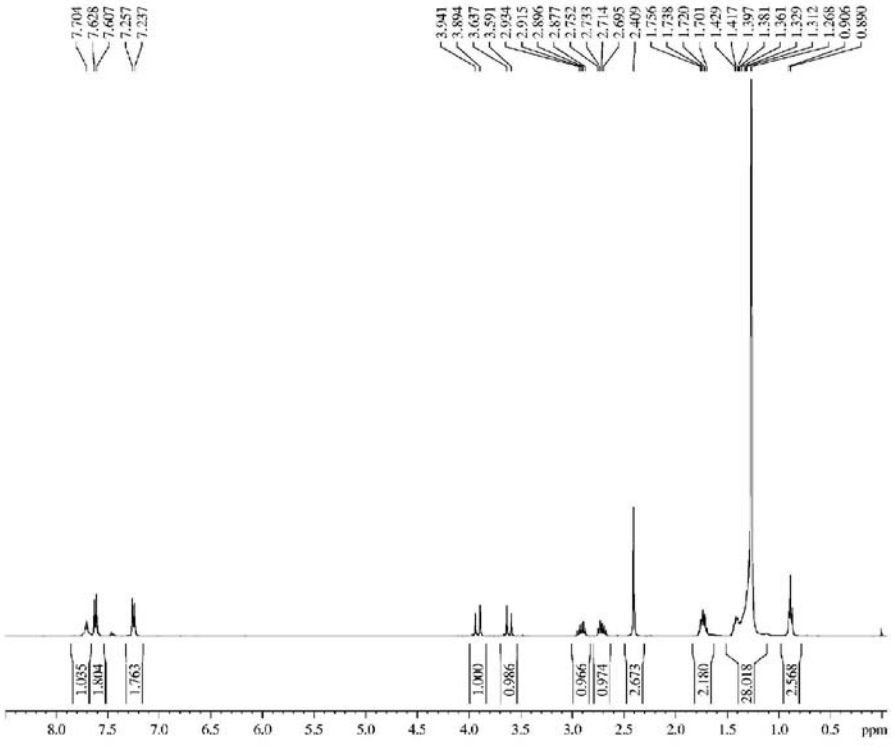


**Figure S24.** $^{1}H$ NMR spectrum of compound **10b** ($CDCl_3$, 400 MHz).

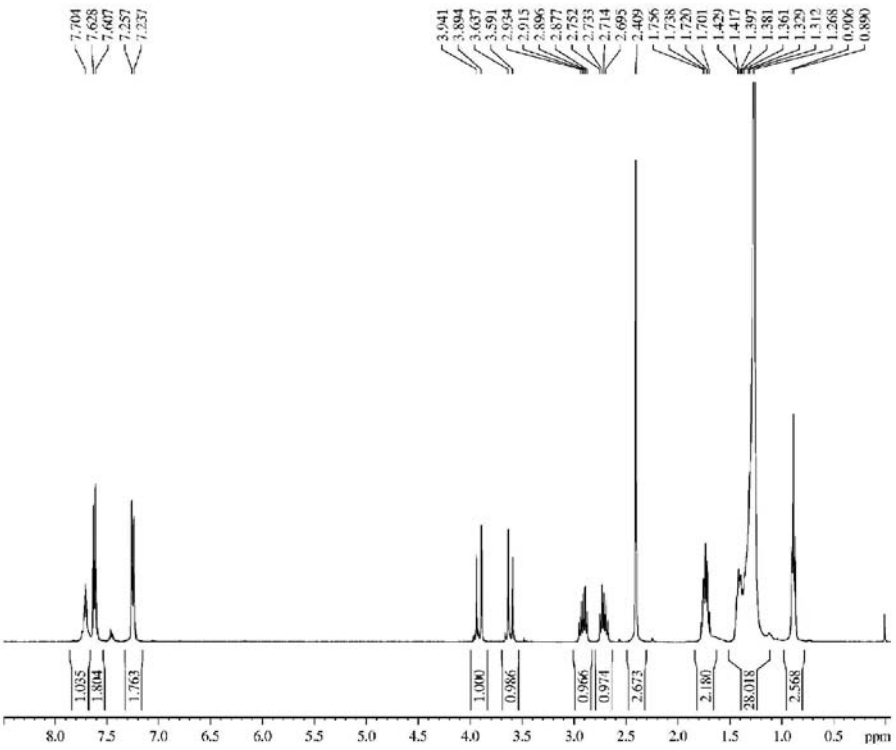


**Figure S25.** $^{1}$H NMR spectrum of compound **10b** ($CDCl_3$, 400 MHz).

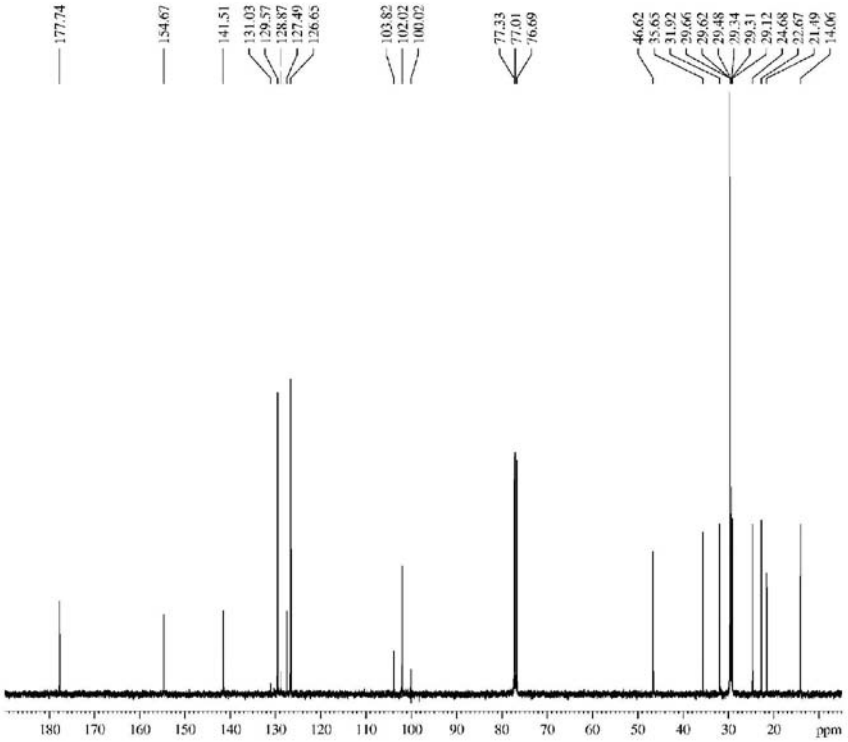


**Figure S26.** $^{13}$C NMR spectrum of compound **10b** ($CDCl_3$, 100 MHz).

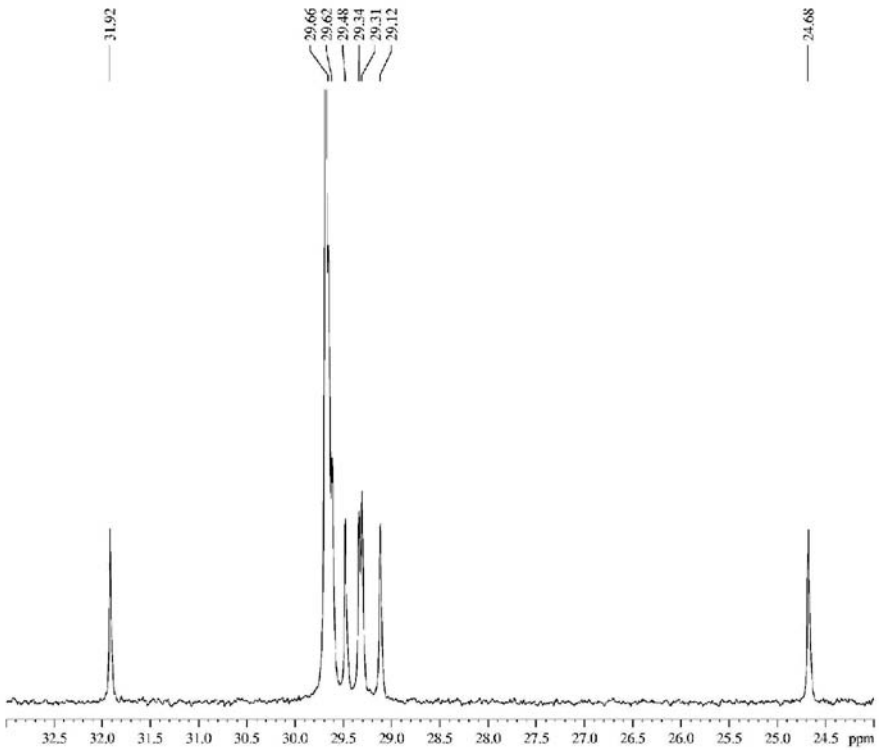


**Figure S27.** $^{13}C$ NMR spectrum of compound **10b** ($CDCl_3$, 100 MHz).

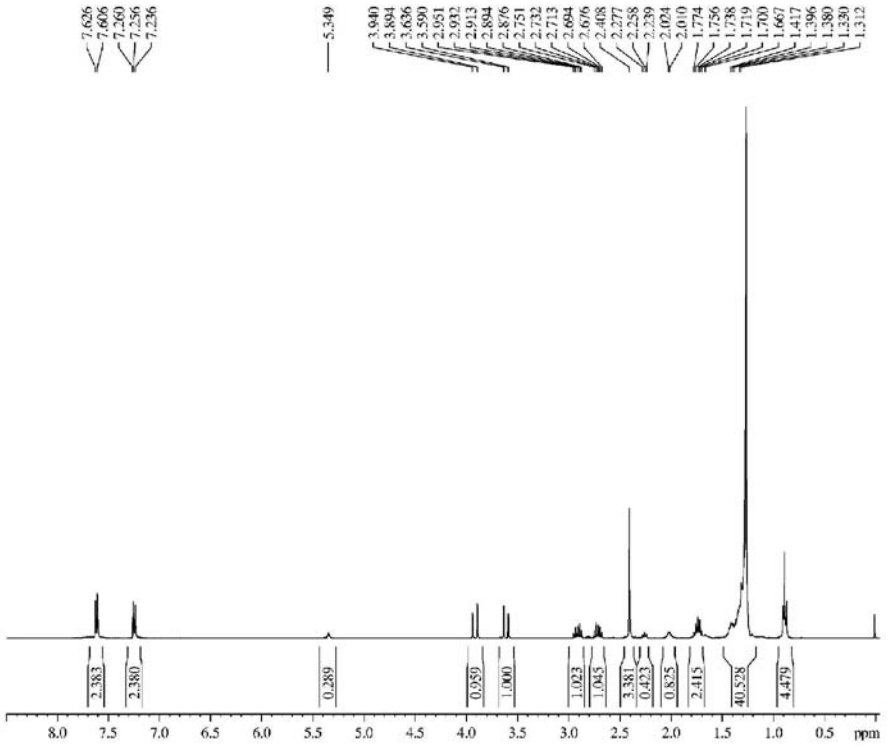


**Figure S28.** $^{1}H$ NMR spectrum of compound **10c** ($CDCl_3$, 400 MHz).

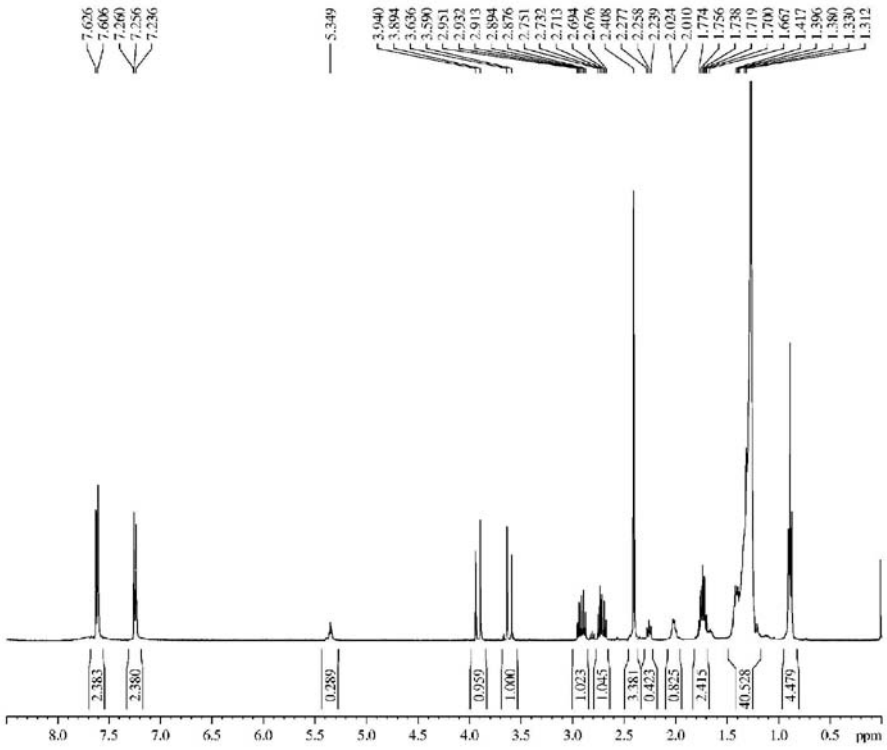


**Figure S29.** $^1$H NMR spectrum of compound **10c** ($CDCl_3$, 400 MHz).

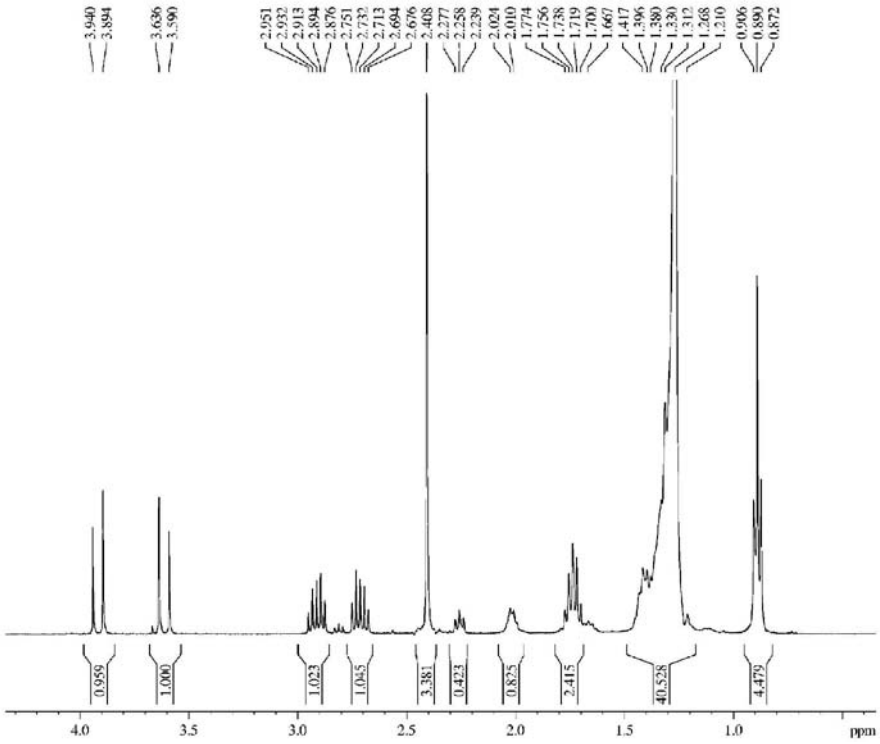


**Figure S30.** $^1$H NMR spectrum of compound **10c** ($CDCl_3$, 400 MHz).

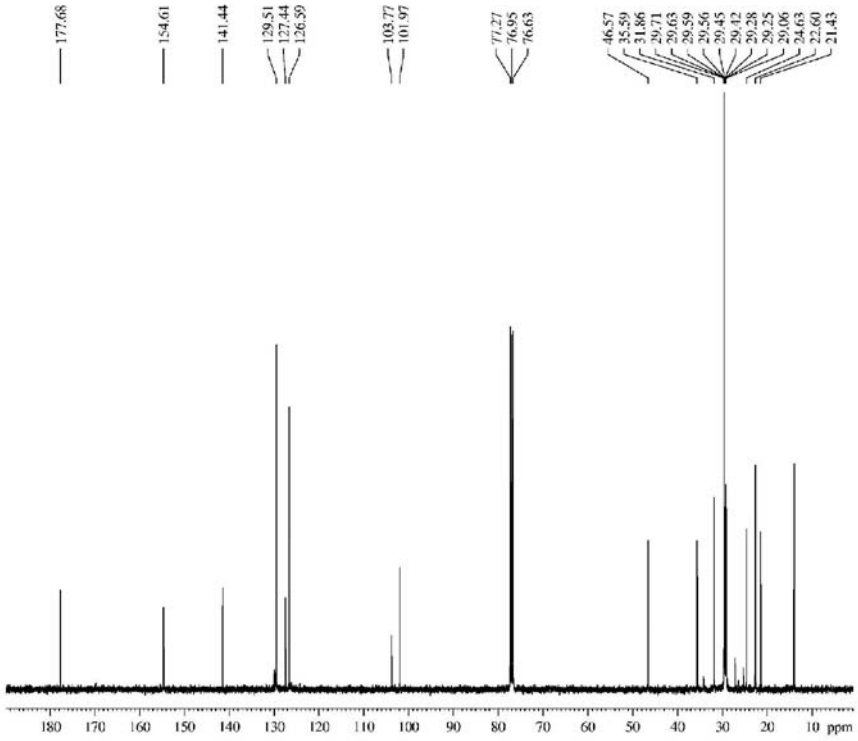


**Figure S31.** $^{13}C$ NMR spectrum of compound **10c** ($CDCl_3$, 100 MHz).

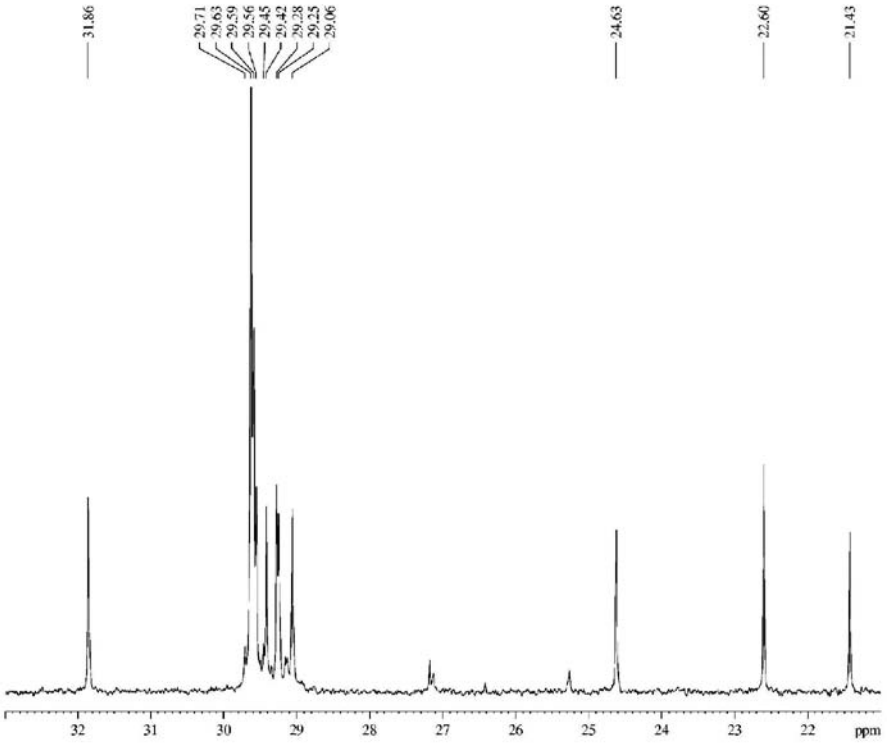


**Figure S32.** $^{13}C$ NMR spectrum of compound **10c** ($CDCl_3$, 100 MHz).

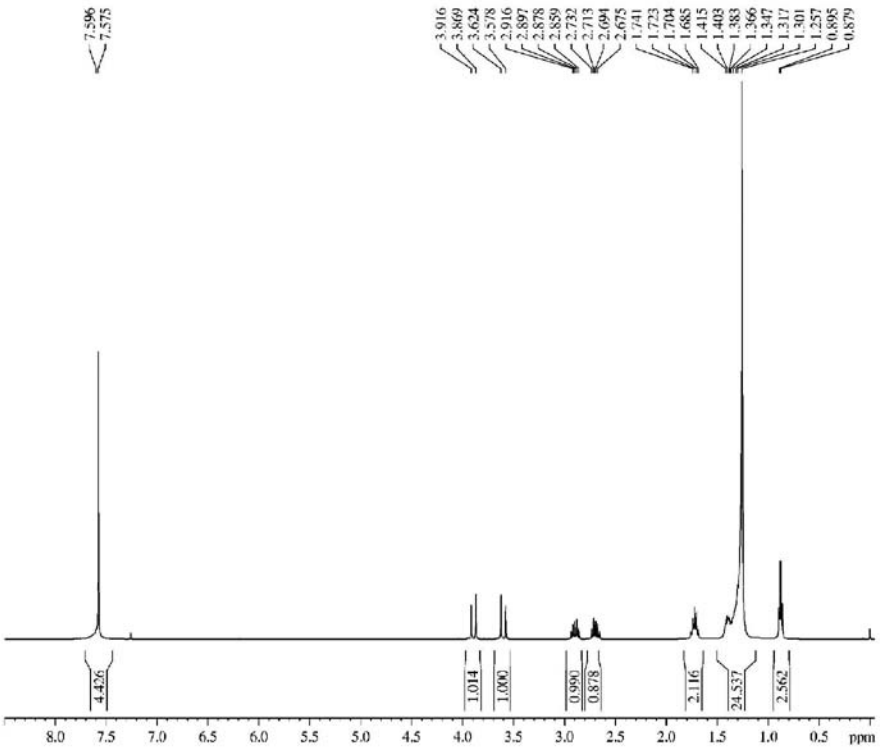


**Figure S33.** $^1$H NMR spectrum of compound **11a** ($CDCl_3$, 400 MHz).

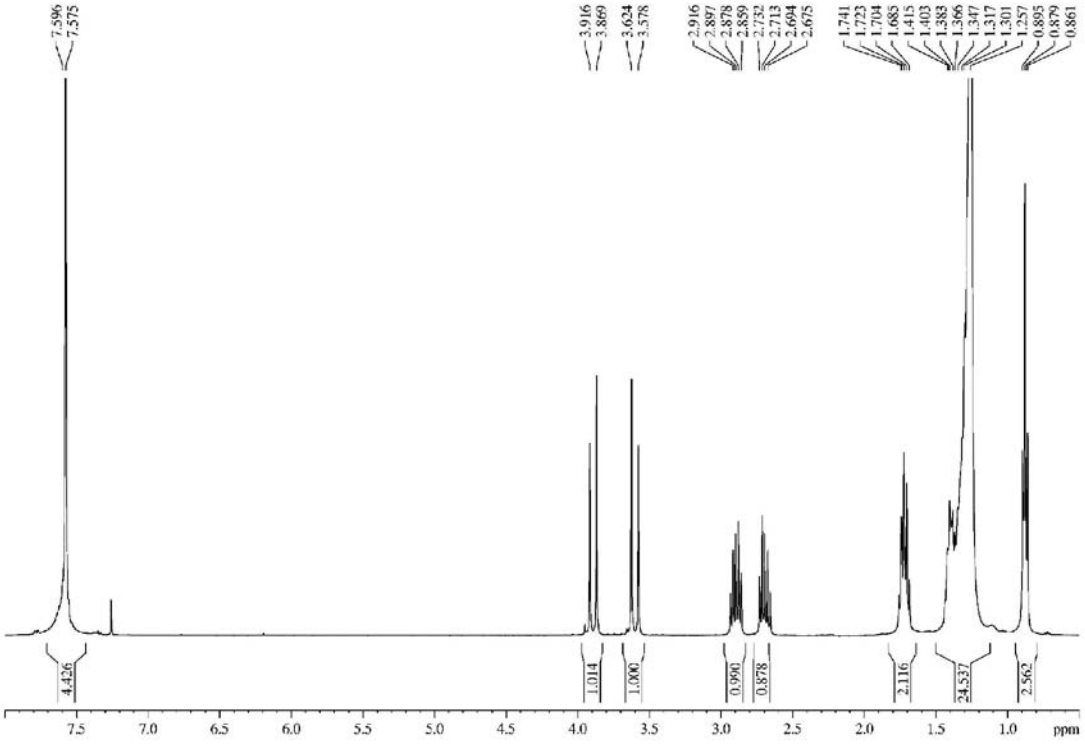


**Figure S34.** $^1$H NMR spectrum of compound **11a** ($CDCl_3$, 400 MHz).

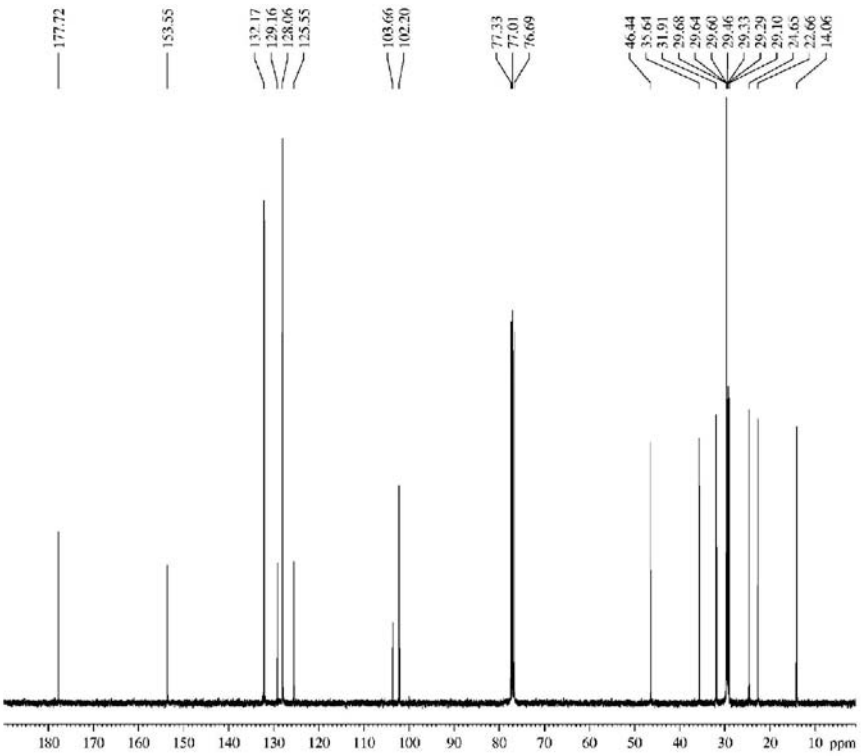


**Figure S35.** $^{13}C$ NMR spectrum of compound **11a** ($CDCl_3$, 100 MHz).

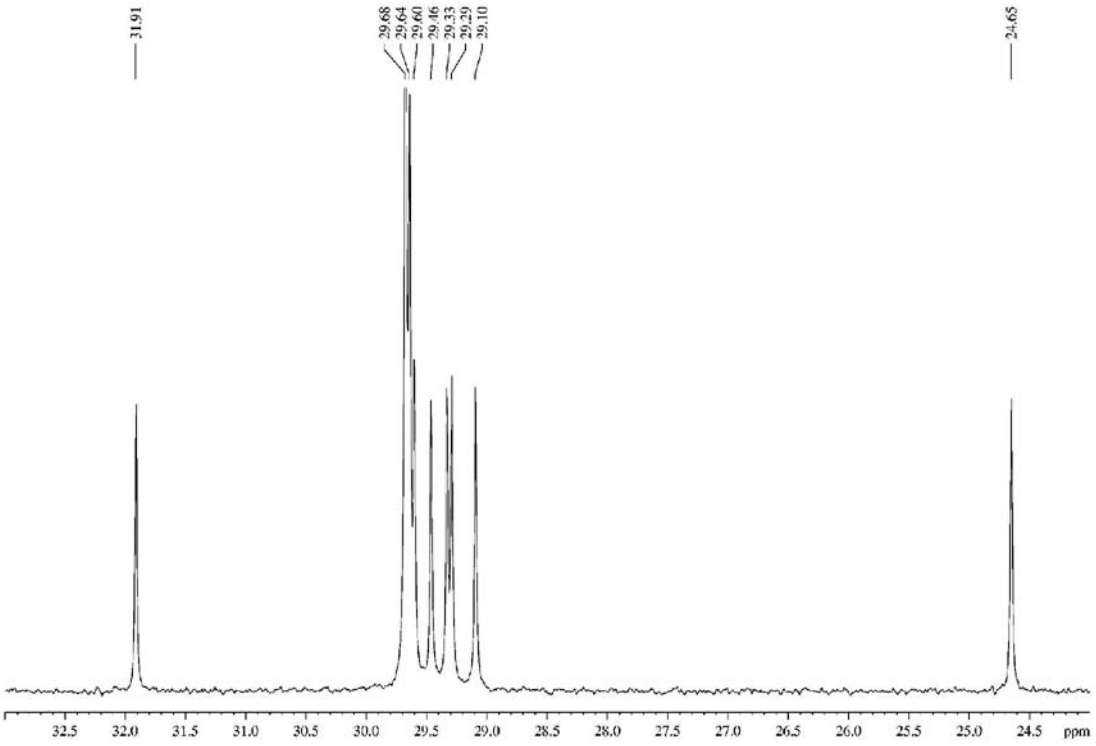


**Figure S36.** $^{13}C$ NMR spectrum of compound **11a** ($CDCl_3$, 100 MHz).

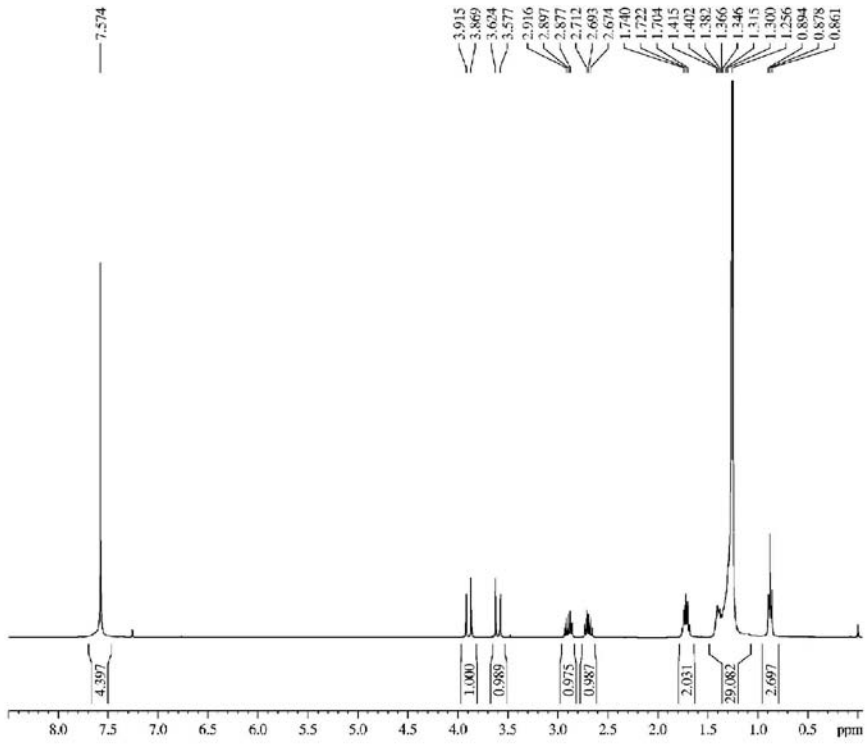


**Figure S37.** $^1$H NMR spectrum of compound **11b** ($CDCl_3$, 400 MHz).

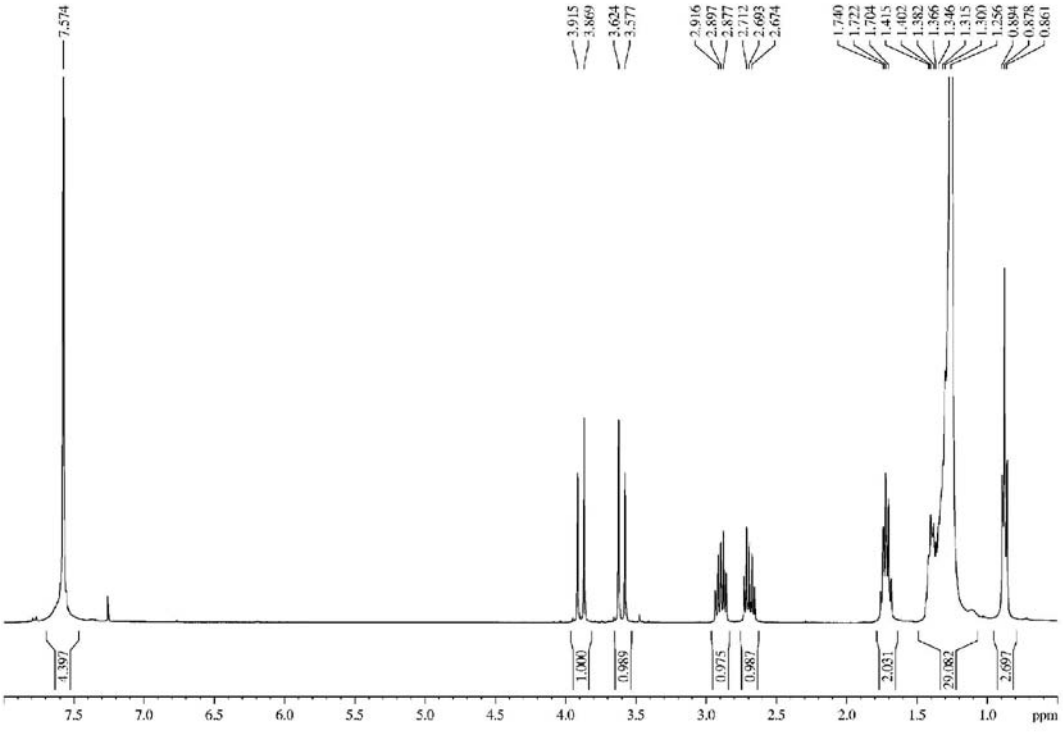


**Figure S38.** $^1$H NMR spectrum of compound **11b** ($CDCl_3$, 400 MHz).

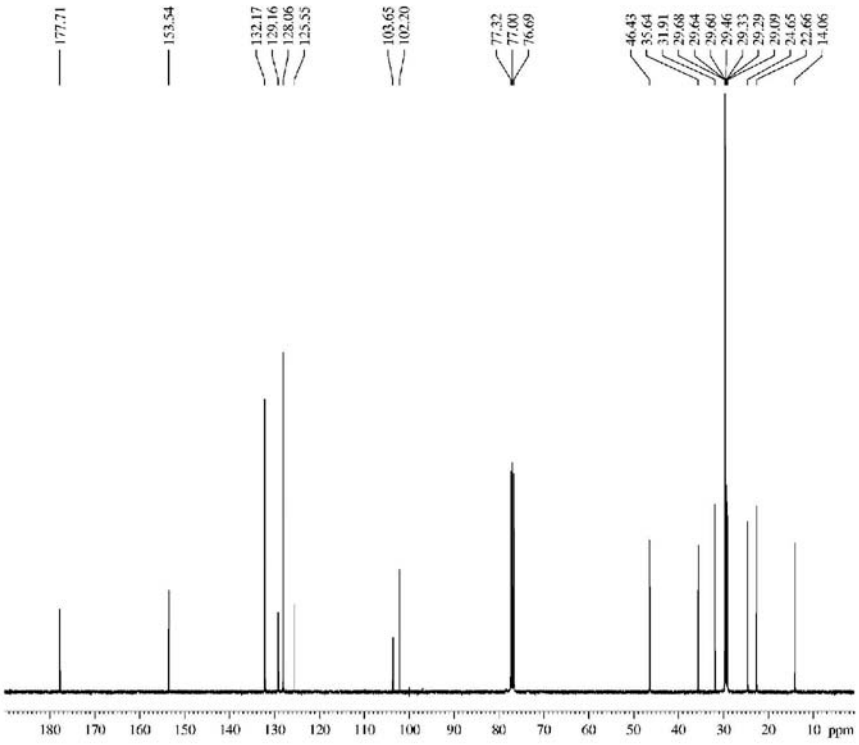


**Figure S39.** $^{13}C$ NMR spectrum of compound **11b** ($CDCl_3$, 100 MHz).

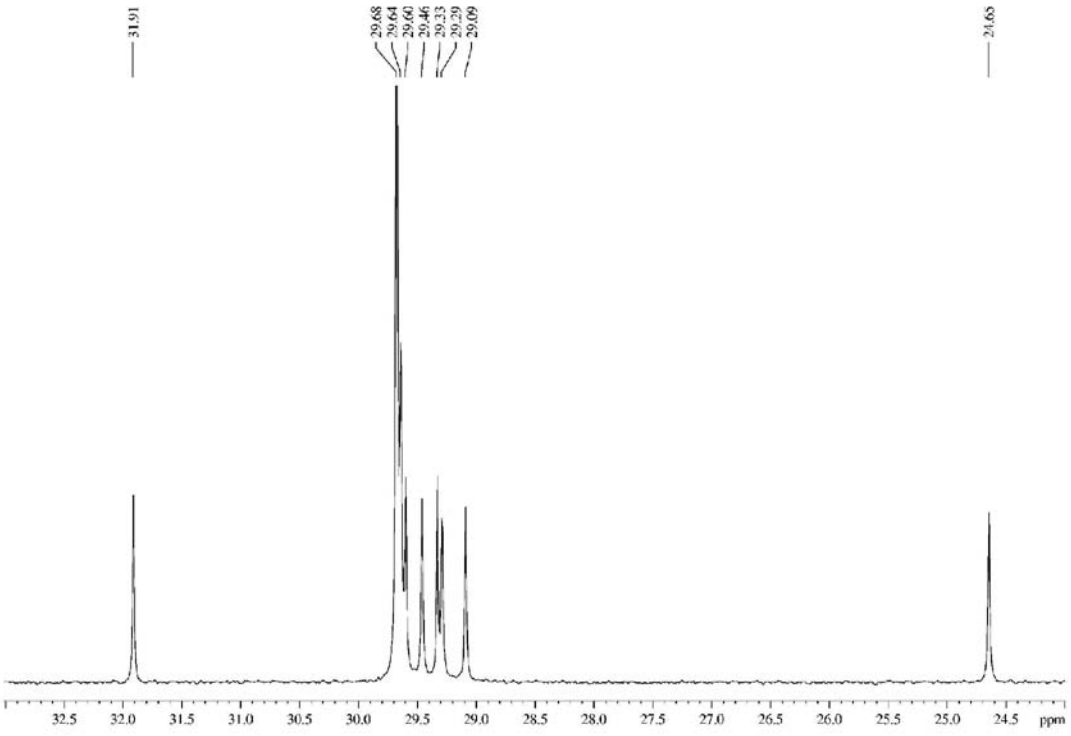


**Figure S40.** $^{13}C$ NMR spectrum of compound **11b** ($CDCl_3$, 100 MHz).

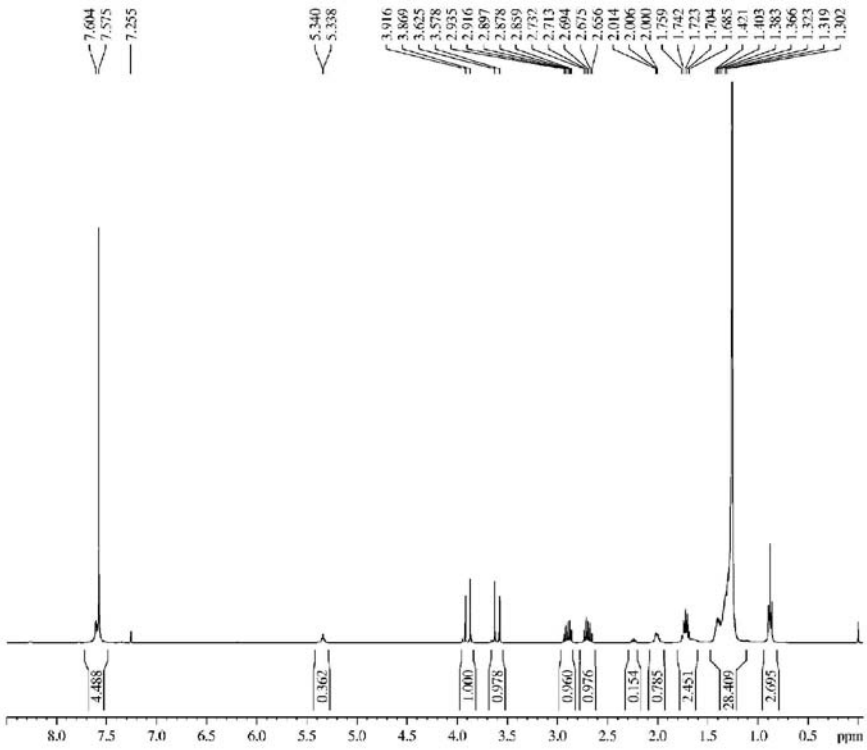


**Figure S41.** $^1$H NMR spectrum of compound **11c** ($CDCl_3$, 400 MHz).

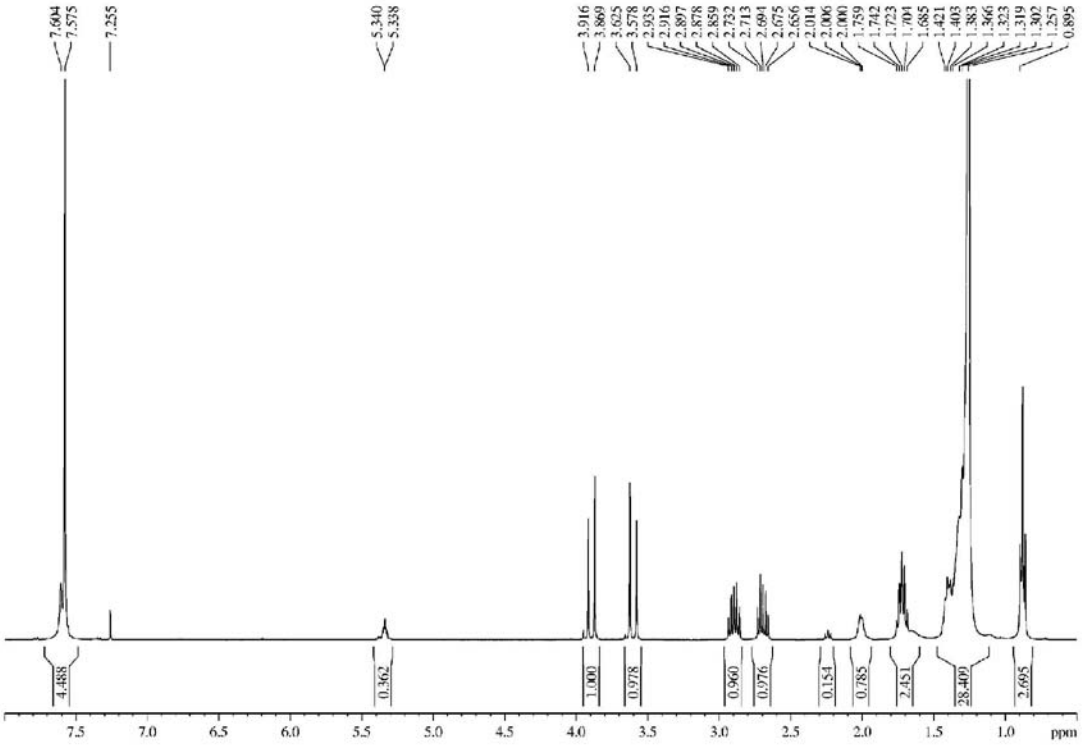


**Figure S42.** $^1$H NMR spectrum of compound **11c** ($CDCl_3$, 400 MHz).

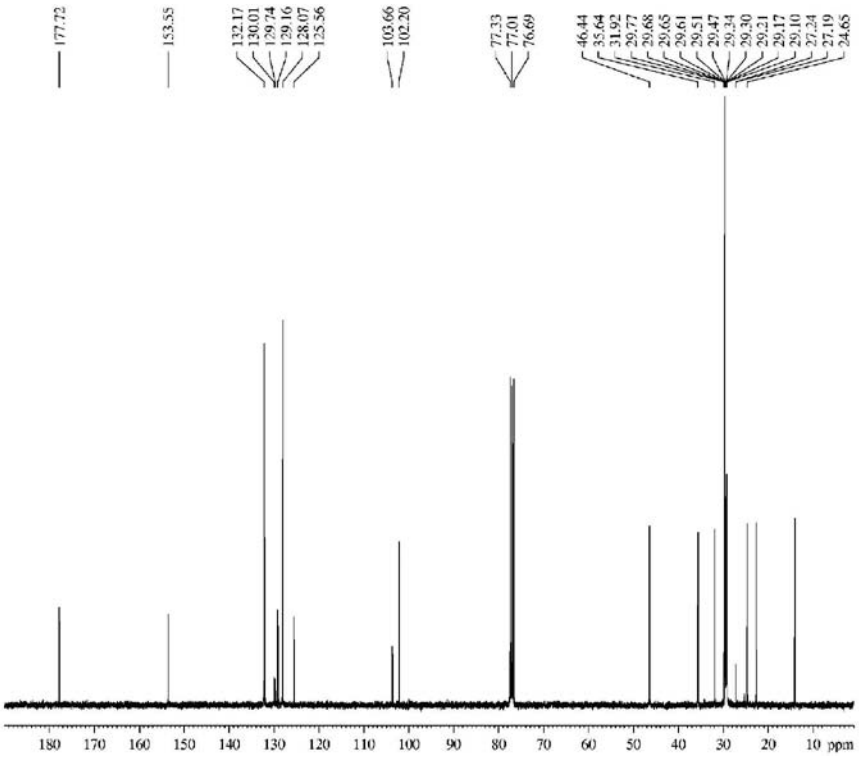


**Figure S43.** $^{13}C$ NMR spectrum of compound **11c** ($CDCl_3$, 100 MHz).

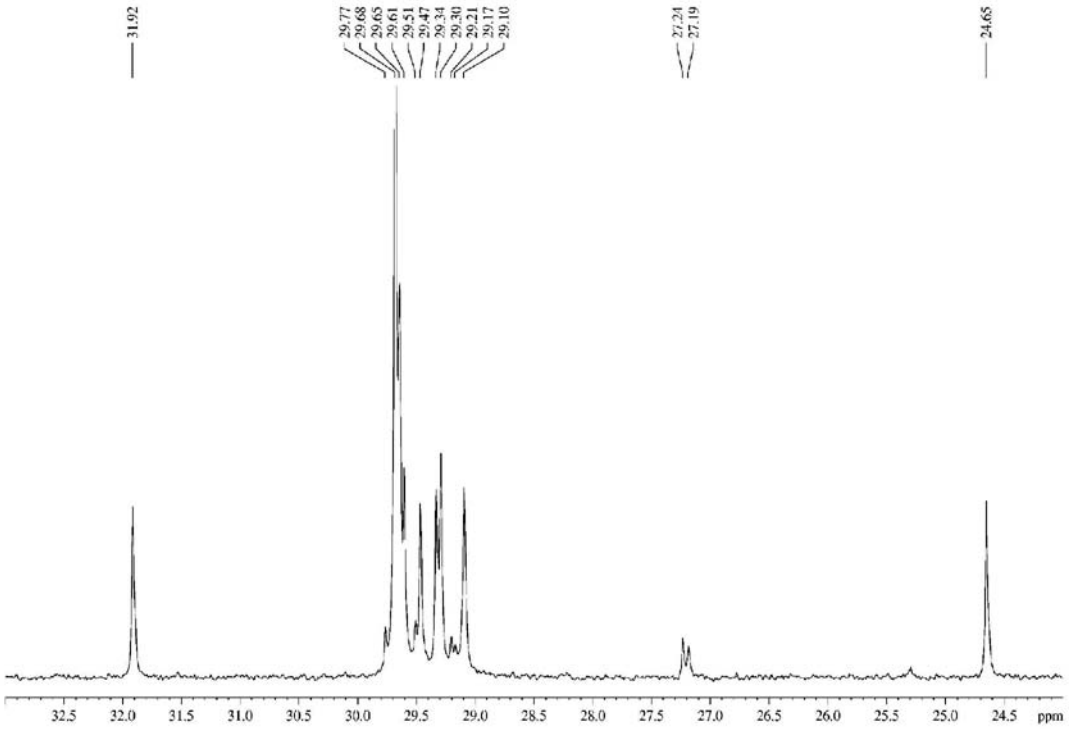


**Figure S44.** $^{13}C$ NMR spectrum of compound **11c** ($CDCl_3$, 100 MHz).

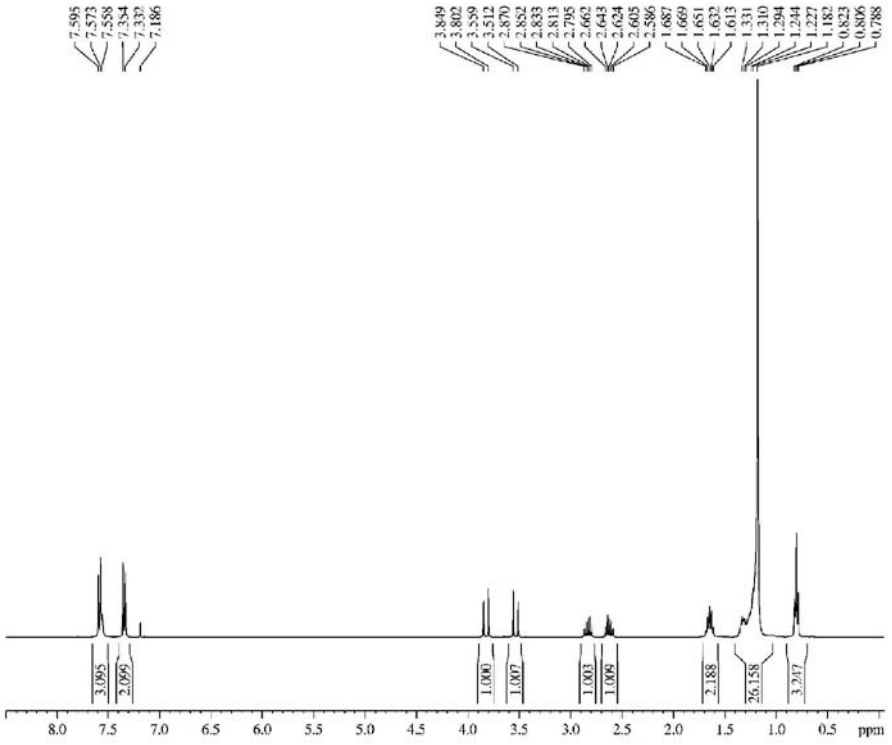


**Figure S45.** $^1$H NMR spectrum of compound **12a** ($CDCl_3$, 400 MHz).

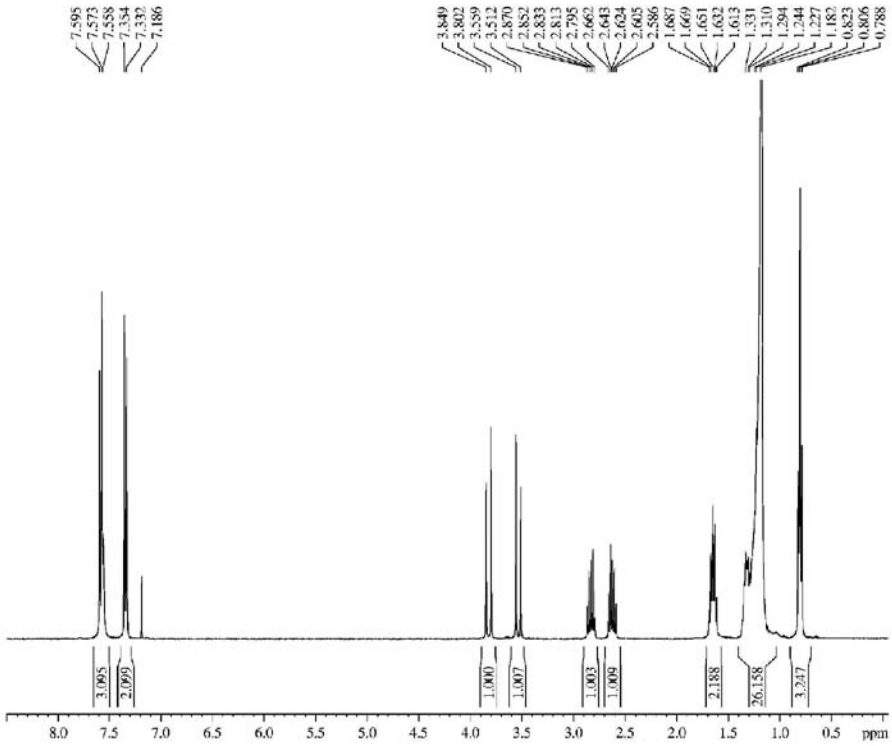


**Figure S46.** $^1$H NMR spectrum of compound **12a** ($CDCl_3$, 400 MHz).

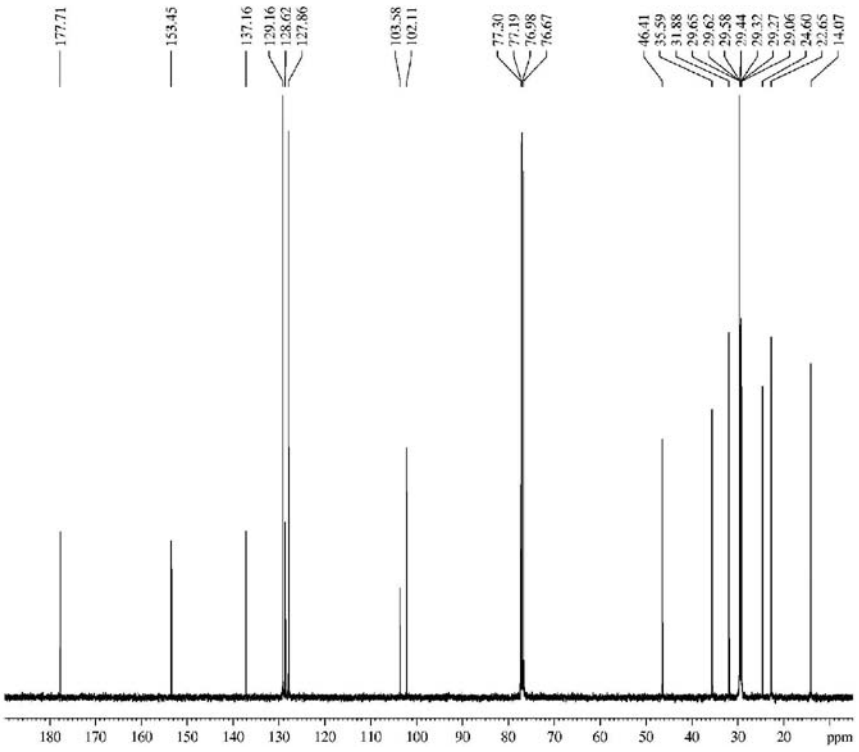


**Figure S47.** $^{13}C$ NMR spectrum of compound **12a** ($CDCl_3$, 100 MHz).

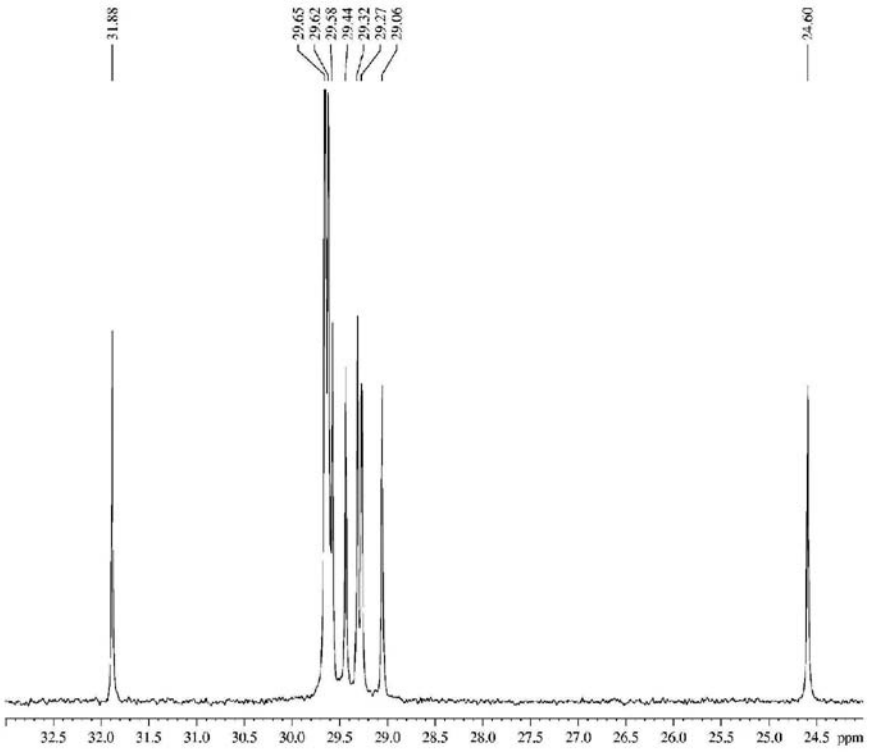


**Figure S48.** $^{13}C$ NMR spectrum of compound **12a** ($CDCl_3$, 100 MHz).

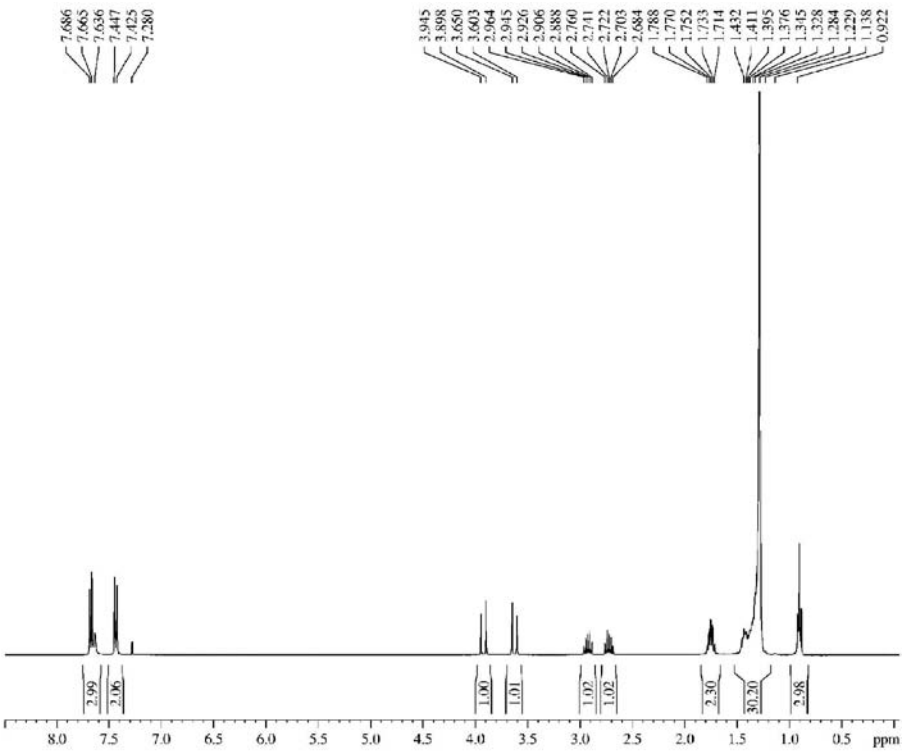


**Figure S49.** $^1$H NMR spectrum of compound **12b** ($CDCl_3$, 400 MHz).

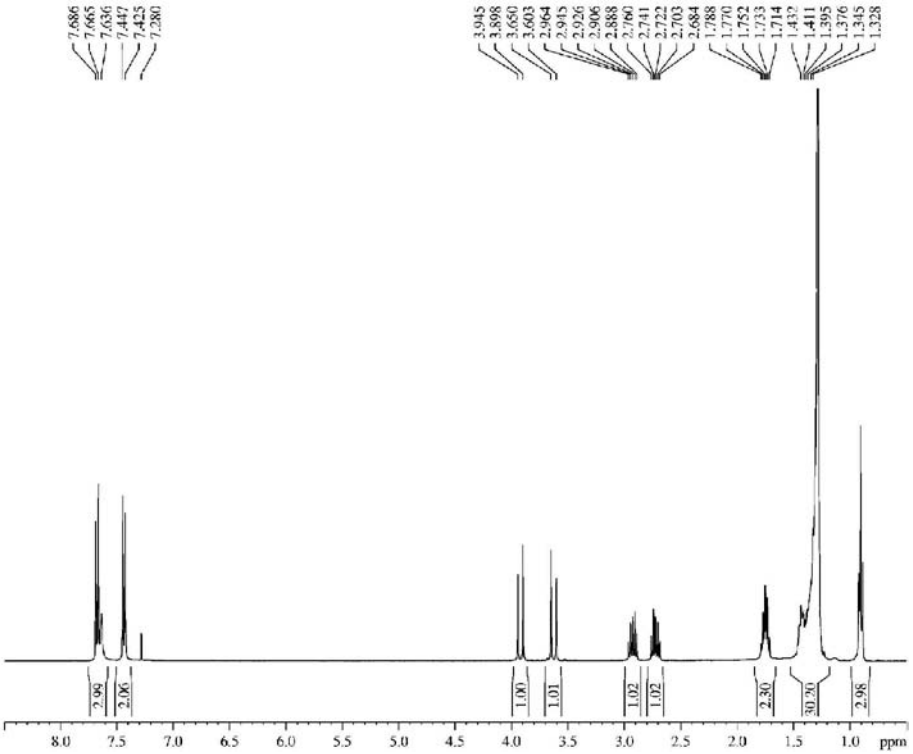


**Figure S50.** $^1$H NMR spectrum of compound **12b** ($CDCl_3$, 400 MHz).

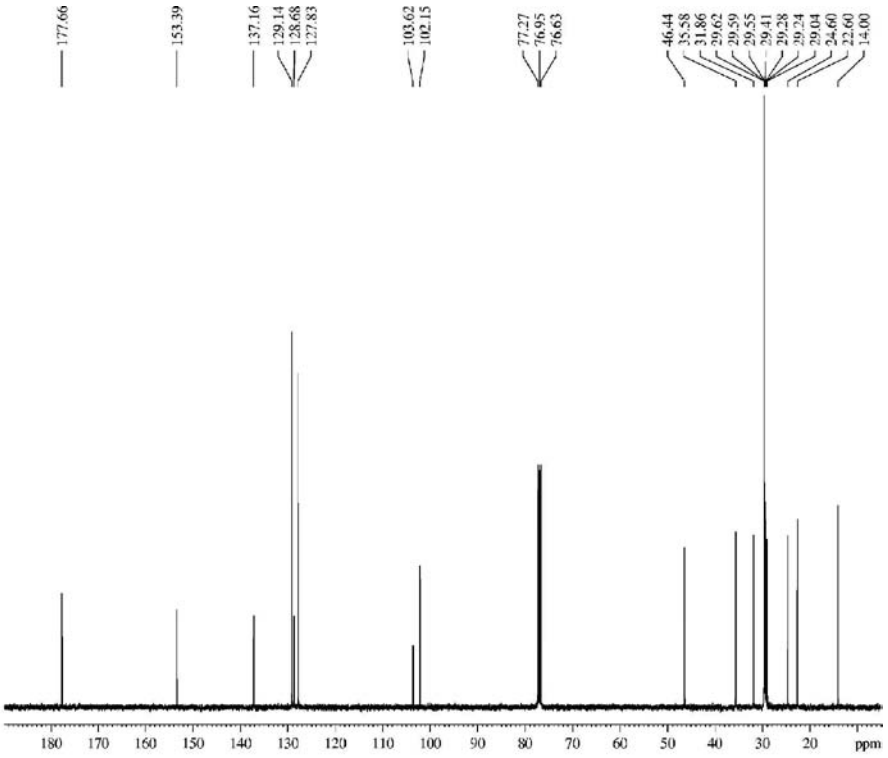


**Figure S51.** $^{13}C$ NMR spectrum of compound **12b** ($CDCl_3$, 100 MHz).

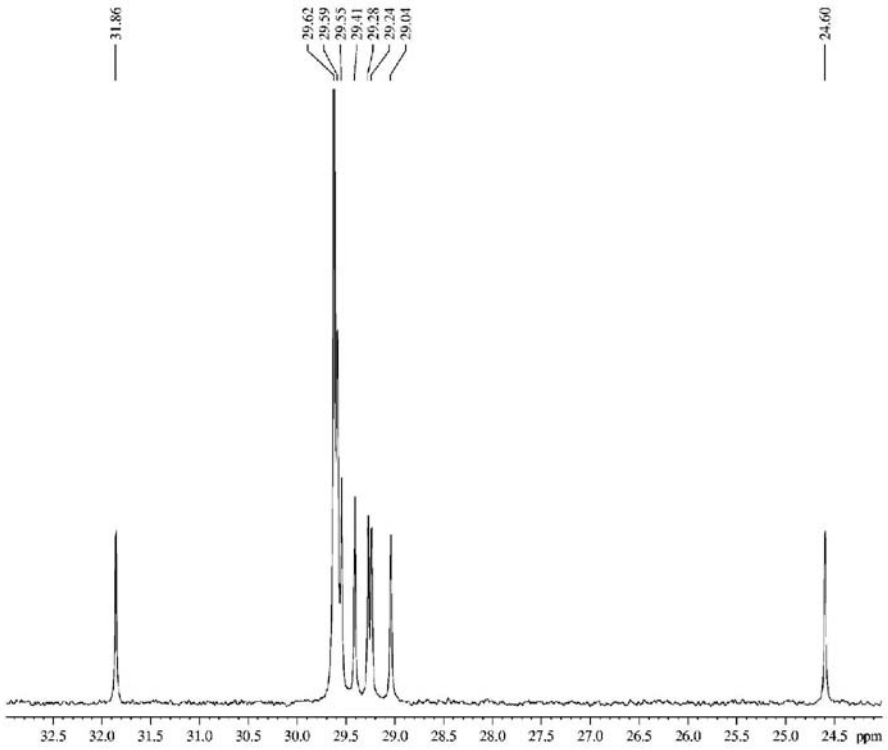


**Figure S52.** $^{13}C$ NMR spectrum of compound **12b** ($CDCl_3$, 100 MHz).

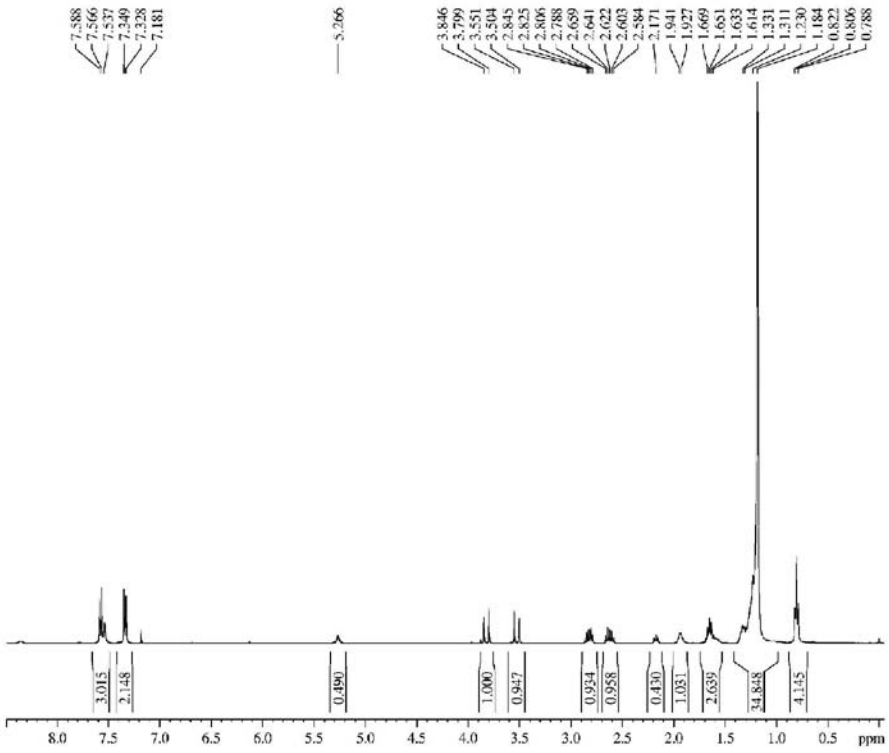


**Figure S53.** $^1$H NMR spectrum of compound **12c** ($CDCl_3$, 400 MHz).

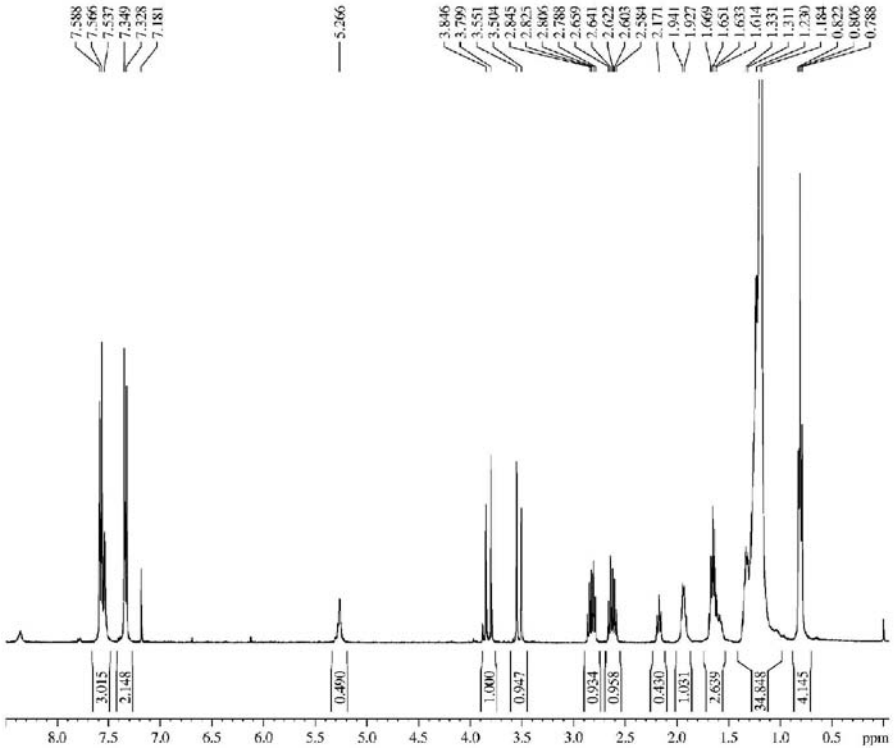


**Figure S54.** $^1$H NMR spectrum of compound **12c** ($CDCl_3$, 400 MHz).

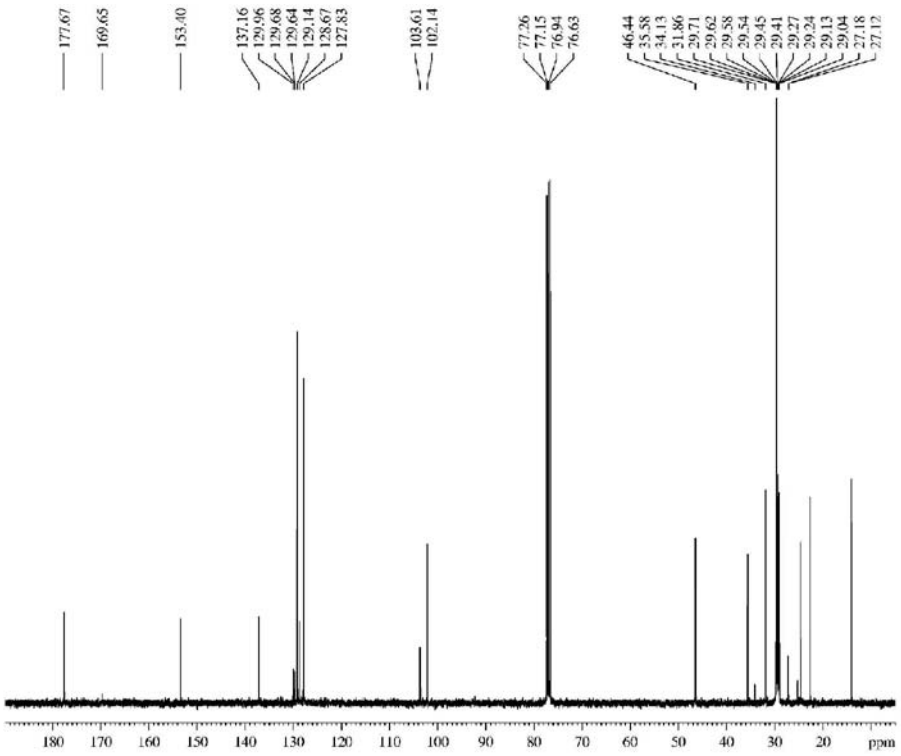


**Figure S55.** $^{13}C$ NMR spectrum of compound **12c** ($CDCl_3$, 100 MHz).

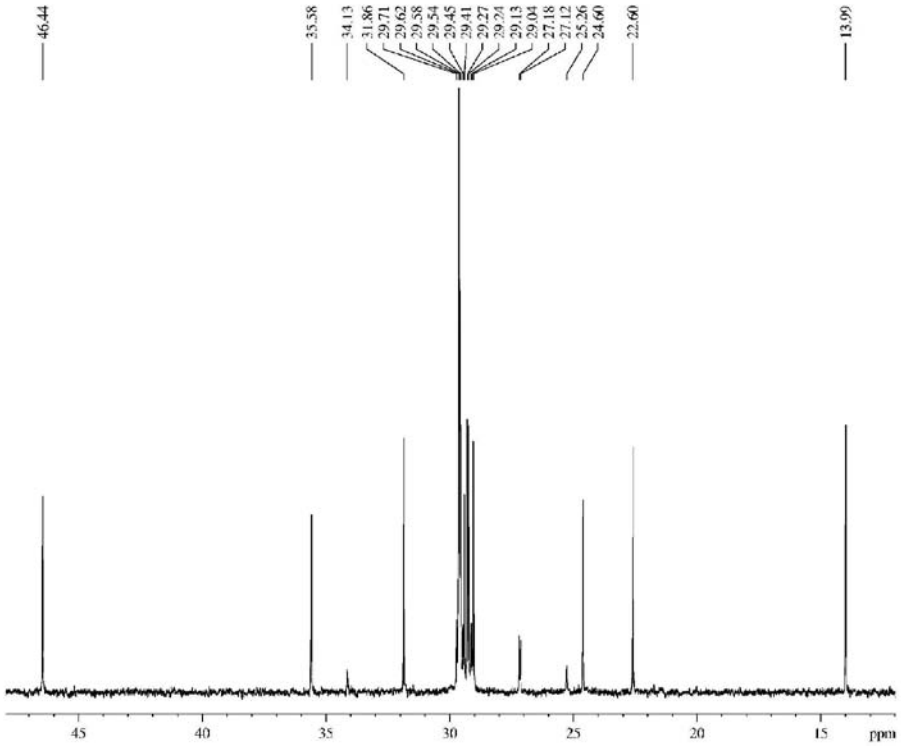


**Figure S56.** $^{13}C$ NMR spectrum of compound **12c** ($CDCl_3$, 100 MHz).

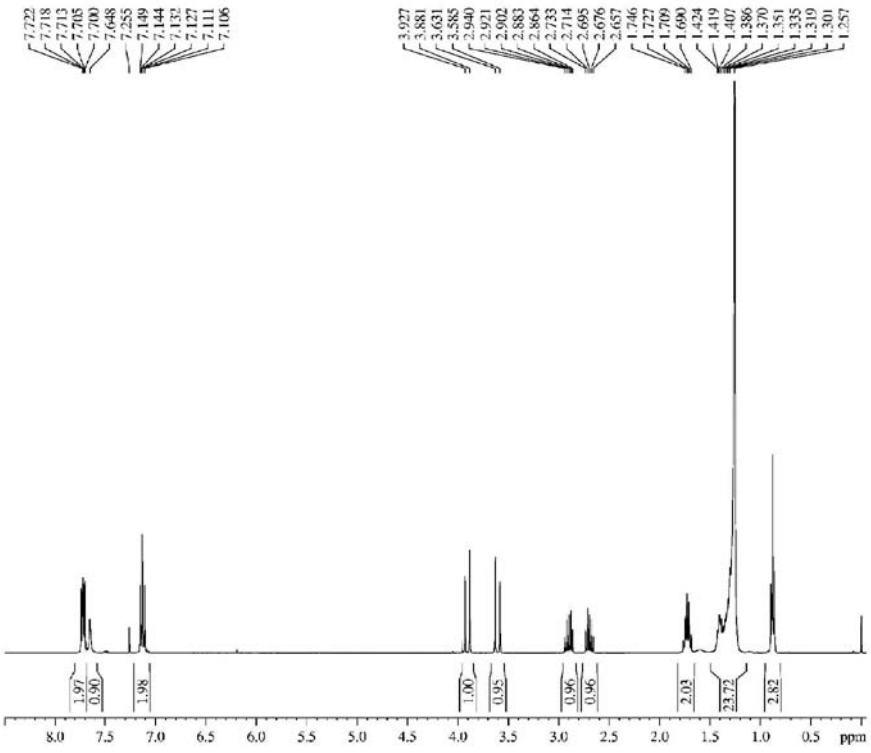


**Figure S57.** $^1$H NMR spectrum of compound **13a** ($CDCl_3$, 400 MHz).

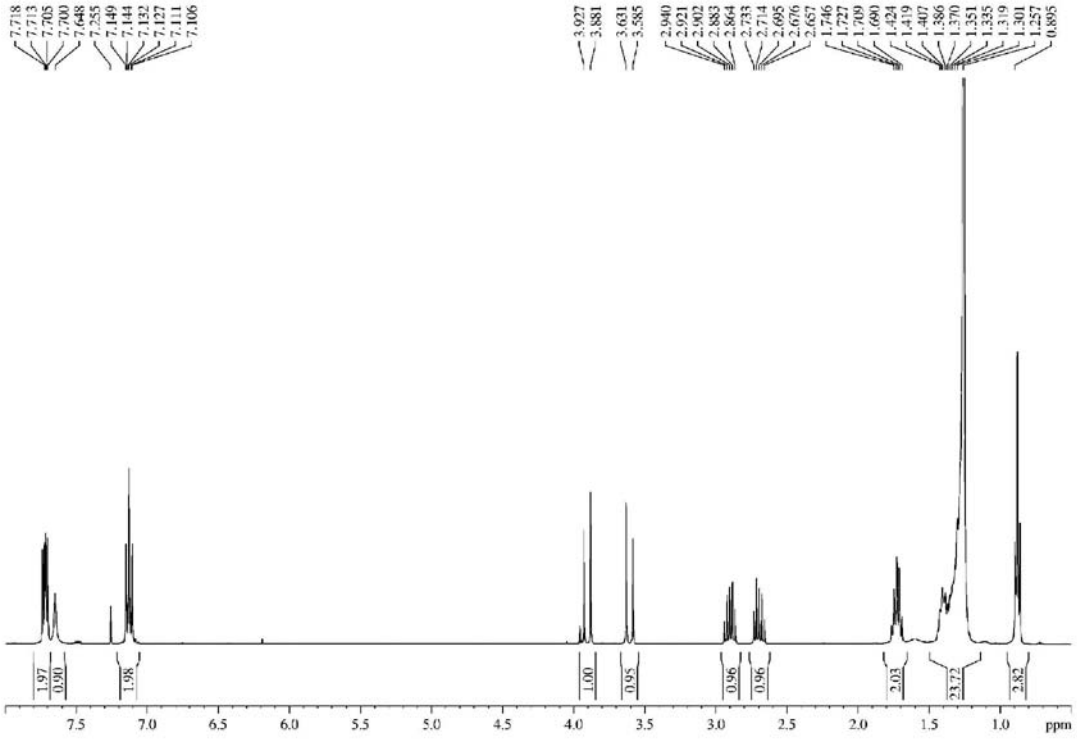


**Figure S58.** $^1$H NMR spectrum of compound **13a** ($CDCl_3$, 400 MHz).

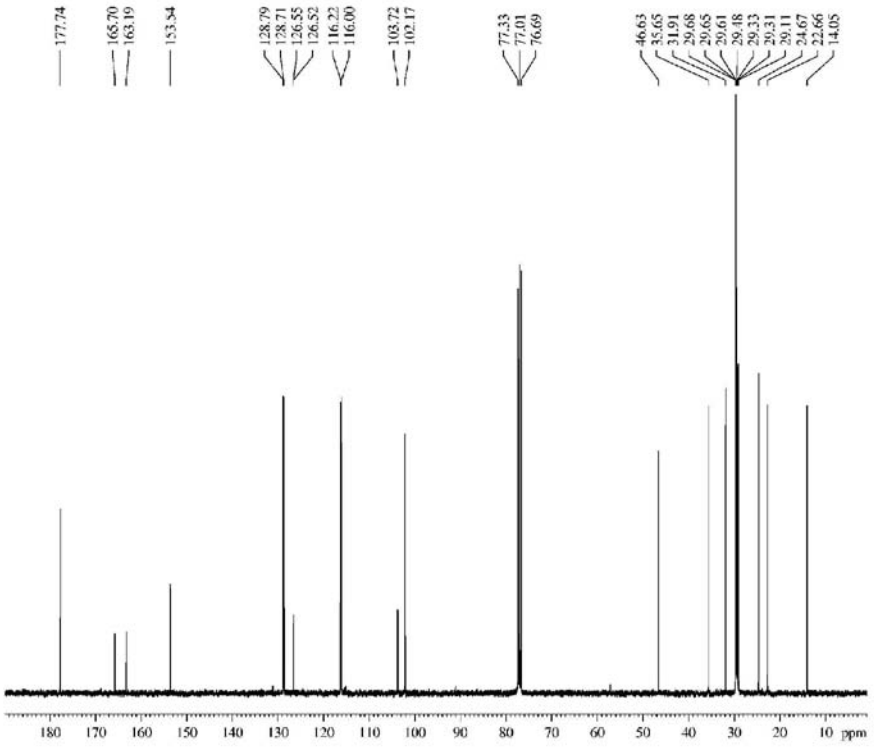


**Figure S59.** $^{13}C$ NMR spectrum of compound **13a** ($CDCl_3$, 100 MHz).

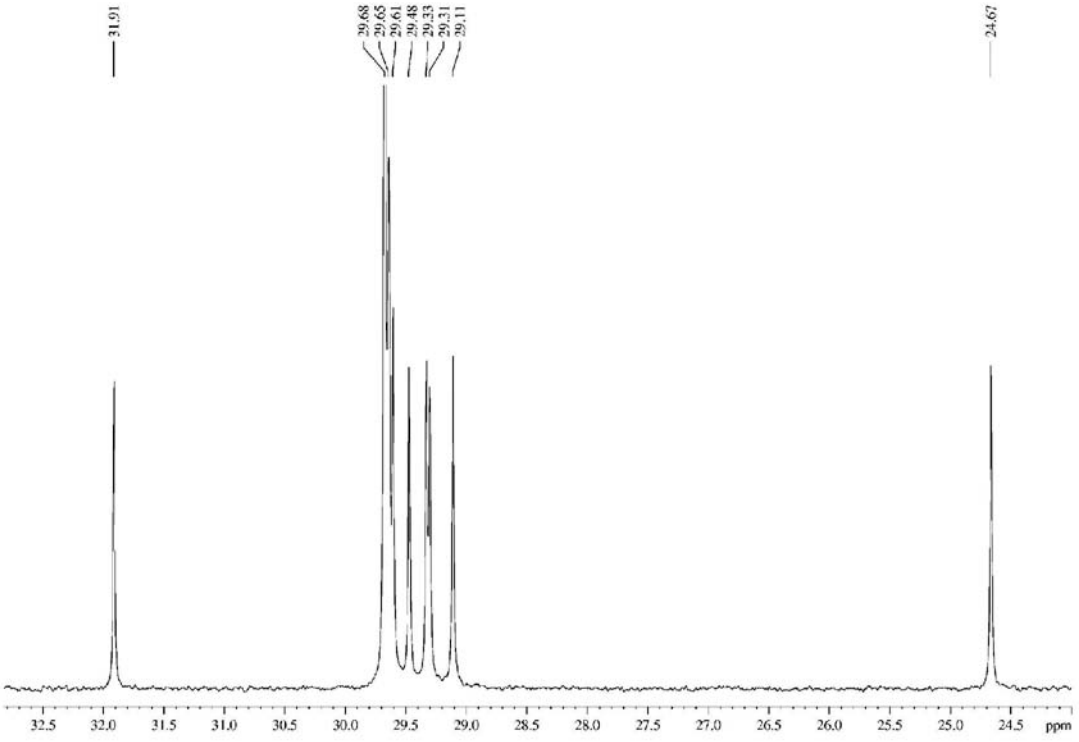


**Figure S60.** $^{13}C$ NMR spectrum of compound **13a** ($CDCl_3$, 100 MHz).

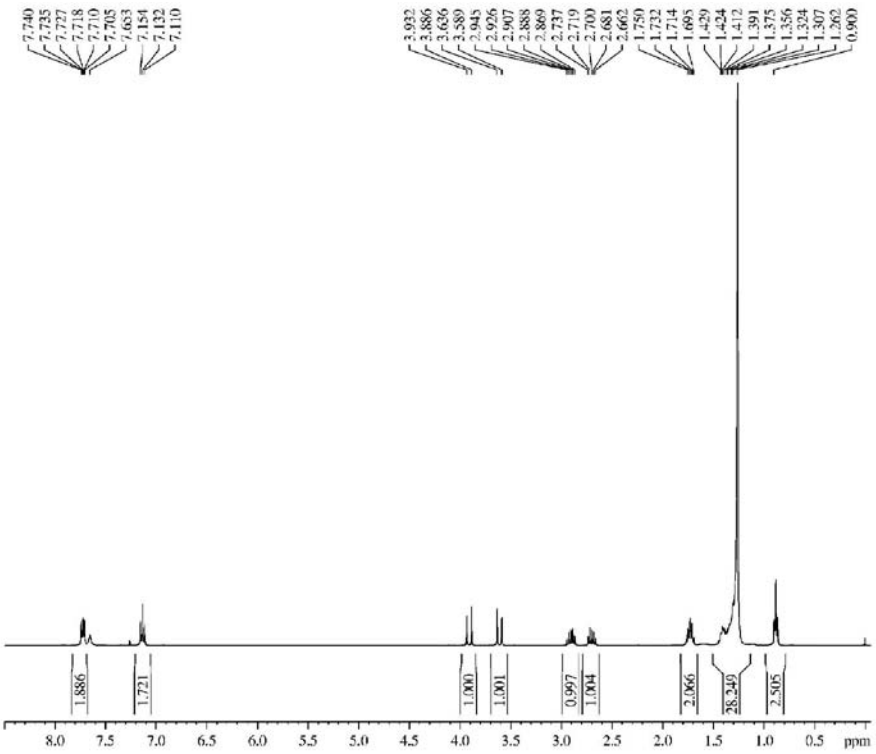


**Figure S61.** $^1$H NMR spectrum of compound **13b** ($CDCl_3$, 400 MHz).

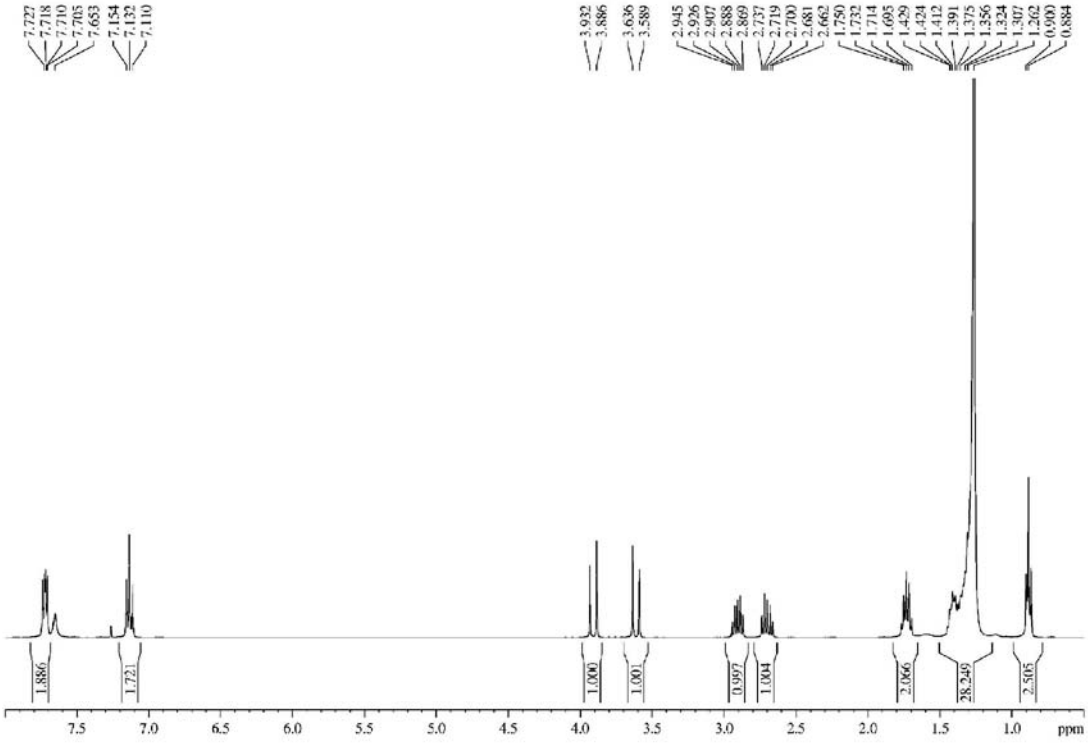


**Figure S62.** $^1$H NMR spectrum of compound **13b** ($CDCl_3$, 400 MHz).

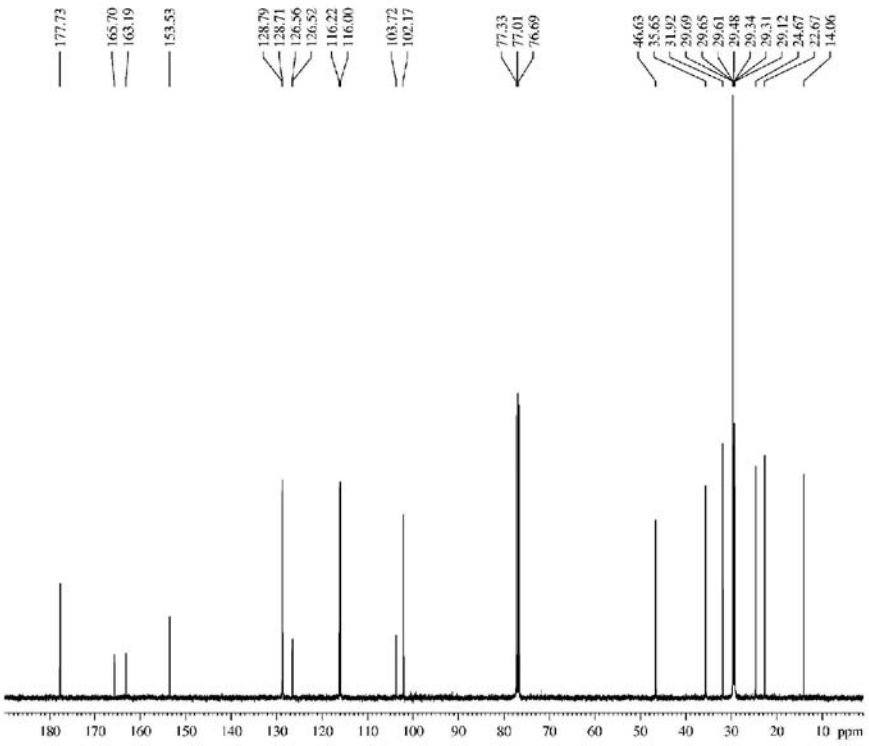


**Figure S63.** $^{13}C$ NMR spectrum of compound **13b** ($CDCl_3$, 100 MHz).

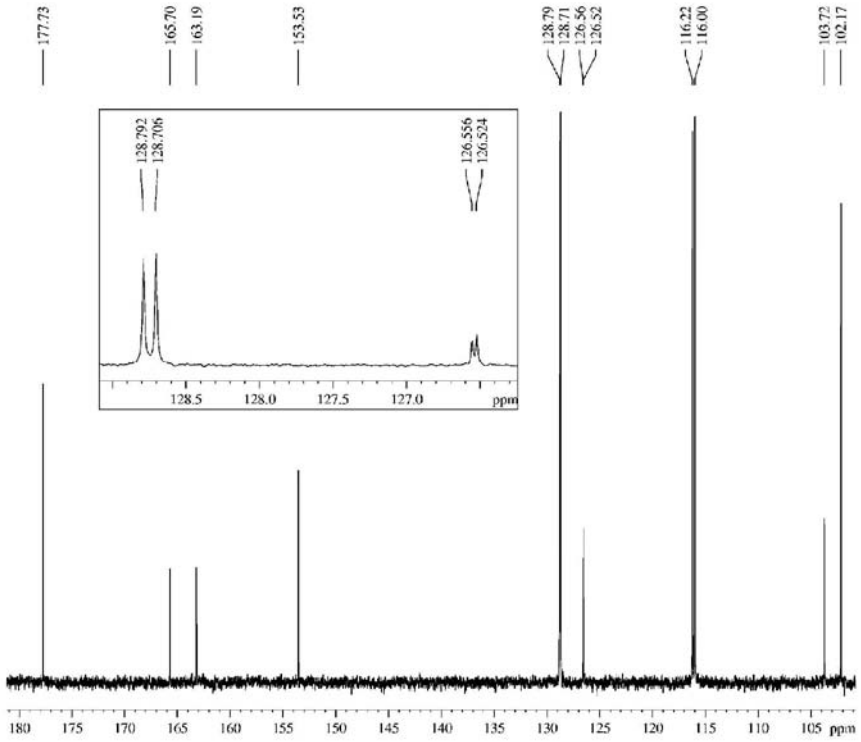


**Figure S64.** $^{13}C$ NMR spectrum of compound **13b** ($CDCl_3$, 100 MHz).

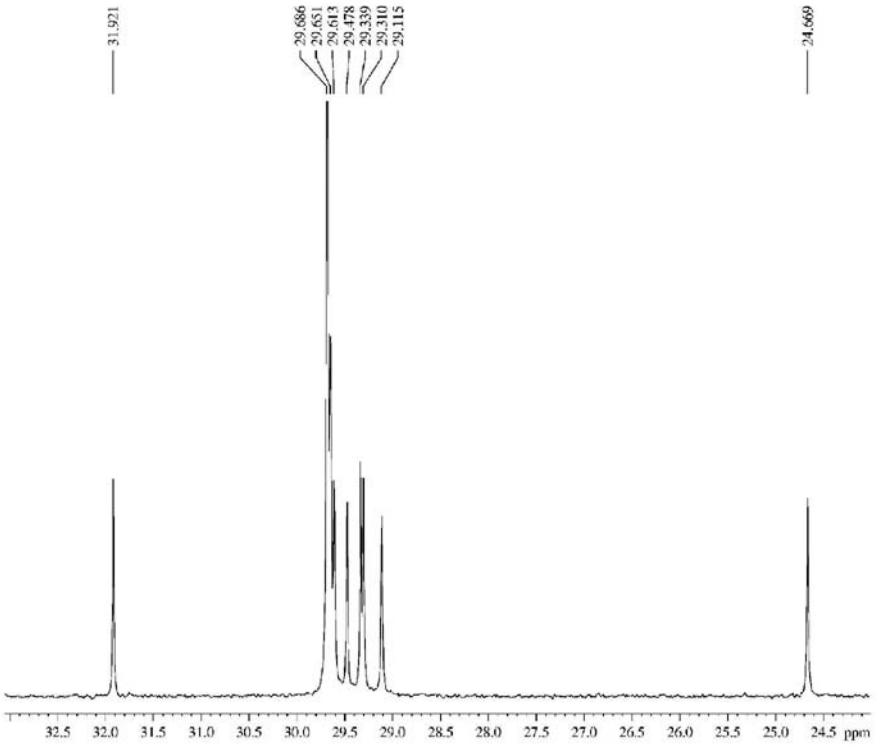


**Figure S65.** $^{13}C$ NMR spectrum of compound **13b** ($CDCl_3$, 100 MHz).

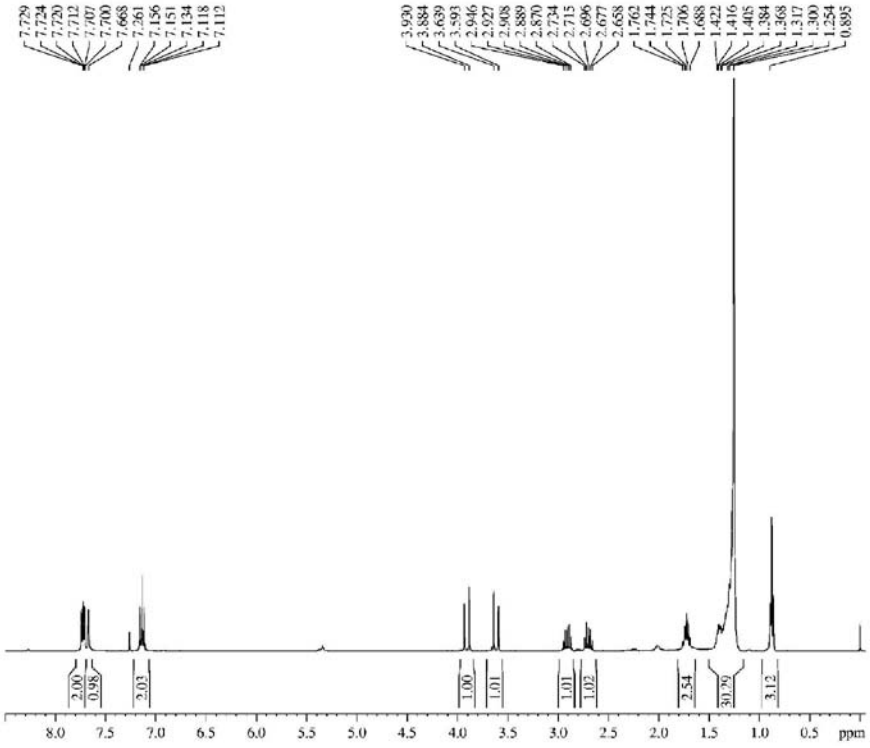


**Figure S66.** $^{1}H$ NMR spectrum of compound **13c** ($CDCl_3$, 400 MHz).

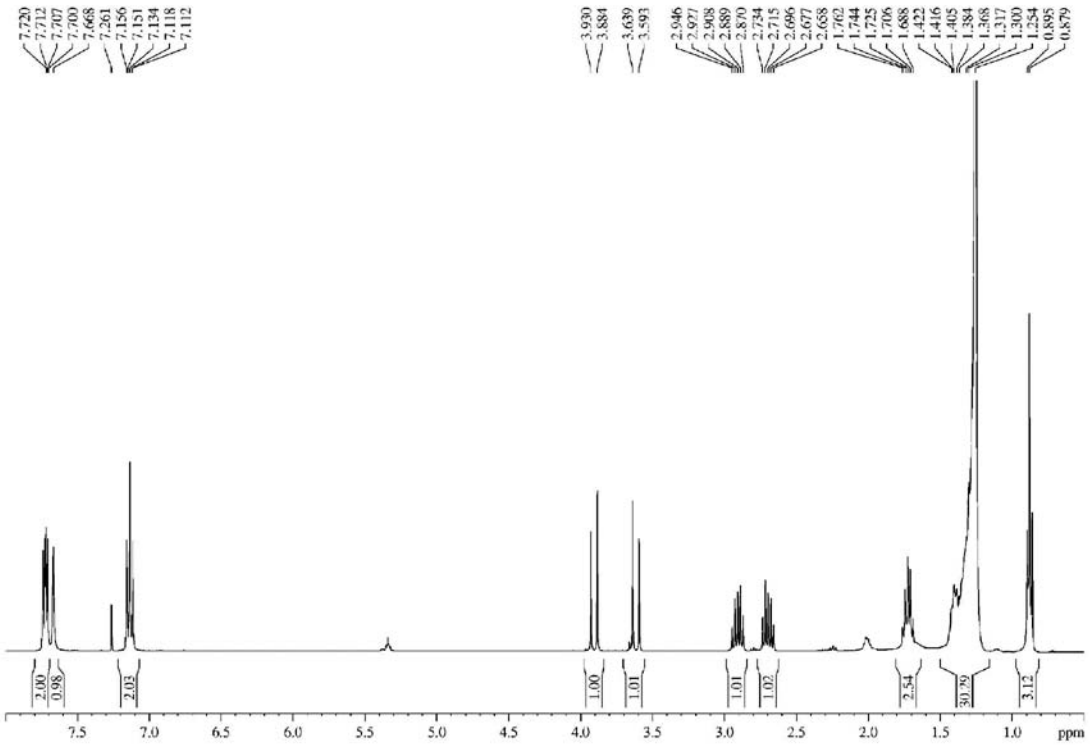


**Figure S67.** $^{1}$H NMR spectrum of compound **13c** ($CDCl_3$, 400 MHz).

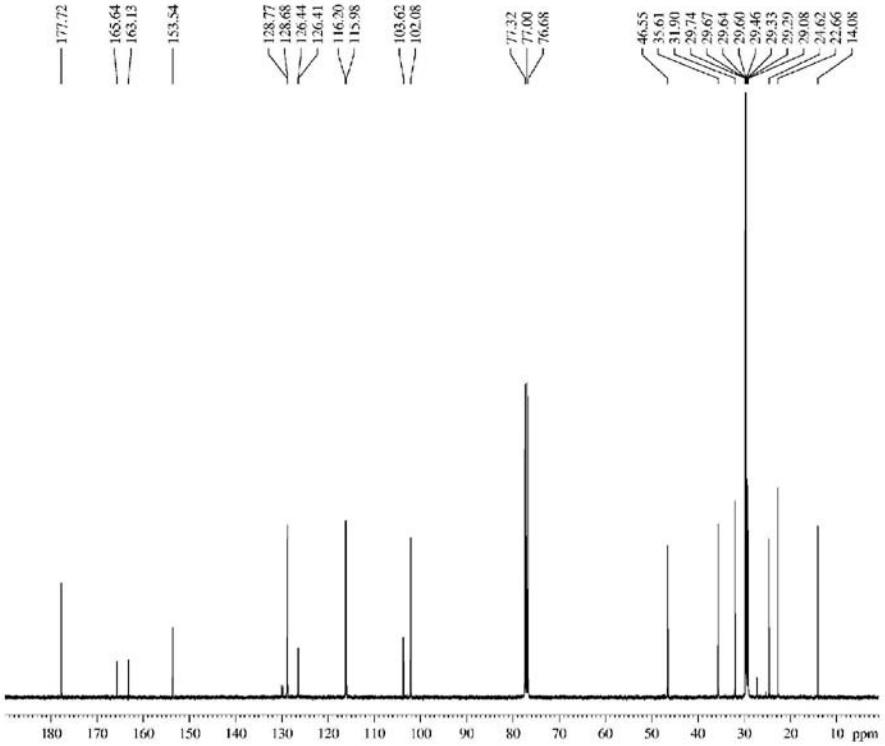


**Figure S68.** $^{13}$C NMR spectrum of compound **13c** ($CDC_{13}$, 100 MHz).

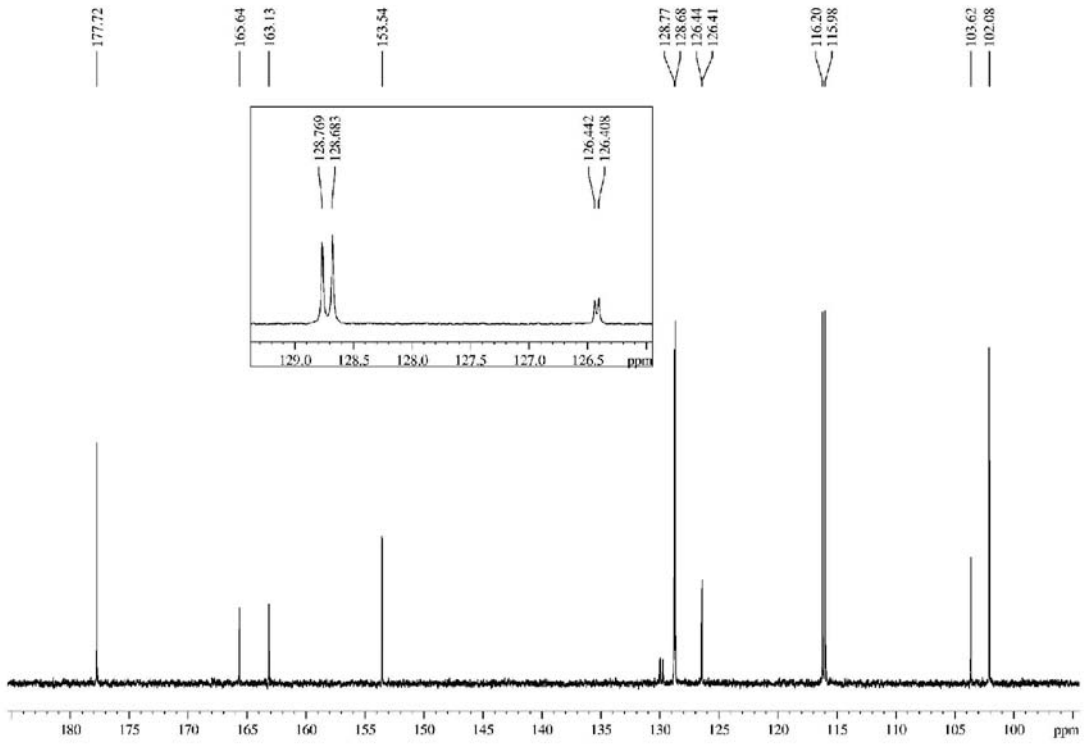


**Figure S69.** $^{13}C$ NMR spectrum of compound **13c** ($CDC_{13}$, 100 MHz).

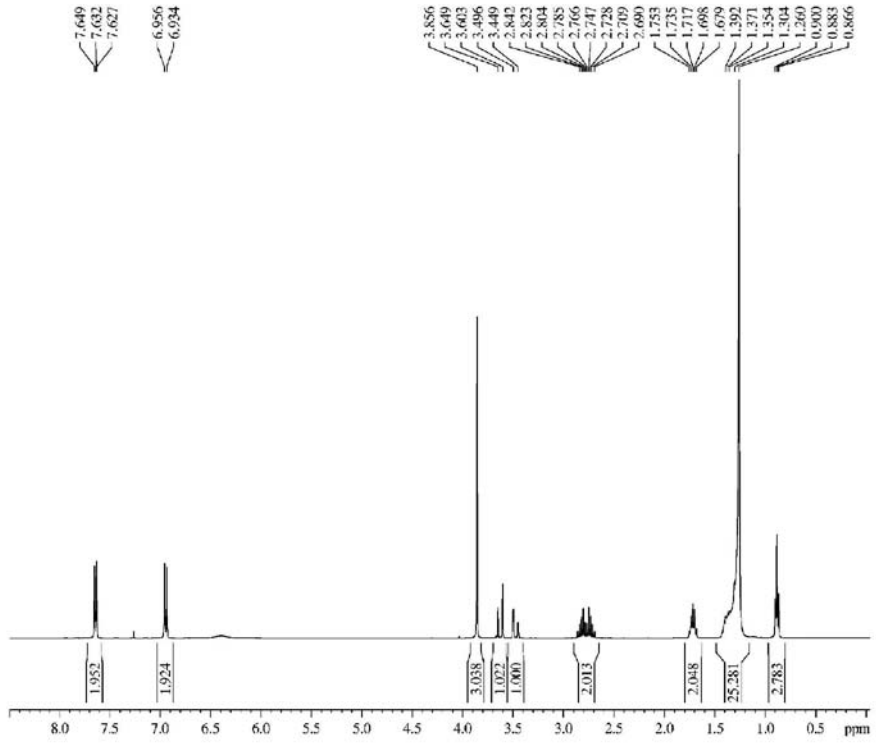


**Figure S70.** $^{1}H$ NMR spectrum of compound **14a** ($CDCl_3$, 400 MHz).

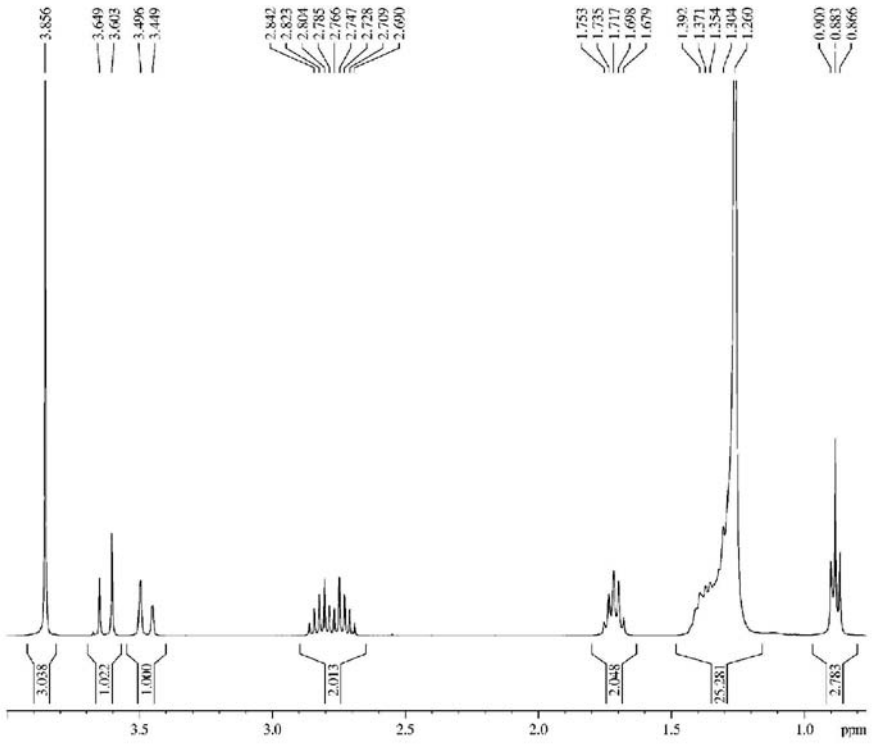


**Figure S71.** $^{1}$H NMR spectrum of compound **14a** ($CDCl_3$, 400 MHz).

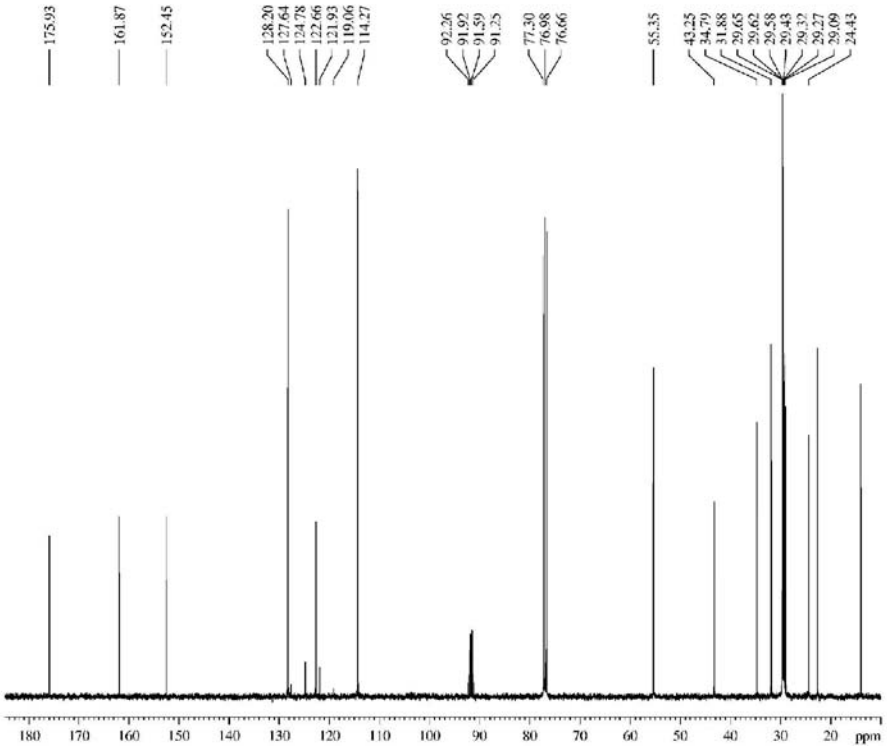


**Figure S72.** $^{13}$C NMR spectrum of compound **14a** ($CDCl_3$, 100 MHz).

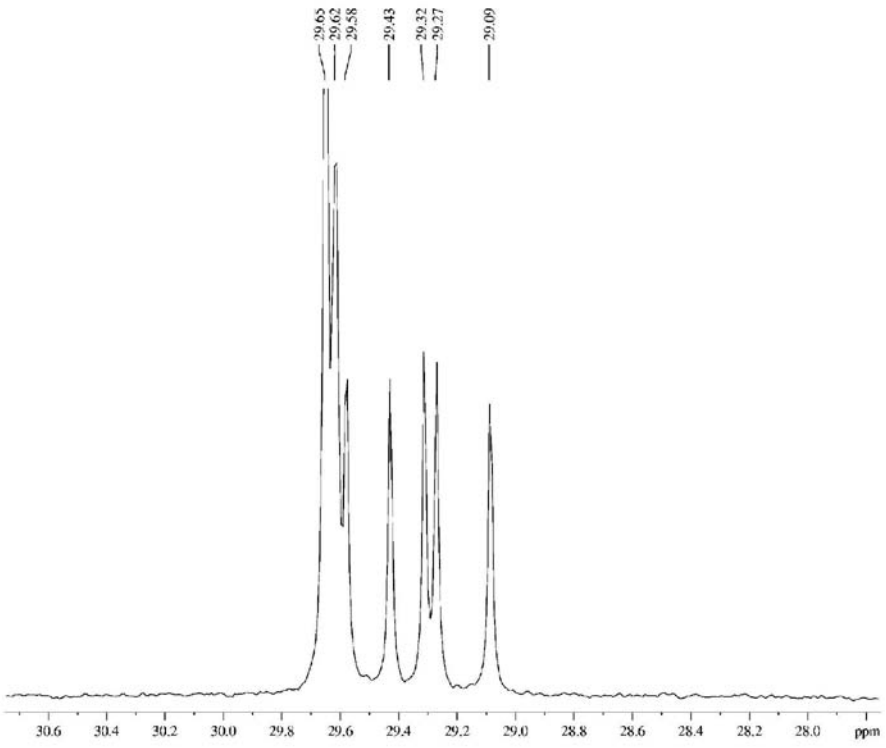


**Figure S73.** $^{13}C$ NMR spectrum of compound **14a** ($CDCl_3$, 100 MHz).

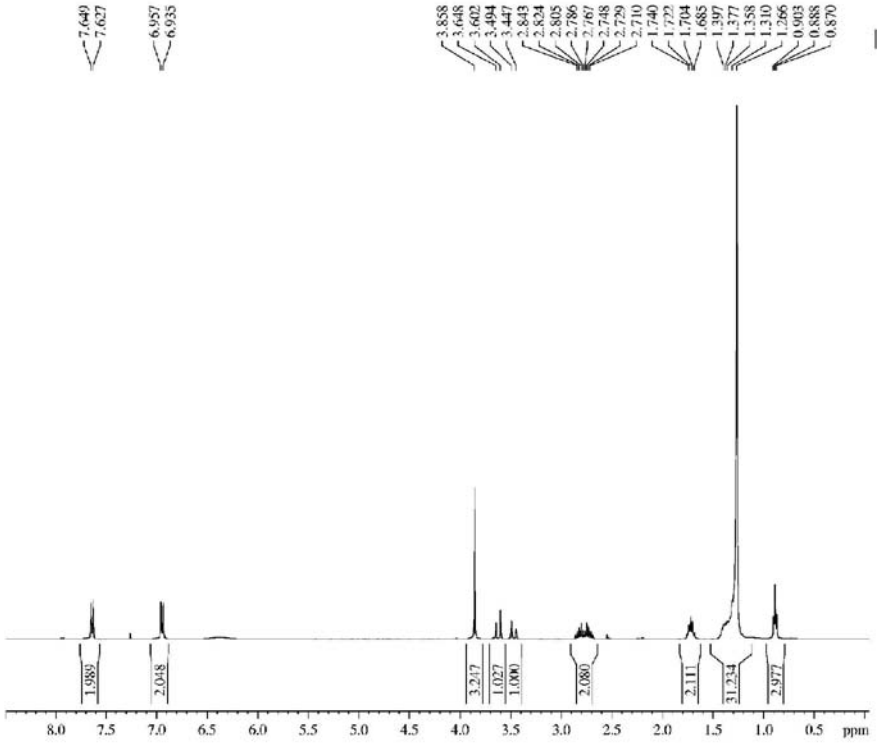


**Figure S74.** $^{1}H$ NMR spectrum of compound **14b** ($CDCl_3$, 400 MHz).

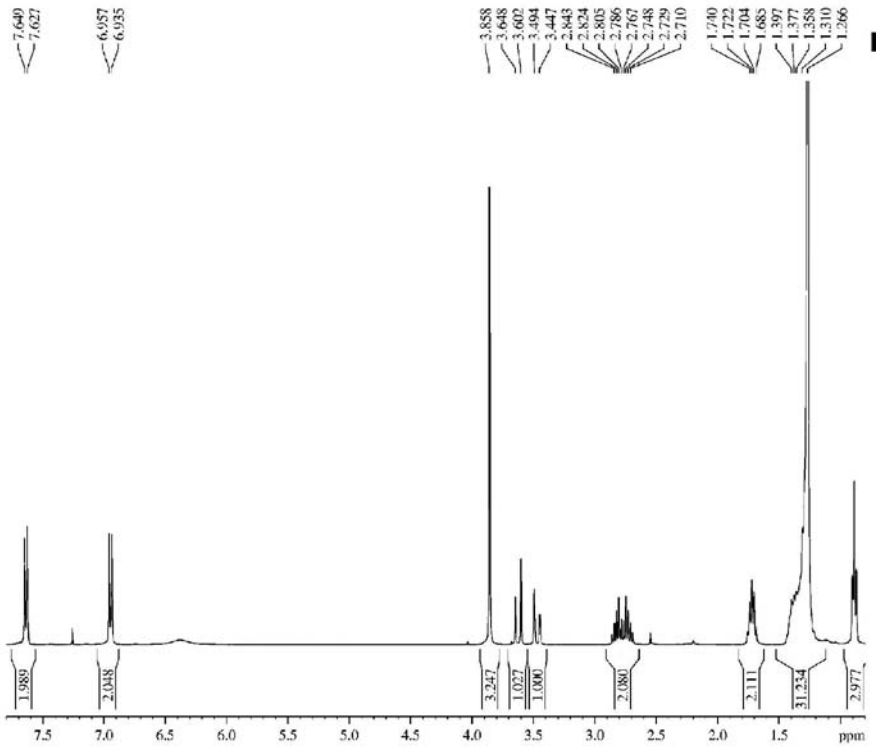


**Figure S75.** $^{1}$H NMR spectrum of compound **14b** ($CDCl_3$, 400 MHz).

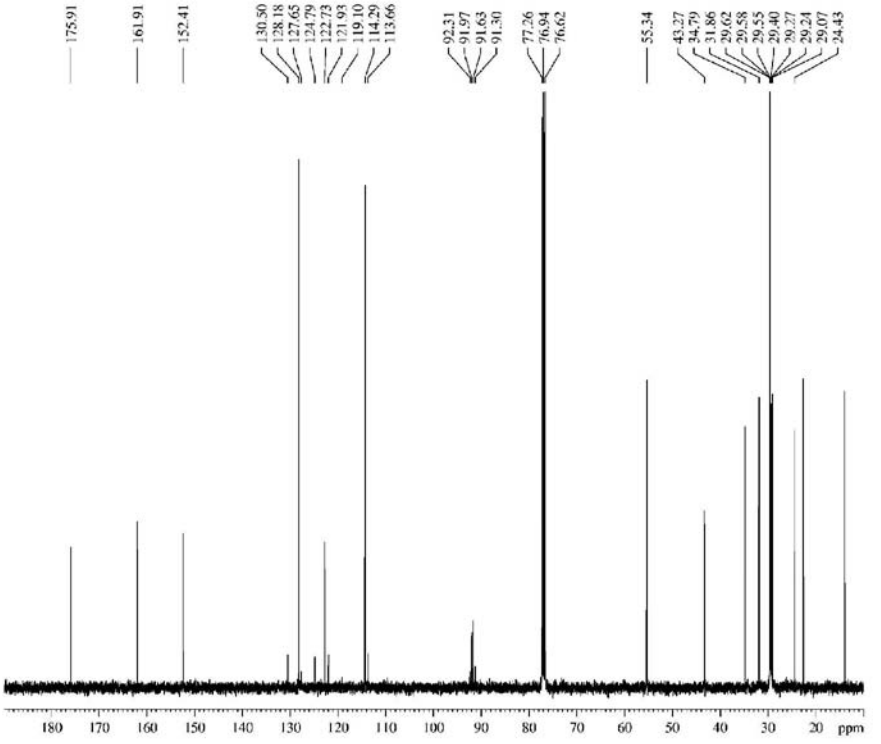


**Figure S76.** $^{13}$C NMR spectrum of compound **14b** ($CDCl_3$, 100 MHz).

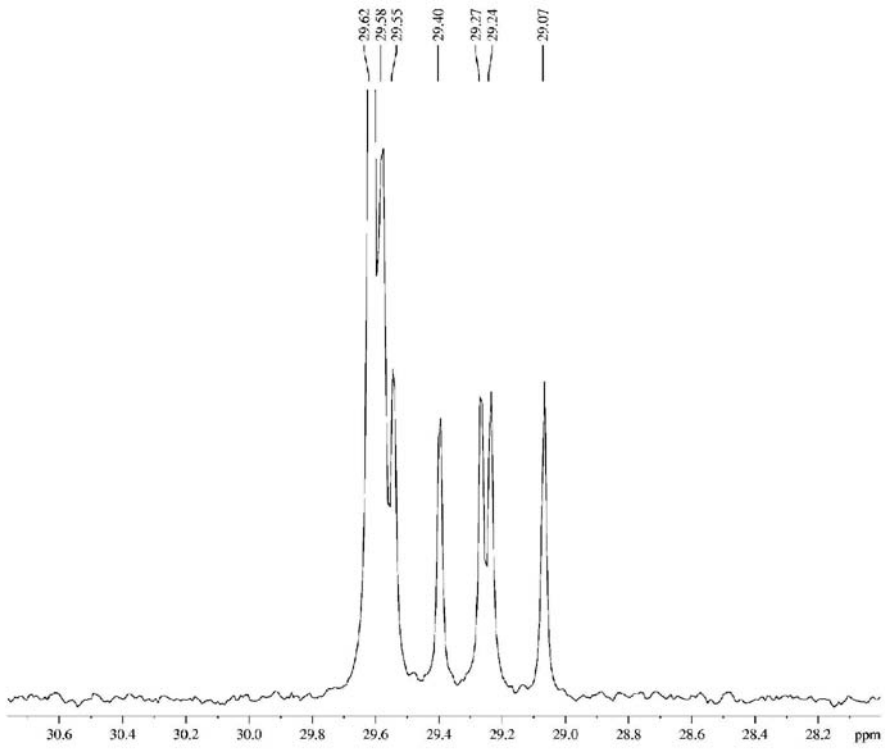


**Figure S77.** $^{13}C$ NMR spectrum of compound **14b** ($CDCl_3$, 100 MHz).

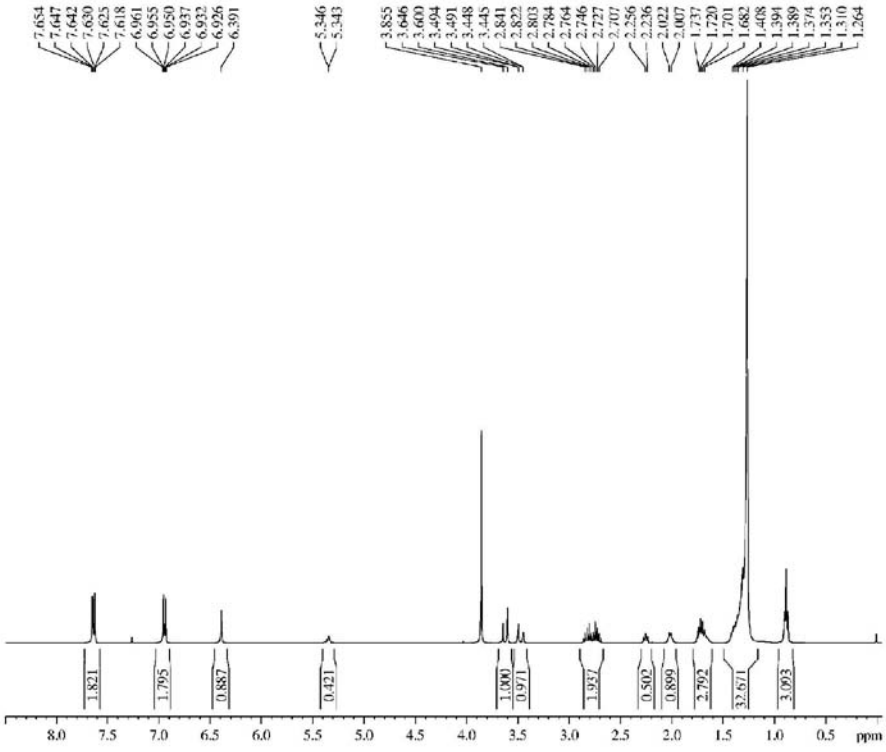


**Figure S78.** $^{1}H$ NMR spectrum of compound **14c** ($CDCl_3$, 400 MHz).

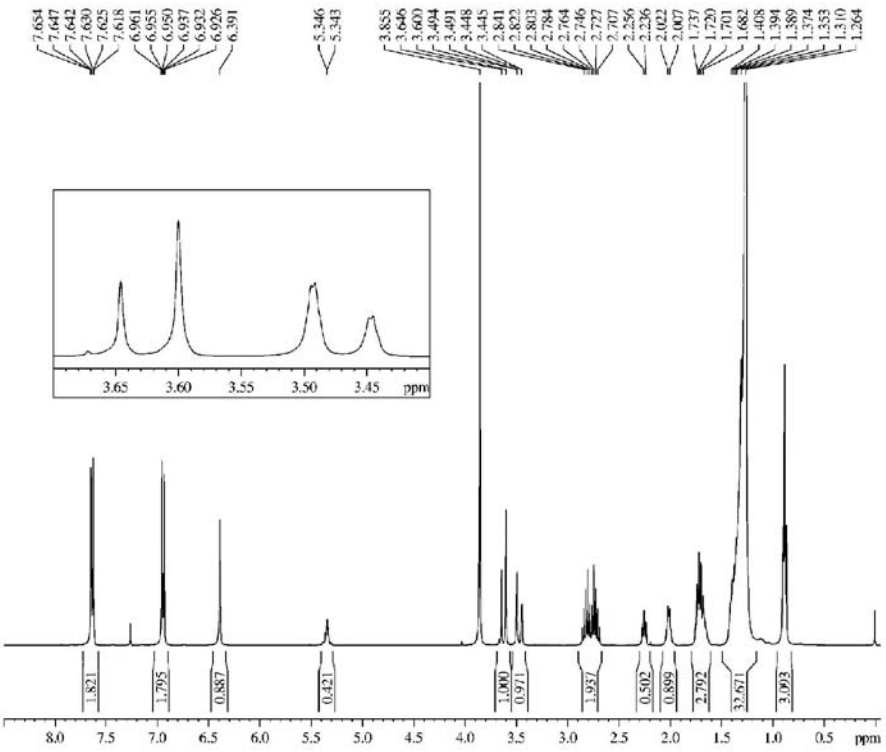

**Figure S79.** $^{1}$H NMR spectrum of compound **14c** ($CDCl_3$, 400 MHz).

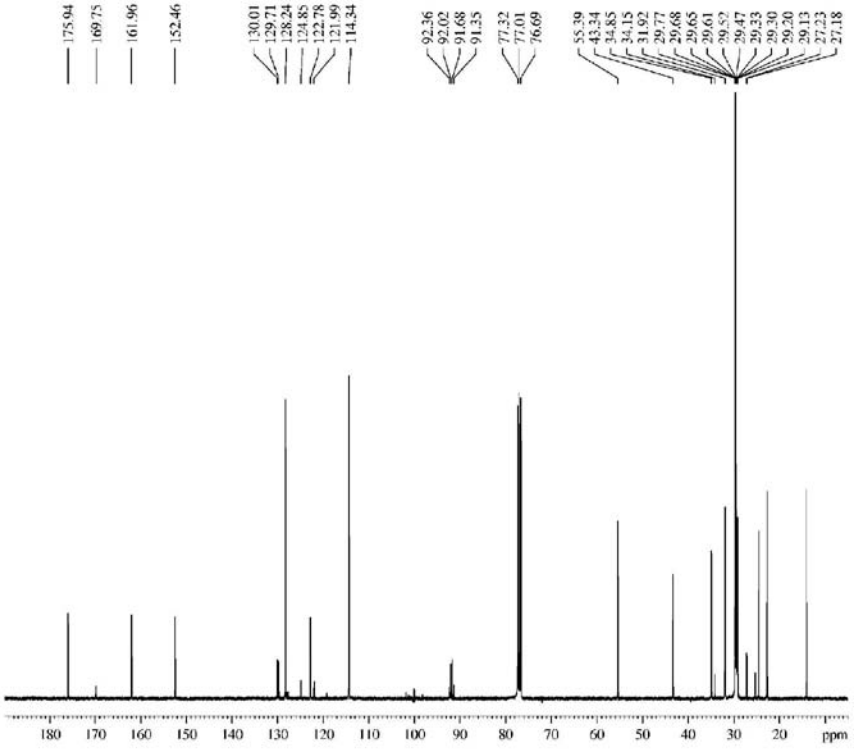

**Figure S80.** $^{13}$C NMR spectrum of compound **14c** ($CDCl_3$, 100 MHz).

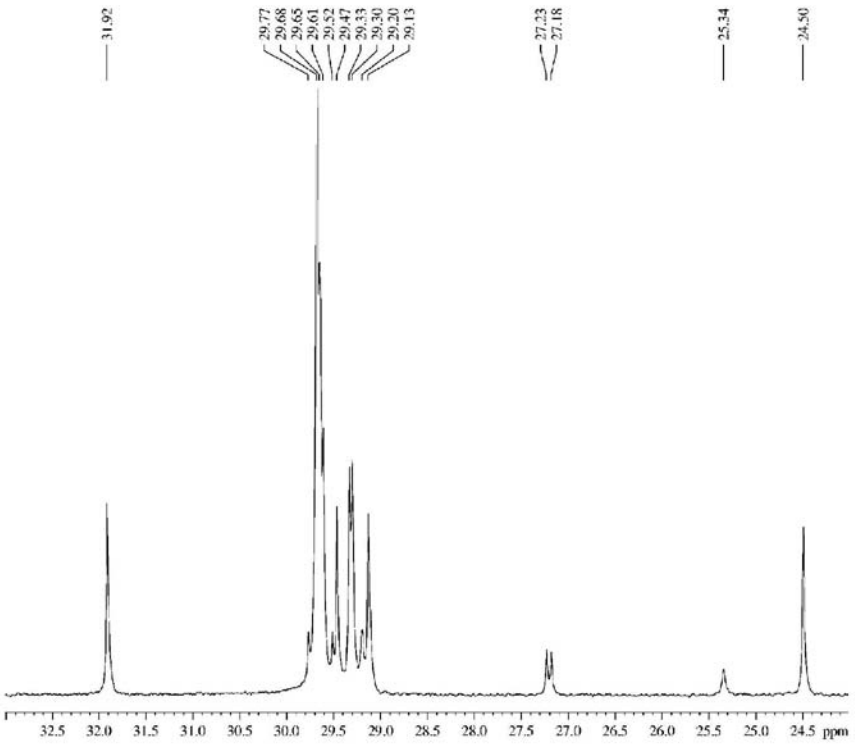


**Figure S81.** $^{13}C$ NMR spectrum of compound **14c** ($CDCl_3$, 100 MHz).

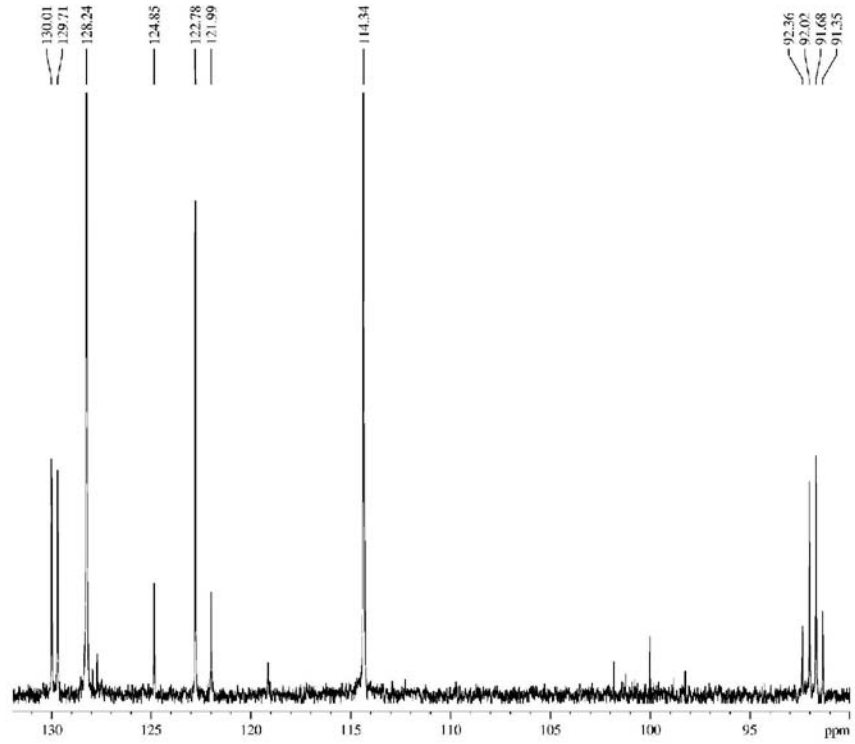


**Figure S82.** $^{13}C$ NMR spectrum of compound **14c** ($CDCl_3$, 100 MHz).

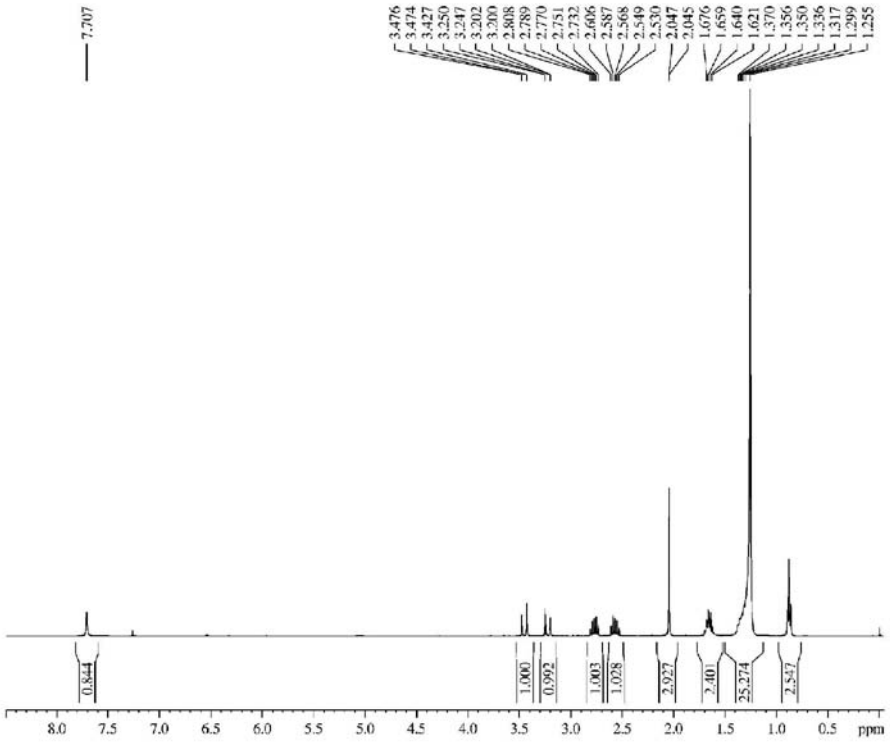


**Figure S83.** $^1$H NMR spectrum of compound **15a** ($CDCl_3$, 400 MHz).

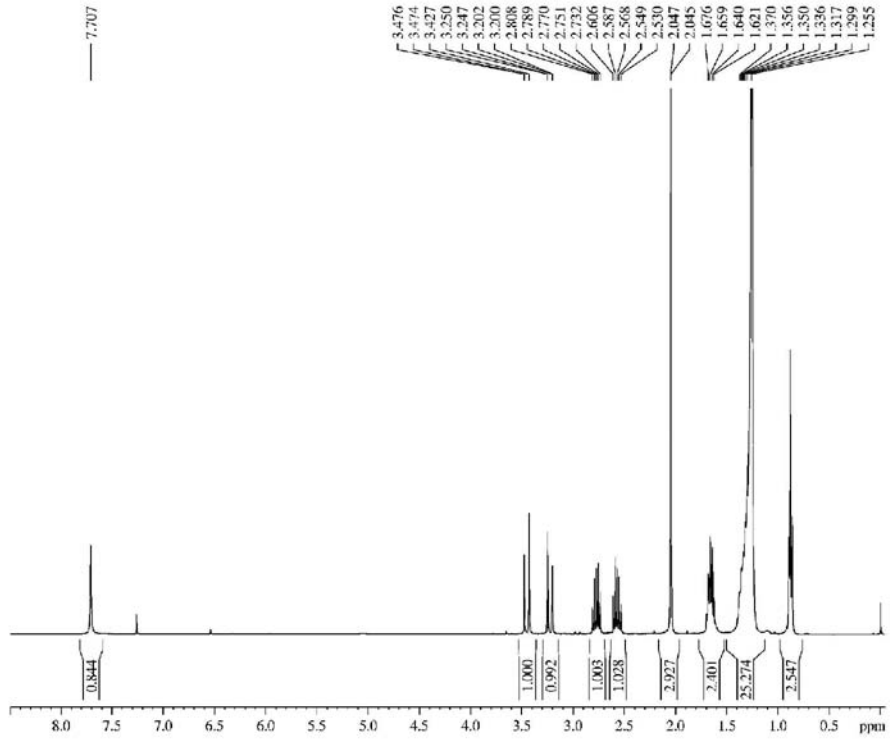


**Figure S84.** $^1$H NMR spectrum of compound **15a** ($CDCl_3$, 400 MHz).

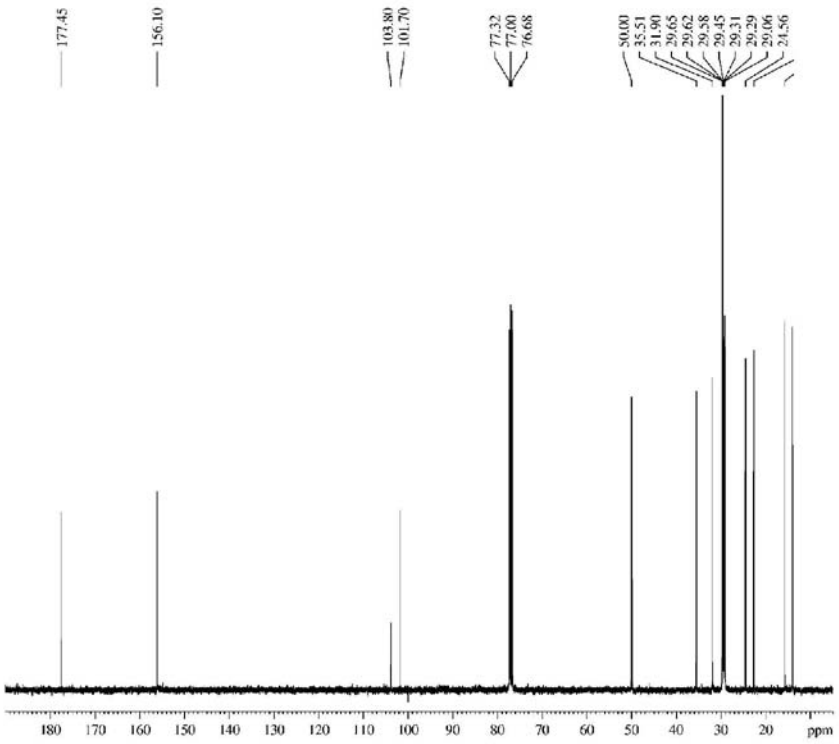


**Figure S85.** $^{13}C$ NMR spectrum of compound **15a** ($CDCl_3$, 100 MHz).

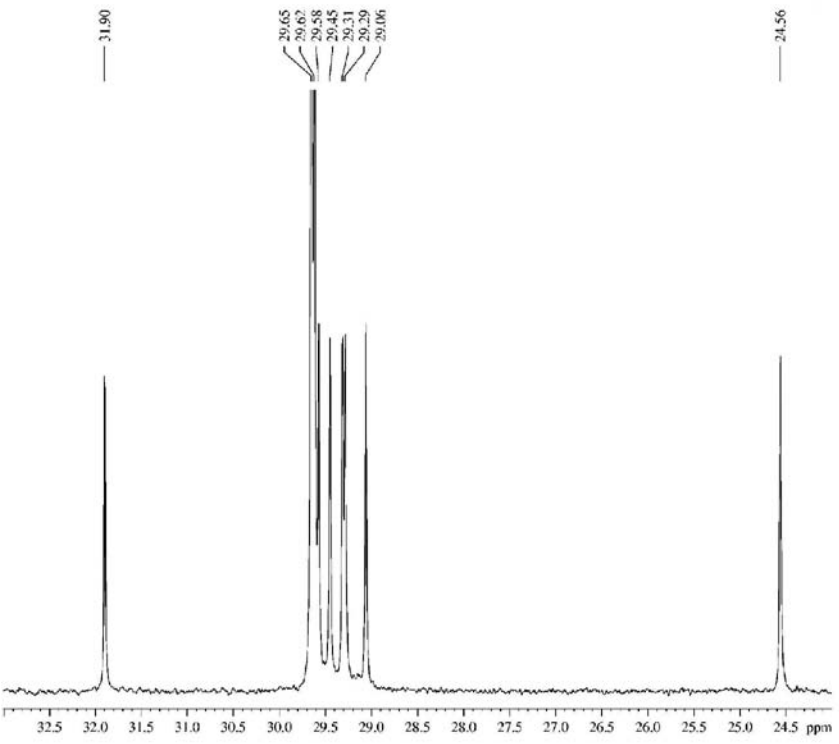


**Figure S86.** $^{13}C$ NMR spectrum of compound **15a** ($CDCl_3$, 100 MHz).

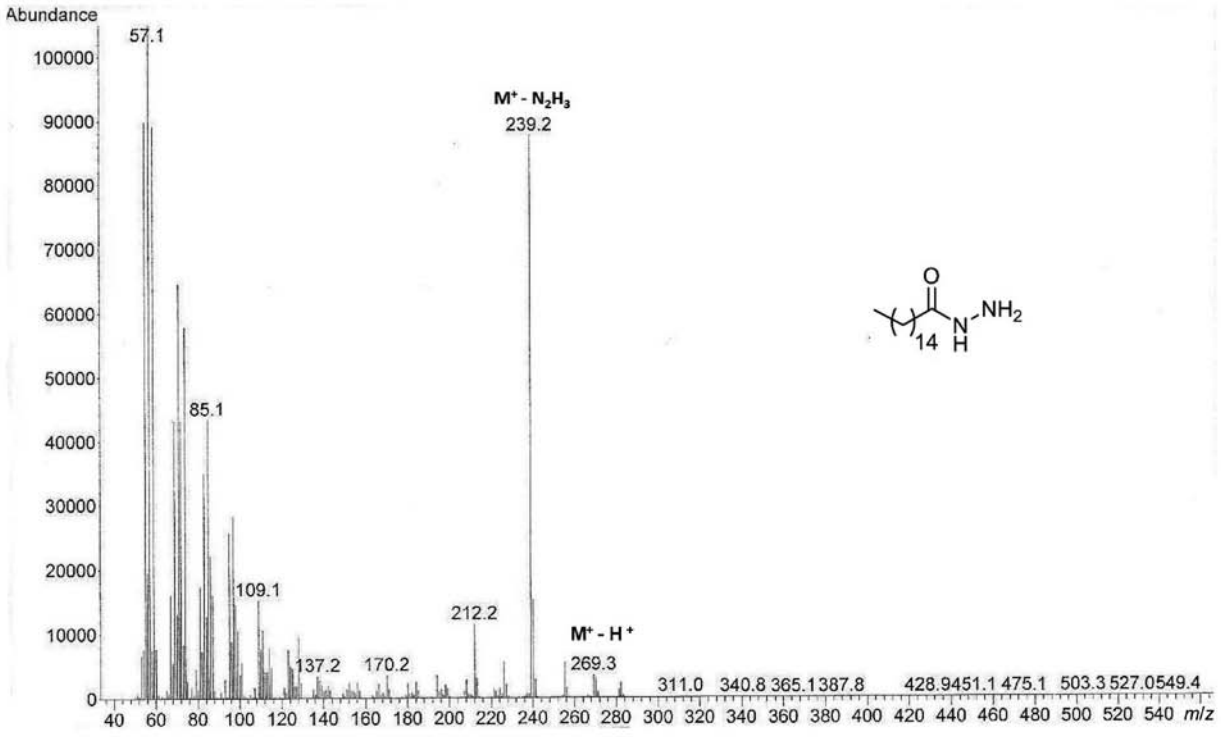


**Figura S87.** Mass spectrum of compound **3a**.

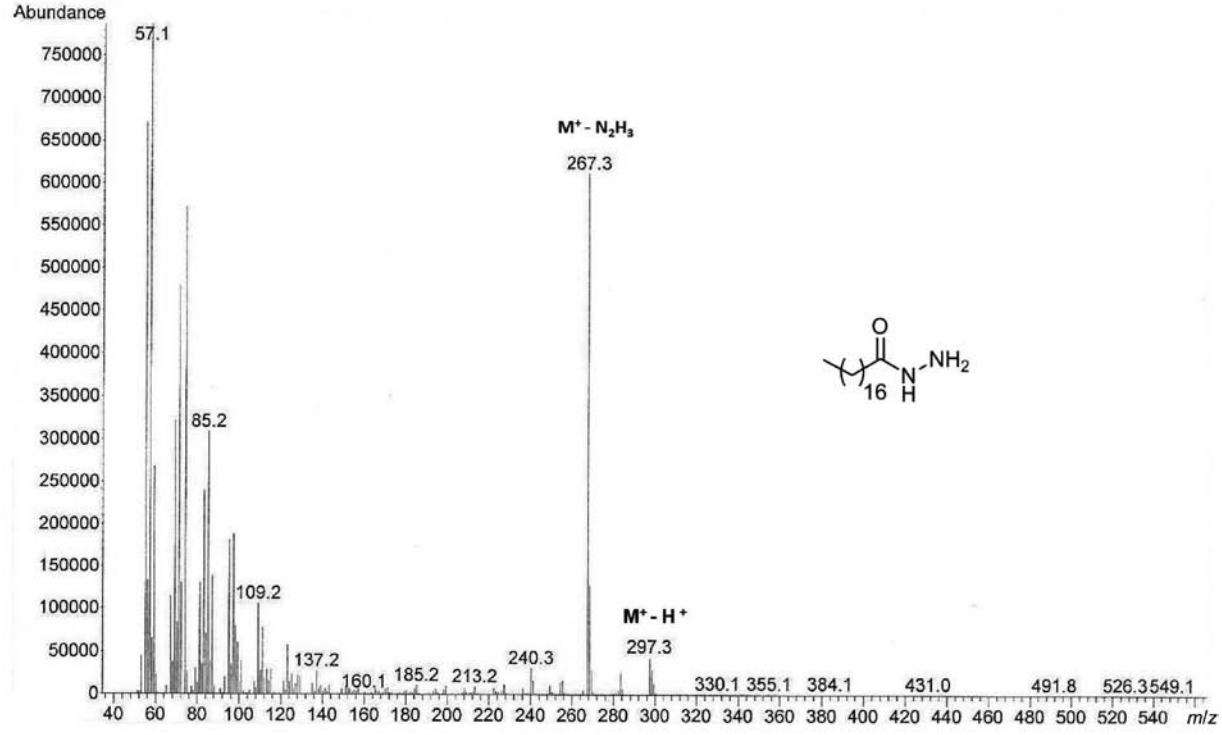


**Figura S88.** Mass spectrum of compound **3b**.

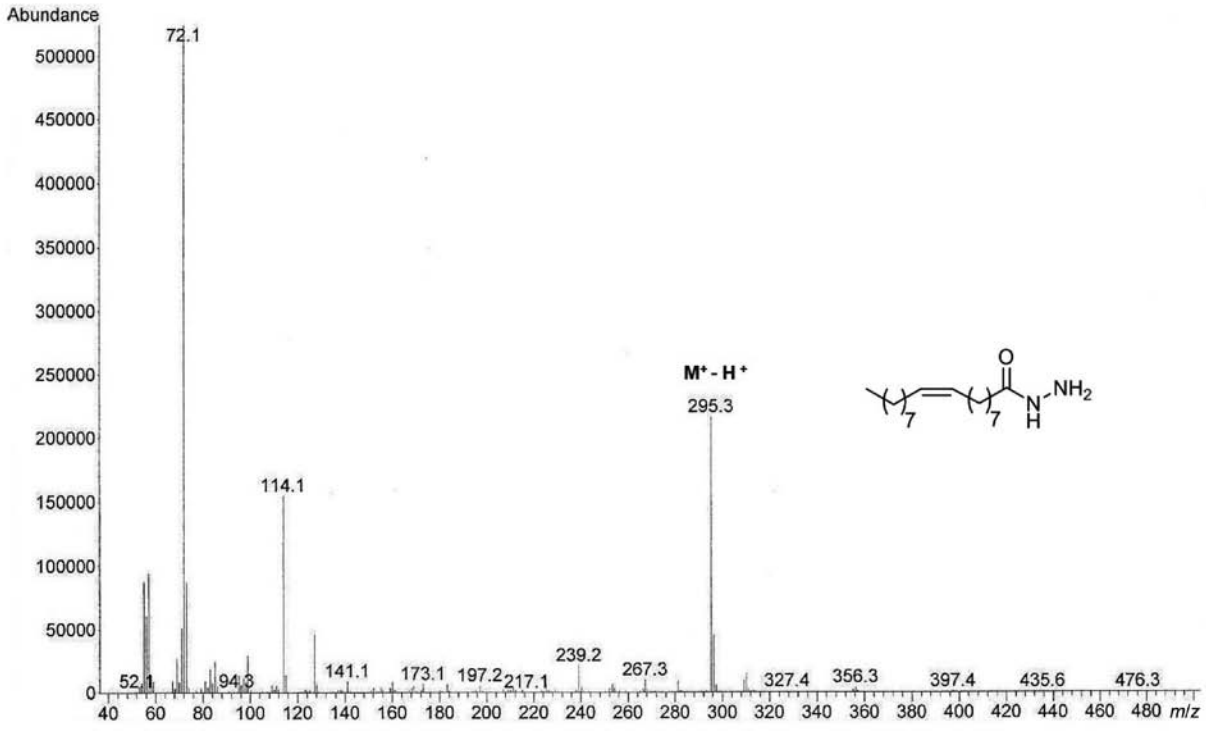


**Figure S89.** Mass spectrum of compound **3c**.