

Supporting Information for:  
**Silver-Catalyzed Carbon Dioxide Fixation on Alkynylindenes**

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### 1. General

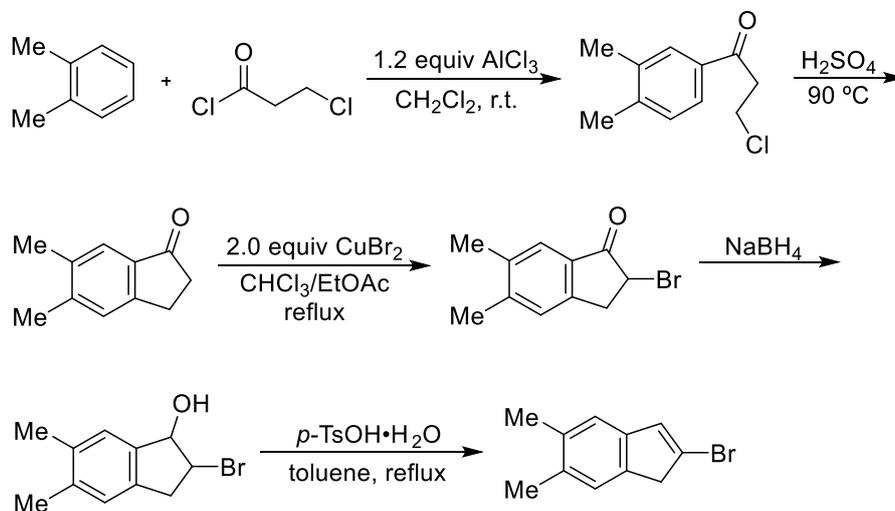
The <sup>1</sup>H and <sup>13</sup>C NMR spectra were recorded with a JEOL model AL-400, ECS-400 or ECX-400 spectrometers using CDCl<sub>3</sub> as the solvent. The IR spectra were measured with a Thermo Electron Corporation model NICOLET 6700 FT-IR spectrometer. The melting points were measured with a Stanford Research Systems MPA100. The ESI high resolution mass spectra were obtained using a Waters LCT Premier XE mass spectrometer. Column chromatography was conducted on silica gel (CHROMATOREX PSQ 100B Fuji Silysia). The dehydrated toluene and 1,8-diazabicyclo[5.4.0]undec-7-ene (DBU) were purchased from FUJIFILM Wako Pure Chemical Co. and used without further purification. The dehydrated CH<sub>2</sub>Cl<sub>2</sub>, dehydrated tetrahydrofuran (THF), the solution of *n*-BuLi (1.6 M in hexane), were purchased from Kanto Chemical Co., Inc.

### 2. General procedure for synthesis of starting materials and Ag-catalyzed CO<sub>2</sub> fixation

#### 2.1 Synthesis of starting materials.

##### Preparation of 2-bromo-5,6-dimethyl-1*H*-indene (S1)

2-bromo-5,6-dimethyl-1*H*-indene **S1** was prepared by the following procedure from 5,6-dimethyl-1-indanone. 5,6-dimethyl-1-indanone was prepared by the following procedure.<sup>1,2</sup>



### Step 1

Under N<sub>2</sub> atmosphere, AlCl<sub>3</sub> (16.2 g, 120 mmol) was added to vigorously stirred solution of *o*-xylene (12.1 mL, 100 mol) in CH<sub>2</sub>Cl<sub>2</sub> (60 mL) at 0 °C. To the suspension was added dropwise a solution of 3-chloropropionyl chloride (9.55 mL, 100 mmol) in CH<sub>2</sub>Cl<sub>2</sub> (50 mL). The reaction mixture was warmed to room temperature and stirred for 1 h. Then, the reaction mixture was quenched with ice water (200 mL). The organic layer was extracted three times with CHCl<sub>3</sub> and washed with water, sat. NaHCO<sub>3</sub> aq., and water. The combined organic layer was dried over Na<sub>2</sub>SO<sub>4</sub>, and the solvent was removed under reduced pressure. The crude was directly used for next step without further purification.

To the crude was added concentrated H<sub>2</sub>SO<sub>4</sub> (50 mL). The reaction mixture was heated at 85-90 °C (heating mantle) until the end of gas evolution. Then the reaction mixture was cooled to room temperature, and carefully poured into ice water (200 mL), and extracted with CHCl<sub>3</sub>. The organic layer was washed with sat. NaHCO<sub>3</sub> aq. and water. The combined organic layer was dried over Na<sub>2</sub>SO<sub>4</sub>, and the solvent was removed under reduced pressure. The crude was directly used for next step without further purification.

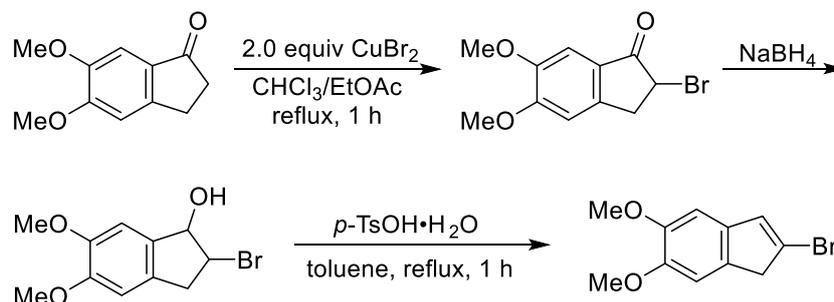
### Step 2

Copper (II) bromide (21.6 g, 96.7 mmol) and the crude were dissolved in ethyl acetate (48 mL) and CHCl<sub>3</sub> (48 mL). This suspension was heated at reflux (heating mantle). After a colour of the suspension was changed to pink, copper (II) bromide (21.6 g, 96.7 mmol) was added. The reaction mixture was stirred until gas evolution was ceased. The reaction mixture was filtered through celite, and the residue was washed with CHCl<sub>3</sub>. The filtrate was diluted by water and extracted three times with CHCl<sub>3</sub>. The combined organic layer was dried over Na<sub>2</sub>SO<sub>4</sub>, and the solvent was removed under reduced pressure. The crude was directly used for next step without further purification.

The crude was dissolved in ethanol (60 mL) and THF (90 mL) and added sodium borohydride (3.78 g, 101 mmol) at 0 °C. The reaction mixture was stirred at room temperature for 15 min. The reaction mixture was quenched with 1 M HCl aq. and extracted with CHCl<sub>3</sub>. The organic phase was separated, dried over Na<sub>2</sub>SO<sub>4</sub>, filtered, and the filtrate was concentrated under reduced pressure to give the crude. The crude was directly used for next step without further purification.

The crude was dissolved in toluene (20 mL) and TsOH·H<sub>2</sub>O (571 mg, 3.00 mmol) was added. The reaction mixture was heated at reflux for 5 min (heating mantle). The reaction mixture was washed with water, sat. NaHCO<sub>3</sub> aq., and water, and the organic layer was dried over Na<sub>2</sub>SO<sub>4</sub>, and the solvent was removed under reduced pressure. The crude was purified by column chromatography (SiO<sub>2</sub>, eluent: *n*-hexane) to give the 2-bromo-5,6-dimethyl-1*H*-indene **S1** as a pale brown solid (16.8 g, 82%).

## Preparation of 2-bromo-5,6-dimethoxy-1*H*-indene (**S2**)



2-bromo-5,6-dimethoxy-1*H*-indene **S2** was prepared by the following procedure.<sup>1</sup> Copper (II) bromide (4.90 g, 21.9 mmol) and 5,6-dimethoxy-1-indanone (3.84 g, 20.0 mmol) were dissolved in ethyl acetate (15 mL) and  $\text{CHCl}_3$  (15 mL). This suspension was heated at reflux (heating mantle). After a colour of the suspension was changed to pink, copper (II) bromide (4.90 g, 21.9 mmol) was added. The reaction mixture was stirred until gas evolution was ceased. The reaction mixture was filtered through celite, and the residue was washed with  $\text{CHCl}_3$ .  $\text{H}_2\text{O}$  was added to the filtrate and the mixture was extracted three times with  $\text{CHCl}_3$ . The combined organic layer was dried over  $\text{Na}_2\text{SO}_4$ , and the solvent was removed under reduced pressure to afford the crude. The crude was directly used for next step without further purification.

This crude was dissolved in ethanol (30 mL) and THF (40 mL) and added sodium borohydride (571 mg, 15.1 mmol) at 0 °C. The reaction mixture was stirred at room temperature for 15 min. The reaction mixture was quenched with 1 M HCl aq. and extracted with  $\text{CHCl}_3$ . The organic phase was separated, dried over  $\text{Na}_2\text{SO}_4$ , filtered, and the filtrate was concentrated to give the crude. The crude was directly used for next step without further purification.

This crude was dissolved in toluene (3 mL) and  $\text{TsOH}\cdot\text{H}_2\text{O}$  (60.2 mg, 0.315 mmol) was added. The reaction mixture was heated at reflux for 5 min (heating mantle). The reaction mixture was washed with water, sat.  $\text{NaHCO}_3$  aq., and water, and the organic layer was dried over  $\text{Na}_2\text{SO}_4$ , and the solvent was removed under reduced pressure. This residue was purified by column chromatography ( $\text{SiO}_2$ , eluent: *n*-hexane) to give the 2-bromo-5,6-dimethoxy-1*H*-indene **S2** as a pale brown solid (466 mg, 1.83 mmol, 9%).

## 2.2 Preparation of alkynyl indenenes

### Method 1

Compounds **1a**, **1g**, and **1m** were synthesized by Method 1.

A corresponding alkyne (5.0 mmol) was dissolved in dehydrated THF (5 mL), and the solution was cooled to -78 °C. To the solution, *n*-BuLi (5.0 mmol, 1.6 M in hexane) was added dropwise. After being stirred for 1 h at -78 °C, a solution of 2-indanone (5.0 mmol) in dehydrated THF (10 mL) was added dropwise. The reaction mixture was then allowed to stir at room temperature. The reaction was monitored by TLC. After the completion, the reaction was quenched by sat.  $\text{NH}_4\text{Cl}$  aq., and the mixture was extracted with  $\text{EtOAc}$ . The combined organic layer was dried over  $\text{Na}_2\text{SO}_4$ , and the solvent was removed under

reduced pressure. The crude was directly used for next step without further purification.

The crude product was dissolved in toluene (5 mL) and TsOH · H<sub>2</sub>O (30 mg, 0.16 mmol) was added. The reaction mixture was heated up to reflux (heating mantle). The reaction was monitored by TLC. After the completion, water was added to the reaction and the mixture was extracted with EtOAc. The combined organic layer was washed with sat. NaHCO<sub>3</sub> aq. and water. The combined organic layer was dried over Na<sub>2</sub>SO<sub>4</sub>, and the solvent was removed under reduced pressure. The was purified by column chromatography (SiO<sub>2</sub>, eluent: hexane or hexane:EtOAc = 10:1) to afford the desired alkynyl indene.

#### Method 2

Compounds **1b**, **1c**, **1e**, **1f**, **1h-1k**, **1n** and **4a-4g** were synthesized by Method 2.

The corresponding alkyne (6.0 mmol, 1.2 equiv) was added to the solution of Pd(PPh<sub>3</sub>)<sub>2</sub>Cl<sub>2</sub> (0.25 mmol, 5 mol%), CuI (0.50 mmol, 10 mol%) and corresponding 2-bromoindene (5 mmol, 1.0 equiv) in *i*-Pr<sub>2</sub>NH (5 mL). The solution was heated at 60 °C (heating mantle). The reaction was monitored by TLC. After the confirming of the consumption of the starting material, the reaction mixture was filtered through celite, then the solvent was removed under reduced pressure. The residue was purified by column chromatography (SiO<sub>2</sub>, eluent: *n*-hexane or *n*-hexane:EtOAc = 10:1) to afford the desired alkynyl indene.

#### Method3

Compounds **1d** and **1l** were synthesized by Method 3.

A corresponding alkyne (3.3 mmol) was dissolved in dehydrated THF (3 mL), and the solution was added dropwise to EtMgBr (3.3 mmol, 0.95 M in THF) solution. After being stirred for 1 h, the solution was heated to reflux. After 2 h, the solution was cooled to 0 °C, and a solution of 2-indanone (3.0 mmol) in dehydrated Et<sub>2</sub>O (3 mL) was added dropwise. The reaction mixture was then allowed to stir at room temperature. The reaction was monitored by TLC. After the completion, the reaction was quenched by NH<sub>4</sub>Cl aq., and the mixture was extracted with Et<sub>2</sub>O. The combined organic layer was dried over Na<sub>2</sub>SO<sub>4</sub>, and the solvent was removed under reduced pressure. The crude was directly used for next step without further purification.

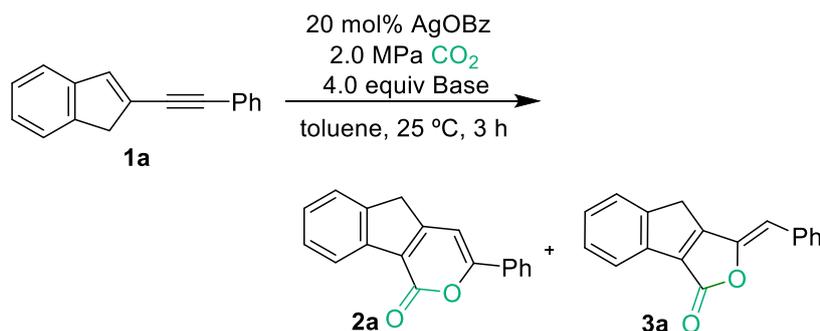
The crude product was dissolved in toluene (4.5 mL) and TsOH · H<sub>2</sub>O (90 mg) was added. The reaction mixture was heated up to reflux (heating mantle). The reaction was monitored by TLC. After the completion, water was added to the reaction and the mixture was extracted with EtOAc. The combined organic layer was washed with sat. NaHCO<sub>3</sub> aq. and water. The combined organic layer was dried over Na<sub>2</sub>SO<sub>4</sub>, and the solvent was removed under reduced pressure. The was purified by column chromatography (SiO<sub>2</sub>, eluent: hexane) to afford the alkynyl indene.

### 2.3 Procedure for the CO<sub>2</sub> fixation reaction on alkynyl indenenes

The reaction was performed using a pressure test tube equipped with a stirring bar in a 30 mL autoclave. To a solution of alkynyl indene **1a** (21.6 mg, 0.100 mmol) and AgOBz (4.6 mg, 0.020 mmol) in dry toluene (1 mL) in a pressure test tube was added DBU (60  $\mu$ L, 0.40 mmol). The pressure test tube was placed in the autoclave. CO<sub>2</sub> (2.0 MPa) was charged and the reaction mixture was stirred at 25 °C for 3 h (heating mantle). After the CO<sub>2</sub> was carefully released, sat. NH<sub>4</sub>Cl aq. (ca. 1.5 mL) was added to the mixture. The resulting mixture was extracted with ethyl acetate and volatile materials were removed under reduced pressure. The residue was purified by column chromatography (SiO<sub>2</sub>, eluent: hexane:EtOAc = 10:1) to afford **2a** (23.1 mg, 0.089 mmol) in 89% yield as a white solid.

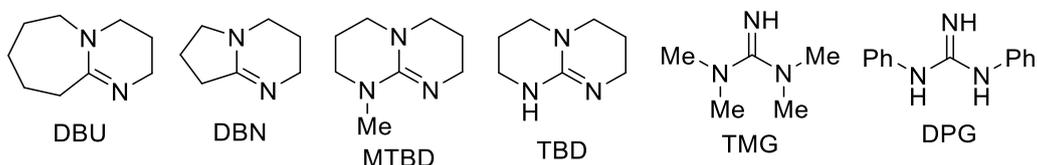
## 3. Supplementary results & discussion of CO<sub>2</sub> fixation

### 3.1 Examination of Base



Entry	Base	RSM (%)	Yield of <b>2a</b> (%) <sup>a</sup>	Yield of <b>3a</b> (%) <sup>a</sup>
1	DBU		86	10
2	DBN		71	6
3	MTBD		56	5
4	TBD		48	2
5	TMG		25	4
6	DPG		0	0

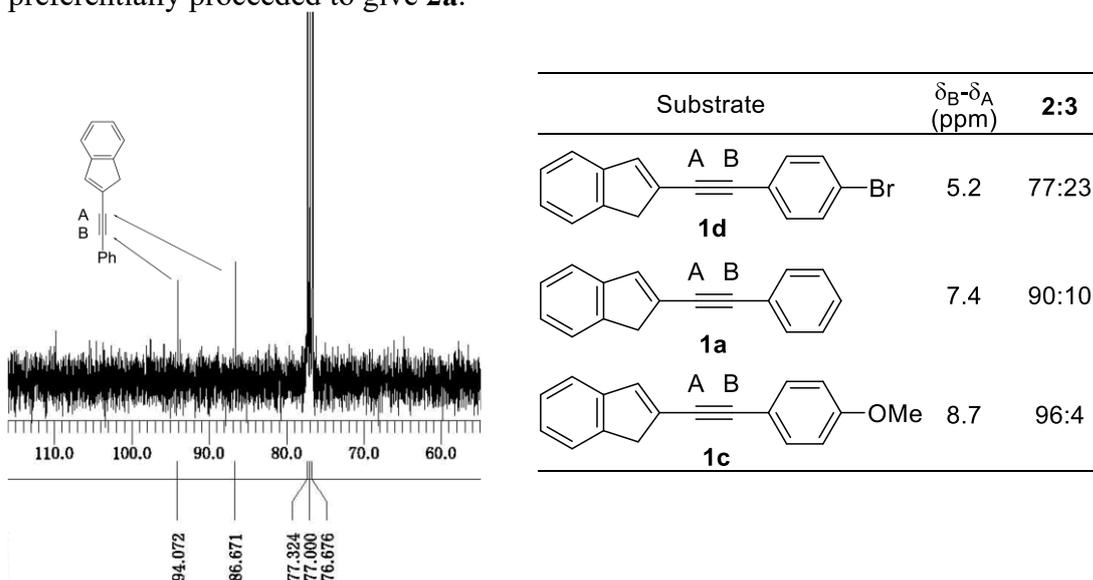
Conditions: Reactions were conducted using **1a** (0.10 mmol), AgOBz (20 mol %), Base (4 equiv), CO<sub>2</sub> (2.0 MPa) in toluene (1.0 mL) at 25 °C for 3 h. <sup>a</sup> NMR yields. RSM = Recovery of strating material.



### 3.2 The prediction of the selectivity of cyclization by $^{13}\text{C}$ NMR measurement

$^{13}\text{C}$  NMR of several substrates was measured to investigate the electronic character of alkyne-carbons and to consider the 5-*exo-dig*/6-*endo-dig* cyclization selectivity.

When  $^{13}\text{C}$  NMR measurement of substrate **1a** was performed, and two peaks assigned to alkyne-carbon atoms A ( $C_A$ ) and B ( $C_B$ ) were identified. The peak ( $\delta_A$ : 86.7 ppm) was assigned to  $C_A$ , and the other one ( $\delta_B$ : 94.1 ppm) was assigned to  $C_B$ . It was confirmed that the electron density around  $C_A$  would be higher than  $C_B$ . Therefore, the coordination of alkyne to a silver catalyst more likely to occur at the  $C_A$ . As a result of the coordination,  $C_B$  become more positively charged and 6-*endo-dig* cyclization preferentially proceeded to give **2a**.

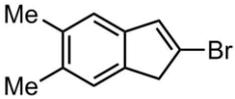


$^{13}\text{C}$  NMR measurement of other substrates was also performed. Substrate **1c**, which showed higher selectivity, and **1d**, which showed lower selectivity, were employed. As a result, the chemical shift of alkyne carbons of **1c** was  $\delta_A = 85.4$  ppm,  $\delta_B = 94.1$  ppm and the chemical shift of alkyne carbons of **1d** was  $\delta_A = 87.8$  ppm,  $\delta_B = 93.0$  ppm. It was found that  $C_B$  is electronically poorer. Therefore, in both cases, 6-*endo-dig* cyclization also occurred preferentially.

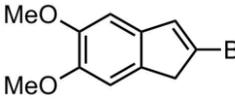
Furthermore, it was also confirmed that  $\delta_B - \delta_A$  values are related to the selectivity of 5-*exo*/6-*endo* cyclization. The  $\delta_B - \delta_A$  value of substrate **1a** was 7.4 ppm, and the ratio of products **2a:3a** was 90:10. In the case of substrate **1c**,  $\delta_B - \delta_A$  value was 8.7 ppm, and the ratio of products **2c:3c** was 96:4. In the case of substrate **1d**,  $\delta_B - \delta_A$  value was 5.2 ppm, and the ratio of products **2d** and **3d** decreased to 77:23. As stated above, substrates which have larger value of  $\delta_B - \delta_A$  show a high 6-*endo* selectivity.

#### 4. Characterization data of starting materials and products

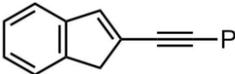
##### 2-bromo-5,6-dimethyl-1*H*-indene (S1)

 Purified by flash column chromatography (eluent: AcOEt/*n*-hexane = 1/10, 16.2 g, 82%). Pale yellow solid; mp 106-107 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 2.26 (s, 3H), 2.27 (s, 3H), 3.53 (s, 2H), 6.85 (s, 1H), 7.08 (s, 1H), 7.14 (s, 1H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 19.9, 45.0, 121.3, 123.5, 124.5, 132.7, 133.1, 134.8, 140.3, 141.9; IR(KBr): 3017, 2935, 1579, 1468, 1387, 1020, 882, 433; HRMS (ESI): [M]<sup>+</sup> calcd for C<sub>11</sub>H<sub>11</sub>Br, 222.0044; found, m/z 222.0043.

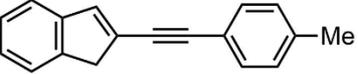
##### 2-bromo-5,6-dimethoxy-1*H*-indene (S2)

 Purified by flash column chromatography (eluent: AcOEt/*n*-hexane = 1/5, 466 mg, 9%). White solid; mp 99-100 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 3.53 (s, 2H), 3.89 (s, 3H), 3.89 (s, 3H), 6.83 (s, 1H), 6.87 (s, 1H), 6.98 (s, 1H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 45.4, 56.1, 56.2, 103.9, 107.6, 122.0, 132.6, 135.0, 136.8, 147.1, 148.3; IR(KBr): 3002, 2965, 1606, 1487, 1262, 1099, 991, 866, 529; HRMS (ESI): [M]<sup>+</sup> calcd for C<sub>11</sub>H<sub>11</sub>BrO<sub>2</sub>, 253.9942; found, m/z 253.9946.

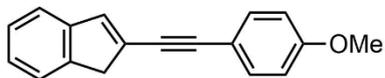
##### 2-(phenylethynyl)-1*H*-indene (1a)<sup>3</sup>

 Purified by flash column chromatography (5.0 mmol scale. eluent: AcOEt/*n*-hexane = 1/50, 471 mg, 44%). White solid; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 3.63 (s, 2H), 7.15 (s, 1H), 7.21-7.30 (m, 3H), 7.31- (d, *J* = 8.2 Hz, 1H), 7.35 (t, *J* = 7.5 Hz, 1H), 7.46-7.48 (m, 4H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 42.7, 86.7, 94.1, 121.4, 123.3, 123.6, 125.7, 126.8, 127.3, 128.2, 128.4, 132.5, 137.3, 143.0, 144.1.

##### 2-(*p*-tolylethynyl)-1*H*-indene (1b)

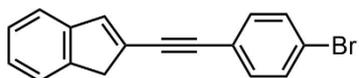
 Purified by flash column chromatography (2.5 mmol scale. eluent: AcOEt/*n*-hexane = 1/50, 371 mg, 64%). Pale yellow solid; mp 139-140 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 2.42 (s, 3H), 3.67 (s, 2H), 7.18 (s, 1H), 7.21 (d, *J* = 8.2 Hz, 2H), 7.29 (d, *J* = 8.2 Hz, 1H), 7.35 (t, *J* = 7.5 Hz, 1H), 7.46-7.48 (m, 4H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 21.5, 42.7, 86.0, 94.3, 120.2, 121.3, 123.5, 125.6, 126.7, 127.5, 129.1, 131.4, 136.9, 138.4, 142.9, 144.2; IR (KBr): 2919, 1505, 1458, 1382, 814, 749, 713; HRMS (ESI): [M+H]<sup>+</sup> calcd for C<sub>18</sub>H<sub>15</sub><sup>+</sup>, 231.1174; found, m/z 231.1184.

### 2-((4-methoxyphenyl)ethynyl)-1*H*-indene (1c)



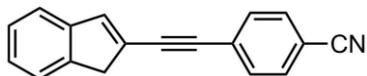
Purified by flash column chromatography (1.0 mmol scale. eluent: AcOEt/*n*-hexane = 1/30, 274 mg, 99%). White solid; mp 138-139 °C ; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 3.60 (s, 2H), 3.82 (s, 3H), 6.87 (d, *J* = 6.8 Hz, 2H), 7.10 (s, 1H), 7.22 (t, *J* = 7.0 Hz, 1H), 7.28 (t, *J* = 7.2 Hz, 1H), 7.38 (d, *J* = 7.2 Hz, 1H), 7.42-7.44 (m, 3H) ; <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 42.7, 55.3, 85.4, 94.1, 114.0, 115.4, 121.2, 123.5, 125.5, 126.7, 127.6, 132.9, 136.5, 142.9, 144.3, 159.6; IR (KBr): 3042, 2838, 1603, 1505, 1245, 1029, 835, 756, 717; HRMS (ESI): [M]<sup>+</sup> calcd for C<sub>18</sub>H<sub>14</sub>O, 246.1045; found, *m/z* 246.1042.

### 2-((4-bromophenyl)ethynyl)-1*H*-indene (1d)



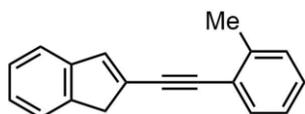
Purified by flash column chromatography (3.0 mmol scale. eluent: *n*-hexane, 366 mg, 41%). Yellow solid; mp 185-186 °C (decomp.); <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 3.61 (s, 2H), 7.16 (s, 1H), 7.23-7.25 (m, 1H), 7.29-7.31 (m, 1H), 7.36 (d, *J* = 8.2 Hz, 2H), 7.40 (d, *J* = 7.2 Hz, 1H), 7.44 (d, *J* = 7.2 Hz, 1H), 7.48 (d, *J* = 8.2 Hz, 2H) ; <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 42.6, 87.8, 93.0, 121.5, 122.3, 122.4, 123.6, 125.9, 126.8, 126.9, 131.6, 132.9, 137.8, 143.0, 144.0 ; IR(KBr): 2919, 1485, 1394, 1087, 1007, 826, 752, 714; HRMS (ESI): [M]<sup>+</sup> calcd for C<sub>17</sub>H<sub>11</sub>Br, 294.0044; found, *m/z* 294.0042.

### 4-((1*H*-inden-2-yl)ethynyl)benzonitrile (1e)



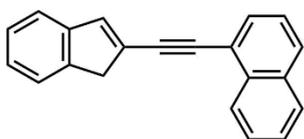
Purified by flash column chromatography (5.0 mmol scale. eluent: AcOEt/*n*-hexane = 1/5, 1.15 g, 95%). Brown solid ; mp 163-164 °C ; <sup>1</sup>H NMR (400MHz, CDCl<sub>3</sub>): δ = 3.63 (s, 2H), 7.24 (s, 1H), 7.25-7.29 (m, 1H), 7.30-7.34 (m, 1H), 7.41-7.48 (m, 2H), 7.55-7.59 (m, 2H), 7.61-7.65 (m, 2H); <sup>13</sup>C NMR (100MHz, CDCl<sub>3</sub>): δ = 42.5 , 91.2 , 92.4 , 111.3 , 118.6 , 121.8 , 123.7 , 126.1 , 126.3 , 126.9 , 128.3 , 131.9 , 132.0 , 139.2 , 143.1 , 143.7 ; IR(KBr): 3053, 2232, 2190, 1604, 1498, 847, 755, 716; HRMS (ESI): [M+H]<sup>+</sup> calcd for C<sub>18</sub>H<sub>12</sub>N<sup>+</sup>, 242.0968; found, *m/z* 242.0960.

### 2-(*o*-tolylethynyl)-1*H*-indene(1f)



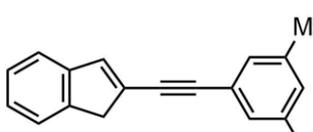
Purified by flash column chromatography (1.75 mmol scale. eluent: *n*-hexane, 338 mg, 83%). Pale yellow solid; mp 106-107 °C ; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 2.50 (s, 3H), 3.64 (s, 2H), 7.14-7.19 (m, 5H), 7.22-7.24 (m, 2H), 7.30 (d, *J* = 7.3 Hz, 1H), 7.40(d, *J* = 7.6 Hz, 1H), 7.44 (d, *J* = 7.6 Hz, 1H), 7.47 (d, *J* = 7.3 Hz, 1H) ; <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 20.7, 42.8, 90.5, 93.1, 121.3, 123.1, 123.6, 125.6, 125.6, 126.8, 127.5, 128.3, 129.5, 131.7, 136.9, 140.0, 143.0, 144.2; IR (KBr):2923, 1637, 1457, 1393, 870, 751, 714 ; HRMS (ESI): [M]<sup>+</sup> calcd for C<sub>18</sub>H<sub>14</sub>, 230.1096; found, *m/z* 230.1102.

### 1-((1*H*-inden-2-yl)ethynyl)naphthalene (1g)



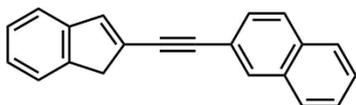
Purified by flash column chromatography (1.5 mmol scale. eluent: *n*-hexane, 536 mg, 66%). Pale yellow solid; mp 102-103 °C ; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 3.73 (s, 2H), 7.24-7.28 (m, 2H), 7.32 (t, *J* = 7.7 Hz, 1H), 7.42-7.48 (m, 3H), 7.52-7.56 (m, 1H), 7.60 (td, *J* = 7.5, 1.4 Hz, 1H), 7.74 (dd, *J* = 7.2, 1.4 Hz, 1H), 7.83-7.86 (m, 2H), 8.40 (d, *J* = 8.2 Hz, 1H) ; <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ =42.8, 91.6, 92.3, 121.0, 121.5, 123.6, 125.3, 125.8, 126.2, 126.4, 126.8, 126.8, 127.3, 128.3, 128.8, 130.3, 133.1, 133.2, 137.4, 143.0, 144.2; IR (KBr):3058, 1505, 1463, 1397, 1153, 801, 754, 713 ; HRMS (ESI): [M+H]<sup>+</sup> calcd for C<sub>21</sub>H<sub>15</sub>, 267.1179; found, *m/z* 267.1172.

### 2-((3,5-dimethylphenyl)ethynyl)-1*H*-indene (1h)



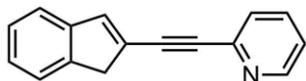
Purified by flash column chromatography (1.0 mmol scale. eluent: *n*-hexane, 236 mg, 97%). Pale yellow solid; mp 61-71 °C ; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 2.31 (s, 6H), 3.60 (s, 2H), 6.96 (s, 1H), 7.12 (s, 1H), 7.15 (s, 2H), 7.22-7.24 (m, 1H), 7.28 (t, *J* = 7.0 Hz, 1H), 7.39 (d, *J* = 7.2 Hz, 1H), 7.43 (d, *J* = 7.2 Hz, 1H) ; <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 21.1, 42.7, 86.0, 94.5, 121.3, 122.9, 123.5, 125.6, 126.7, 127.5, 129.2, 130.2, 137.0, 137.9, 142.9, 144.2; IR (KBr):3063, 2914, 2359, 1596, 1457, 848, 754 ; HRMS (ESI): [M]<sup>+</sup> calcd for C<sub>19</sub>H<sub>16</sub>, 244.1252; found, *m/z* 244.1246.

### 2-((1*H*-inden-2-yl)ethynyl)naphthalene (1i)



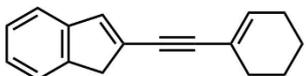
Purified by flash column chromatography (1.0 mmol scale, eluent: *n*-hexane, 226 mg, 85%). White solid; mp 180-182 °C (decomp.); <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 3.66 (s, 2H), 7.19 (s, 1H), 7.23-7.25 (m, 1H), 7.30 (t, *J* = 7.2 Hz, 1H), 7.41-7.45 (m, 2H), 7.48- 7.50 (m, 2H), 7.56 (d, *J* = 8.6 Hz, 1H), 7.80-7.82 (m, 3H), 8.03 (s, 1H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 42.7, 87.1, 94.6, 120.6, 121.4, 123.6, 125.7, 126.6, 126.7, 126.8, 127.3, 127.8, 127.8, 128.0, 128.3, 131.3, 132.8, 133.0, 137.5, 143.0, 144.2; IR (KBr): 3058, 2360, 1498, 1391, 823, 755, 714; HRMS (ESI): [M]<sup>+</sup> calcd for C<sub>21</sub>H<sub>14</sub>, 266.1096; found, *m/z* 266.1097.

### 2-((1*H*-inden-2-yl)ethynyl)pyridine (1j)



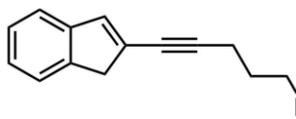
Purified by flash column chromatography (2.0 mmol scale, eluent: AcOEt/*n*-hexane = 1/10, 433 mg, quant.). Brown solid; mp 108 °C (decomp.); <sup>1</sup>H NMR (400MHz, CDCl<sub>3</sub>): δ = 3.65 (s, 2H), 7.20-7.33 (m, 4H), 7.40-7.52 (m, 3H), 7.64-7.70 (m, 1H), 8.58-8.66 (m, 1H); <sup>13</sup>C NMR (100MHz, CDCl<sub>3</sub>): δ = 42.5, 86.6, 93.2, 121.7, 122.6, 123.6, 126.1, 126.2, 126.8, 127.0, 136.1, 139.2, 143.1, 143.4, 143.7, 160.1; IR(KBr): 3049, 2195, 1578, 1466, 1425, 781, 758; HRMS (ESI): [M+H]<sup>+</sup> calcd for C<sub>16</sub>H<sub>12</sub>N<sup>+</sup>, 218.0970; found, *m/z* 218.0965.

### 2-(cyclohex-1-en-1-ylethynyl)-1*H*-indene (1k)



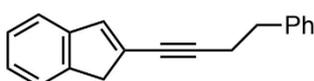
Purified by flash column chromatography (1.0 mmol scale, eluent: *n*-hexane, 93.5 mg, 42%). Pale yellow solid; mp 82-83 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 1.57-1.72 (m, 4H), 2.12-2.26 (m, 4H), 3.53 (s, 2H), 6.20 (s, 1H), 7.01 (s, 1H), 7.20 (t, *J* = 7.2 Hz, 1H), 7.25-7.27 (m, 1H), 7.35 (d, *J* = 7.2 Hz, 1H), 7.39 (d, *J* = 7.2 Hz, 1H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 21.5, 22.3, 25.8, 29.2, 42.8, 84.0, 96.0, 120.8, 121.1, 123.5, 125.4, 126.7, 127.8, 135.4, 136.2, 142.9, 144.3; IR (KBr): 3019, 2920, 1458, 1385, 852, 754, 714; HRMS (ESI): [M+H]<sup>+</sup> calcd for C<sub>17</sub>H<sub>17</sub>, 221.1330; found, *m/z* 221.1324.

### 2-(hex-1-yn-1-yl)-1H-indene (1l)



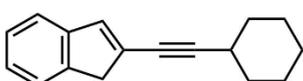
Purified by flash column chromatography (3.0 mmol scale, eluent: *n*-hexane, 244 mg, 35%). Yellow oil;  $^1\text{H}$  NMR (400MHz,  $\text{CDCl}_3$ ):  $\delta$  = 0.95 (t,  $J$  = 7.2 Hz, 3H), 1.41-1.51 (m, 2H), 1.52-1.63 (m, 2H), 2.43 (t,  $J$  = 7.2 Hz, 2H), 3.48 (s, 2H), 6.95 (s, 1H), 7.17-7.21 (m, 1H), 7.25 (t,  $J$  = 7.4 Hz, 1H), 7.33 (d,  $J$  = 7.4 Hz, 1H), 7.38 (d,  $J$  = 7.4 Hz, 1H);  $^{13}\text{C}$  NMR (100MHz,  $\text{CDCl}_3$ ):  $\delta$  = 13.6, 19.5, 22.0, 30.8, 42.9, 77.7, 95.4, 121.0, 123.4, 125.2, 126.6, 128.3, 135.6, 142.6, 144.3 ; IR(KBr):3068, 2958, 2872, 2218, 1459, 1391, 752, 715 ; HRMS (ESI):  $[\text{M}+\text{H}]^+$  calcd for  $\text{C}_{15}\text{H}_{17}$ , 197.1130; found,  $m/z$  197.1329.

### 2-(4-phenylbut-1-yn-1-yl)-1H-indene (1m)



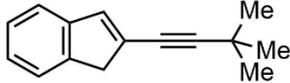
Purified by flash column chromatography (20.0 mmol scale, eluent: *n*-hexane, 800 mg, 16%). Pale yellow solid; mp 56-57  $^{\circ}\text{C}$  ;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ):  $\delta$  = 2.71 (t,  $J$  = 7.5 Hz, 2H), 2.92 (t,  $J$  = 7.5 Hz, 2H), 3.46 (s, 2H), 6.95 (s, 1H), 7.19 (t,  $J$  = 7.5 Hz, 1H), 7.23-7.27 (m, 4H), 7.30-7.35 (m, 3H), 7.38 (d,  $J$  = 7.2 Hz, 1H) ;  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  = 22.1, 35.2, 42.8, 78.5, 94.5, 121.1, 123.4, 125.3, 126.3, 126.6, 128.0, 128.4, 128.5, 135.9, 140.6, 142.6, 144.3 ; IR(KBr):3067, 3024, 2928, 1455, 750, 717, 700; HRMS (ESI):  $[\text{M}]^+$  calcd for  $\text{C}_{19}\text{H}_{16}$ , 244.1252,  $m/z$  244.1246.

### 2-(cyclohexylethynyl)-1H-indene (1n)

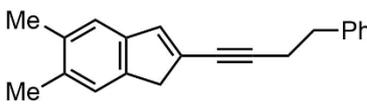


Purified by flash column chromatography (2.0 mmol scale, eluent: *n*-hexane, 508 mg, 91%). Pale yellow solid; mp 61-62  $^{\circ}\text{C}$  ;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ):  $\delta$  = 1.22-1.40 (m, 3H), 1.44-1.61 (m, 3H), 1.66-1.80 (m, 2H), 1.82-1.94 (m, 2H), 2.53-2.64 (m, 1H), 3.48 (s, 2H), 6.95 (s, 1H), 7.18 (t,  $J$  = 7.4 Hz, 1H), 7.24 (t,  $J$  = 7.4 Hz, 1H), 7.32 (d,  $J$  = 7.4 Hz, 1H), 7.37 (d,  $J$  = 7.4 Hz, 1H) ;  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  = 25.0, 25.9, 30.1, 32.7, 43.0, 99.5, 120.9, 123.4, 125.2, 126.6, 128.3, 135.6, 142.7, 144.4 ; IR(KBr):3055, 2933, 2851, 1460, 1446, 867, 749, 714 ; HRMS (ESI):  $[\text{M}]^+$  calcd for  $\text{C}_{17}\text{H}_{18}$ , 222.1409; found,  $m/z$  222.1405.

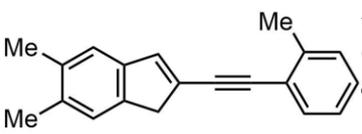
### 2-(3,3-dimethylbut-1-yn-1-yl)-1H-indene (1o)

 Purified by flash column chromatography (1.0 mmol scale, eluent: *n*-hexane, 160 mg, 82%). White solid; mp 84-85 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 1.31 (s, 9H), 3.47 (s, 2H), 6.94 (s, 1H), 7.18 (td, *J* = 7.5, 1.2 Hz, 1H), 7.23- 7.26 (m, 1H), 7.32 (d, *J* = 7.2 Hz, 1H), 7.37 (d, *J* = 7.2 Hz, 1H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 28.2, 31.0, 43.0, 76.0, 103.5, 120.9, 123.4, 125.1, 126.5, 128.3, 135.6, 142.7, 144.4; IR(KBr):3072, 2964, 2864, 1458, 1363, 756, 717; HRMS (ESI): [M]<sup>+</sup> calcd for C<sub>15</sub>H<sub>16</sub>, 196.1252; found, *m/z* 196.1258.

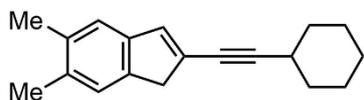
### 5,6-dimethyl-2-(4-phenylbut-1-yn-1-yl)-1H-indene (4a)

 Purified by flash column chromatography (0.5 mmol scale, eluent: *n*-hexane, 94.0 mg, 69%). Brown solid; mp 112-113 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 2.27 (s, 3H), 2.28 (s, 3H), 2.70 (t, *J* = 7.6 Hz, 2H), 2.91 (t, *J* = 7.6 Hz, 2H), 3.40 (s, 2H), 6.89 (s, 1H), 7.12 (s, 1H), 7.17 (s, 1H), 7.22-7.26 (m, 3H), 7.30-7.32 (m, 2H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 19.9, 20.0, 22.1, 35.2, 42.4, 78.7, 93.9, 122.1, 124.8, 126.3, 126.8, 128.4, 128.5, 133.8, 134.8, 135.9, 140.5, 140.7, 142.2; IR(KBr):3065, 3030, 2920, 1496, 1452, 1332, 887, 744, 699; HRMS (ESI): [M]<sup>+</sup> calcd for C<sub>21</sub>H<sub>20</sub>, 272.1565; found, *m/z* 272.1565.

### 5,6-dimethyl-2-(*o*-tolylethynyl)-1H-indene (4b)

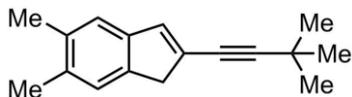
 Purified by flash column chromatography (1.5 mmol scale, eluent: *n*-hexane, 302 mg, 68%). Brown solid; mp 133-135 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 2.31 (s, 3H), 2.32 (s, 3H), 2.50 (s, 3H), 3.58 (s, 2H), 7.09 (s, 1H), 7.19 (s, 2H), 7.22 (s, 3H), 7.47 (d, *J* = 7.7 Hz, 1H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 19.9, 20.1, 20.7, 42.3, 90.9, 92.5, 122.4, 123.2, 124.8, 125.6, 126.3, 128.1, 129.4, 131.7, 134.2, 134.9, 136.9, 139.9, 140.8, 142.2; IR(KBr):3016, 2976, 2913, 1455, 1381, 886, 874, 756; HRMS (ESI): [M]<sup>+</sup> calcd for C<sub>20</sub>H<sub>18</sub>, 258.1409; found, *m/z* 258.1402.

### 2-(cyclohexylethynyl)-5,6-dimethyl-1H-indene (4c)



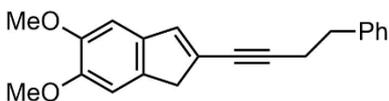
Purified by flash column chromatography (1.0 mmol scale. eluent: *n*-hexane, 211 mg, 84%). Pale yellow solid; mp 100-102 °C ; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 1.26-1.40 (m, 3H), 1.44-1.60 (m, 3H), 1.69-1.80 (m, 2H), 1.83-1.94 (m, 2H), 2.28 (s, 6H), 2.52-2.64 (m, 1H), 3.42 (s, 2H), 6.89 (s, 1H), 7.11 (s, 1H), 7.16 (s, 1H) ; <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 19.9, 20.0, 25.0, 25.9, 30.1, 32.8, 42.5, 77.8, 98.9, 122.0, 124.7, 127.1, 133.6, 134.7, 135.6, 140.5, 142.3 ; IR(KBr):3008, 2922, 2852, 1447, 1380, 1301, 886 ; HRMS (ESI): [M]<sup>+</sup> calcd for C<sub>19</sub>H<sub>22</sub>, 250.1722; found, m/z 250.1728.

### 2-(3,3-dimethylbut-1-yn-1-yl)-5,6-dimethyl-1H-indene (4d)



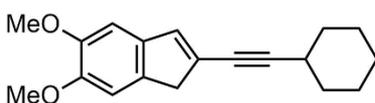
Purified by flash column chromatography (1.0 mmol scale. eluent: *n*-hexane, 175 mg, 78%). White solid; mp 111-113 °C ; <sup>1</sup>H NMR (400MHz, CDCl<sub>3</sub>): δ = 1.30 (s, 9H), 2.27 (s, 3H), 2.28 (s, 3H), 3.41 (s, 2H), 6.88 (s, 1H), 7.11 (s, 1H), 7.16 (s, 1H); <sup>13</sup>C NMR (100MHz, CDCl<sub>3</sub>): δ = 19.9, 20.0, 28.2, 31.1, 42.6, 76.3, 102.8, 122.0, 124.7, 127.1, 133.6, 134.6, 135.6, 140.5, 142.4 ; IR(KBr): 2997, 2965, 1491, 1460, 1326, 1295, 1222, 1187, 1106, 886 ; HRMS (ESI):[M+H]<sup>+</sup> calcd for C<sub>17</sub>H<sub>21</sub>, 225.1643; found, m/z 225.1646.

### 5,6-dimethoxy-2-(4-phenylbut-1-yn-1-yl)-1H-indene (4e)



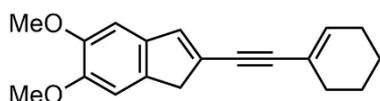
Purified by flash column chromatography (1.0 mmol scale. eluent: AcOEt/*n*-hexane = 1/5, 295 mg, 97%). Yellow solid; mp 115-116 °C ; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 2.70 (t, *J* = 7.5 Hz, 2H), 2.91 (t, *J* = 7.5 Hz, 2H), 3.41 (s, 2H), 3.89 (s, 3H), 3.90 (s, 3H), 6.85-6.91 (m, 2H), 6.98 (s, 1H), 7.19-7.28 (m, 0H), 7.29-7.35 (m, 2H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 22.1, 35.2, 42.7, 56.0, 56.1, 78.6, 93.7, 104.3, 107.5, 126.3, 126.3, 128.3, 128.5, 135.2, 135.8, 136.8, 140.7, 147.8, 148.4; IR(KBr): 3027, 2998, 2939, 2835, 1488, 1324, 1217, 1106, 1000, 874 ; HRMS (ESI): [M]<sup>+</sup> calcd for C<sub>21</sub>H<sub>20</sub>O<sub>2</sub>, 304.1463; found, m/z 304.1468.

### 2-(cyclohexylethynyl)-5,6-dimethoxy-1H-indene (4f)



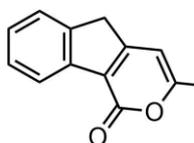
Purified by flash column chromatography (1.0 mmol scale. eluent: AcOEt/*n*-hexane = 1/5, 247 mg, 87%). Pale yellow solid; mp 100-101 °C ; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 1.24-1.42 (m, 3H), 1.43-1.60 (m, 3H), 1.69-1.82 (m, 2H), 1.82-1.94 (m, 2H), 2.50-2.64 (m, 1H), 3.42 (s, 2H), 3.90 (s, 6H), 6.85-6.91 (m, 2H), 6.98 (s, 1H) ; <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 25.0, 25.9, 30.1, 32.8, 42.9, 56.0, 56.2, 77.6, 98.7, 104.3, 107.5, 126.6, 135.3, 135.5, 137.0, 147.7, 148.4 ; IR(KBr): 2997, 2919, 2854, 1487, 1323, 1219, 1195, 1106, 866 ; HRMS (ESI): [M]<sup>+</sup> calcd for C<sub>19</sub>H<sub>22</sub>O<sub>2</sub>, 282.1620; found, m/z 282.1627.

### 2-(cyclohex-1-en-1-ylethynyl)-5,6-dimethoxy-1*H*-indene (4g)



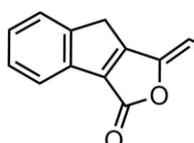
Purified by flash column chromatography (1.0 mmol scale. eluent: AcOEt/*n*-hexane = 1/5, 207 mg, 74%). Pale yellow solid; mp 134-135 °C ; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 1.56-1.72 (m, 4H), 2.11-2.25 (m, 4H), 3.47 (s, 2H), 3.90 (s, 6H), 6.18 (s, 1H), 6.90 (s, 1H), 6.93 (s, 1H), 6.99 (s, 1H) ; <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 21.5, 22.3, 25.8, 29.2, 42.7, 56.0, 56.2, 84.2, 95.3, 104.4, 107.5, 120.9, 126.1, 135.0, 135.6, 136.1, 137.0, 147.9, 148.5; IR(KBr): 2999, 2930, 2831, 1486, 1323, 1219, 1106, 863 ; HRMS (ESI): [M]<sup>+</sup> calcd for C<sub>19</sub>H<sub>20</sub>O<sub>2</sub>, 280.1463; found, m/z 280.1454.

### 3-phenylindeno[1,2-*c*]pyran-1(5*H*)-one (2a)



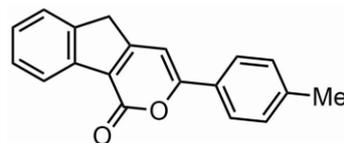
Purified by flash column chromatography (0.10 mmol scale. eluent: AcOEt/*n*-hexane = 1/5, 21.6 mg, 83%). Red solid ; mp 203 °C (decomp.); <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 3.88 (s, 2H), 7.05 (s, 1H), 7.32 (t, 1H, *J* = 7.7 Hz), 7.43-7.53 (m, 5H), 7.91-7.92 (m, 2H), 8.13 (d, 1H, *J* = 7.6 Hz) ; <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 38.7, 100.8, 122.4, 123.9, 125.6, 126.5, 127.5, 129.0, 130.5, 131.7, 138.9, 141.0, 149.2, 158.5, 159.4 ; IR(KBr):3076, 1714, 1531, 1381, 1025, 767, 712; HRMS (ESI): [M+H]<sup>+</sup> calcd for C<sub>18</sub>H<sub>13</sub>O<sub>2</sub><sup>+</sup>, 261.0916; found, m/z 261.0920.

### (*Z*)-1-benzylidene-1,8-dihydro-3*H*-indeno[1,2-*c*]furan-3-one (3a)



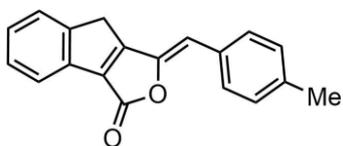
Purified by flash column chromatography (0.10 mmol scale. eluent: AcOEt/*n*-hexane = 1/5, 1.6 mg, 6%). Red solid ; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 3.85 (s, 2H), 6.12 (s, 1H), 7.34-7.44 (m, 6H), 7.54 (d, *J* = 7.4 Hz, 1H), 7.74 (d, *J* = 7.4 Hz, 1H), 7.84 (d, *J* = 7.4 Hz, 2H) ; <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 32.8, 111.2, 121.5, 125.1, 127.2, 127.6, 128.8, 129.1, 129.1, 130.7, 133.0, 134.8, 136.2, 144.6, 146.3, 162.7, 163.4 ; IR(KBr):2963, 2854, 1789, 1262, 1094, 1005, 801, 737, 694; HRMS (ESI): [M]<sup>+</sup> calcd for C<sub>18</sub>H<sub>12</sub>O<sub>2</sub>, 260.0837; found, m/z 260.0830.

### 3-(*p*-tolyl)indeno[1,2-*c*]pyran-1(5*H*)-one (2b)



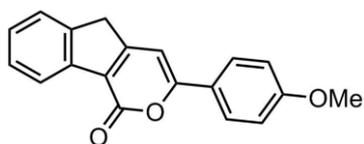
Purified by flash column chromatography (0.10 mmol scale. eluent: AcOEt/*n*-hexane = 1/5, 20.6 mg, 75%). Brown solid ; mp 208 °C (decop.); <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 2.40 (s, 3H), 3.85 (s, 2H), 6.99 (s, 1H), 7.25-7.32 (m, 3H), 7.42 (t, *J* = 7.5 Hz, 1H), 7.50 (d, *J* = 7.2 Hz, 1H), 7.79 (d, *J* = 8.2 Hz, 2H), 8.10 (d, *J* = 7.7 Hz, 1H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 21.0, 38.7, 104.9, 122.4, 123.9, 124.2, 126.1, 126.5, 127.5, 129.1, 130.1, 131.3, 132.5, 136.8, 138.9, 140.9, 158.4, 159.2, 161.6 ; IR(KBr):3085, 2915, 1712, 1535, 819, 782, 710; HRMS (ESI): [M+H]<sup>+</sup> calcd for C<sub>19</sub>H<sub>15</sub>O<sub>2</sub><sup>+</sup>, 275.1072; found, m/z 275.1065.

**(Z)-1-(4-methylbenzylidene)-1,8-dihydro-3H-indeno[1,2-c]furan-3-one (3b)**



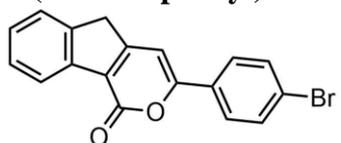
Purified by flash column chromatography (0.10 mmol scale. eluent: AcOEt/*n*-hexane = 1/5, 1.4 mg, 5%). Brown solid ; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 2.39 (s, 3H), 3.84 (s, 2H), 6.10 (s, 1H), 7.21 (s, 1H), 7.23 (s, 1H), 7.33 (t, *J* = 7.5 Hz, 1H), 7.40 (t, *J* = 7.7 Hz, 1H), 7.54 (d, *J* = 7.7 Hz, 1H), 7.71-7.77 (m, 3H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 21.5, 32.8, 111.4, 121.5, 125.1, 127.1, 127.6, 129.7, 130.3, 130.7, 135.0, 135.8, 139.6, 144.1, 146.3, 162.8, 163.6; IR(KBr):2963, 2924, 1759, 1262, 1092, 1023, 941, 814, 775; HRMS (ESI): [M+H]<sup>+</sup> calcd for C<sub>19</sub>H<sub>15</sub>O<sub>2</sub><sup>+</sup>, 275.1072; found, *m/z* 275.1067.

**3-(4-methoxyphenyl)indeno[1,2-c]pyran-1(5H)-one (2c)**



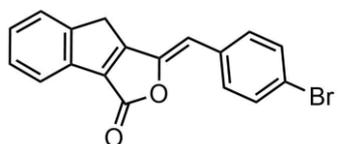
Purified by flash column chromatography (0.10 mmol scale. eluent: AcOEt/*n*-hexane = 1/5, 24.4 mg, 84%). Yellow green solid ; mp 182 °C (decomp.); <sup>1</sup>H NMR(400 MHz, CDCl<sub>3</sub>): δ = 3.83 (s, 2H), 3.86 (s, 3H), 6.91 (s, 1H), 6.93-6.99 (m, 2H), 7.29 (td, *J* = 7.5, 0.9 Hz, 1H), 7.40 (t, *J* = 7.5 Hz, 1H), 7.49 (d, *J* = 7.2 Hz, 1H), 7.81-7.87 (m, 2H), 8.08 (d, *J* = 7.7 Hz, 1H).; <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 38.6 , 55.4 , 99.4 , 114.3 , 122.2 , 123.3 , 123.9 , 124.2 , 126.2 , 127.3 , 127.4 , 139.1 , 140.8 , 158.9 , 159.0 , 159.6 , 161.5; IR(KBr):2837, 1703, 1604, 1533, 1261, 1186, 1026, 826; HRMS (ESI): [M+H]<sup>+</sup> calcd for C<sub>19</sub>H<sub>15</sub>O<sub>3</sub><sup>+</sup>, 291.1021; found *m/z* 291.1019.

**3-(4-bromophenyl)indeno[1,2-c]pyran-1(5H)-one (2d)**



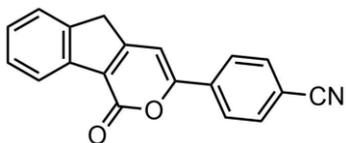
Purified by flash column chromatography (0.10 mmol scale. eluent: AcOEt/*n*-hexane = 1/5, 20.0 mg, 59%). Yellow solid ; mp 215 °C (decomp.); <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 3.86 (s, 2H), 7.02 (s, 1H), 7.32 (t, *J* = 7.5 Hz, 1H), 7.42 (t, *J* = 7.5 Hz, 1H), 7.51 (d, *J* = 7.4 Hz, 1H), 7.59-7.60 (m, 2H), 7.75-7.76 (m, 2H), 8.10 (d, *J* = 7.6 Hz, 1H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 38.7, 101.0, 122.4, 124.0, 124.9, 125.0, 126.7, 127.0, 127.6, 130.5, 132.2, 138.7, 141.0, 158.2, 158.2, 158.5; IR(KBr):2927, 1703, 1533, 1492, 1384, 1008, 820, 781, 714; HRMS (ESI): [M+H]<sup>+</sup> calcd for C<sub>18</sub>H<sub>13</sub>BrO<sub>2</sub><sup>+</sup>, 339.0021; found, *m/z* 339.0024.

**(Z)-1-(4-bromobenzylidene)-1,8-dihydro-3H-indeno[1,2-c]furan-3-one (3d)**



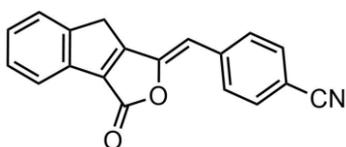
Purified by flash column chromatography (0.10 mmol scale. eluent: AcOEt/*n*-hexane = 1/5, 5.8 mg, 17%). Yellow solid ; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 3.84 (s, 2H), 6.04 (s, 1H), 7.35 (t, *J* = 7.6 Hz, 1H), 7.41 (t, *J* = 7.6 Hz, 1H), 7.53-7.55 (m, 3H), 7.70 (d, *J* = 8.8 Hz, 2H), 7.74 (d, *J* = 7.3 Hz, 1H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 32.8, 109.8, 121.6, 123.4, 125.2, 127.4, 127.7, 132.0, 132.0, 132.1, 134.7, 136.7, 145.0, 146.3, 162.4, 163.1; IR(KBr):2925, 2854, 1759, 1627, 1457, 939, 775; HRMS (ESI): [M]<sup>+</sup> calcd for C<sub>18</sub>H<sub>11</sub>BrO<sub>2</sub>, 337.9942; found, *m/z* 337.9941.

#### 4-(1-oxo-1,5-dihydroindeno[1,2-*c*]pyran-3-yl)benzonitrile (2e)



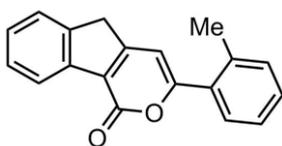
Purified by flash column chromatography (0.10 mmol scale, eluent: AcOEt/*n*-hexane = 1/5, 9.7 mg, 34%). Yellow solid ; mp 246 °C (decomp.); <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 3.92 (s, 2H), 7.15 (s, 1H), 7.37 (t, *J* = 7.3 Hz, 1H), 7.46 (t, *J* = 7.3 Hz, 1H), 7.56 (d, *J* = 7.3 Hz, 1H), 7.76 (s, 1H), 7.78 (s, 1H), 8.01 (s, 1H), 8.03 (s, 1H), 8.15 (d, *J* = 7.3 Hz, 1H) ; <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 38.7, 102.8, 113.6, 118.2, 122.8, 124.1, 125.9, 126.4, 127.2, 127.7, 132.7, 135.6, 138.5, 141.3, 156.6, 157.5, 158.1; IR(KBr):2924, 2233, 1708, 840, 783, 743, 711 ; HRMS (ESI): [M+H]<sup>+</sup> calcd for C<sub>19</sub>H<sub>13</sub>NO<sub>2</sub><sup>+</sup>, 286.0868; found, *m/z* 286.0873.

#### (*Z*)-4-((3-oxo-3,8-dihydro-1*H*-indeno[1,2-*c*]furan-1-ylidene)methyl)benzonitrile (3e)



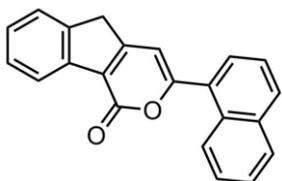
Purified by flash column chromatography (0.10 mmol scale, eluent: AcOEt/*n*-hexane = 1/5, 12.8 mg, 45%). Yellow solid ; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 3.86 (s, 2H), 6.09 (s, 1H), 7.39-7.42 (m, 2H), 7.57 (d, *J* = 7.2 Hz, 1H), 7.68 (d, *J* = 8.4 Hz, 2H), 7.76 (d, *J* = 7.2 Hz, 1H), 7.92 (d, *J* = 8.4 Hz, 2H) ; <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 32.8, 108.5, 111.7, 118.7, 121.8, 125.3, 127.8, 127.8, 130.7, 132.4, 134.4, 137.4, 137.8, 146.5, 146.7, 162.0, 162.6; IR(KBr):2925, 2226, 1761, 1632, 943, 776, 711; HRMS (ESI): [M]<sup>+</sup> calcd for C<sub>19</sub>H<sub>11</sub>NO<sub>2</sub>, 285.0790; found, *m/z* 285.0780.

#### 3-(*o*-tolyl)indeno[1,2-*c*]pyran-1(5*H*)-one (2f)



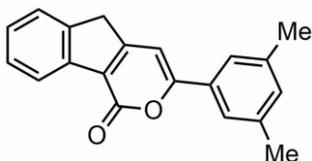
Purified by flash column chromatography (0.10 mmol scale, eluent: AcOEt/*n*-hexane = 1/5, 17.3 mg, 63%). Red solid ; mp 147-149 °C; <sup>1</sup>H NMR(400 MHz, CDCl<sub>3</sub>): δ = 2.53 (s, 3H), 3.88 (s, 2H), 6.71 (s, 1H), 7.25-7.39 (m, 4H), 7.43 (t, *J* = 7.5 Hz, 1H), 7.53 (d, *J* = 7.2 Hz, 2H), 8.13 (d, *J* = 7.7 Hz, 1H).; <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 21.0, 38.7, 104.9, 122.4, 123.9, 124.2, 126.1, 126.5, 127.5, 129.1, 130.1, 131.3, 132.5, 136.8, 138.9, 140.9, 158.4, 159.2, 161.6 (); IR(KBr):2983, 1707, 1611, 1536, 1037, 921, 767, 725; HRMS (ESI): [M+H]<sup>+</sup> calcd for C<sub>19</sub>H<sub>15</sub>O<sub>2</sub><sup>+</sup>, 275.1066; found *m/z* 275.1059.

### 3-(naphthalen-1-yl)indeno[1,2-*c*]pyran-1(5*H*)-one (2g)



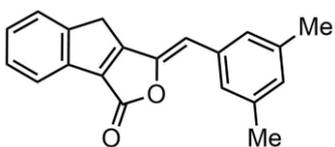
Purified by flash column chromatography (0.10 mmol scale, eluent: AcOEt/*n*-hexane = 1/5, 21.1 mg, 68%). Red solid ; mp 170 °C (decomp.); <sup>1</sup>H NMR(400 MHz, CDCl<sub>3</sub>): δ = 3.91 (s, 2H), 6.91 (s, 1H), 7.35 (t, *J* = 7.6 Hz, 1H), 7.46 (t, *J* = 7.6 Hz, 1H), 7.51-7.60 (m, 4H), 7.76 (dd, *J* = 7.3, 1.0 Hz, 1H), 7.92 (dd, *J* = 6.8, 2.0 Hz, 1H), 7.96 (d, *J* = 8.3 Hz, 1H), 8.17 (d, *J* = 7.8 Hz, 1H), 8.26 (d, *J* = 7.8 Hz, 1H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 38.7, 106.1, 122.5, 124.0, 124.6, 125.0, 125.0, 126.4, 126.6, 127.3, 127.6, 127.8, 128.7, 130.4, 130.5, 130.9, 133.8, 138.9, 141.0, 158.4, 159.3, 160.7; IR(KBr):3047, 1728, 1598, 1531, 943, 777, 714; HRMS (ESI): [M+H]<sup>+</sup> calcd for C<sub>22</sub>H<sub>15</sub>O<sub>2</sub><sup>+</sup>, 311.1066; found m/z 311.1065.

### (*Z*)-1-(3,5-dimethylbenzylidene)-1,8-dihydro-3-indeno[1,2-*c*]furan-3-one (2h)



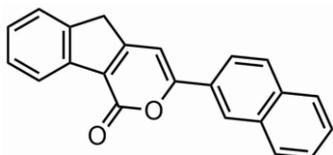
Purified by flash column chromatography (0.10 mmol scale, eluent: AcOEt/*n*-hexane = 1/5, 17.9 mg, 62%) Yellow solid ; mp 205 °C (decomp.); <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 2.37 (s, 6H), 3.83 (s, 2H), 7.00 (s, 1H), 7.06 (s, 1H), 7.29 (t, *J* = 8.0 Hz, 1H), 7.40 (t, *J* = 8.0 Hz, 1H), 7.48-7.51 (m, 3H), 8.10 (d, *J* = 8.0 Hz, 1H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 21.3, 38.6, 100.6, 122.3, 123.4, 123.9, 124.2, 126.4, 127.4, 131.5, 132.3, 138.6, 139.0, 140.9, 158.7, 159.0, 159.8; IR(KBr):2915, 1709, 1609, 1592, 1388, 718; HRMS (ESI): [M+H]<sup>+</sup> calcd for C<sub>20</sub>H<sub>17</sub>O<sub>2</sub><sup>+</sup>, 289.1229; found, m/z 289.1220.

### (*Z*)-1-(3,5-dimethylbenzylidene)-1,8-dihydro-3*H*-indeno[1,2-*c*]furan-3-one (3h)



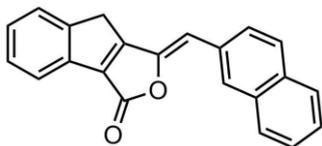
Purified by flash column chromatography (0.10 mmol scale, eluent: AcOEt/*n*-hexane = 1/5, 1.4 mg, 5%). Yellow solid ; mp 189 °C (decomp.); <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 2.36 (s, 6H), 3.83 (s, 2H), 6.05 (s, 1H), 6.99 (s, 1H), 7.34 (d, *J* = 7.2 Hz, 1H), 7.40 (t, *J* = 7.5 Hz, 1H), 7.46 (s, 2H), 7.53 (d, *J* = 7.7 Hz, 1H), 7.74 (d, *J* = 7.2 Hz, 1H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 21.3, 32.8, 111.7, 121.2, 121.5, 125.1, 127.1, 127.6, 128.5, 131.1, 132.9, 135.0, 135.9, 138.4, 144.4, 146.3, 162.9; IR(KBr):2926, 1764, 1632, 1366, 1092, 931, 775; HRMS (ESI): [M+H]<sup>+</sup> calcd for C<sub>20</sub>H<sub>17</sub>O<sub>2</sub><sup>+</sup>, 289.1229; found, m/z 289.1220.

### 3-(naphthalen-1-yl)indeno[1,2-*c*]pyran-1(5*H*)-one (2i)



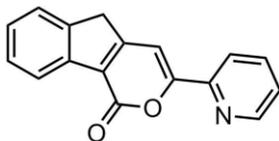
Purified by flash column chromatography (0.10 mmol scale, eluent: AcOEt/*n*-hexane = 1/5, 17.1 mg, 55%). Red solid ; mp 194 °C (decomp.); <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): = 3.91 (s, 2H), 6.91 (s, 1H), 7.35 (t, *J* = 7.6 Hz, 1H), 7.46 (t, *J* = 7.6 Hz, 1H), 7.51-7.61 (m, 4H), 7.77 (d, *J* = 7.3 Hz, 1H), 7.89-7.93 (m, 1H), 7.96 (d, *J* = 8.3 Hz, 1H), 8.17 (d, *J* = 7.8 Hz, 1H), 8.26 (d, *J* = 7.8 Hz, 1H) ; <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 38.7, 106.1, 122.5, 124.0, 124.6, 125.0, 125.0, 126.4, 126.6, 127.3, 127.6, 127.8, 128.7, 130.4, 130.5, 130.9, 133.8, 138.9, 141.0, 158.4, 159.3, 160.7; IR(KBr):2925, 1708, 1531, 1462, 1381, 1061, 782; HRMS (ESI): [M+H]<sup>+</sup> calcd for C<sub>20</sub>H<sub>17</sub>O<sub>2</sub><sup>+</sup>, 289.1228; found, m/z 289.1225.

### (*Z*)-1-(naphthalen-2-ylmethylene)-1,8-dihydro-3*H*-indeno[1,2-*c*]furan-3-one (3i)



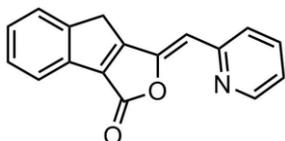
Purified by flash column chromatography (0.10 mmol scale, eluent: AcOEt/*n*-hexane = 1/5, 2.5 mg, 8%) Brown solid ; mp 173 °C (decomp.); <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 3.85 (s, 2H), 6.25 (s, 1H), 7.34 (td, *J* = 7.5, 1.2 Hz, 1H), 7.40 (t, *J* = 7.2 Hz, 1H), 7.47-7.52 (m, 2H), 7.54 (d, *J* = 7.2 Hz, 1H), 7.74 (d, *J* = 7.7 Hz, 1H), 7.78-7.91 (m, 3H), 8.02 (dd, *J* = 8.8, 1.6 Hz, 1H), 8.22 (s, 1H) ; <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 32.8 , 111.4 , 121.5 , 125.2 , 126.5 , 127.1 , 127.2 , 127.4 , 127.6 , 127.7 , 128.5 , 128.6 , 130.7 , 130.9 , 133.3 , 133.4 , 134.9 , 136.1 , 144.8 , 146.3 , 162.7 , 163.5; IR(KBr):3055, 2925, 1762, 1369, 937, 774, 740, 709; HRMS (ESI): [M+H]<sup>+</sup> calcd for C<sub>22</sub>H<sub>15</sub>O<sub>2</sub><sup>+</sup>, 311.1066; found, m/z 311.1068.

### 3-(pyridin-2-yl)indeno[1,2-*c*]pyran-1(5*H*)-one (2j)



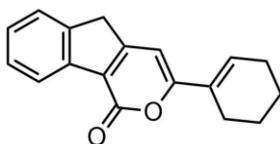
Purified by flash column chromatography (0.10 mmol scale, eluent: AcOEt/*n*-hexane = 1/3, 3.4 mg, 13%). Yellow solid ; mp 150 °C (decomp.); <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 3.92 (s, 2H), 7.32-7.38 (m, 2H), 7.45 (t, *J* = 7.3 Hz, 1H), 7.55 (d, *J* = 7.6 Hz, 1H), 7.75 (s, 1H), 7.85 (td, *J* = 7.8, 1.7 Hz, 1H), 8.11 (d, *J* = 8.1 Hz, 1H), 8.16 (d, *J* = 7.6 Hz, 1H), 8.65-8.69 (m, 1H) ; <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 38.8 , 102.7 , 120.7 , 122.6 , 124.0 , 124.6 , 126.2 , 126.9 , 127.5 , 137.2 , 138.8 , 141.4 , 149.2 , 149.7 , 157.7 , 158.5; IR(KBr):2924, 1733, 1578, 1474, 1385, 1070, 782, 712; HRMS (ESI): [M+H]<sup>+</sup> calcd for C<sub>17</sub>H<sub>12</sub>NO<sub>2</sub><sup>+</sup>, 262.0868; found, m/z 262.0868.

**(Z)-1-(pyridin-2-ylmethylene)-1,8-dihydro-3H-indeno[1,2-c]furan-3-one (3j)**



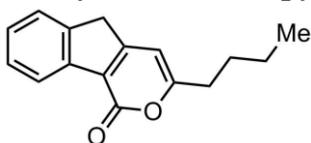
Purified by flash column chromatography (0.10 mmol scale, eluent: AcOEt/*n*-hexane = 1/3, 6.5 mg, 25%). Orange solid ; mp 134 °C (decomp.); <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 3.87 (s, 2H), 6.38 (s, 1H), 7.19-7.24 (m, 1H), 7.34-7.46 (m, 3H), 7.56 (d, *J* = 7.2 Hz, 2H), 7.73-7.80 (m, 2H), 8.29 (d, *J* = 8.3 Hz, 1H), 8.64 (d, *J* = 4.7 Hz, 1H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 32.8 , 111.5 , 121.7 , 122.8 , 125.3 , 126.1 , 127.6 , 127.7 , 134.5 , 136.6 , 137.4 , 146.4 , 146.6 , 149.8 , 152.4 , 162.7 , 162.9; IR(KBr):2924, 1793, 1582, 1288, 939, 778, 750; HRMS (ESI): [M+H]<sup>+</sup> calcd for C<sub>17</sub>H<sub>12</sub>NO<sub>2</sub><sup>+</sup>, 262.0868; found, m/z 262.0869.

**3-(cyclohex-1-en-1-yl)indeno[1,2-c]pyran-1(5H)-one (2k)**



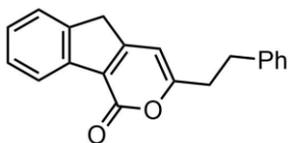
Purified by flash column chromatography (0.10 mmol scale, eluent: AcOEt/*n*-hexane = 1/5, 22.7 mg, 86%). Red solid ; mp 148 °C (decomp.); <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 1.66-1.77 (m, 4H), 2.28 (s, 4H), 3.77 (s, 2H), 6.45 (s, 1H), 6.93 (s, 1H), 7.28 (t, *J* = 6.6 Hz, 1H), 7.40 (s, 1H), 7.48 (d, *J* = 6.8 Hz, 1H), 8.07 (d, *J* = 6.8 Hz, 1H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 21.6, 22.2, 24.1, 25.8, 38.6, 99.3, 122.2, 123.8, 123.9, 126.1, 127.4, 128.5, 132.3, 139.2, 140.9, 158.8, 158.9, 160.2; IR(KBr):2931, 2862, 1710, 1536, 1382, 782, 711; HRMS (ESI): [M+H]<sup>+</sup> calcd for C<sub>18</sub>H<sub>17</sub>O<sub>2</sub><sup>+</sup>, 265.1228; found, m/z 268.1219.

**3-butylindeno[1,2-c]pyran-1(5H)-one (2l)**



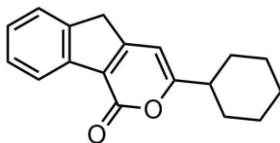
Purified by flash column chromatography (0.10 mmol scale, eluent: AcOEt/*n*-hexane = 1/10, 15.4 mg, 64%). Red solid ; mp 101-102 °C; <sup>1</sup>H NMR(400 MHz, CDCl<sub>3</sub>): δ = 0.95 (t, *J* = 7.2 Hz, 3H), 1.34-1.46 (m, 0H), 1.66-1.75 (m, 2H), 2.59 (t, *J* = 7.7 Hz, 2H), 3.76 (s, 2H), 6.36 (s, 1H), 7.26-7.31 (m, 1H), 7.40 (t, *J* = 7.6 Hz, 1H), 7.48 (d, *J* = 7.2 Hz, 1H), 8.06 (d, *J* = 7.7 Hz, 1H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 13.7 , 22.1 , 29.2 , 33.7 , 38.5 , 102.5 , 122.1 , 123.3 , 123.8 , 126.1 , 127.4 , 139.0 , 140.6 , 158.9 , 159.8 , 165.3; IR(KBr):2957, 2873, 1729, 1618, 1550, 1465, 921, 786; HRMS (ESI): [M+H]<sup>+</sup> calcd for C<sub>16</sub>H<sub>17</sub>O<sub>2</sub><sup>+</sup>, 241.1228; found m/z 241.1222.

### 3-phenethylindeno[1,2-*c*]pyran-1(5*H*)-one (2m)



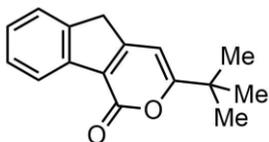
Purified by flash column chromatography (0.10 mmol scale; eluent: AcOEt/*n*-hexane = 1/10-1/5, 21.0 mg, 73%. 1.00 mmol scale; 202 mg, 70%). Red solid; mp 149-150 °C ; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 2.89 (t, *J* = 7.8 Hz, 2H), 3.05 (t, *J* = 7.8 Hz, 2H), 3.72 (s, 2H), 6.28 (s, 1H), 7.18-7.31 (m, 6H), 7.40 (t, *J* = 7.6 Hz, 1H), 7.48 (d, *J* = 7.3 Hz, 1H), 8.08 (d, *J* = 7.8 Hz, 1H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 33.4, 35.9, 38.5, 103.1, 122.1, 123.6, 123.9, 126.3, 126.4, 127.4, 128.3, 128.6, 138.9, 140.0, 140.6, 158.7, 159.6, 163.7; IR(KBr):3068, 2917, 1721, 1615, 1544, 783, 714; HRMS (ESI): [M+H]<sup>+</sup> calcd for C<sub>20</sub>H<sub>17</sub>O<sub>2</sub><sup>+</sup>, 289.1228; found, *m/z* 289.1224.

### 3-cyclohexylindeno[1,2-*c*]pyran-1(5*H*)-one (2n)



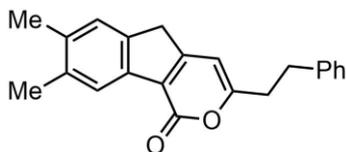
Purified by flash column chromatography (0.10 mmol scale. eluent: AcOEt/*n*-hexane = 1/5, 20.8 mg, 78%). Red solid; mp 149-150 °C ; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 1.23-1.52 (m, 5H), 1.73-1.76 (m, 1H), 1.84-1.87 (m, 2H), 2.02-2.05 (m, 2H), 2.51 (tt, *J* = 11.6, 3.4 Hz, 1H), 3.76 (s, 2H), 6.34 (s, 1H), 7.28 (t, *J* = 7.2 Hz, 1H), 7.39 (t, *J* = 7.7 Hz, 1H), 7.48 (d, *J* = 7.7 Hz, 1H), 8.06 (d, *J* = 7.2 Hz, 1H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 25.7, 25.9, 30.7, 38.5, 42.4, 100.4, 122.1, 123.4, 123.8, 126.1, 127.3, 139.1, 140.6, 146.3, 159.1, 159.7, 169.2; IR(KBr): 3110, 2923, 1725, 1549, 947, 782, 712; HRMS (ESI): [M+H]<sup>+</sup> calcd for C<sub>18</sub>H<sub>19</sub>O<sub>2</sub><sup>+</sup>, 267.1385; found, *m/z* 267.1382.

### 3-(*tert*-butyl)indeno[1,2-*c*]pyran-1(5*H*)-one (2o)



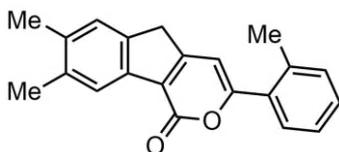
Purified by flash column chromatography (0.10 mmol scale. eluent: AcOEt/*n*-hexane = 1/10-1/5, 19.2 mg, 80%). Red solid ; mp 113 °C (decomp.); <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 1.35 (s, 9H), 3.77 (s, 2H), 6.43 (s, 1H), 7.28 (t, *J* = 7.7 Hz, 1H), 7.40 (t, *J* = 7.7 Hz 1H), 7.49 (d, *J* = 7.7 Hz, 1H), 8.08 (d, *J* = 7.7 Hz, 1H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 28.2, 36.3, 38.6, 99.1, 122.1, 123.3, 123.8, 126.1, 127.3, 139.1, 140.7, 158.9, 159.6, 172.0; IR(KBr):2960, 2933, 1731, 1605, 1547, 786, 716; HRMS (ESI): [M+H]<sup>+</sup> calcd for C<sub>16</sub>H<sub>17</sub>O<sub>2</sub><sup>+</sup>, 241.1228; found, *m/z* 241.1218.

### 7,8-dimethyl-3-phenethylindeno[1,2-*c*]pyran-1(5*H*)-one (5a)



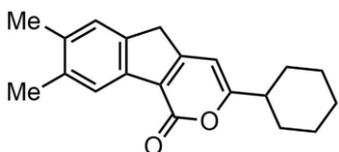
Purified by flash column chromatography (0.10 mmol scale, eluent: AcOEt/*n*-hexane = 1/5, 28.2 mg, 89%). Red solid ; mp 168 °C (decomp.); <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 2.32 (s, 3H), 2.34 (s, 3H), 2.88 (t, *J* = 7.8 Hz, 2H), 3.04 (t, *J* = 7.8 Hz, 2H), 3.65 (s, 2H), 6.26 (s, 1H), 7.19-7.21 (m, 3H), 7.28-7.29 (m, 2H), 7.86 (s, 1H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 19.9, 20.1, 33.5, 35.9, 38.1, 103.3, 123.0, 123.8, 125.1, 126.4, 128.3, 128.5, 134.9, 135.8, 136.7, 138.4, 140.1, 158.3, 159.8, 163.0; IR(KBr):2920, 1717, 1618, 1547, 1381, 835, 715 ; HRMS (ESI): [M+H]<sup>+</sup> calcd for C<sub>22</sub>H<sub>21</sub>O<sub>2</sub><sup>+</sup>, 317.1542; found *m/z* 317.1537.

### 7,8-dimethyl-3-(*o*-tolyl)indeno[1,2-*c*]pyran-1(5*H*)-one (5b)



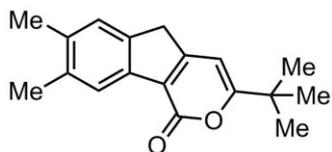
Purified by flash column chromatography (0.10 mmol scale, eluent: AcOEt/*n*-hexane = 1/5, 19.0 mg, 63%). Red solid ; mp 105 °C (decomp.); <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 2.34 (s, 3H), 2.36 (s, 3H), 2.52 (s, 3H), 3.80 (s, 2H), 6.68 (s, 1H), 7.27-7.35 (m, 4H), 7.52 (d, *J* = 7.7 Hz, 1H), 7.91 (s, 1H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 19.9, 20.2, 21.0, 38.3, 105.1, 123.3, 124.3, 125.1, 126.0, 129.1, 130.0, 131.2, 132.6, 135.2, 135.9, 136.6, 136.7, 138.7, 157.9, 159.4, 160.9; IR(KBr):2888, 1706, 1611, 1536, 1383, 921, 768; HRMS (ESI): [M+H]<sup>+</sup> calcd for C<sub>21</sub>H<sub>19</sub>O<sub>2</sub><sup>+</sup>, 303.1385; found *m/z* 303.1388.

### 3-cyclohexyl-7,8-dimethylindeno[1,2-*c*]pyran-1(5*H*)-one (5c)



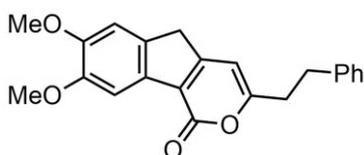
Purified by flash column chromatography (0.10 mmol scale, eluent: AcOEt/*n*-hexane = 1/10-1/5, 15.9 mg, 54%). Red solid ; mp 161 °C (decomp.); <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 1.23-1.51 (m, 5H), 1.73-1.76 (m, 1H), 1.84-1.87 (m, 2H), 2.02- 2.05 (m, 2H), 2.32 (s, 3H), 2.34 (s, 3H), 2.49-2.52 (m, 1H), 3.69 (s, 2H), 6.31 (s, 1H), 7.26 (s, 1H), 7.84 (s, 1H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 19.9, 20.1, 25.8, 30.8, 38.2, 42.4, 100.6, 123.0, 123.6, 125.1, 134.7, 135.7, 136.9, 138.4, 158.6, 159.9, 168.6; IR(KBr):2925, 2857, 1707, 1610, 1453, 1382, 811; HRMS (ESI): [M+H]<sup>+</sup> calcd for C<sub>20</sub>H<sub>23</sub>O<sub>2</sub><sup>+</sup>, 295.1698; found *m/z* 295.1689.

### 3-(tert-butyl)-7,8-dimethylindeno[1,2-*c*]pyran-1(5*H*)-one (5d)



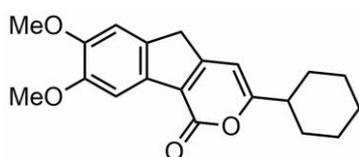
Purified by flash column chromatography (0.10 mmol scale, eluent: AcOEt/*n*-hexane = 1/5, 16.6 mg, 84%). Red solid; mp 135 °C (decomp.); <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 1.30 (s, 9H), 2.27 (s, 3H), 2.28 (s, 3H), 3.41 (s, 2H), 6.88 (s, 1H), 7.11 (s, 1H), 7.16 (s, 1H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 19.9, 20.0, 28.2, 31.1, 42.6, 76.3, 102.8, 122.0, 124.7, 127.1, 133.6, 134.6, 135.6, 140.5, 142.4; IR(KBr): 2965, 2923, 1718, 1608, 1541, 1464, 1380, 926; HRMS (ESI): [M+H]<sup>+</sup> calcd for C<sub>18</sub>H<sub>21</sub>O<sub>2</sub><sup>+</sup>, 269.1541; found m/z 269.1535.

### 7,8-dimethoxy-3-phenethylindeno[1,2-*c*]pyran-1(5*H*)-one (5e)



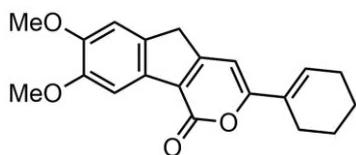
Purified by flash column chromatography (0.10 mmol scale, eluent: AcOEt/*n*-hexane = 1/5-1/3, 29.6 mg, 89%). Red solid; mp 158-159 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 2.89 (t, *J* = 7.7 Hz, 2H), 3.05 (t, *J* = 7.7 Hz, 2H), 3.65 (s, 2H), 3.92 (s, 3H), 3.99 (s, 3H), 6.26 (s, 1H), 7.05 (s, 1H), 7.19-7.21 (m, 3H), 7.28-7.30 (m, 2H), 7.63 (s, 1H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 33.5, 35.9, 38.3, 56.2, 56.2, 103.3, 105.0, 107.5, 123.9, 126.4, 128.3, 128.5, 131.7, 133.2, 140.1, 148.3, 148.9, 157.9, 159.9, 162.5; IR(KBr): 2923, 1716, 1618, 1494, 1301, 1214, 1097, 809; HRMS (ESI): [M+H]<sup>+</sup> calcd for C<sub>22</sub>H<sub>21</sub>O<sub>4</sub><sup>+</sup>, 349.1440; found m/z 349.1437.

### 3-cyclohexyl-7,8-dimethoxyindeno[1,2-*c*]pyran-1(5*H*)-one (5f)



Purified by flash column chromatography (0.10 mmol scale, eluent: AcOEt/*n*-hexane = 1/5-1/3, 22.2 mg, 68%) Red solid; mp 174-176 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 1.18-1.51 (m, 5H), 1.72-1.78 (m, 1H), 1.81-1.89 (m, 2H), 2.00-2.07 (m, 2H), 2.45-2.56 (m, 1H), 3.69 (s, 2H), 3.92 (s, 3H), 3.99 (s, 3H), 6.31 (s, 1H), 7.06 (s, 1H), 7.62 (s, 1H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 25.8, 25.9, 30.8, 38.4, 42.3, 56.1, 56.2, 100.5, 105.1, 107.5, 123.7, 131.9, 133.1, 148.2, 148.9, 158.2, 159.9, 168.1; IR(KBr): 2940, 2850, 1715, 1607, 1493, 1284, 1213, 1099; HRMS (ESI): [M+H]<sup>+</sup> calcd for C<sub>20</sub>H<sub>23</sub>O<sub>4</sub><sup>+</sup>, 327.1596; found m/z 327.1597.

### 3-(cyclohex-1-en-1-yl)-7,8-dimethoxyindeno[1,2-c]pyran-1(5H)-one (5g)



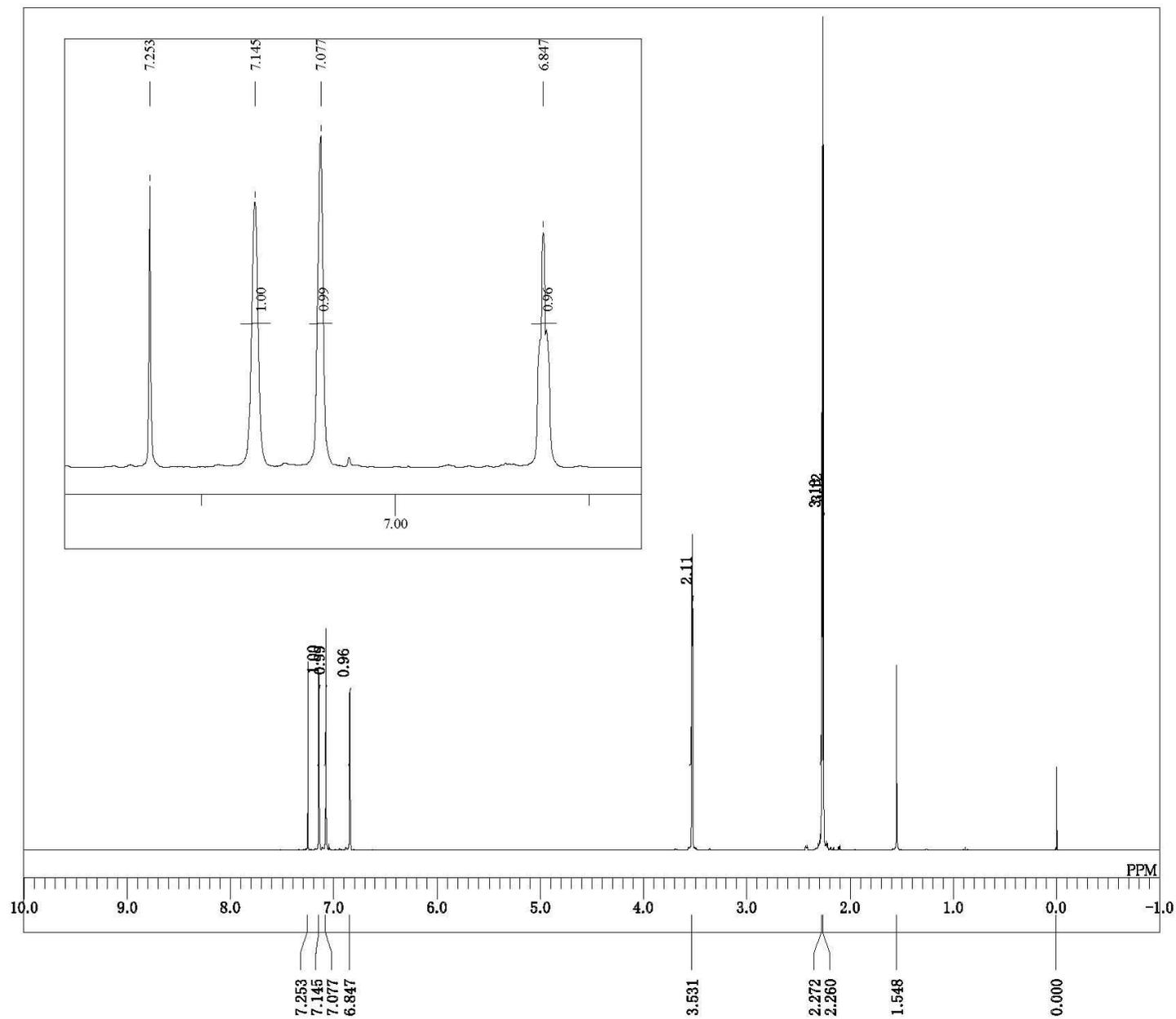
Purified by flash column chromatography (0.10 mmol scale, eluent: AcOEt/*n*-hexane = 1/5-1/3, 25.3 mg, 78%). Red solid ; mp 189 °C (decomp.) <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ = 1.64-1.70 (m, 2H), 1.72-1.81 (m, 2H), 2.25-2.32 (m, 4H), 3.69 (s, 2H), 3.91 (s, 3H), 3.99 (s, 3H), 6.43 (s, 1H),

6.86-6.94 (m, 1H), 7.04 (s, 1H), 7.61 (s, 1H) ; <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>): δ = 21.7, 22.2, 24.1, 25.8, 38.4, 56.1, 56.2, 99.5, 105.0, 107.5, 124.2, 128.5, 131.7, 132.0, 133.5, 148.3, 148.9, 157.9, 159.1, 159.2; IR(KBr):2994, . 2935, 1711, 1582, 1492, 1292, 1102; HRMS (ESI): [M]<sup>+</sup> calcd for C<sub>20</sub>H<sub>20</sub>O<sub>4</sub>,324.1362; found m/z 324.1365

## 5. References

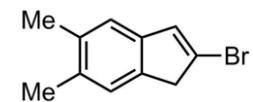
- (1) Akwabi-Ameyaw, A. A.; Deaton, D. N.; Mcfadyen, R. B.; Navas, F, III, PCT Int. Appl., 2009005998, 08 Jan 2009.
- (2) Ivchenko, P. V.; Nifant'ev, I. E.; Ustynyuk, L. Yu.; Ezerskii, V. A. *Russ. Chem. Bull.* **2009**, 58, 929-935.
- (3) Ivchenko, P. V.; Nifant'ev, I. E.; Mkoyan, Sh. G. *Russ. Chem. Bull.* **2007**, 56, 70–76.

## 6. $^1\text{H}$ and $^{13}\text{C}$ NMR spectra



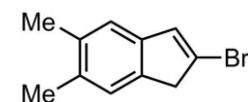
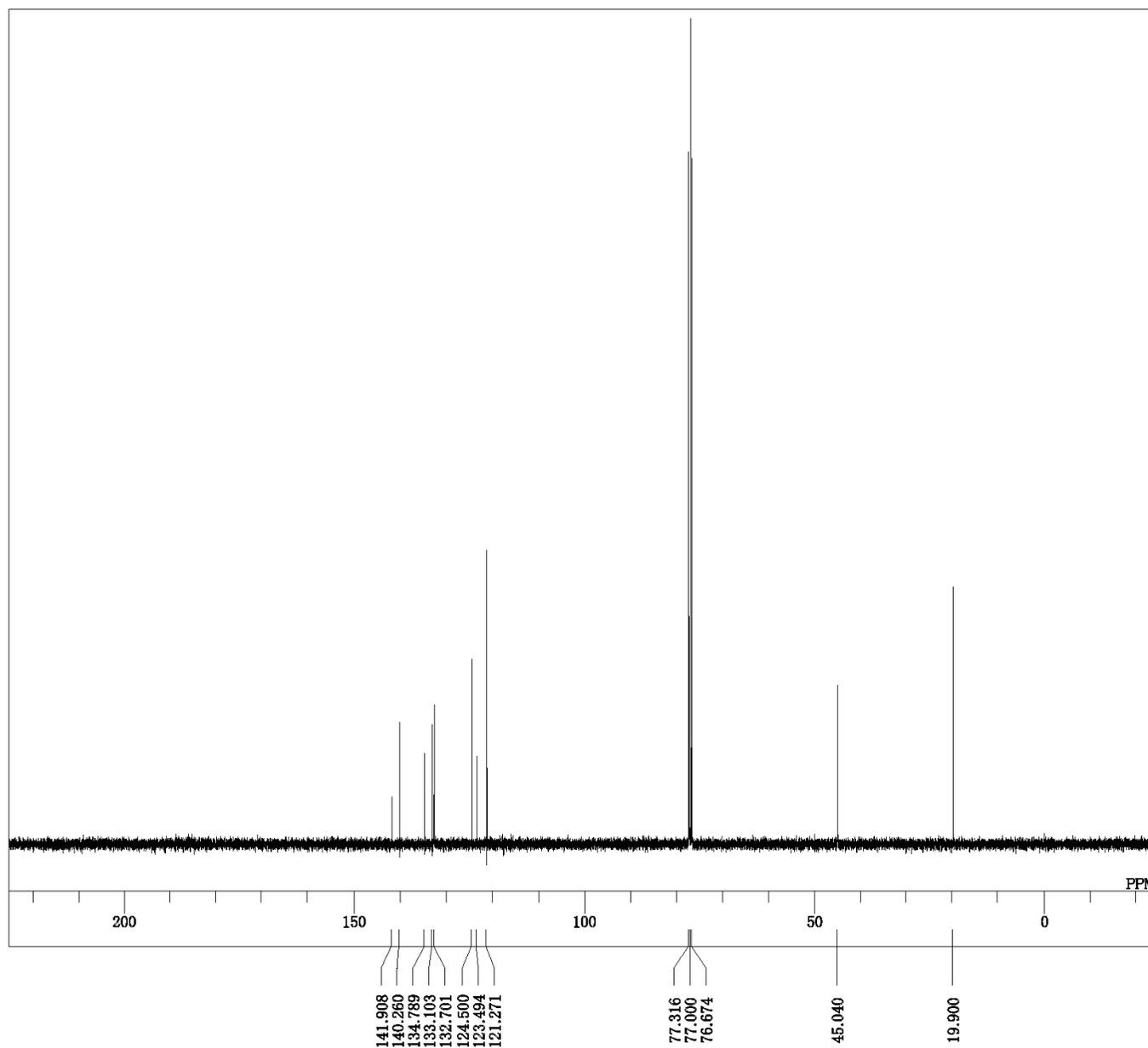
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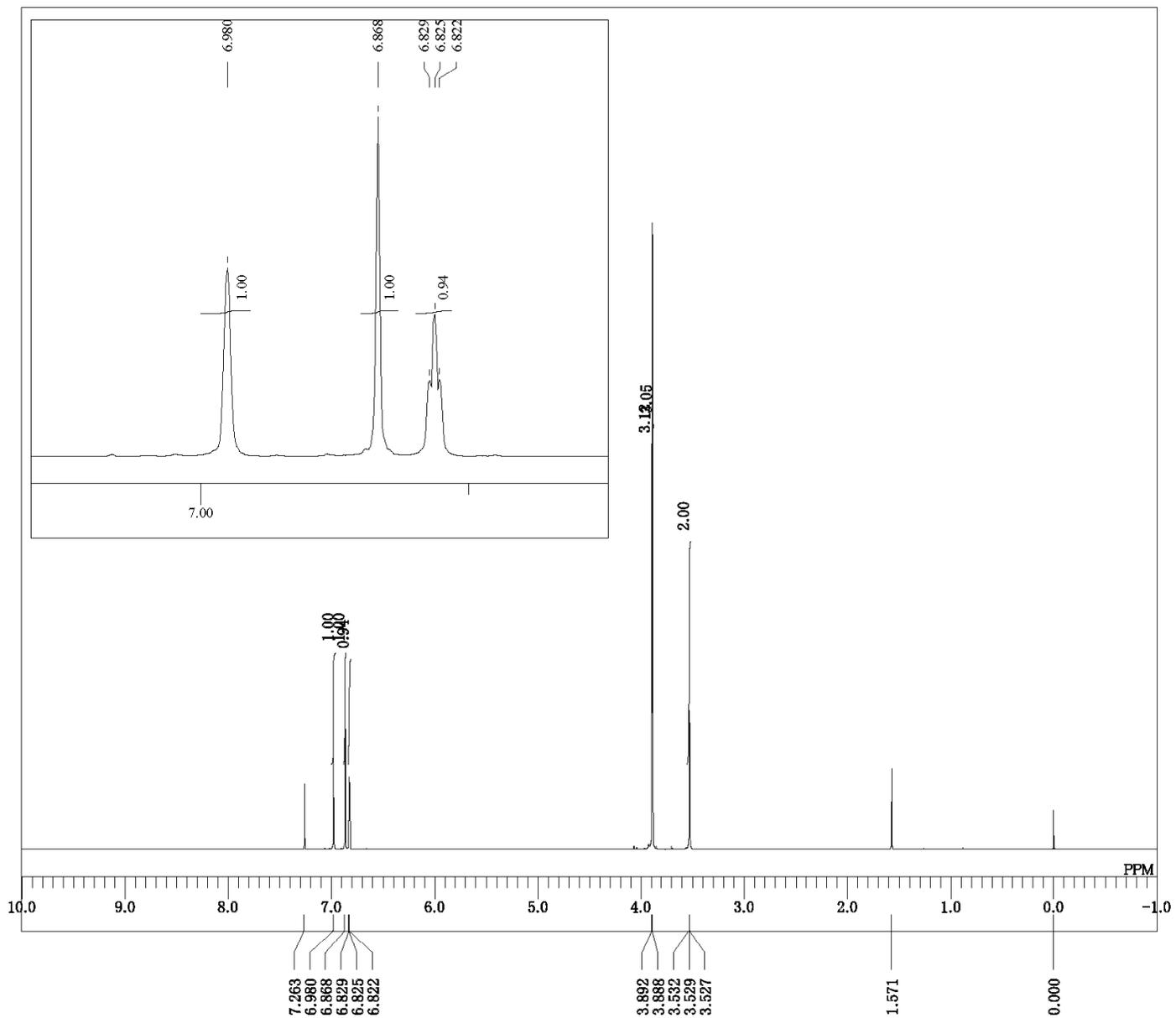


**S1**

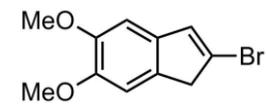
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**S1**

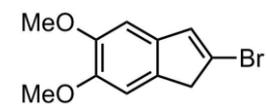
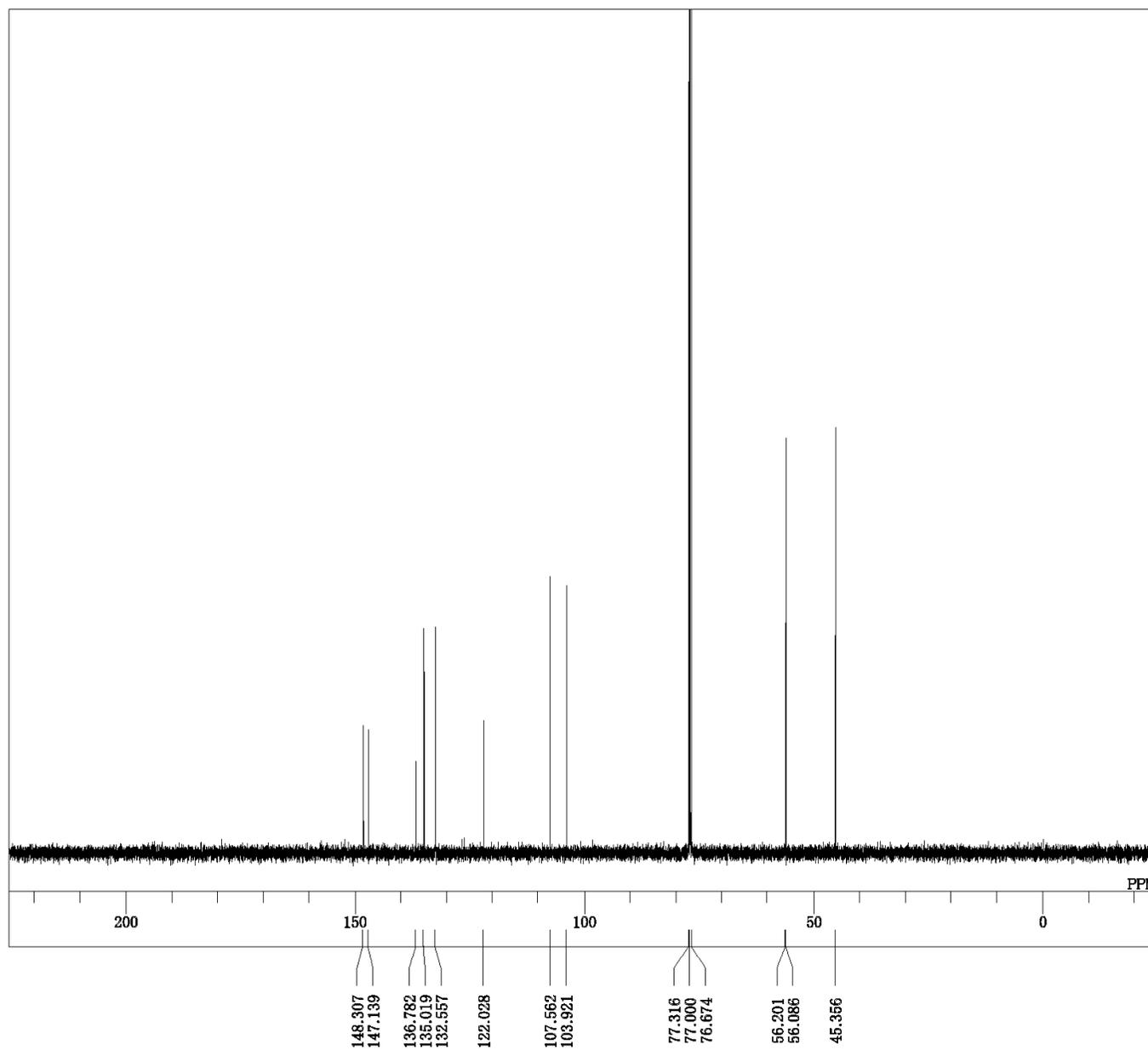


DFILE 20200302 5,6-dimethoxy bromoind  
 COMNT single\_pulse  
 DATIM 2020-03-02 14:48:59  
 OBNUC 1H  
 EXMOD proton.jxp  
 OBFRQ 395.88 MHz  
 OBSET 6.28 KHz  
 OBFIN 0.87 Hz  
 POINT 13107  
 FREQU 5938.24 Hz  
 SCANS 8  
 ACQTM 2.2073 sec  
 PD 5.0000 sec  
 PW1 3.14 usec  
 IRNUC 1H  
 CTEMP 19.8 c  
 SLVNT CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 38

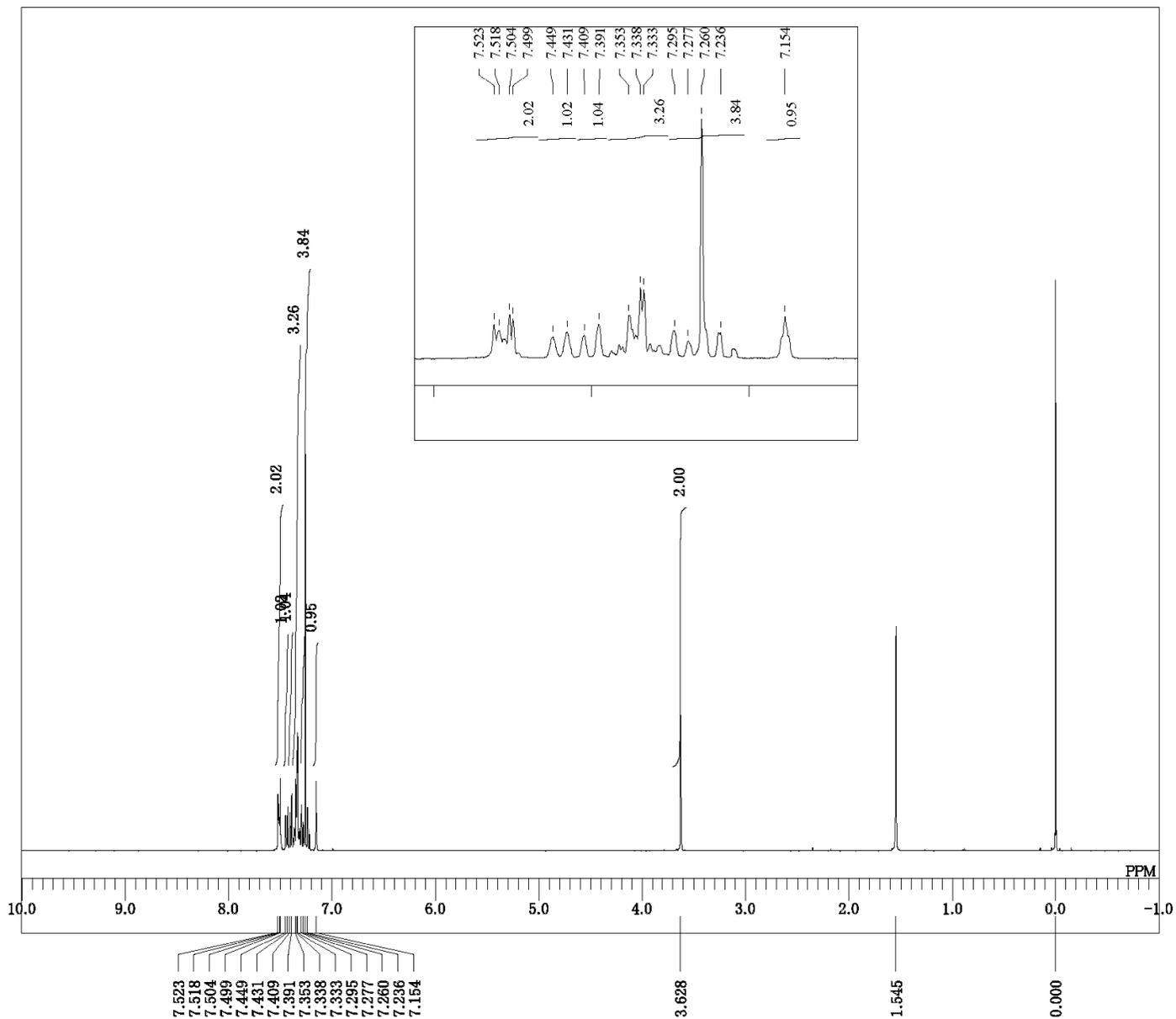


**S2**

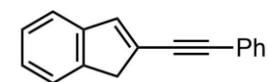
DFILE 20200302 5,6-dimethoxy bromind  
 COMNT single pulse decoupled gated NOE  
 DATIM 2020-03-02 14:51:46  
 OBNUC 13C  
 EXMOD carbon.jpg  
 OBFREQ 99.55 MHz  
 OBSET 5.13 KHz  
 OBFIN 0.98 Hz  
 POINT 26214  
 FREQU 25000.00 Hz  
 SCANS 1024  
 ACQTM 1.0486 sec  
 PD 2.0000 sec  
 PW1 3.59 usec  
 IRNUC 1H  
 CTEMP 20.3 c  
 SLVNT CDCL3  
 EXREF 77.00 ppm  
 BF 0.12 Hz  
 RGAIN 50



**S2**

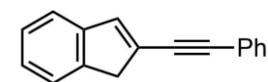
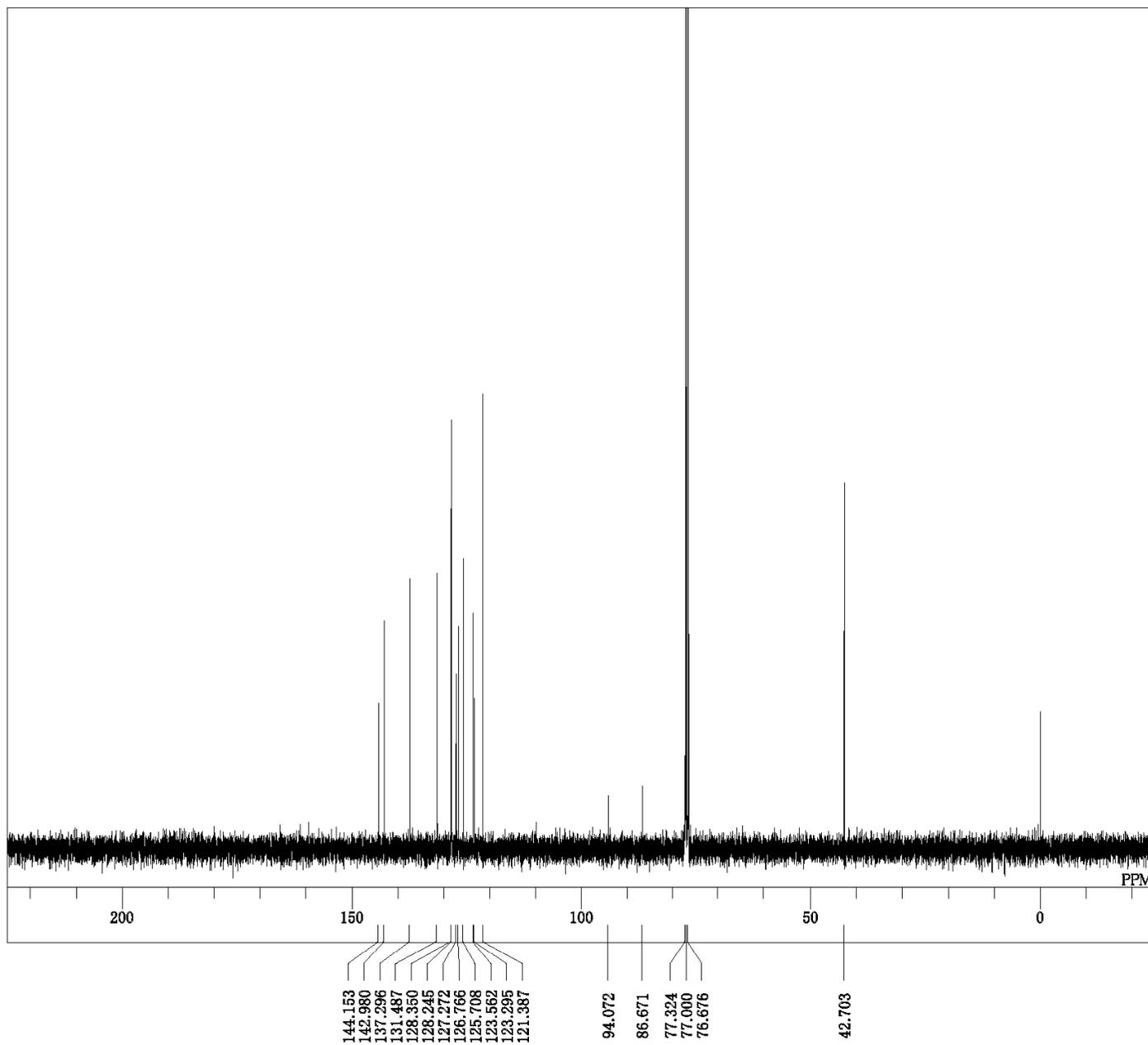


DFILE 20191216 Ph-Indene\_Proton-1-1.a  
 COMNT single\_pulse  
 DATIM 2019-12-16 15:54:40  
 OBNUC 1H  
 EXMOD proton.jxp  
 OBFREQ 395.88 MHz  
 OBSET 6.28 KHz  
 OBFIN 0.87 Hz  
 POINT 13107  
 FREQU 5938.24 Hz  
 SCANS 8  
 ACQTM 2.2073 sec  
 PD 5.0000 sec  
 PW1 3.14 usec  
 IRNUC 1H  
 CTEMP 20.0 c  
 CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 50

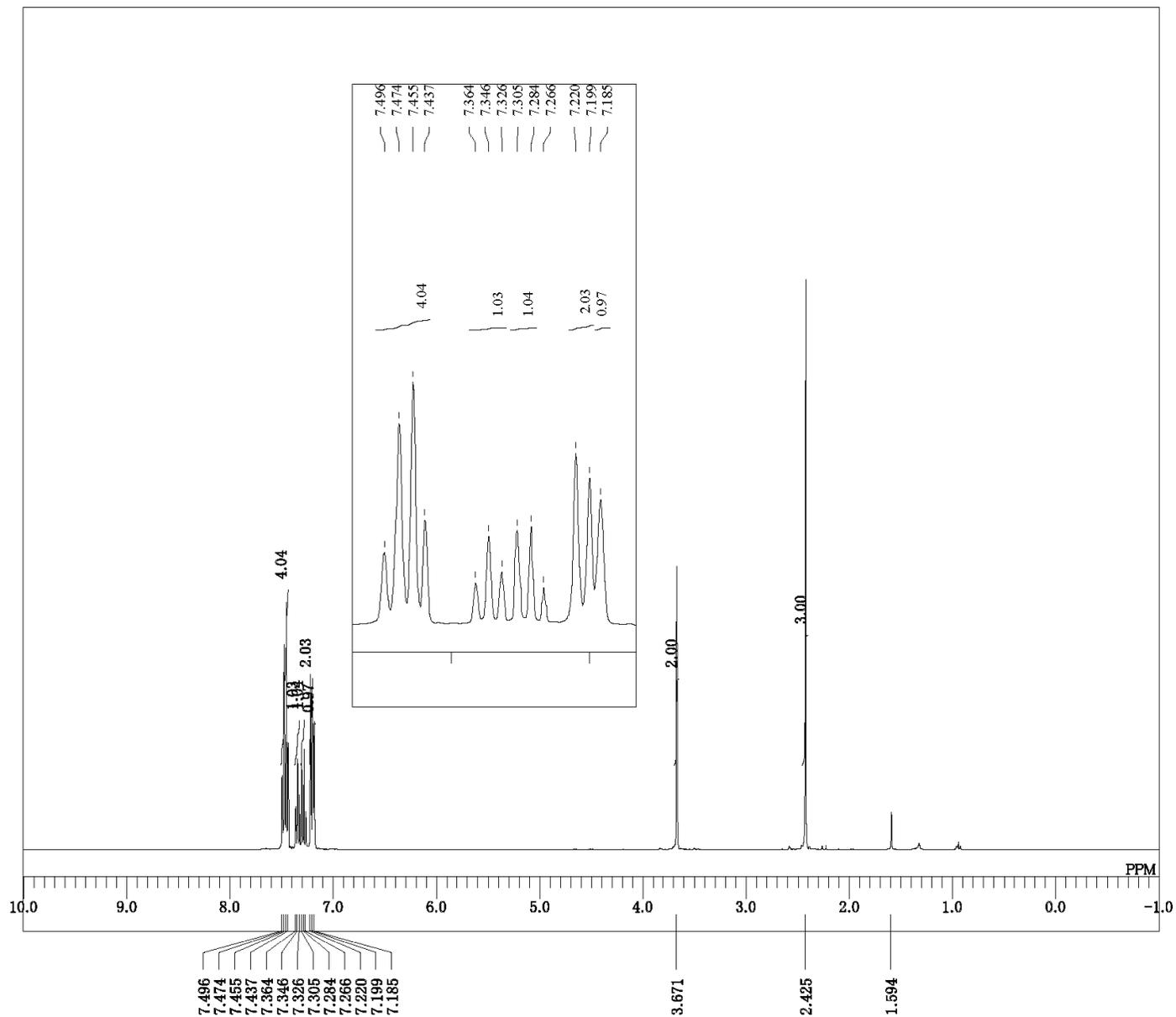


**1a**

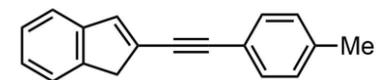
DFILE 20190706 indenesubphbcm-1.als  
COMNT single pulse decoupled gated NOE  
DATIM 2019-07-06 15:24:00  
OBNUC <sup>13</sup>C  
EXMOD single\_pulse\_dec  
OBFRQ 98.52 MHz  
OBSET 4.64 KHz  
OBFIN 8.74 Hz  
POINT 26214  
FREQU 24630.17 Hz  
SCANS 1024  
ACQTM 1.0643 sec  
PD 2.0000 sec  
PW1 3.17 usec  
IRNUC <sup>1</sup>H  
CTEMP 21.8 c  
SLVNT CDCL<sub>3</sub>  
EXREF 77.00 ppm  
BF 0.12 Hz  
RGAIN 36



**1a**

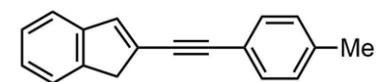
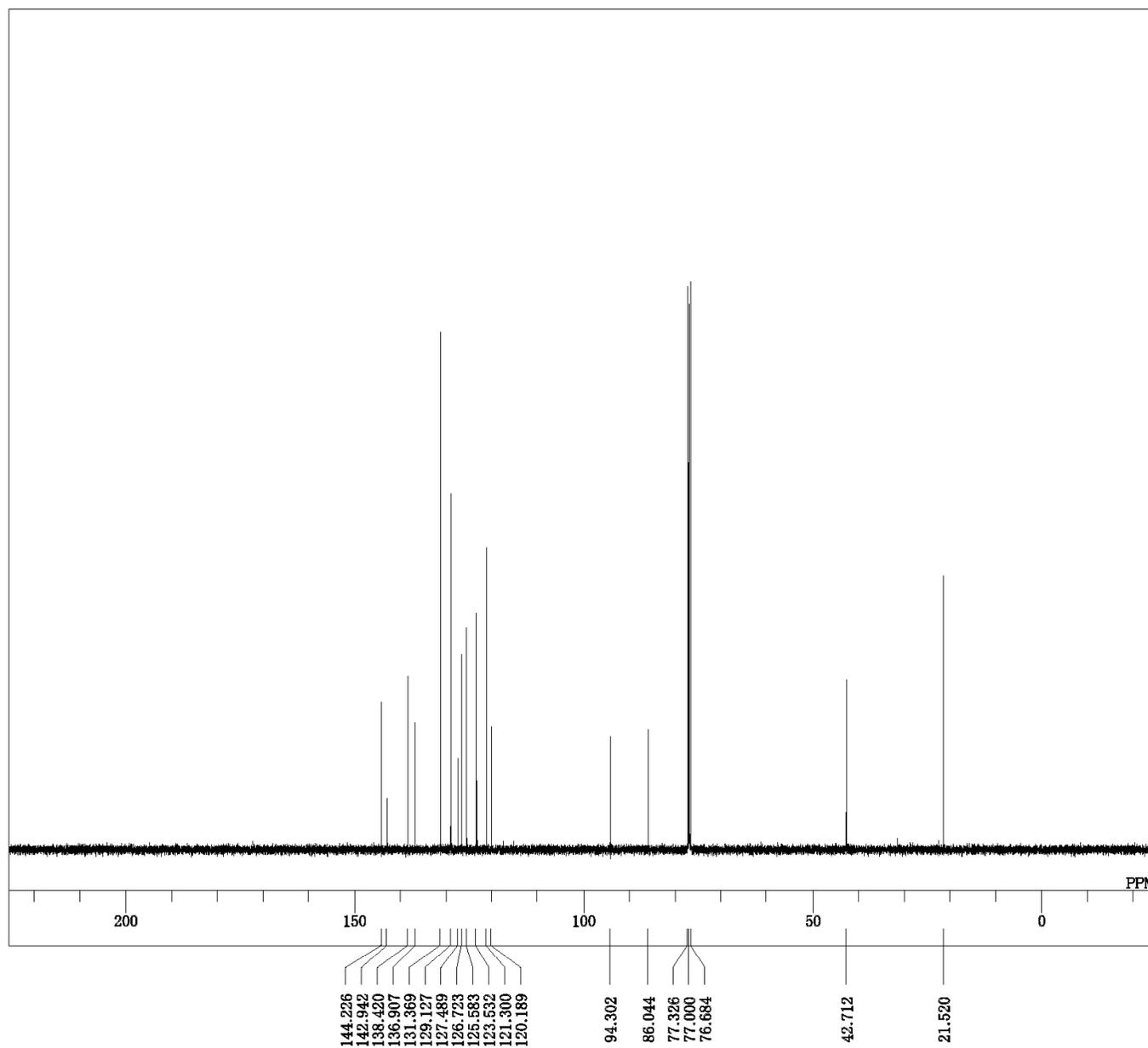


DFILE 20191209 4-tolyl ethynyl indene\_P1  
 COMNT single\_pulse  
 DATIM 2019-12-09 10:02:25  
 OBNUC 1H  
 EXMOD proton.jxp  
 OBFREQ 395.88 MHz  
 OBSET 6.28 KHz  
 OBFIN 0.87 Hz  
 POINT 13107  
 FREQU 5938.24 Hz  
 SCANS 8  
 ACQTM 2.2073 sec  
 PD 5.0000 sec  
 PW1 3.14 usec  
 IRNUC 1H  
 CTEMP 20.4 c  
 SLVNT CDCL3  
 EXREF 7.22 ppm  
 BF 0.12 Hz  
 RGAIN 34

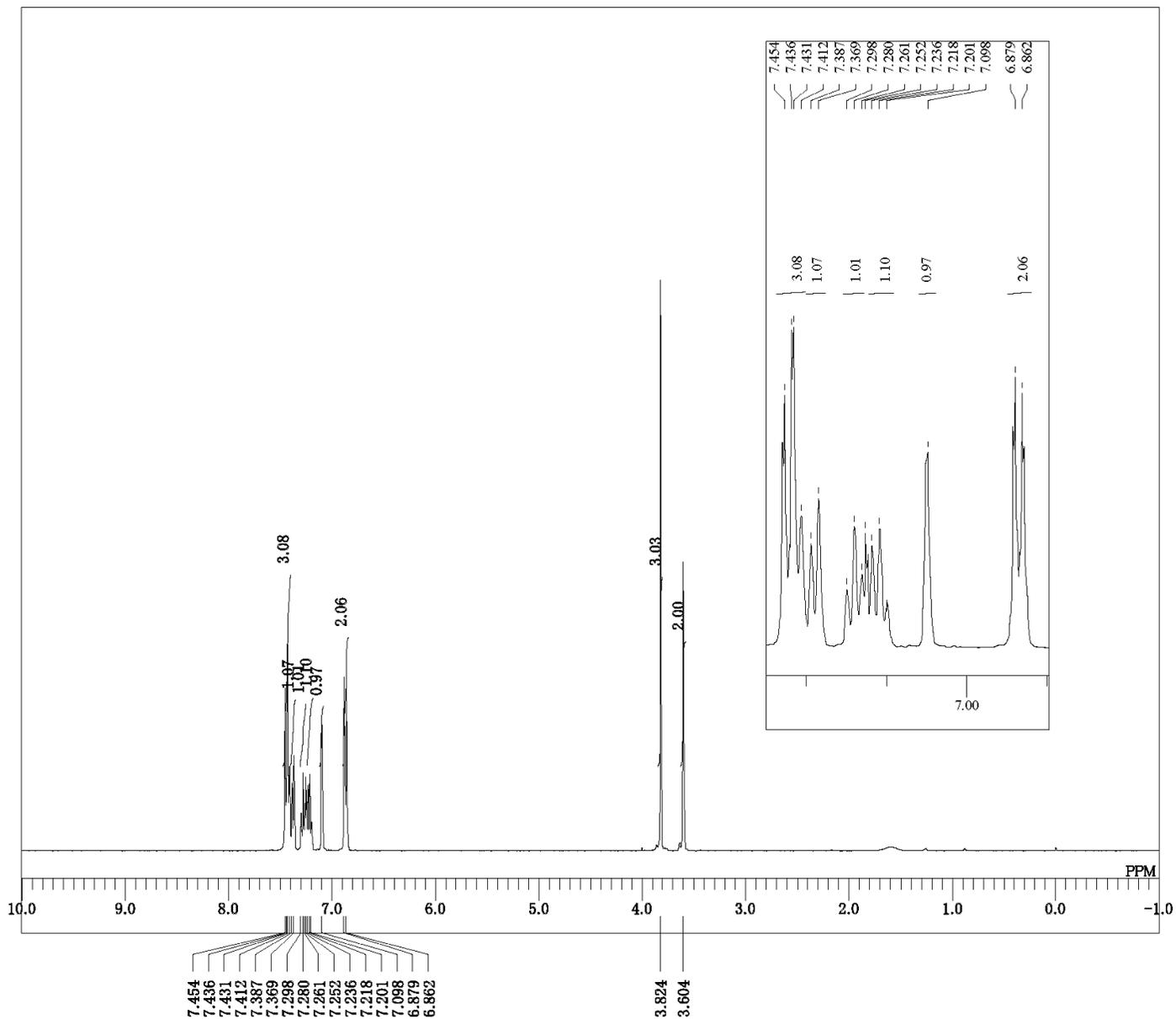


**1b**

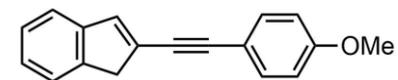
DFILE 20191209 4-tolyl ethynyl indene\_C  
COMNT single pulse decoupled gated NOE  
DATIM 2019-12-09 10:03:39  
OBNUC 13C  
EXMOD carbon.jxp  
OBFRQ 99.55 MHz  
OBSET 5.13 KHz  
OBFIN 0.98 Hz  
POINT 26214  
FREQU 25000.00 Hz  
SCANS 1024  
ACQTM 1.0486 sec  
PD 2.0000 sec  
PW1 3.59 usec  
IRNUC 1H  
CTEMP 19.7 c  
SLVNT CDCL3  
EXREF 77.00 ppm  
BF 0.12 Hz  
RGAIN 50



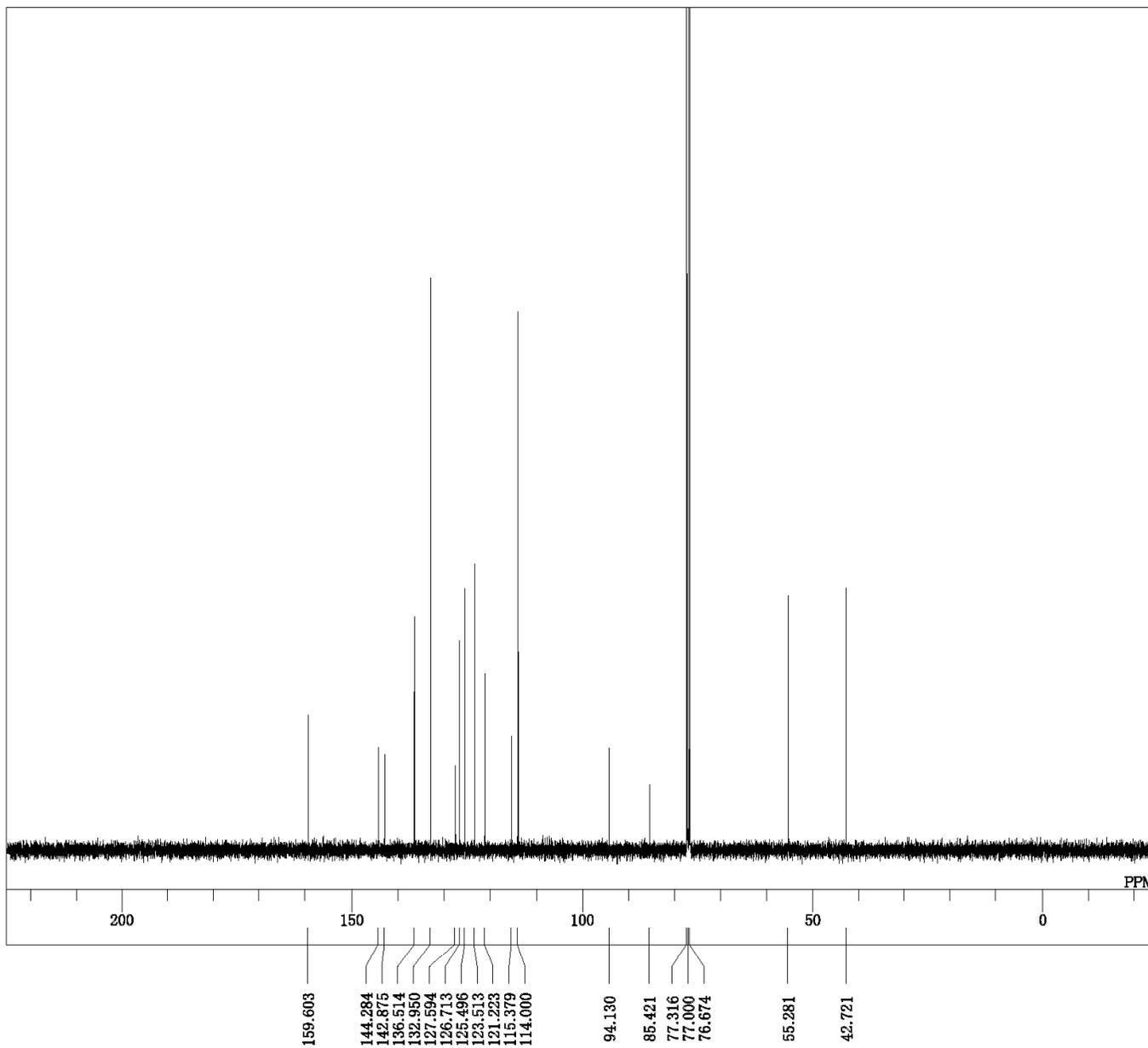
**1b**



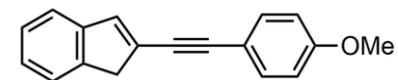
DFILE 20191204 p-methoxyphenyl ethynyl  
 COMNT single\_pulse  
 DATIM 2019-12-04 10:46:50  
 OBNUC 1H  
 EXMOD proton.jxp  
 OBFRQ 395.88 MHz  
 OBSET 6.28 KHz  
 OBFIN 0.87 Hz  
 POINT 13107  
 FREQU 5938.24 Hz  
 SCANS 8  
 ACQTM 2.2073 sec  
 PD 5.0000 sec  
 PW1 3.14 usec  
 IRNUC 1H  
 CTEMP 20.0 c  
 CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 36



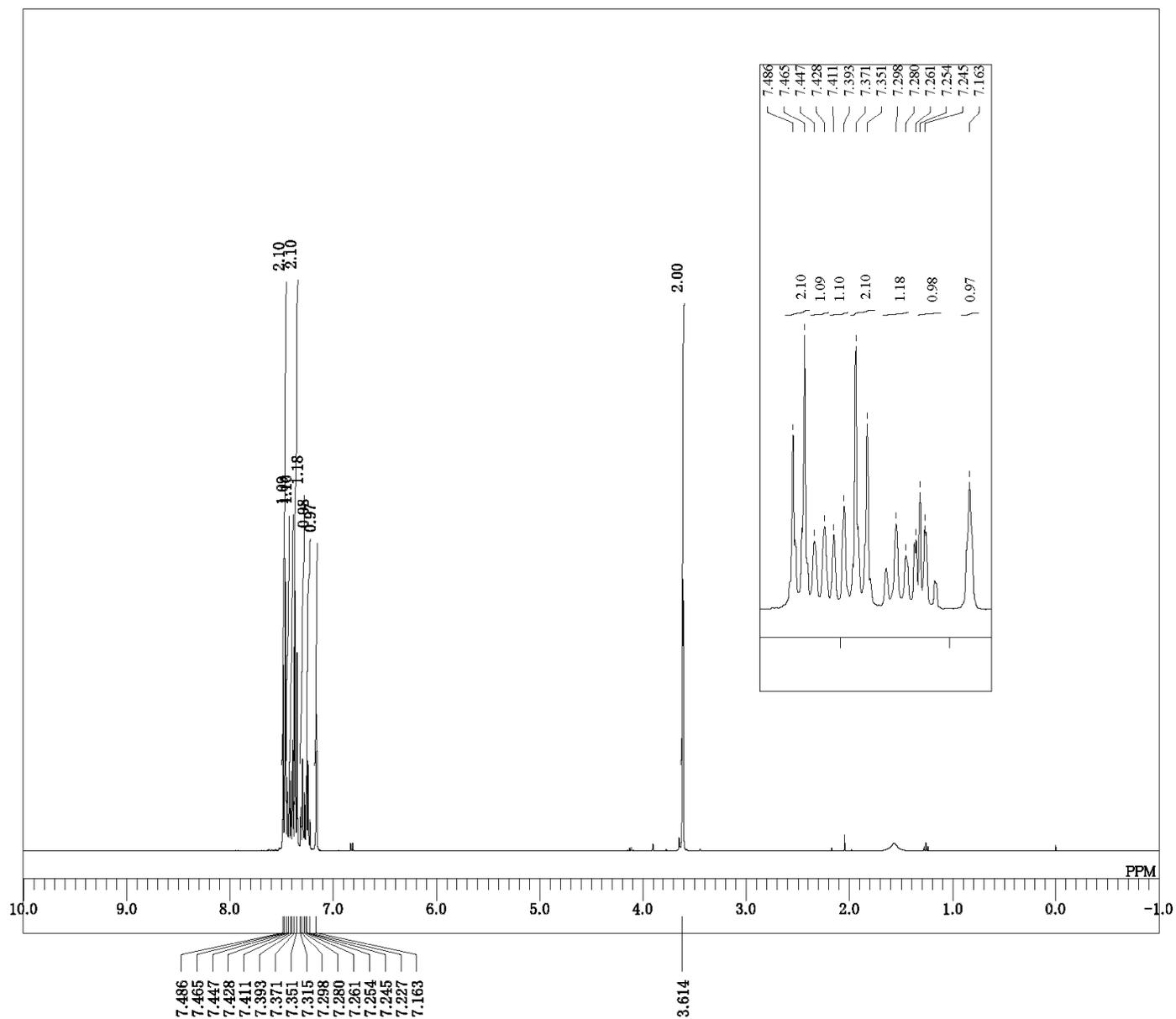
**1c**



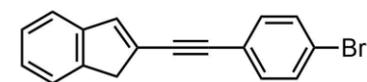
DFILE 20191204 p-methoxyphenyl ethyny  
 COMNT single pulse decoupled gated NOE  
 DATIM 2019-12-04 10:48:03  
 OBNUC 13C  
 EXMOD carbon.jxp  
 OBFREQ 99.55 MHz  
 OBSET 5.13 KHz  
 OBFIN 0.98 Hz  
 POINT 26214  
 FREQU 25000.00 Hz  
 SCANS 1024  
 ACQTM 1.0486 sec  
 PD 2.0000 sec  
 PW1 3.59 usec  
 IRNUC 1H  
 CTEMP 19.9 c  
 CDCL3  
 EXREF 77.00 ppm  
 BF 0.12 Hz  
 RGAIN 50



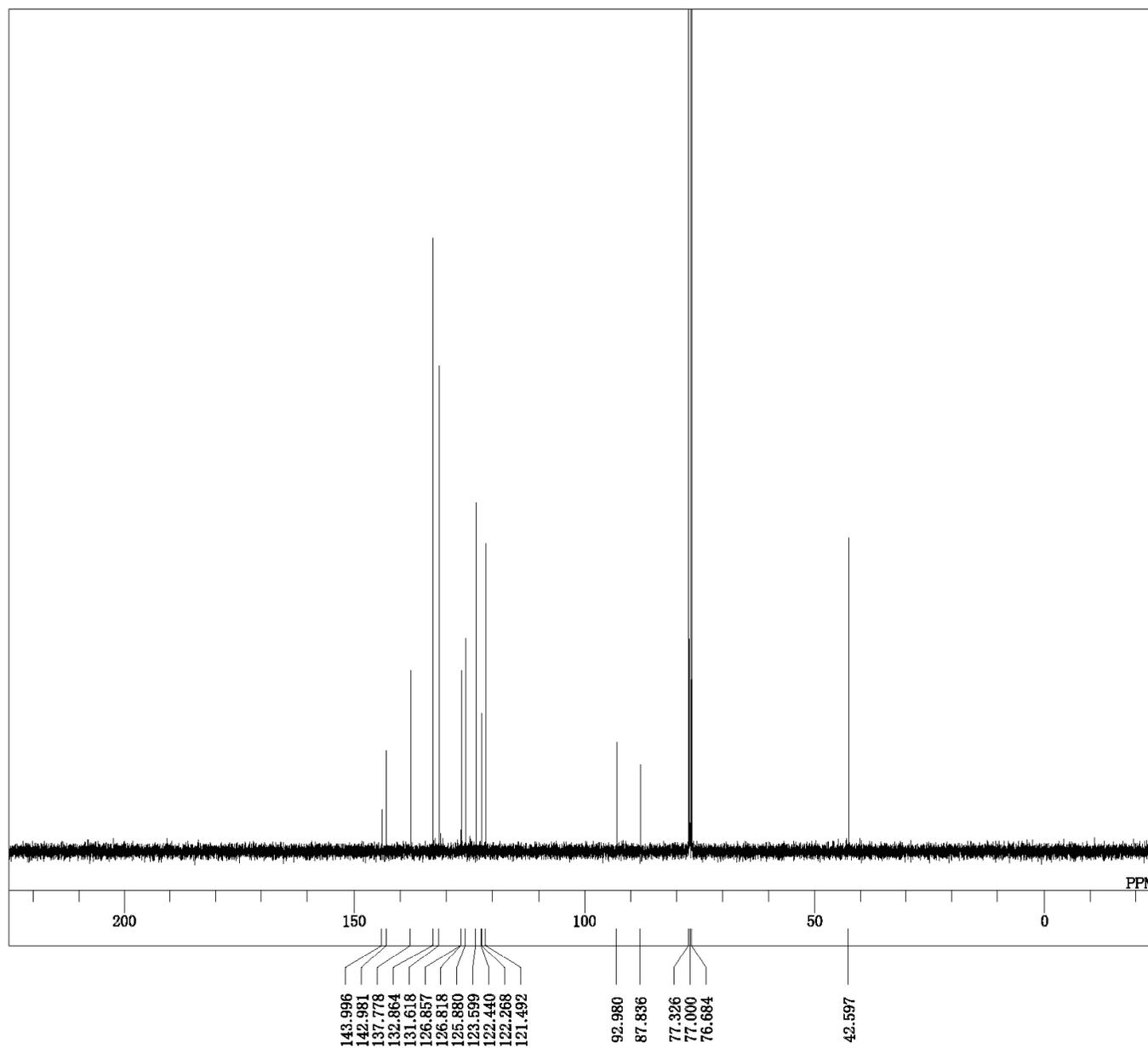
**1c**



DFILE 20191204 p-bromophenyl ethynyl i  
 COMNT single\_pulse  
 DATIM 2019-12-04 14:12:38  
 OBNUC 1H  
 EXMOD proton.jxp  
 OBFREQ 395.88 MHz  
 OBSET 6.28 KHz  
 OBFIN 0.87 Hz  
 POINT 13107  
 FREQU 5938.24 Hz  
 SCANS 8  
 ACQTM 2.2073 sec  
 PD 5.0000 sec  
 PW1 3.14 usec  
 IRNUC 1H  
 CTEMP 20.2 c  
 SLVNT CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 38



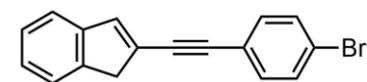
**1d**



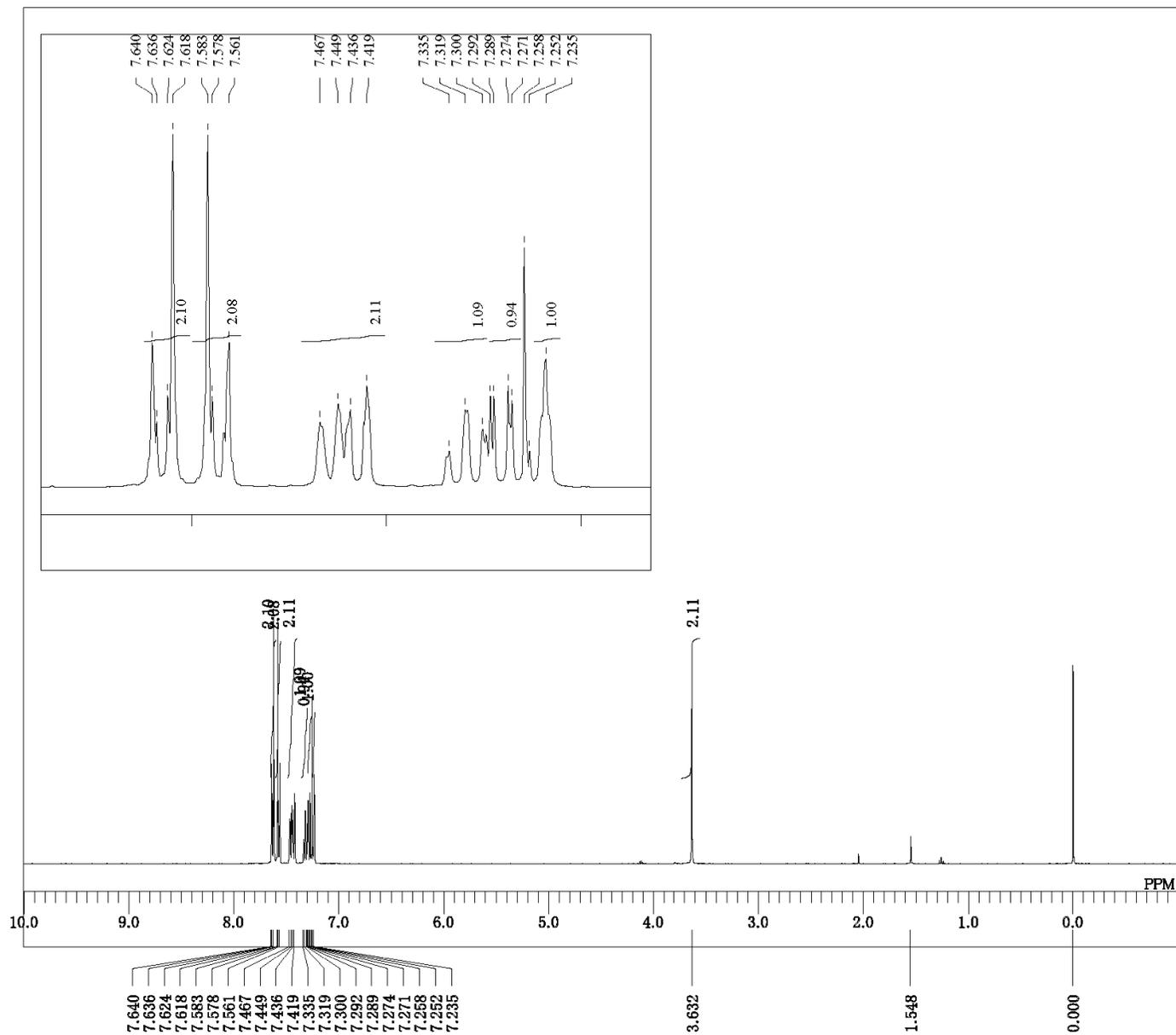
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DFILE 20191204 p-bromophenyl ethynyl i
COMNT single pulse decoupled gated NOE
DATIM 2019-12-04 14:13:51
OBNUC 13C
EXMOD carbon.jxp
OBFRQ 99.55 MHz
OBSET 5.13 KHz
OBFIN 0.98 Hz
POINT 26214
FREQU 25000.00 Hz
SCANS 1024
ACQTM 1.0486 sec
PD 2.0000 sec
PW1 3.59 usec
IRNUC 1H
CTEMP 20.0 c
SLVNT CDCL3
EXREF 77.00 ppm
BF 0.12 Hz
RGAIN 50

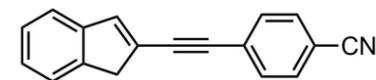
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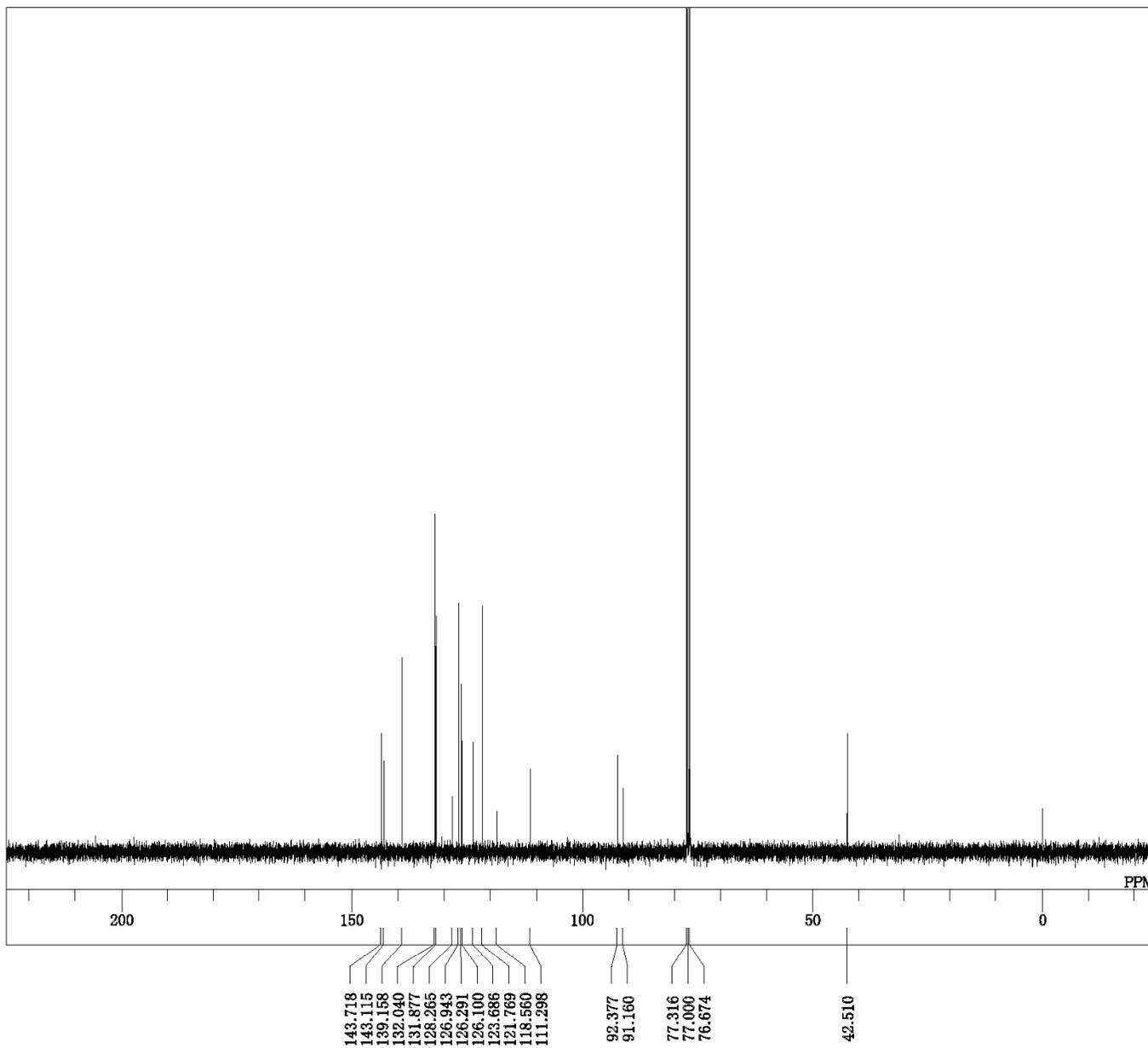
**1d**



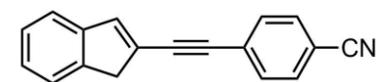
DFILE 20200228 p-CN-Indene\_Proton-1-  
 COMNT single\_pulse  
 DATIM 2020-02-28 11:25:04  
 OBNUC 1H  
 EXMOD proton.jxp  
 OBFRQ 395.88 MHz  
 OBSET 6.28 KHz  
 OBFIN 0.87 Hz  
 POINT 13107  
 FREQU 5938.24 Hz  
 SCANS 8  
 ACQTM 2.2073 sec  
 PD 5.0000 sec  
 PW1 3.14 usec  
 IRNUC 1H  
 CTEMP 20.5 c  
 SLVNT CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 42



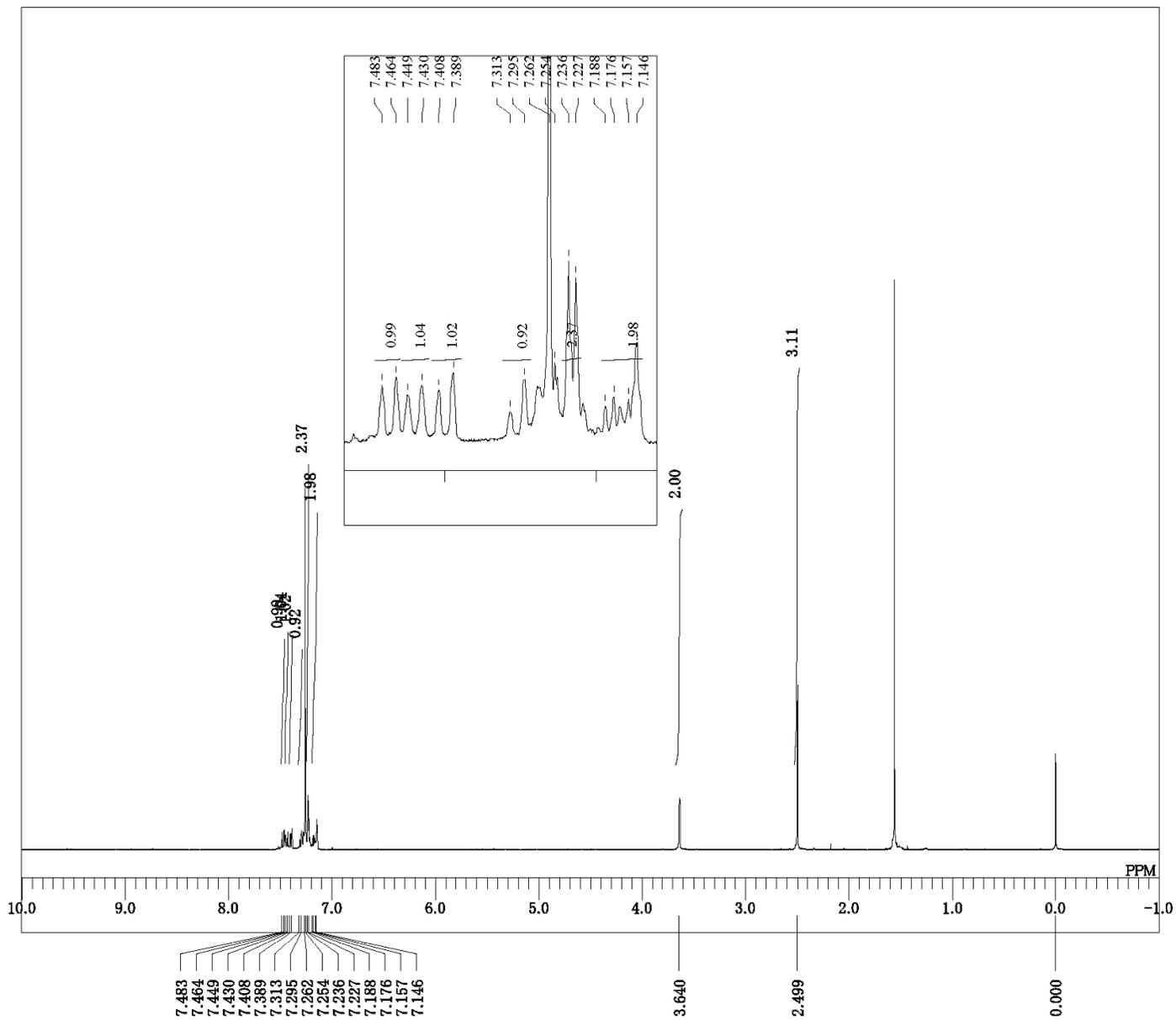
**1e**



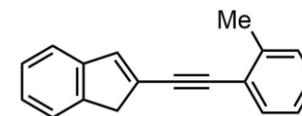
DFILE 20200228 p-CN-Indene\_Carbon-1-  
 COMNT single pulse decoupled gated NOE  
 DATIM 2020-02-28 11:27:52  
 OBNUC 13C  
 EXMOD carbon.jxp  
 OBFREQ 99.55 MHz  
 OBSETE 5.13 KHz  
 OBFIN 0.98 Hz  
 POINT 26214  
 FREQU 25000.00 Hz  
 SCANS 1024  
 ACQTM 1.0486 sec  
 PD 2.0000 sec  
 PW1 3.59 usec  
 IRNUC 1H  
 CTEMP 19.5 c  
 CDCL3  
 EXREF 77.00 ppm  
 BF 0.12 Hz  
 RGAIN 50



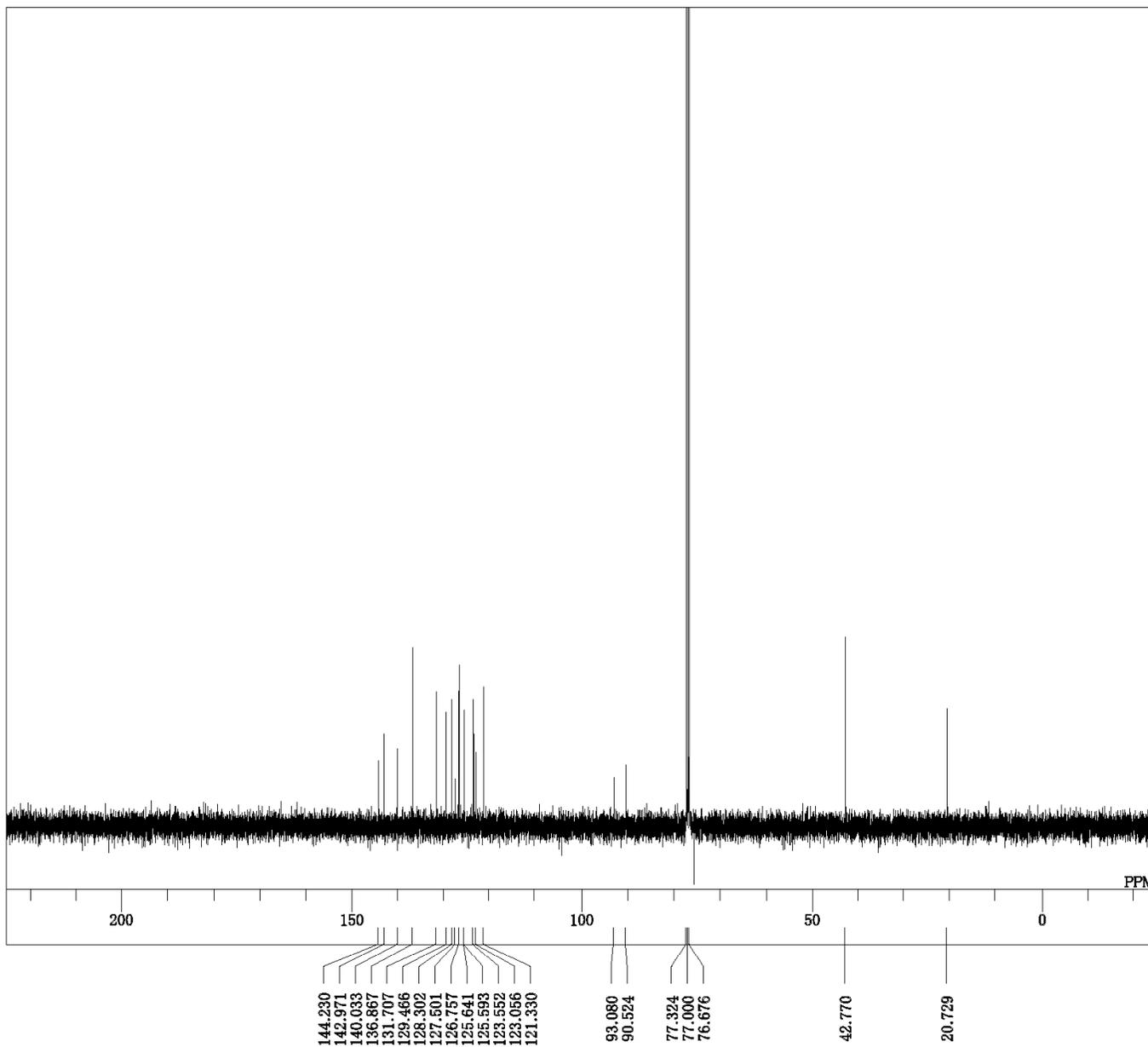
**1e**



DFILE 20191203 2-tolyethynyl indene.als  
 COMNT auto  
 DATIM Thu Dec 06 19:34:30 2018  
 OBNUC 1H  
 EXMOD NON  
 OBFRQ 399.65 MHz  
 OBSET 124.00 KHz  
 OBFIN 10500.00 Hz  
 POINT 32768  
 FREQU 7992.01 Hz  
 SCANS 16  
 ACQTM 4.1001 sec  
 PD 3.0000 sec  
 PW1 6.60 usec  
 IRNUC 1H  
 CTEMP 6348.8 c  
 SLVNT CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 24



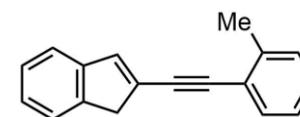
**1f**



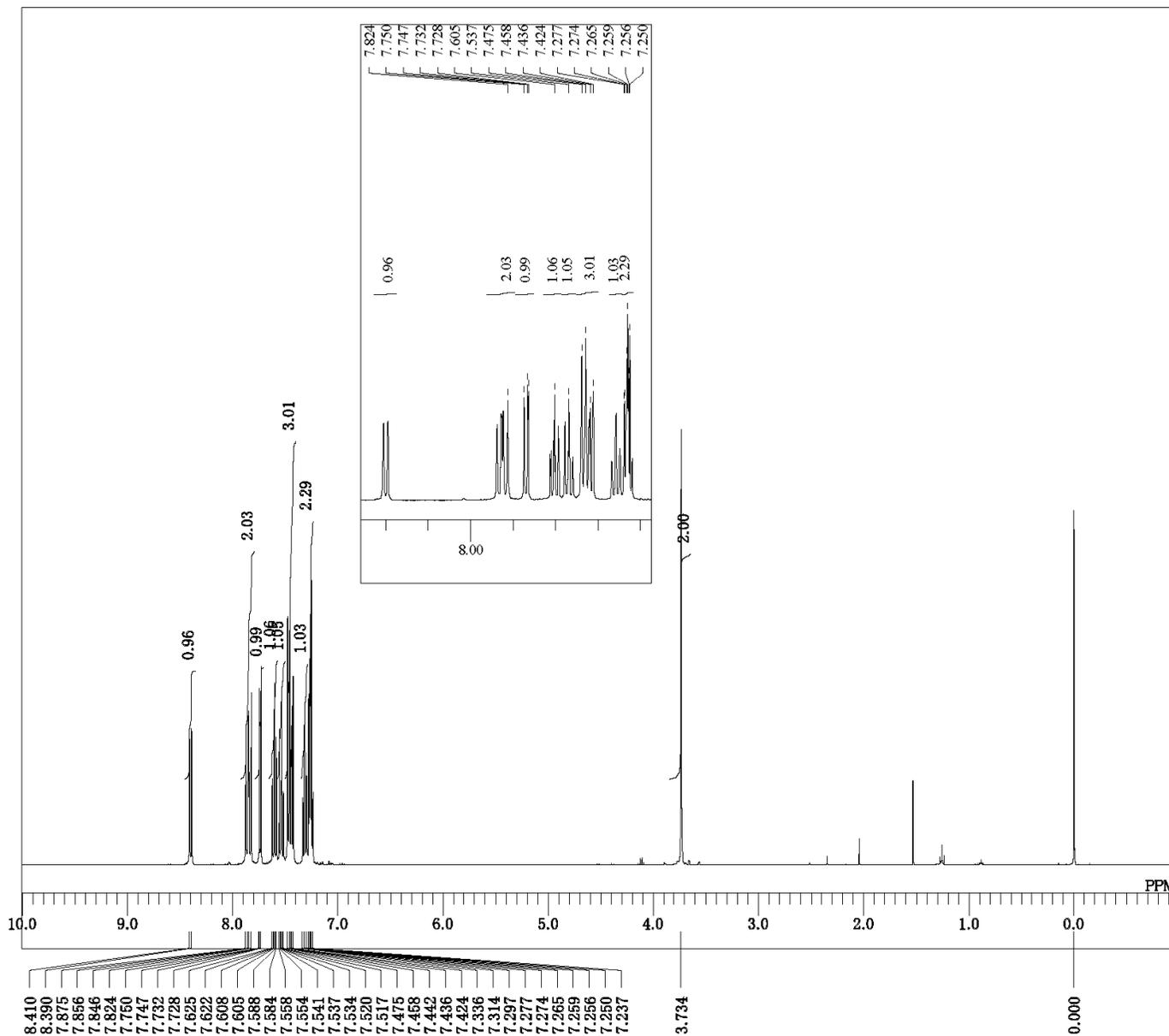
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DFILE 20191203 2-tolyethyny lindne-bcr
COMNT single pulse decoupled gated NOE
DATIM 2019-12-03 13:37:16
OBNUC 13C
EXMOD single_pulse_dec
OBFRQ 98.52 MHz
OBSET 4.64 KHz
OBFIN 8.74 Hz
POINT 26214
FREQU 24630.17 Hz
SCANS 512
ACQTM 1.0643 sec
PD 2.0000 sec
PW1 3.17 usec
IRNUC 1H
CTEMP 20.3 c
SLVNT CDCL3
EXREF 77.00 ppm
BF 0.12 Hz
RGAIN 38

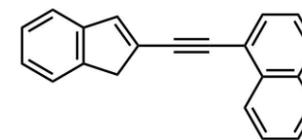
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**1f**

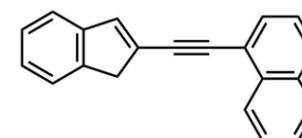
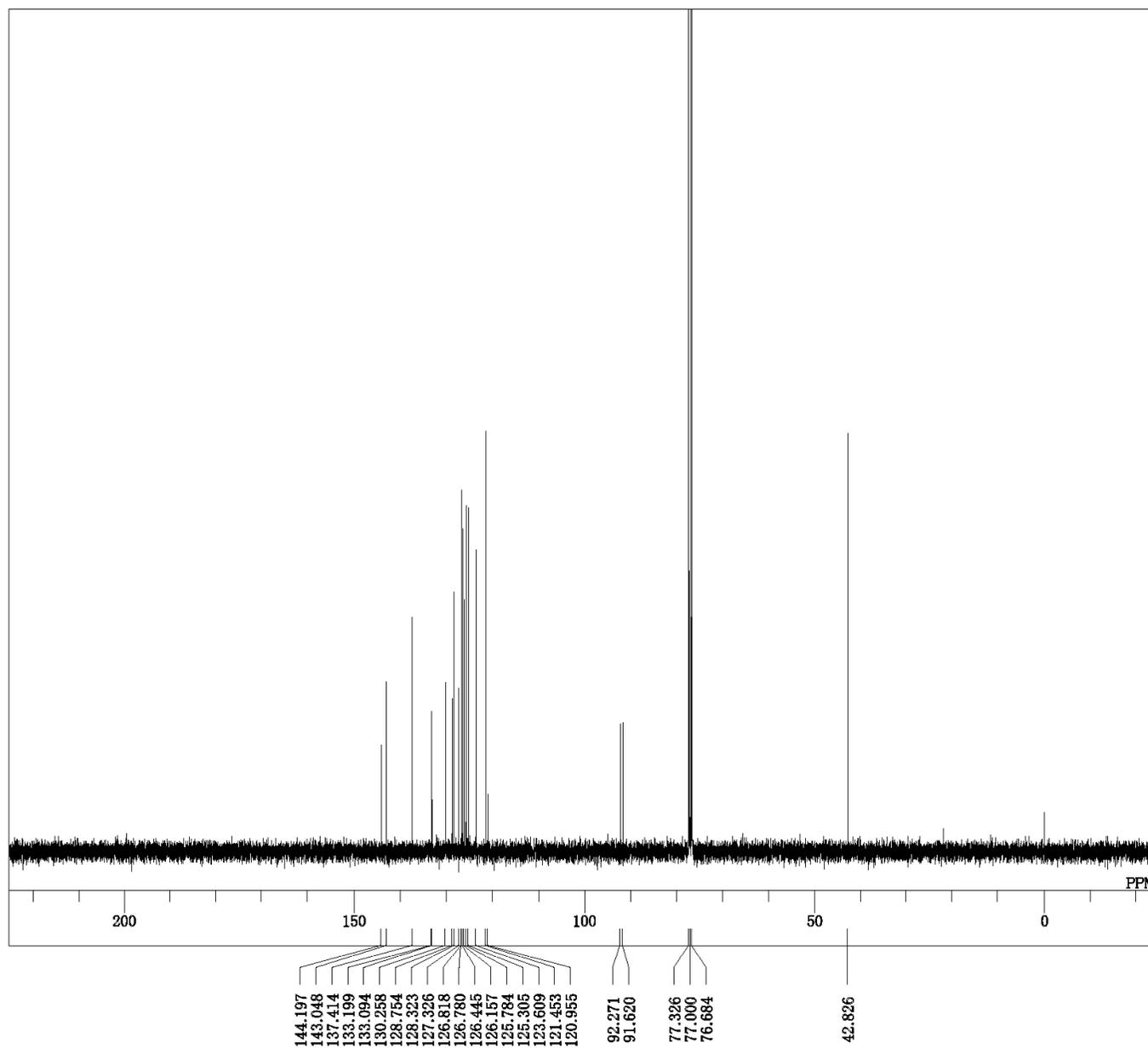


DFILE 20200106 1-Naph-Indene\_Proton-1  
 COMNT single\_pulse  
 DATIM 2020-01-06 18:49:17  
 OBNUC 1H  
 EXMOD proton.jxp  
 OBFRQ 395.88 MHz  
 OBSET 6.28 KHz  
 OBFIN 0.87 Hz  
 POINT 13107  
 FREQU 5938.24 Hz  
 SCANS 8  
 ACQTM 2.2073 sec  
 PD 5.0000 sec  
 PW1 3.14 usec  
 IRNUC 1H  
 CTEMP 19.4 c  
 CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 38

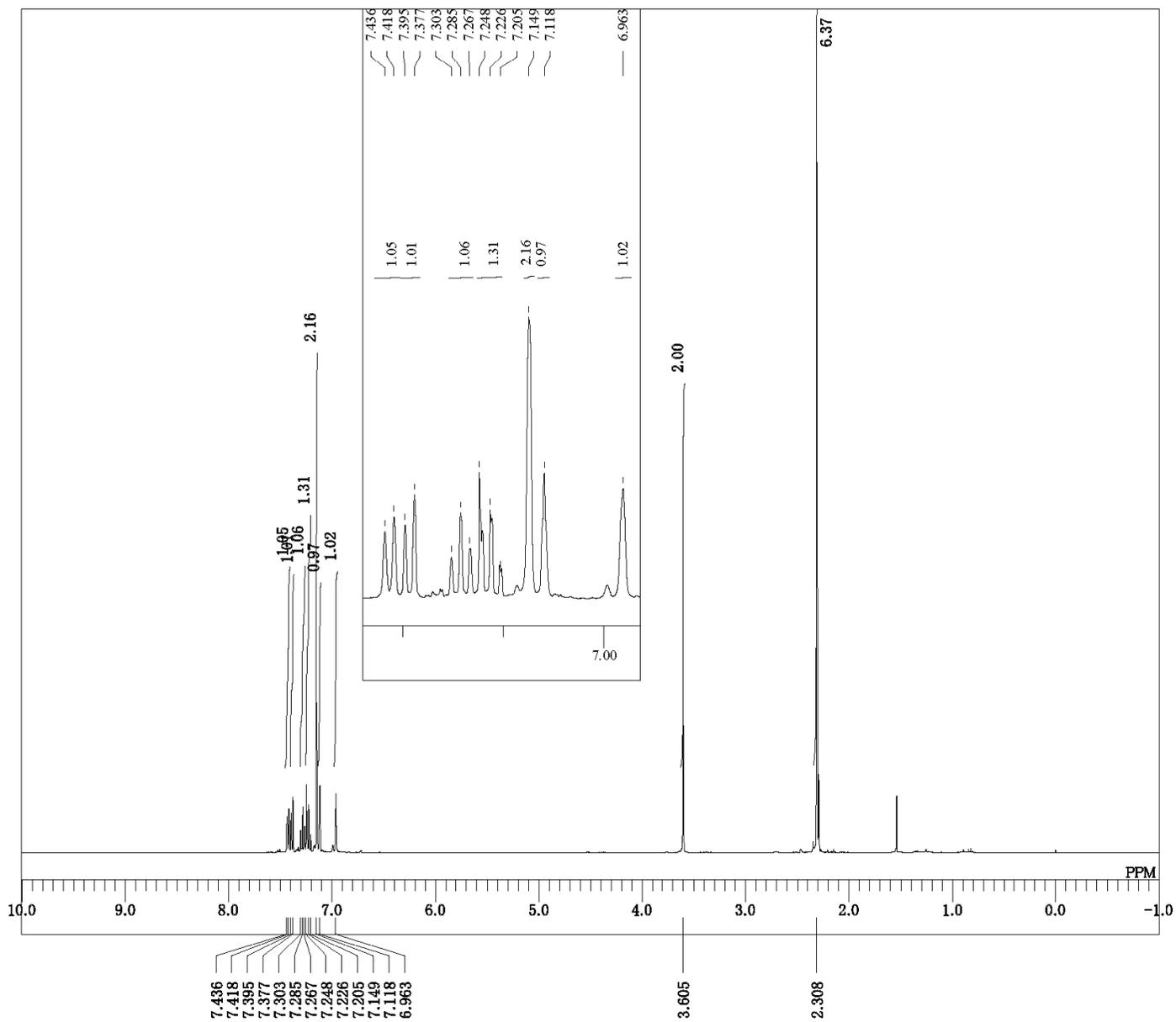


**1g**

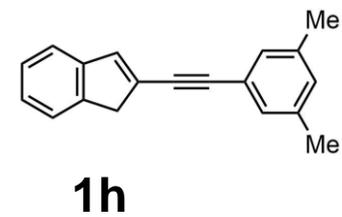
DFILE 20200106 1-Naph-Indene\_Carbon-  
COMNT single pulse decoupled gated NOE  
DATIM 2020-01-06 18:51:58  
OBNUC 13C  
EXMOD carbon.jxp  
OBFRQ 99.55 MHz  
OBSET 5.13 KHz  
OBFIN 0.98 Hz  
POINT 26214  
FREQU 25000.00 Hz  
SCANS 1024  
ACQTM 1.0486 sec  
PD 2.0000 sec  
PW1 3.59 usec  
IRNUC 1H  
CTEMP 19.5 c  
SLVNT CDCL3  
EXREF 77.00 ppm  
BF 0.12 Hz  
RGAIN 50

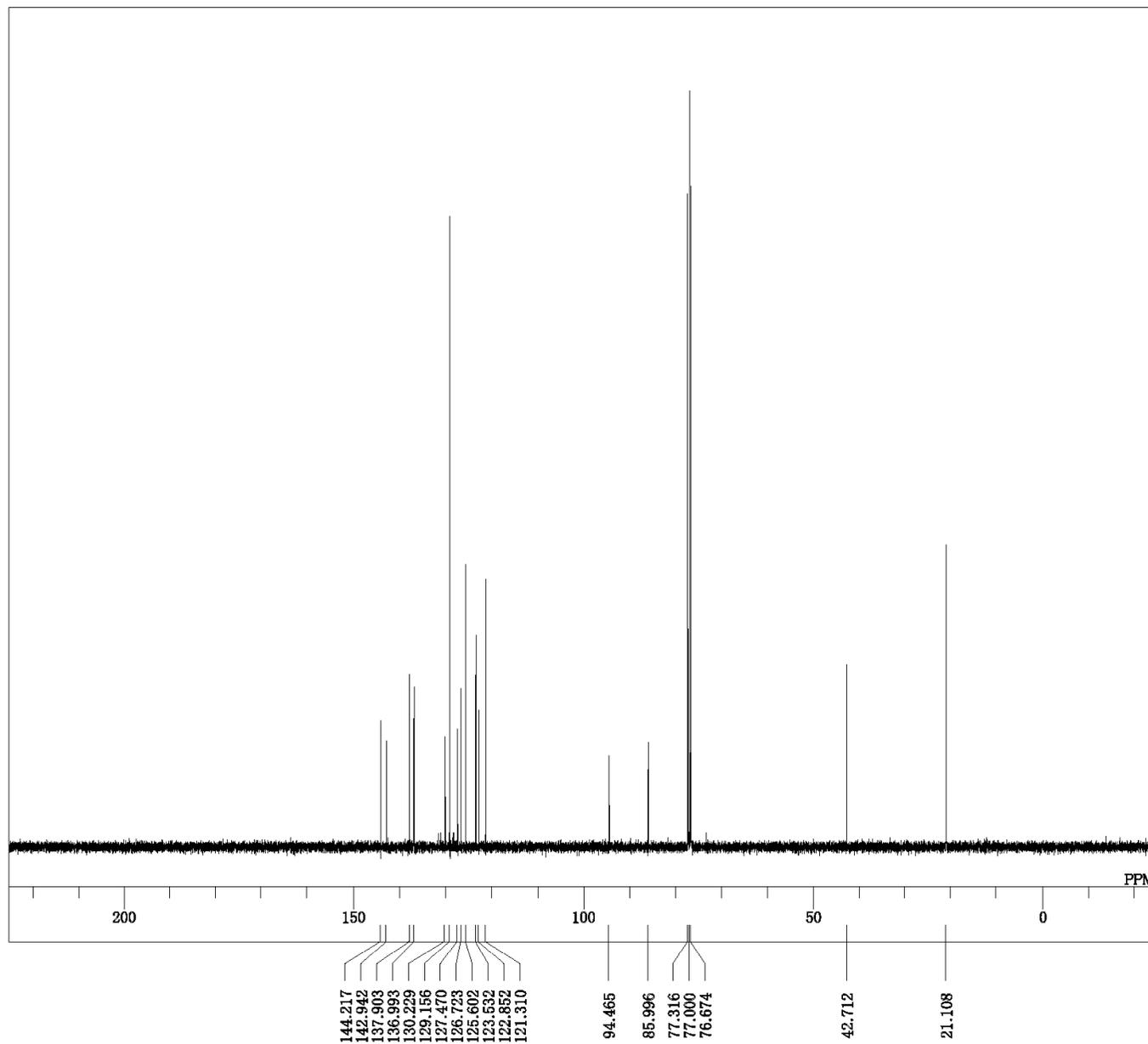


1g



DFILE 20191204 3,5-dimethylphenyl ethy  
 COMNT single\_pulse  
 DATIM 2019-12-04 19:17:32  
 OBNUC 1H  
 EXMOD proton.jxp  
 OBFRQ 395.88 MHz  
 OBSET 6.28 KHz  
 OBFIN 0.87 Hz  
 POINT 13107  
 FREQU 5938.24 Hz  
 SCANS 8  
 ACQTM 2.2073 sec  
 PD 5.0000 sec  
 PW1 3.14 usec  
 IRNUC 1H  
 CTEMP 19.6 c  
 SLVNT CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 34

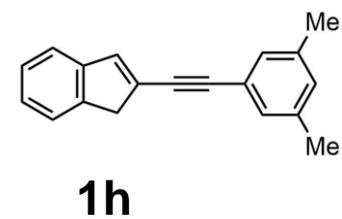


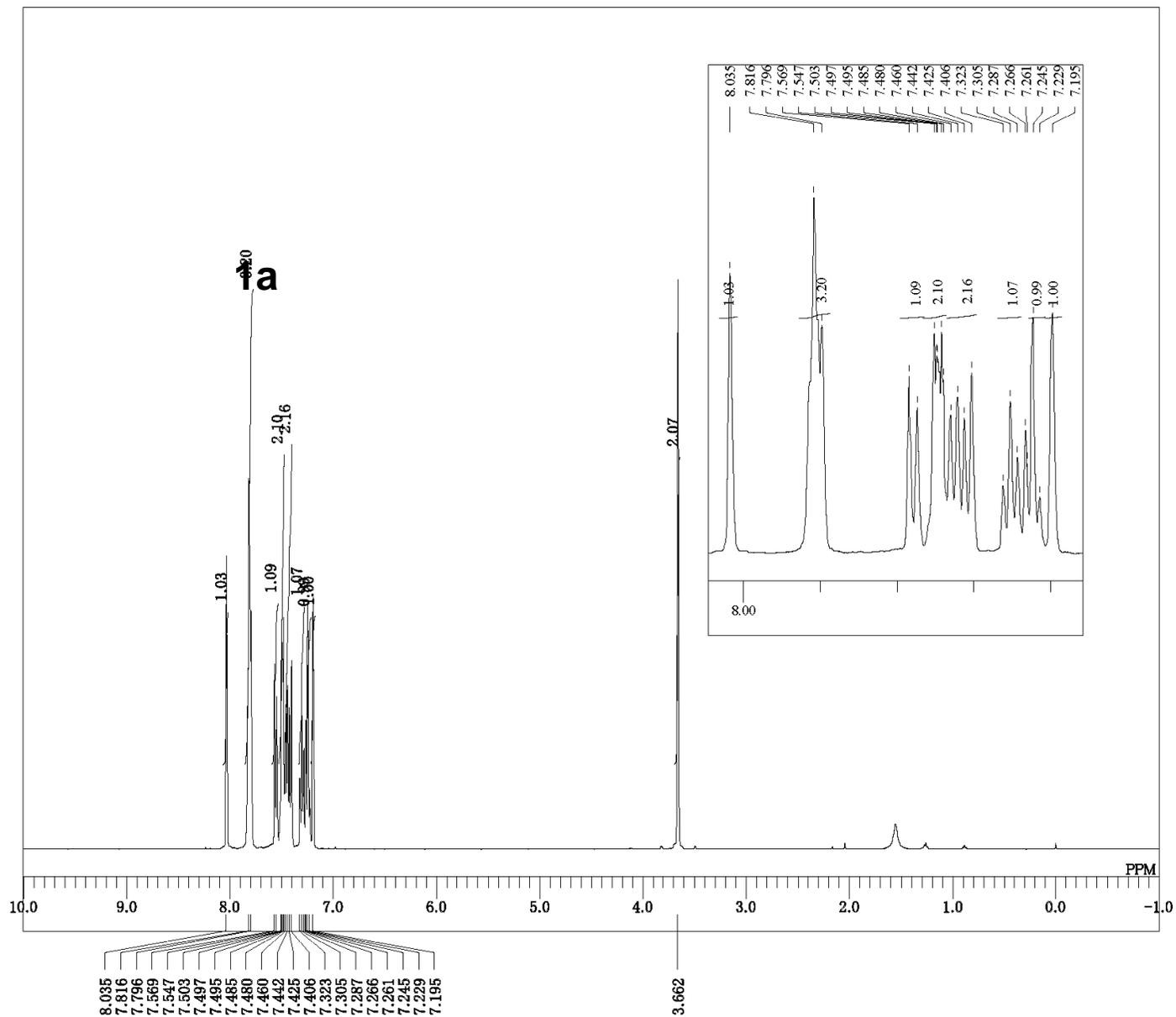


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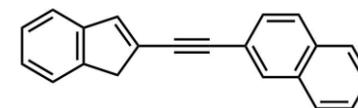
DFILE 20191204 3,5-dimethylphenyl ethy
COMNT single pulse decoupled gated NOE
DATIM 2019-12-04 19:18:45
OBNUC 13C
EXMOD carbon.jxp
OBFRQ 99.55 MHz
OBSET 5.13 KHz
OBFIN 0.98 Hz
POINT 26214
FREQU 25000.00 Hz
SCANS 1024
ACQTM 1.0486 sec
PD 2.0000 sec
PW1 3.59 usec
IRNUC 1H
CTEMP 19.7 c
CDCL3
EXREF 77.00 ppm
BF 0.12 Hz
RGAIN 50

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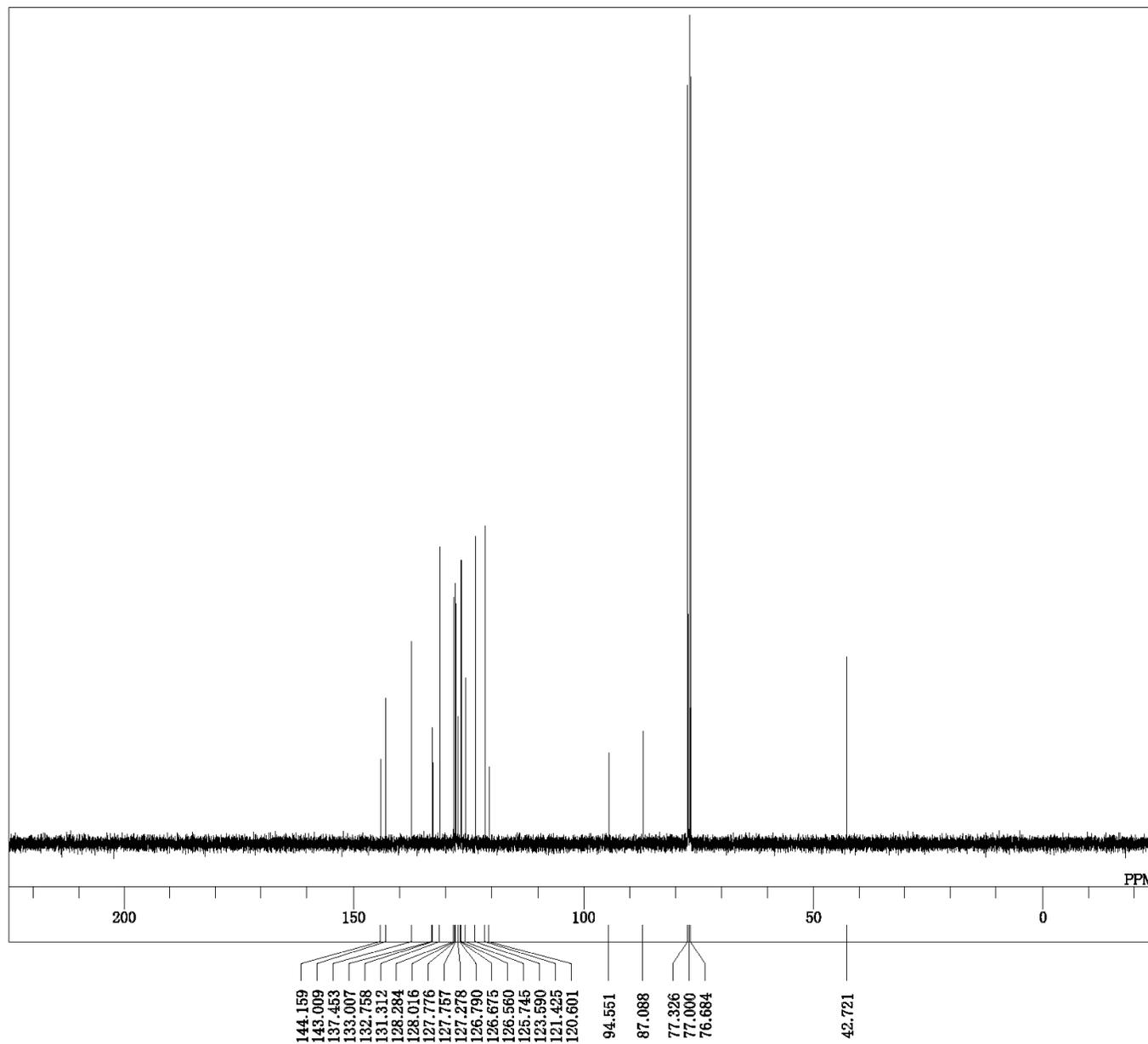




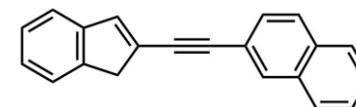
DFILE 20191203 2-naphthalenyl indene-1  
 COMNT single\_pulse  
 DATIM 2019-12-03 20:53:37  
 OBNUC 1H  
 EXMOD proton.jxp  
 OBFRQ 395.88 MHz  
 OBSET 6.28 KHz  
 OBFIN 0.87 Hz  
 POINT 13107  
 FREQU 5938.24 Hz  
 SCANS 8  
 ACQTM 2.2073 sec  
 PD 5.0000 sec  
 PW1 3.14 usec  
 IRNUC 1H  
 CTEMP 19.7 c  
 CDCL3  
 SLVNT  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 36



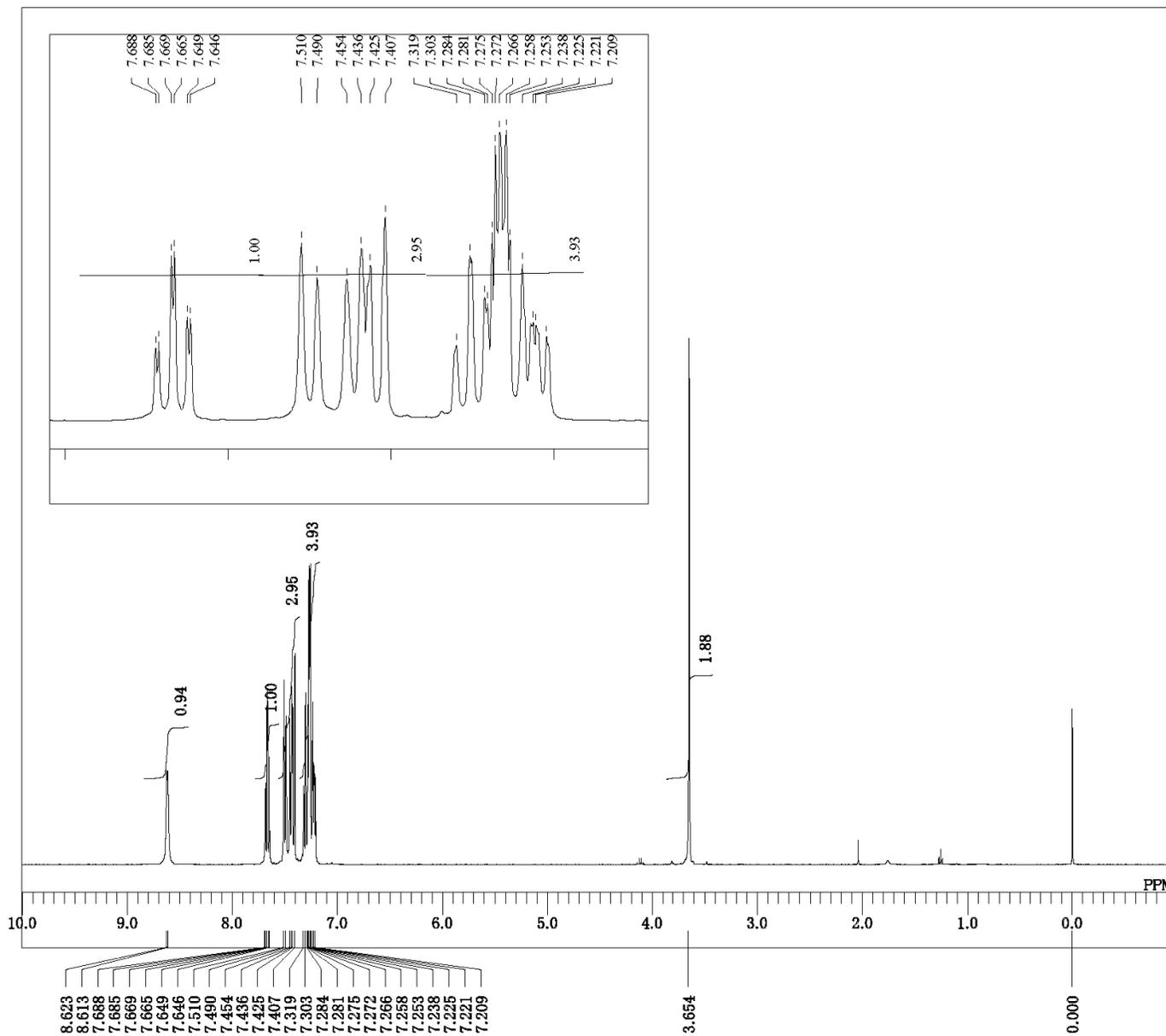
**1i**



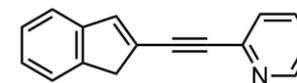
DFILE 20191203 2-naphthalenyl indene-1  
 COMNT single pulse decoupled gated NOE  
 DATIM 2019-12-03 20:56:54  
 OBNUC 13C  
 EXMOD carbon.jxp  
 OBFRQ 99.55 MHz  
 OBSET 5.13 KHz  
 OBFIN 0.98 Hz  
 POINT 26214  
 FREQU 25000.00 Hz  
 SCANS 1024  
 ACQTM 1.0486 sec  
 PD 2.0000 sec  
 PW1 3.59 usec  
 IRNUC 1H  
 CTEMP 19.8 c  
 SLVNT CDCL3  
 EXREF 77.00 ppm  
 BF 0.12 Hz  
 RGAIN 50



**1i**

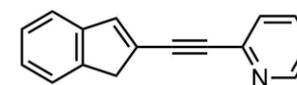
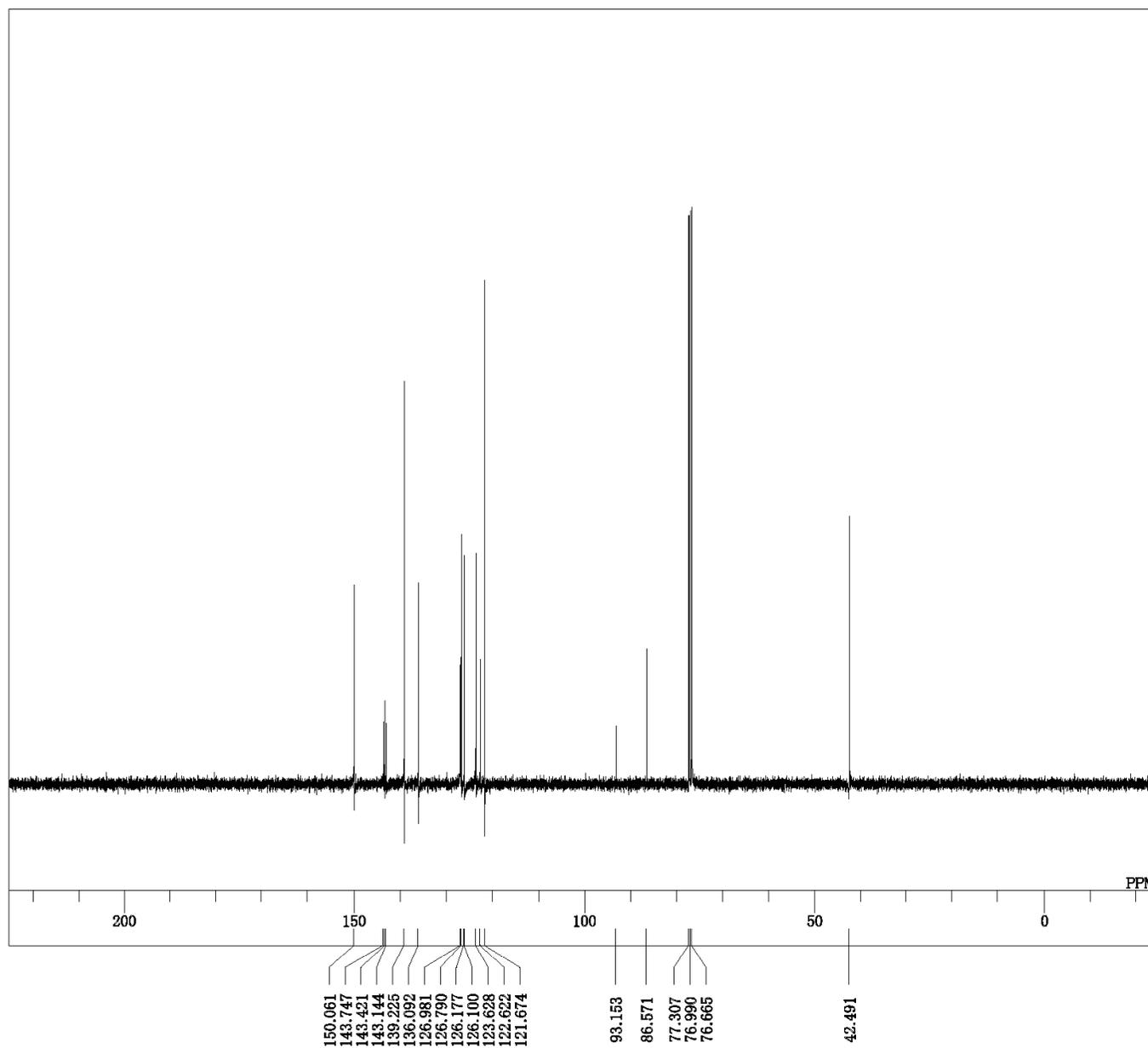


DFILE 20200128 2-py-Indene\_Proton-1-1  
 COMNT single\_pulse  
 DATIM 2020-01-28 12:14:06  
 OBNUC 1H  
 EXMOD proton.jxp  
 OBFRQ 395.88 MHz  
 OBSET 6.28 KHz  
 OBFIN 0.87 Hz  
 POINT 13107  
 FREQU 5938.24 Hz  
 SCANS 8  
 ACQTM 2.2073 sec  
 PD 5.0000 sec  
 PW1 3.14 usec  
 IRNUC 1H  
 CTEMP 20.4 c  
 SLVNT CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 30

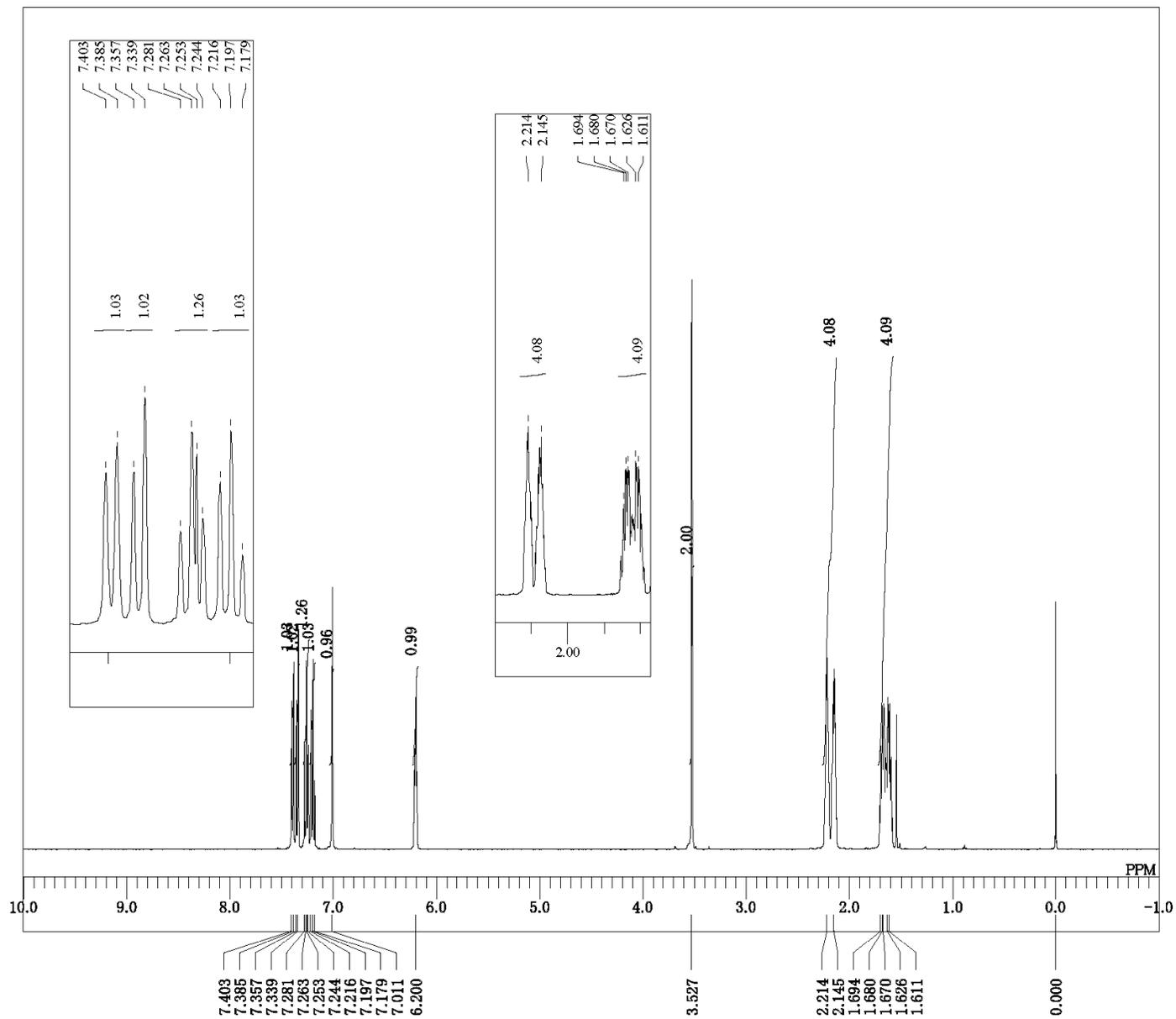


**1j**

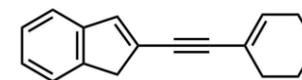
DFILE 20200128 2-py-Indene\_Carbon-1-  
COMNT single pulse decoupled gated NOE  
DATIM 2020-01-28 12:16:45  
OBNUC 13C  
EXMOD carbon.jxp  
OBFRQ 99.55 MHz  
OBSET 5.13 KHz  
OBFIN 0.98 Hz  
POINT 26214  
FREQU 25000.00 Hz  
SCANS 512  
ACQTM 1.0486 sec  
PD 2.0000 sec  
PW1 3.59 usec  
IRNUC 1H  
CTEMP 19.8 c  
SLVNT CDCL3  
EXREF 77.00 ppm  
BF 0.12 Hz  
RGAIN 50



1j

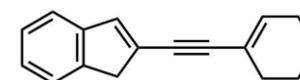
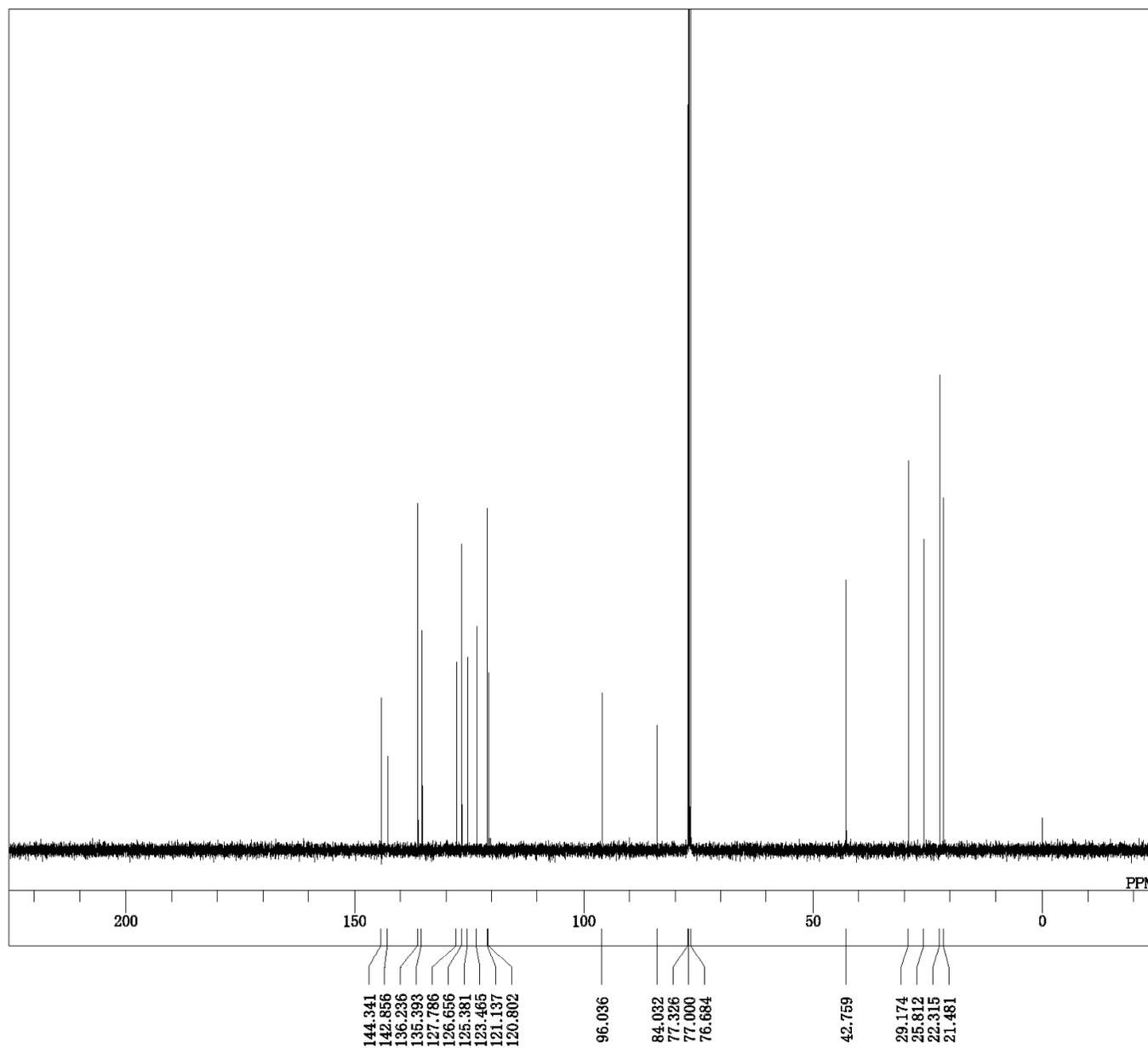


DFILE 20191210 cyclohexenyl ethynyl ind  
 COMNT single\_pulse  
 DATIM 2019-12-10 13:25:48  
 OBNUC 1H  
 EXMOD proton.jxp  
 OBFRQ 395.88 MHz  
 OBSET 6.28 KHz  
 OBFIN 0.87 Hz  
 POINT 13107  
 FREQU 5938.24 Hz  
 SCANS 8  
 ACQTM 2.2073 sec  
 PD 5.0000 sec  
 PW1 3.14 usec  
 IRNUC 1H  
 CTEMP 19.5 c  
 CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 34

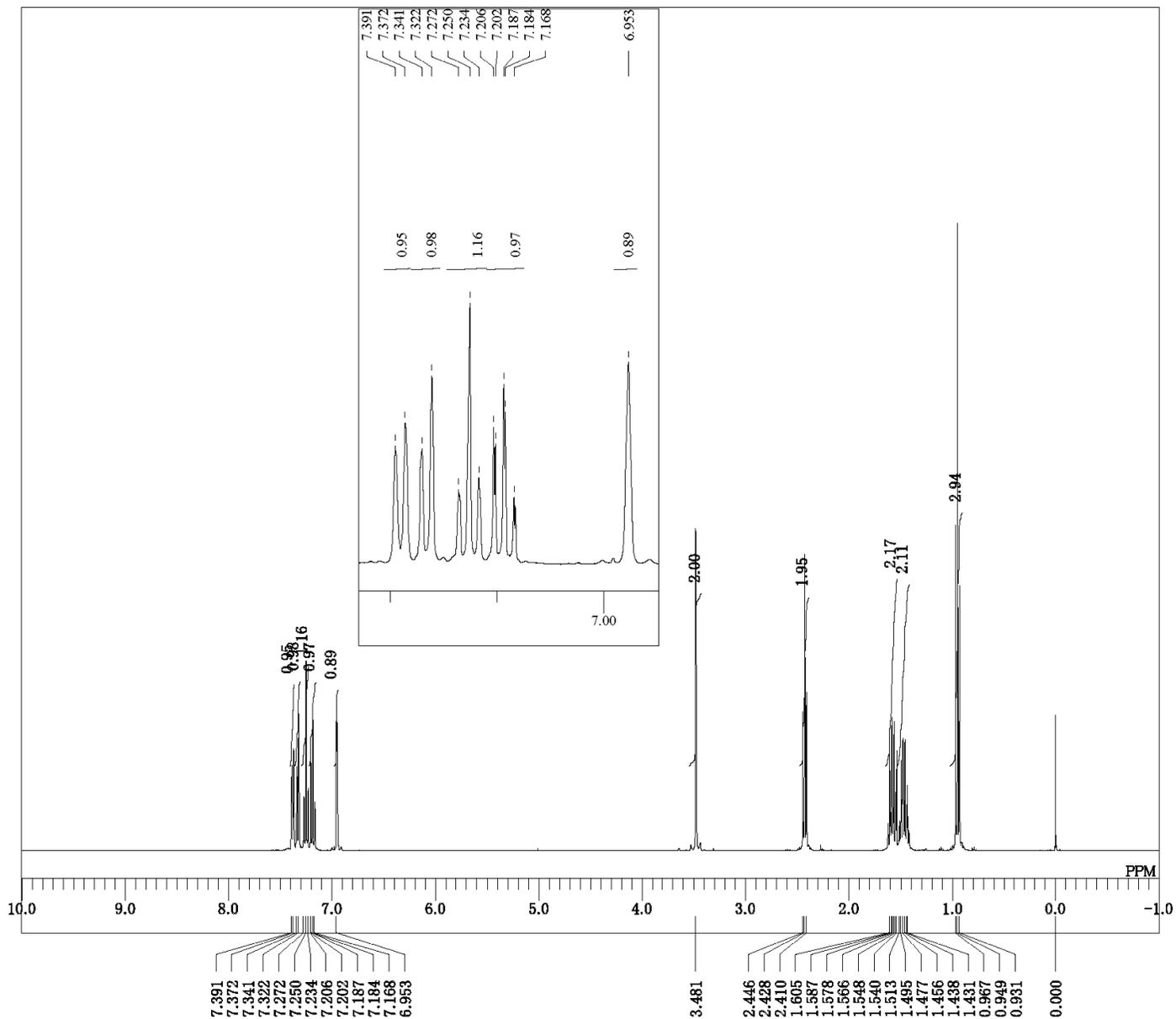


**1k**

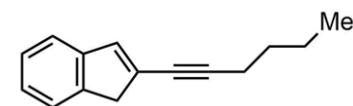
DFILE 20191210 cyclohexenyl ethynyl ind  
COMNT single pulse decoupled gated NOE  
DATIM 2019-12-10 13:27:00  
OBNUC 13C  
EXMOD carbon.jxp  
OBFRQ 99.55 MHz  
OBSET 5.13 KHz  
OBFIN 0.98 Hz  
POINT 26214  
FREQU 25000.00 Hz  
SCANS 1024  
ACQTM 1.0486 sec  
PD 2.0000 sec  
PW1 3.59 usec  
IRNUC 1H  
CTEMP 19.9 c  
SLVNT CDCL3  
EXREF 77.00 ppm  
BF 0.12 Hz  
RGAIN 50



**1k**

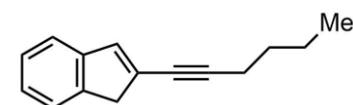
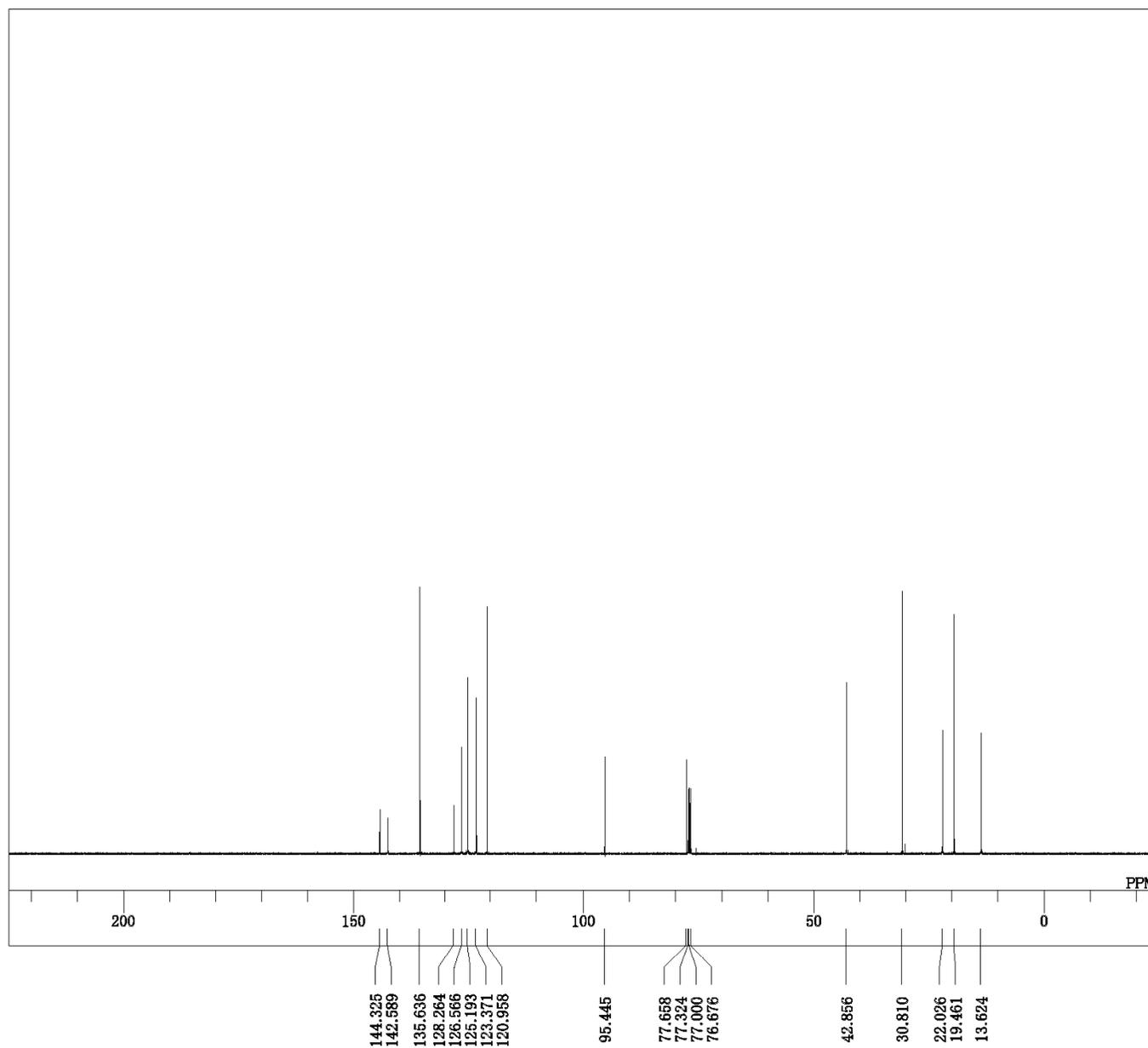


DFILE 20191206 n-Bu\_indene\_non-1.als  
 COMNT single\_pulse  
 DATIM 2019-12-06 07:06:13  
 OBNUC 1H  
 EXMOD single\_pulse.ex2  
 OBFREQ 391.78 MHz  
 OBSET 8.51 KHz  
 OBFIN 3.34 Hz  
 POINT 26214  
 FREQU 5882.26 Hz  
 SCANS 8  
 ACQTM 4.4564 sec  
 PD 3.0000 sec  
 PW1 5.90 usec  
 IRNUC 1H  
 CTEMP 19.9 c  
 SLVNT CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 40

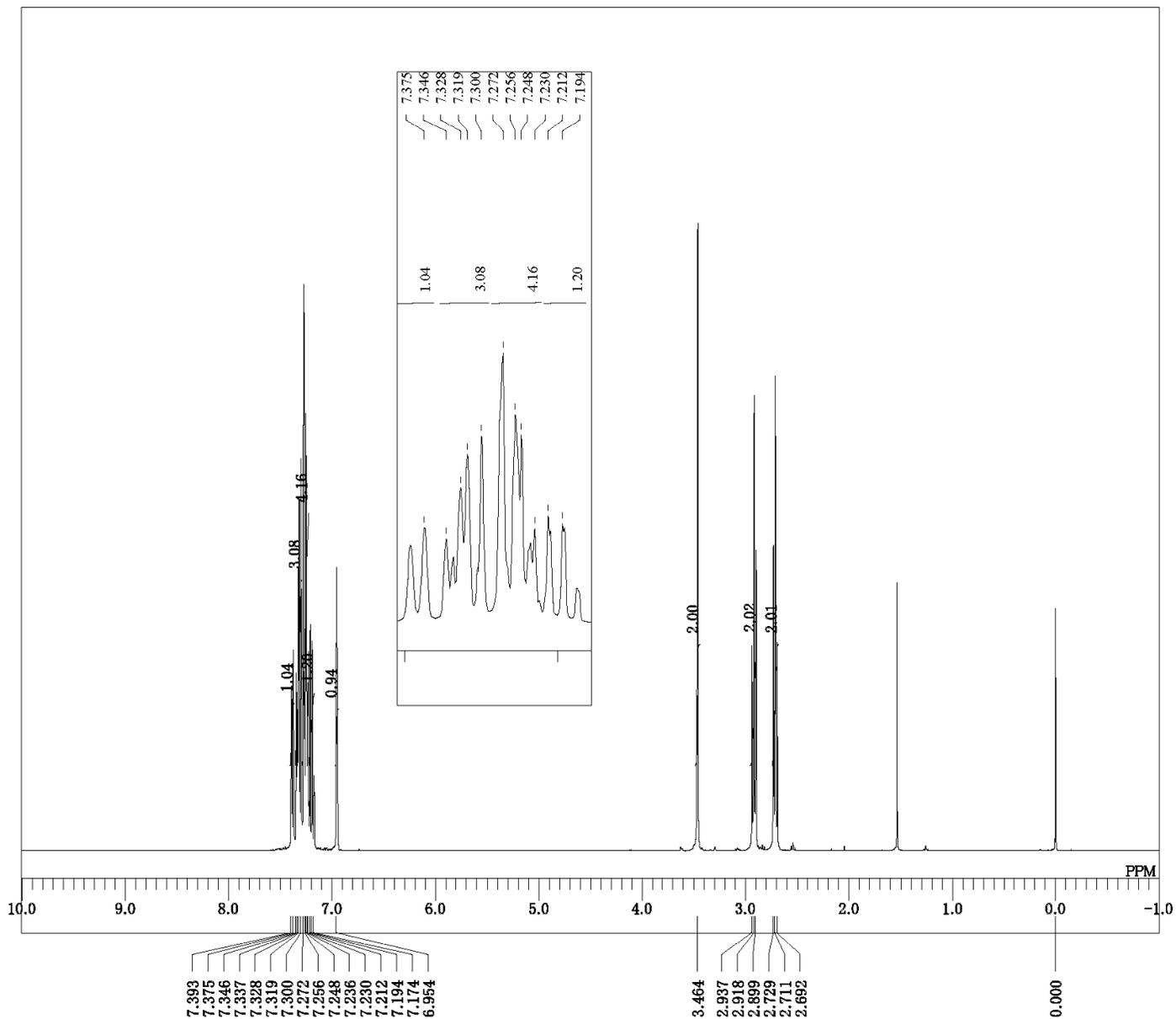


11

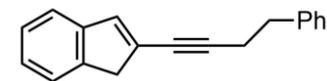
DFILE 20200304 n-Bu-Indene\_bcm-1.als  
COMNT single pulse decoupled gated NOE  
DATIM 2020-03-04 17:44:47  
OBNUC 13C  
EXMOD single\_pulse\_dec  
OBFRQ 98.52 MHz  
OBSET 4.64 KHz  
OBFIN 8.74 Hz  
POINT 26214  
FREQU 24630.17 Hz  
SCANS 1024  
ACQTM 1.0643 sec  
PD 2.0000 sec  
PW1 3.17 usec  
IRNUC 1H  
CTEMP 19.5 c  
SLVNT CDCL3  
EXREF 77.00 ppm  
BF 0.12 Hz  
RGAIN 42



11

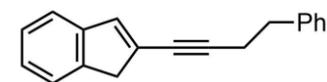
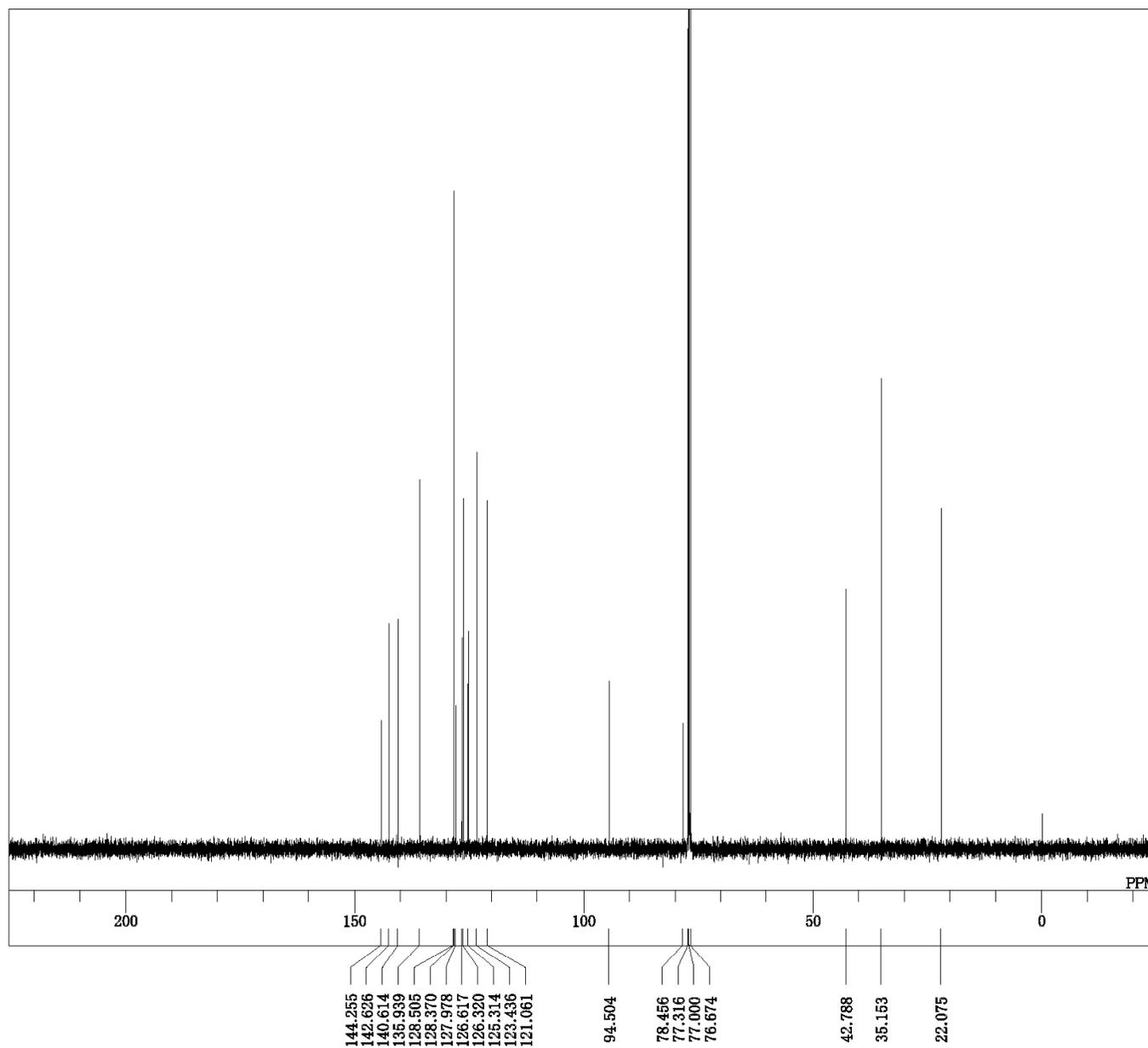


DFILE 20200107 phenethyl ethynyl indene  
 COMNT single\_pulse  
 DATIM 2020-01-07 11:25:39  
 OBNUC 1H  
 EXMOD proton.jxp  
 OBFREQ 395.88 MHz  
 OBSET 6.28 KHz  
 OBFIN 0.87 Hz  
 POINT 13107  
 FREQU 5938.24 Hz  
 SCANS 8  
 ACQTM 2.2073 sec  
 PD 5.0000 sec  
 PW1 3.14 usec  
 IRNUC 1H  
 CTEMP 20.4 c  
 CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 36

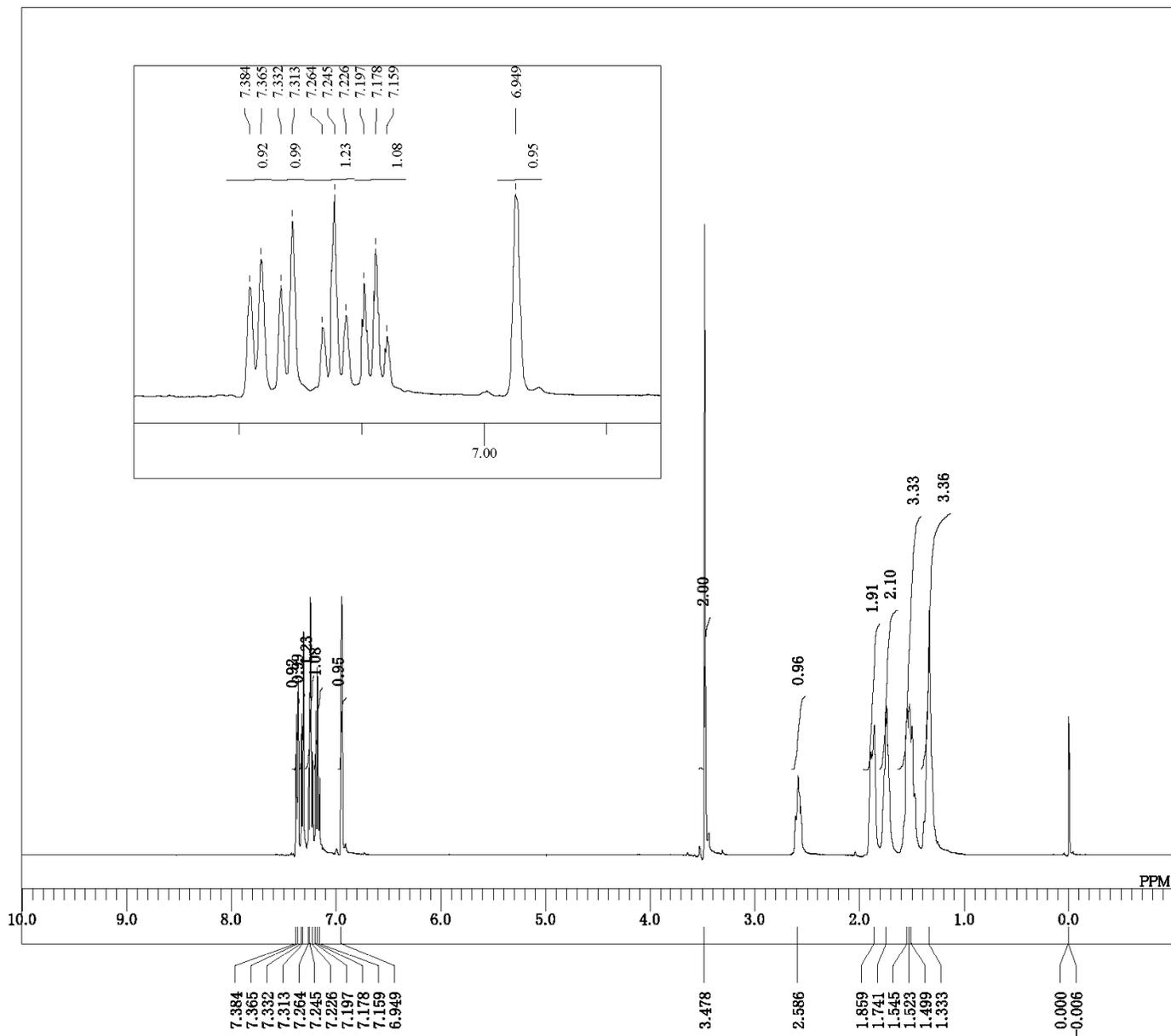


1m

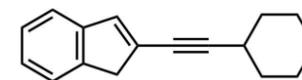
DFILE 20200107 phenethyl ethynyl indene  
 COMNT single pulse decoupled gated NOE  
 DATIM 2020-01-07 11:26:51  
 OBNUC 13C  
 EXMOD carbon.jxp  
 OBFRQ 99.55 MHz  
 OBSET 5.13 KHz  
 OBFIN 0.98 Hz  
 POINT 26214  
 FREQU 25000.00 Hz  
 SCANS 1024  
 ACQTM 1.0486 sec  
 PD 2.0000 sec  
 PW1 3.59 usec  
 IRNUC 1H  
 CTEMP 19.4 c  
 SLVNT CDCL3  
 EXREF 77.00 ppm  
 BF 0.12 Hz  
 RGAIN 50



1m

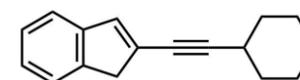
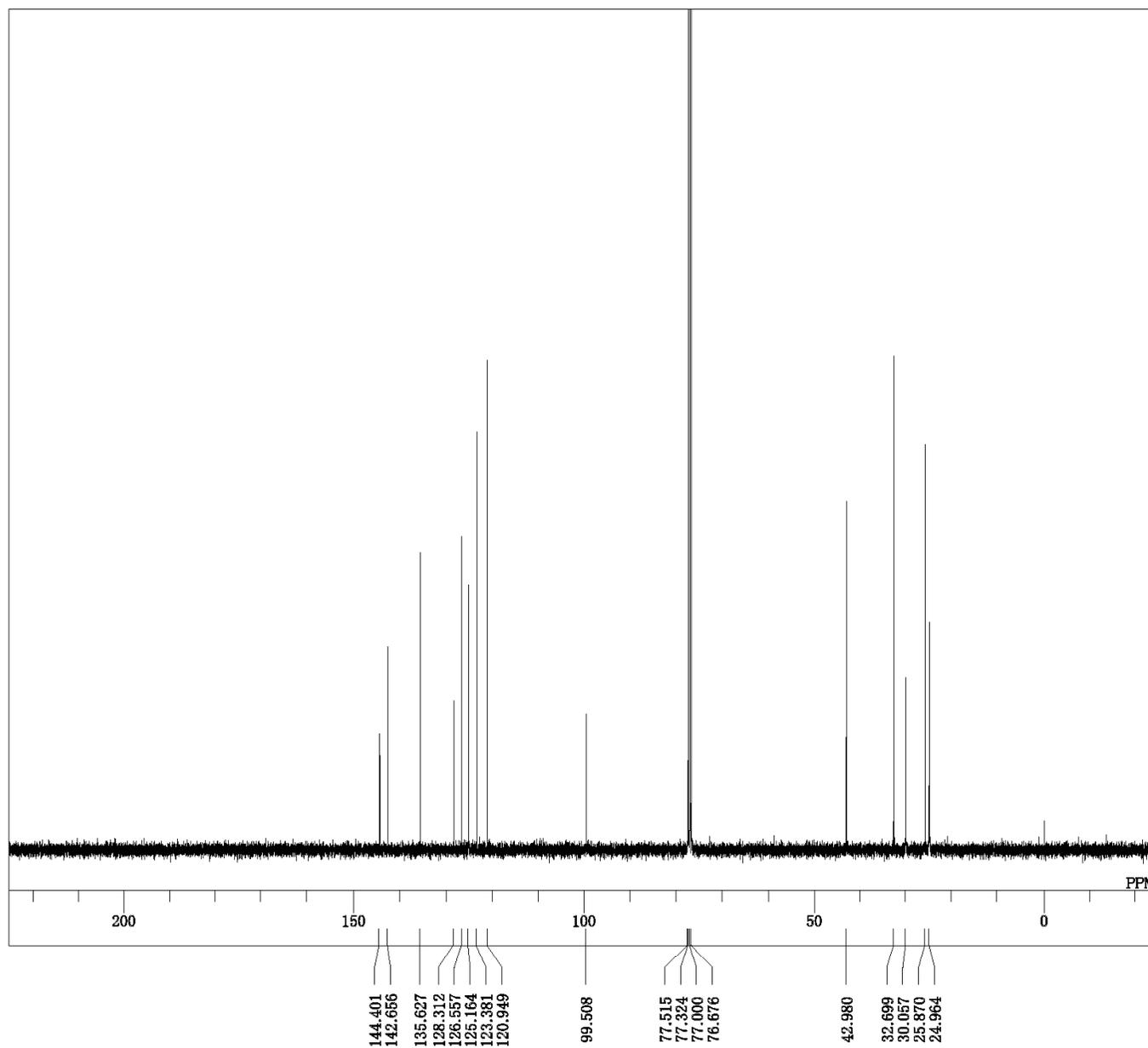


DFILE 20191204 cyclohexyl\_indene\_non-1  
 COMNT single\_pulse  
 DATIM 2019-12-04 13:40:07  
 OBNUC 1H  
 EXMOD single\_pulse.ex2  
 OBFRQ 391.78 MHz  
 OBSET 8.51 KHz  
 OBFIN 3.34 Hz  
 POINT 26214  
 FREQU 5882.26 Hz  
 SCANS 8  
 ACQTM 4.4564 sec  
 PD 3.0000 sec  
 PW1 5.90 usec  
 IRNUC 1H  
 CTEMP 20.1 c  
 SLVNT CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 40

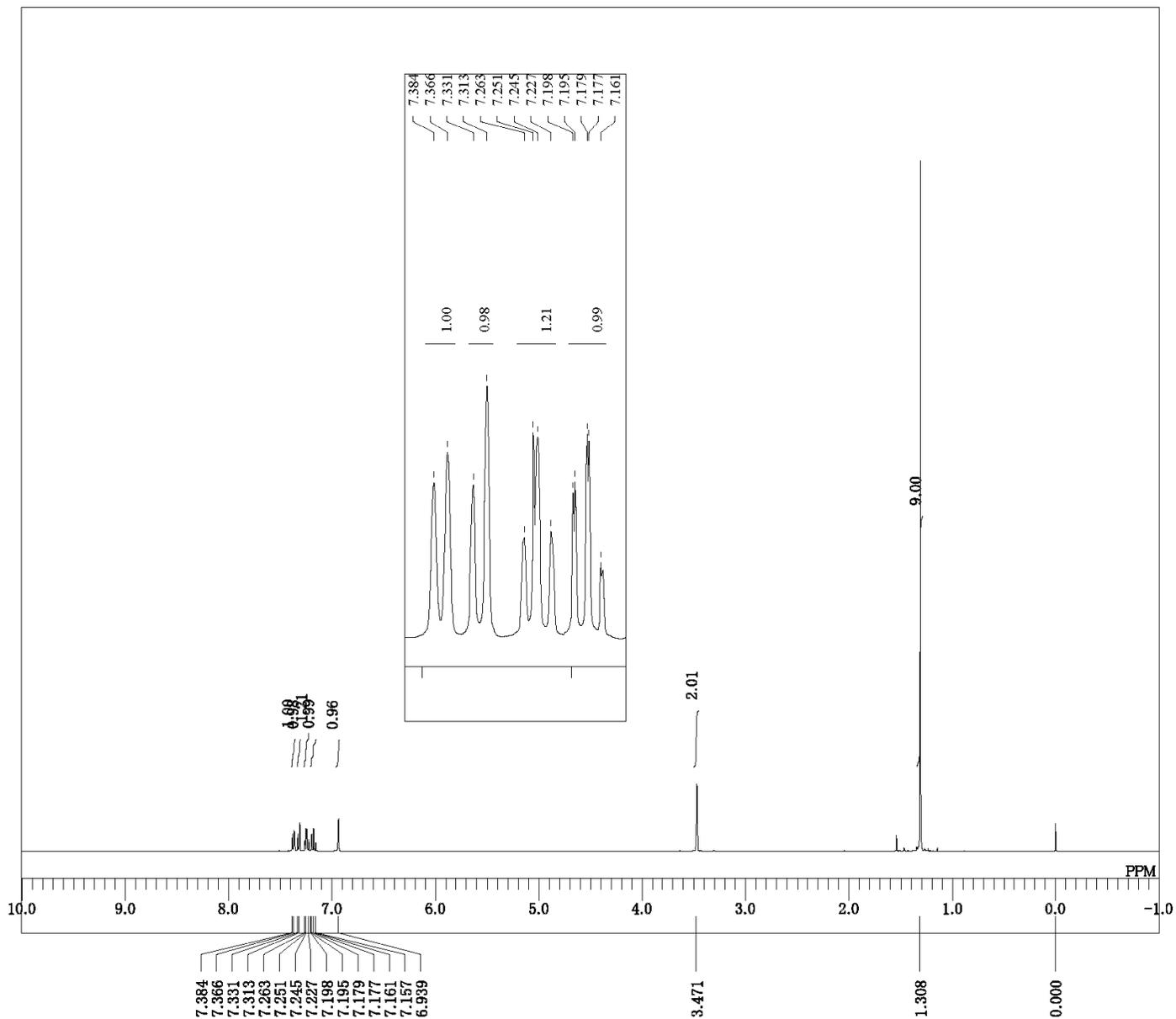


1n

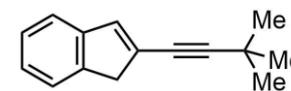
DFILE 20191204 cyclohexyl\_indene\_bcm-1  
COMNT single pulse decoupled gated NOE  
DATIM 2019-12-04 14:35:40  
OBNUC 13C  
EXMOD single\_pulse\_dec  
OBFRQ 98.52 MHz  
OBSET 4.64 KHz  
OBFIN 8.74 Hz  
POINT 26214  
FREQU 24630.17 Hz  
SCANS 1024  
ACQTM 1.0643 sec  
PD 2.0000 sec  
PW1 3.17 usec  
IRNUC 1H  
CTEMP 20.5 c  
SLVNT CDCL3  
EXREF 77.00 ppm  
BF 0.12 Hz  
RGAIN 36



1n

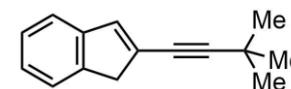
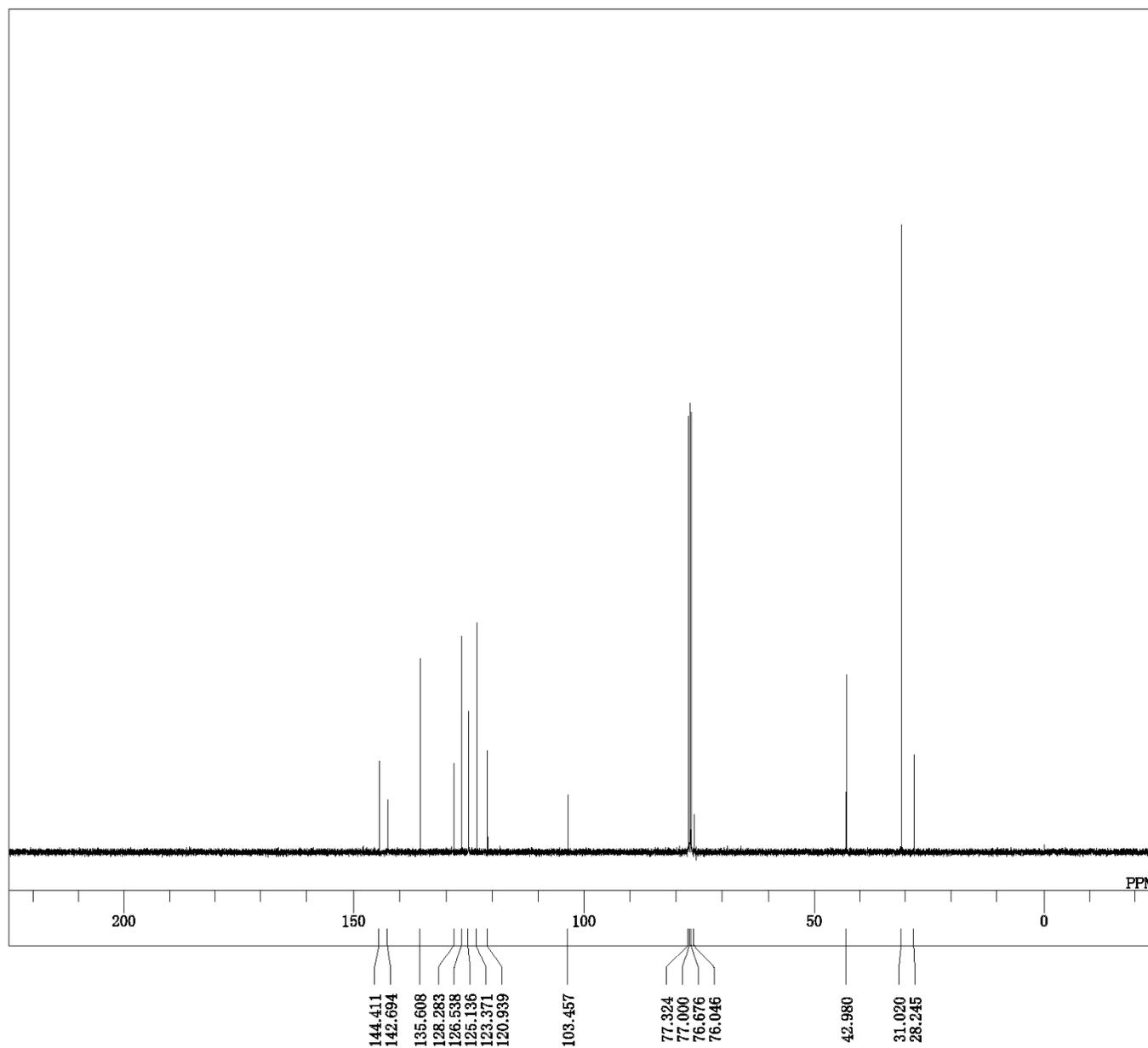


DFILE 20191206 t-Bu indene\_Proton-1-1.  
 COMNT single\_pulse  
 DATIM 2019-12-06 09:55:56  
 OBNUC 1H  
 EXMOD proton.jxp  
 OBFREQ 395.88 MHz  
 OBSET 6.28 KHz  
 OBFIN 0.87 Hz  
 POINT 13107  
 FREQU 5938.24 Hz  
 SCANS 8  
 ACQTM 2.2073 sec  
 PD 5.0000 sec  
 PW1 3.14 usec  
 IRNUC 1H  
 CTEMP 19.3 c  
 CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 32

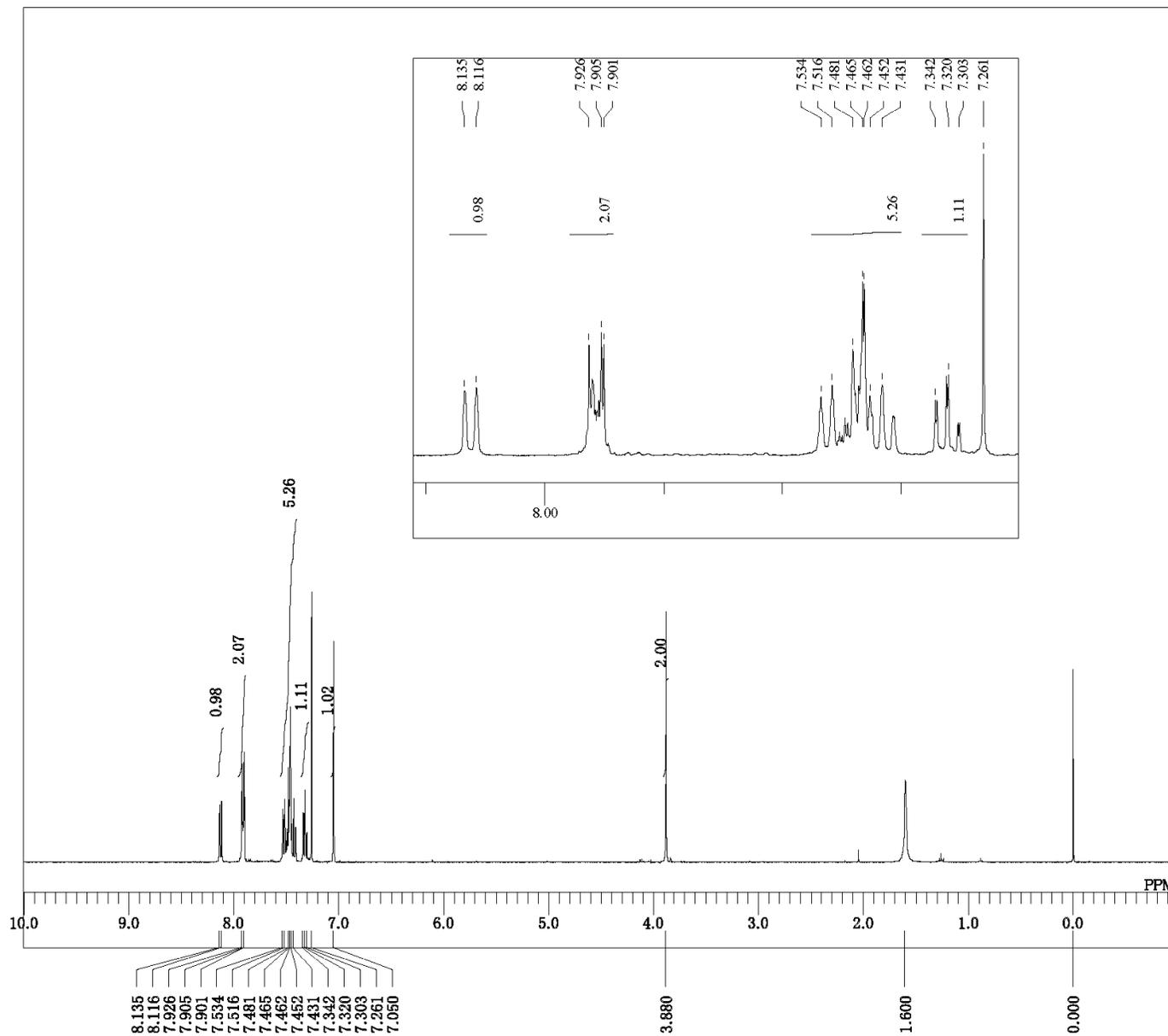


**10**

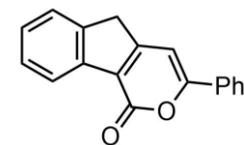
DFILE 20191206 t-Bu\_Indene\_bcm-1.als  
 COMNT single pulse decoupled gated NOE  
 DATIM 2019-12-06 06:59:07  
 OBNUC 13C  
 EXMOD single\_pulse\_dec  
 OBFRQ 98.52 MHz  
 OBSET 4.64 KHz  
 OBFIN 8.74 Hz  
 POINT 26214  
 FREQU 24630.17 Hz  
 SCANS 1024  
 ACQTM 1.0643 sec  
 PD 2.0000 sec  
 PW1 3.17 usec  
 IRNUC 1H  
 CTEMP 20.6 c  
 SLVNT CDCL3  
 EXREF 77.00 ppm  
 BF 0.12 Hz  
 RGAIN 40



**10**

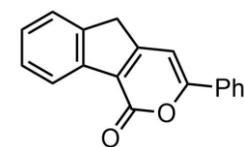
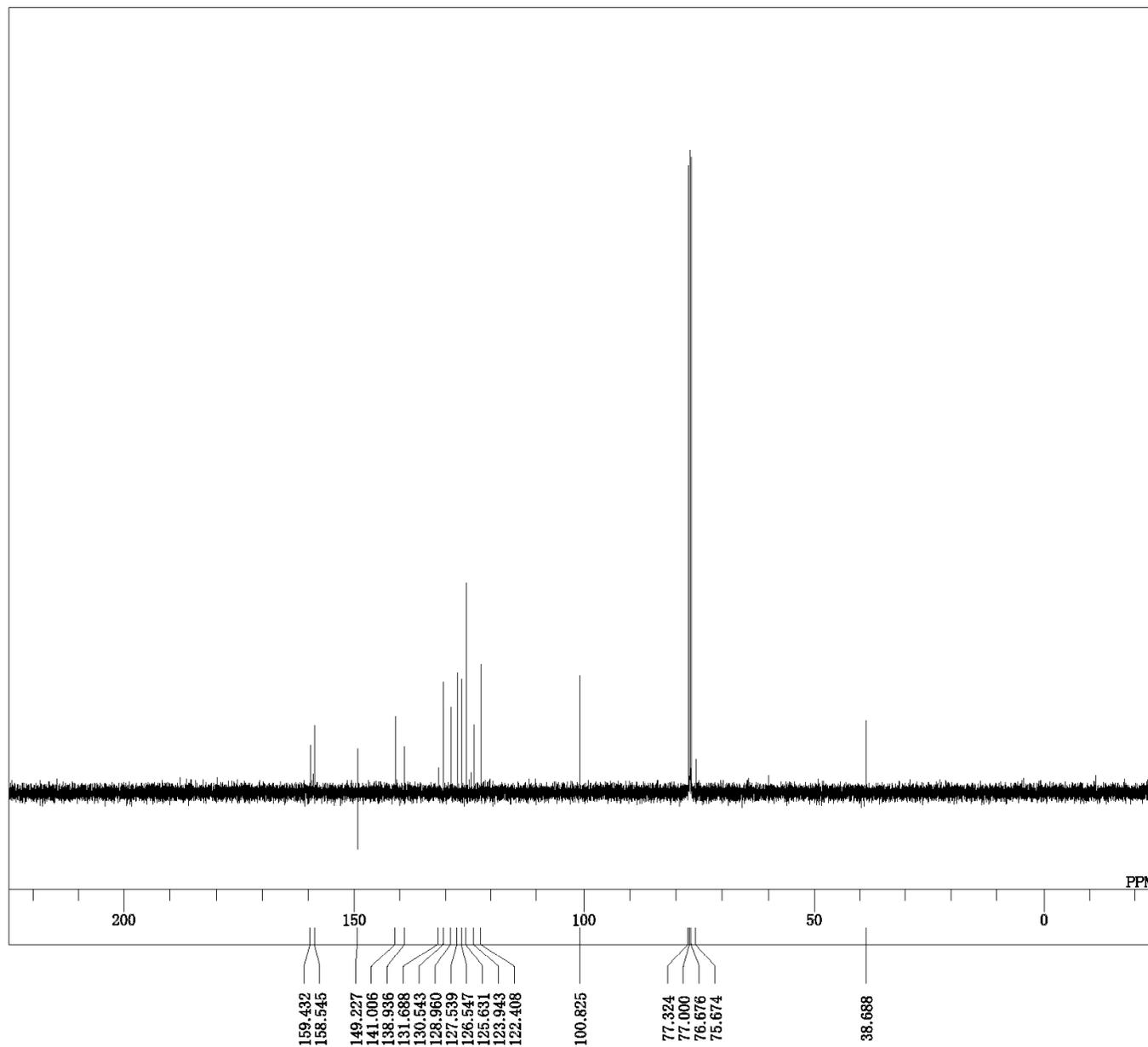


DFILE 20180920 Ph-Prod-6-1.als  
 COMNT single\_pulse  
 DATIM 2018-09-20 19:51:19  
 OBNUC 1H  
 EXMOD single\_pulse.ex2  
 OBFRQ 391.78 MHz  
 OBSET 8.51 KHz  
 OBFIN 3.34 Hz  
 POINT 26214  
 FREQU 5882.26 Hz  
 SCANS 8  
 ACQTM 4.4564 sec  
 PD 3.0000 sec  
 PW1 5.90 usec  
 IRNUC 1H  
 CTEMP 21.4 c  
 CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 48

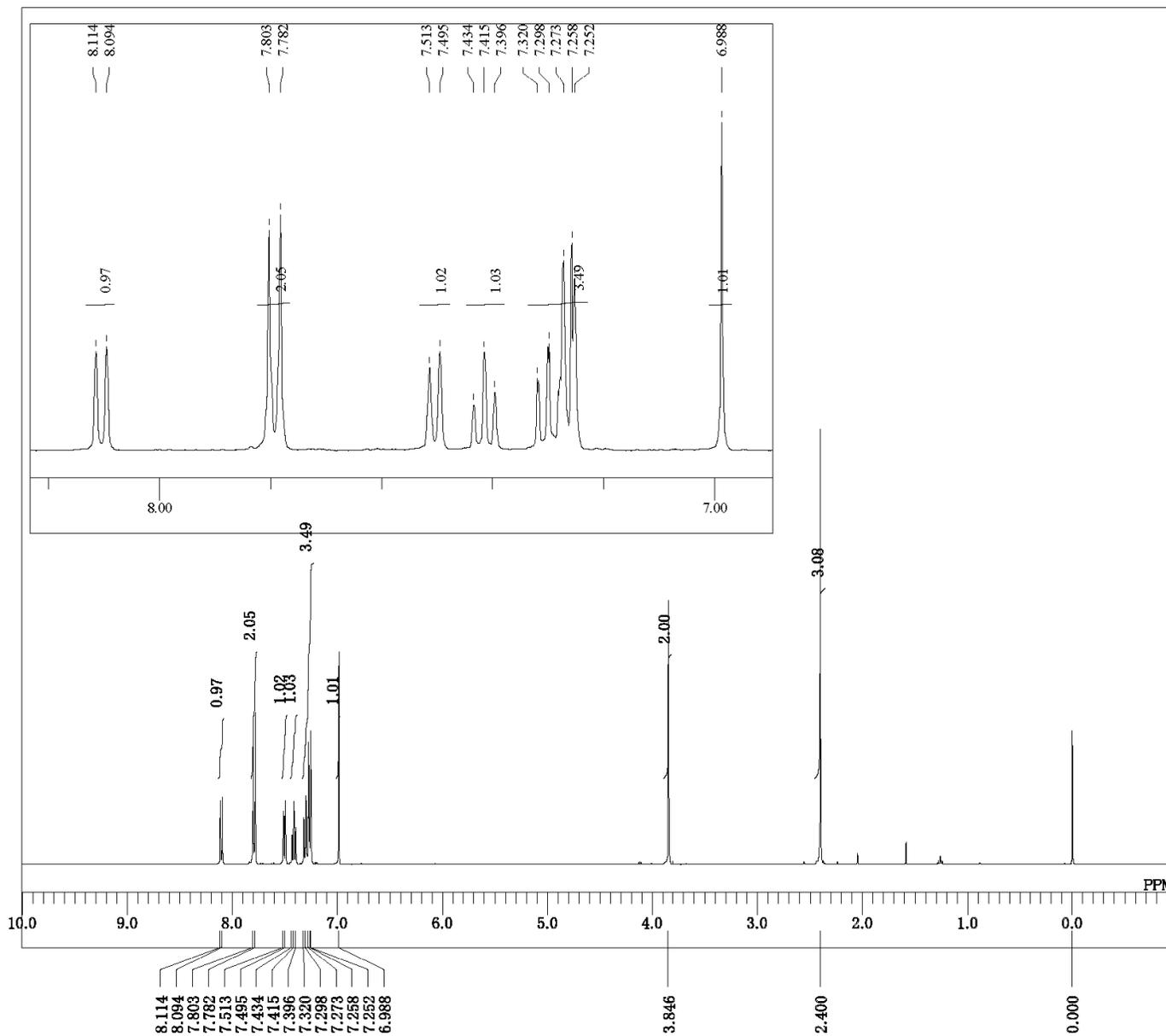


**2a**

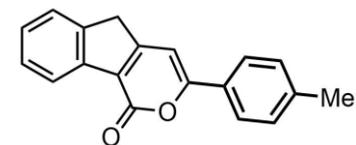
DFILE 20180922 indeneprod6recrystbcm-  
 COMNT single pulse decoupled gated NOE  
 DATIM 2018-09-22 12:13:14  
 OBNUC 13C  
 EXMOD single\_pulse\_dec  
 OBFRQ 98.52 MHz  
 OBSET 4.64 KHz  
 OBFIN 8.74 Hz  
 POINT 26214  
 FREQU 24630.17 Hz  
 SCANS 256  
 ACQTM 1.0643 sec  
 PD 2.0000 sec  
 PW1 3.17 usec  
 IRNUC 1H  
 CTEMP 22.1 c  
 SLVNT CDCL3  
 EXREF 77.00 ppm  
 BF 0.12 Hz  
 RGAIN 46



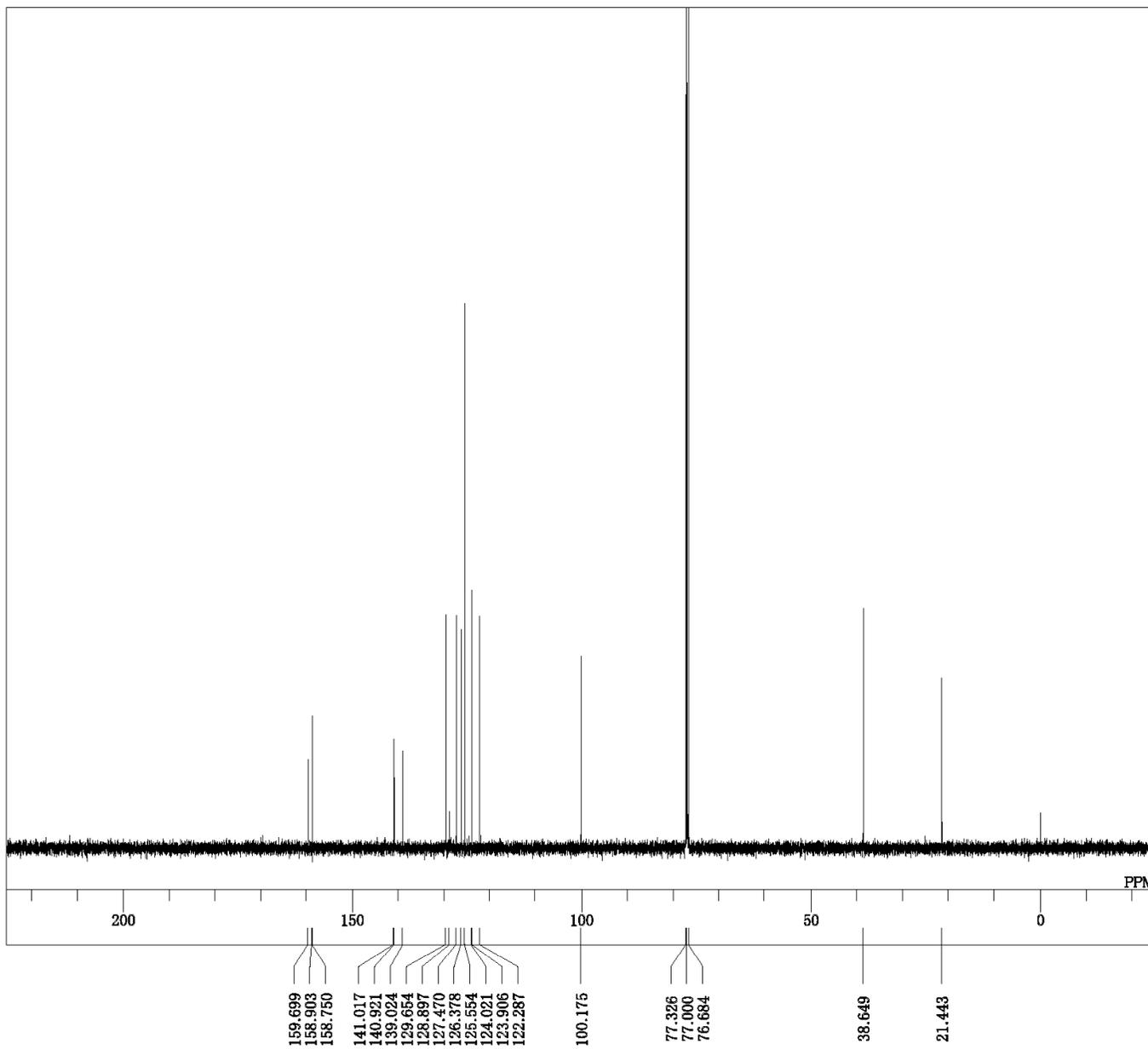
**2a**



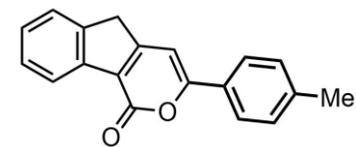
DFILE 20200109 p-tol-Indene-Prod-6\_Pr  
 COMNT single\_pulse  
 DATIM 2020-01-09 12:35:42  
 OBNUC 1H  
 EXMOD proton.jxp  
 OBFRQ 395.88 MHz  
 OBSET 6.28 KHz  
 OBFIN 0.87 Hz  
 POINT 13107  
 FREQU 5938.24 Hz  
 SCANS 8  
 ACQTM 2.2073 sec  
 PD 5.0000 sec  
 PW1 3.14 usec  
 IRNUC 1H  
 CTEMP 19.8 c  
 SLVNT CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 38



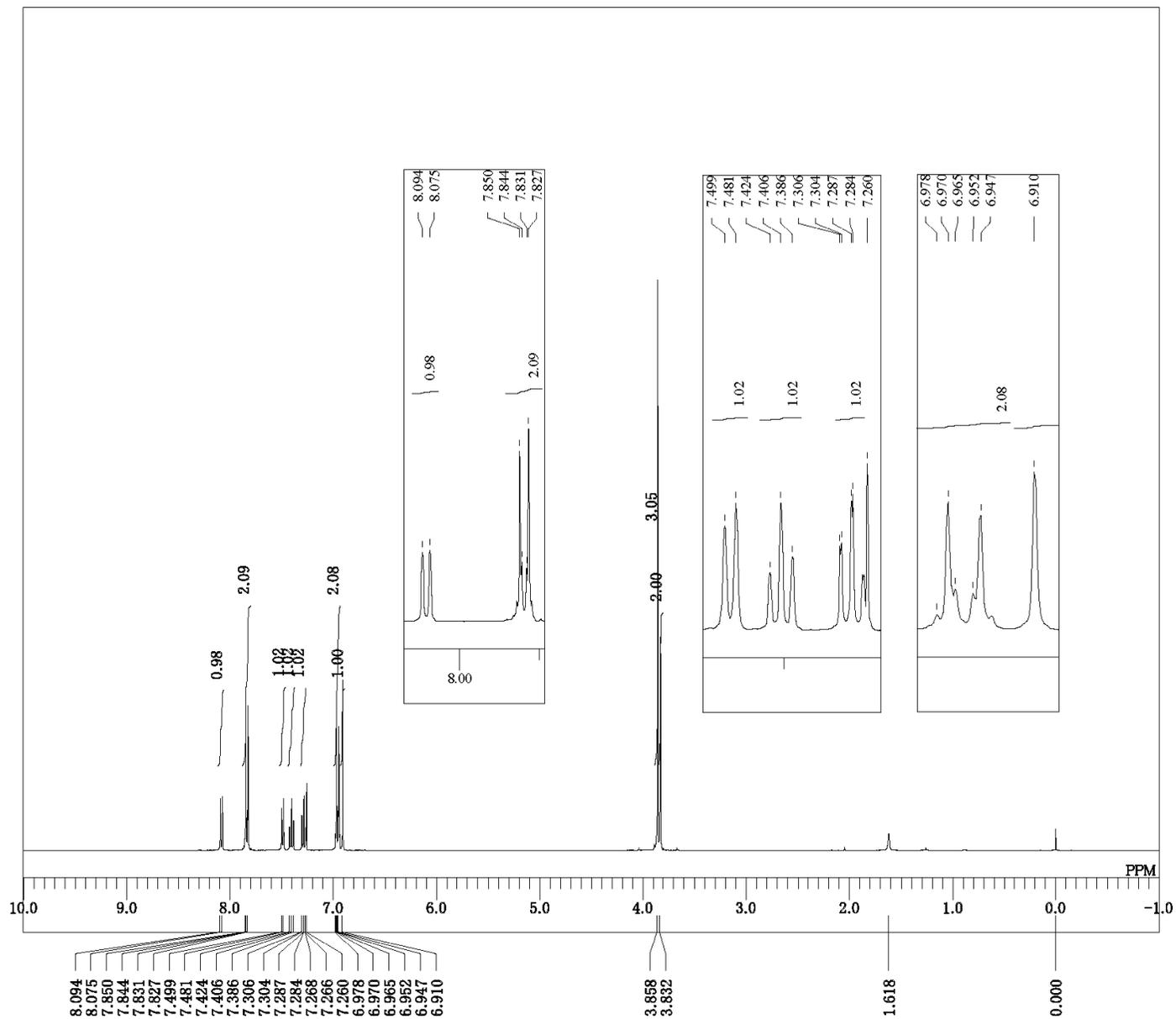
**2b**



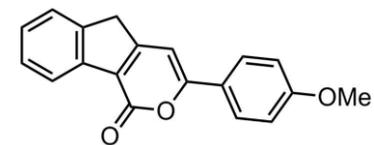
DFILE 20200109 p-tol-Indene-Prod-6.Ca  
 COMNT single pulse decoupled gated NOE  
 DATIM 2020-01-09 12:38:21  
 OBNUC 13C  
 EXMOD carbon.jxp  
 OBFRQ 99.55 MHz  
 OBSET 5.13 KHz  
 OBFIN 0.98 Hz  
 POINT 26214  
 FREQU 25000.00 Hz  
 SCANS 1024  
 ACQTM 1.0486 sec  
 PD 2.0000 sec  
 PW1 3.59 usec  
 IRNUC 1H  
 CTEMP 19.7 c  
 SLVNT CDCL3  
 EXREF 77.00 ppm  
 BF 0.12 Hz  
 RGAIN 50



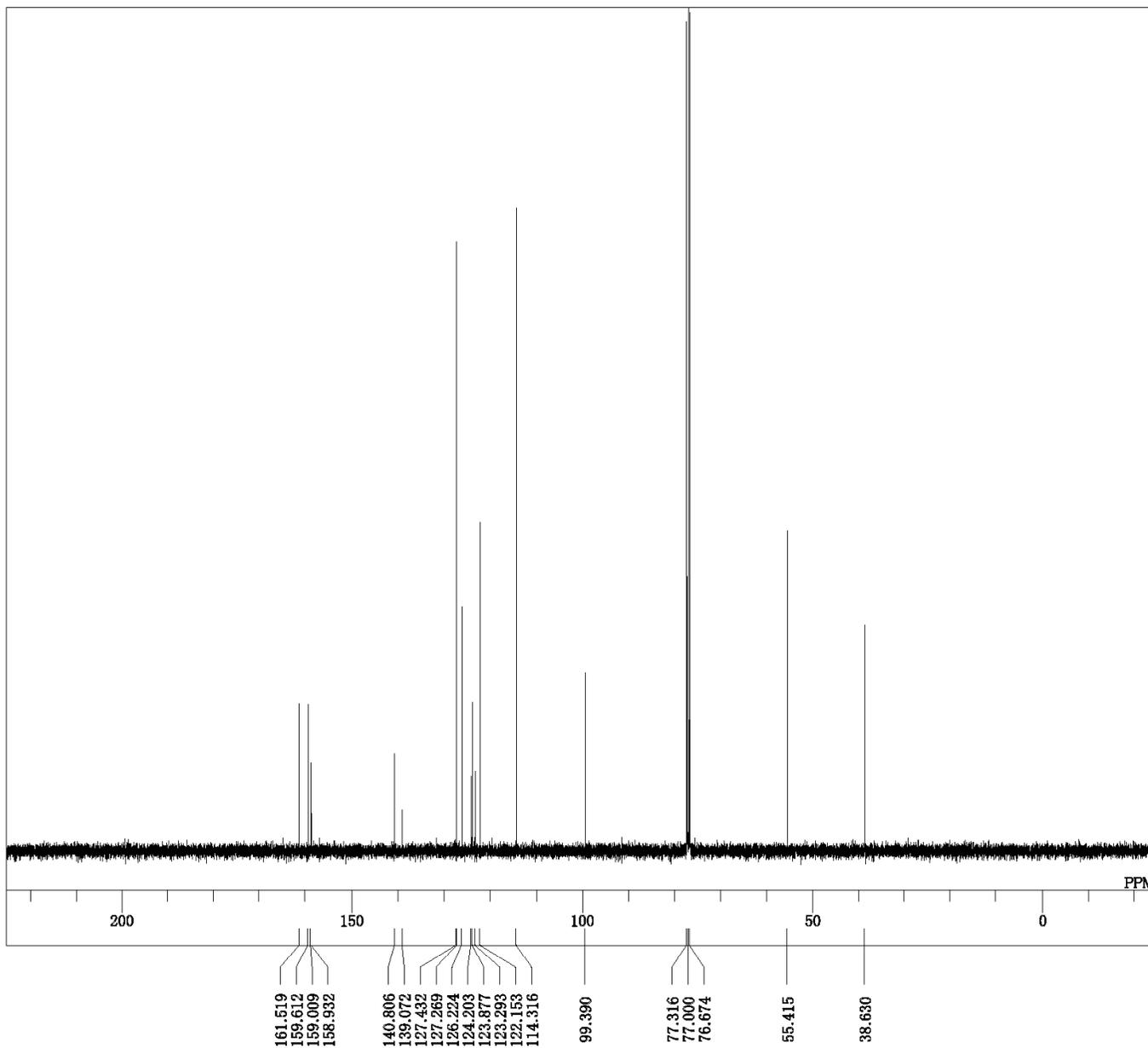
**2b**



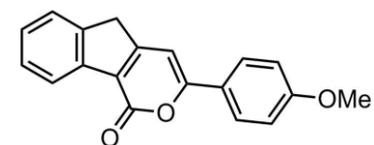
DFILE 20200316 p-methoxyphenyl ester-1  
 COMNT single\_pulse  
 DATIM 2020-03-16 14:41:00  
 OBNUC 1H  
 EXMOD proton.jxp  
 OBFRQ 395.88 MHz  
 OBSET 6.28 KHz  
 OBFIN 0.87 Hz  
 POINT 13107  
 FREQU 5938.24 Hz  
 SCANS 8  
 ACQTM 2.2073 sec  
 PD 5.0000 sec  
 PW1 3.14 usec  
 IRNUC 1H  
 CTEMP 19.7 c  
 SLVNT CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 36



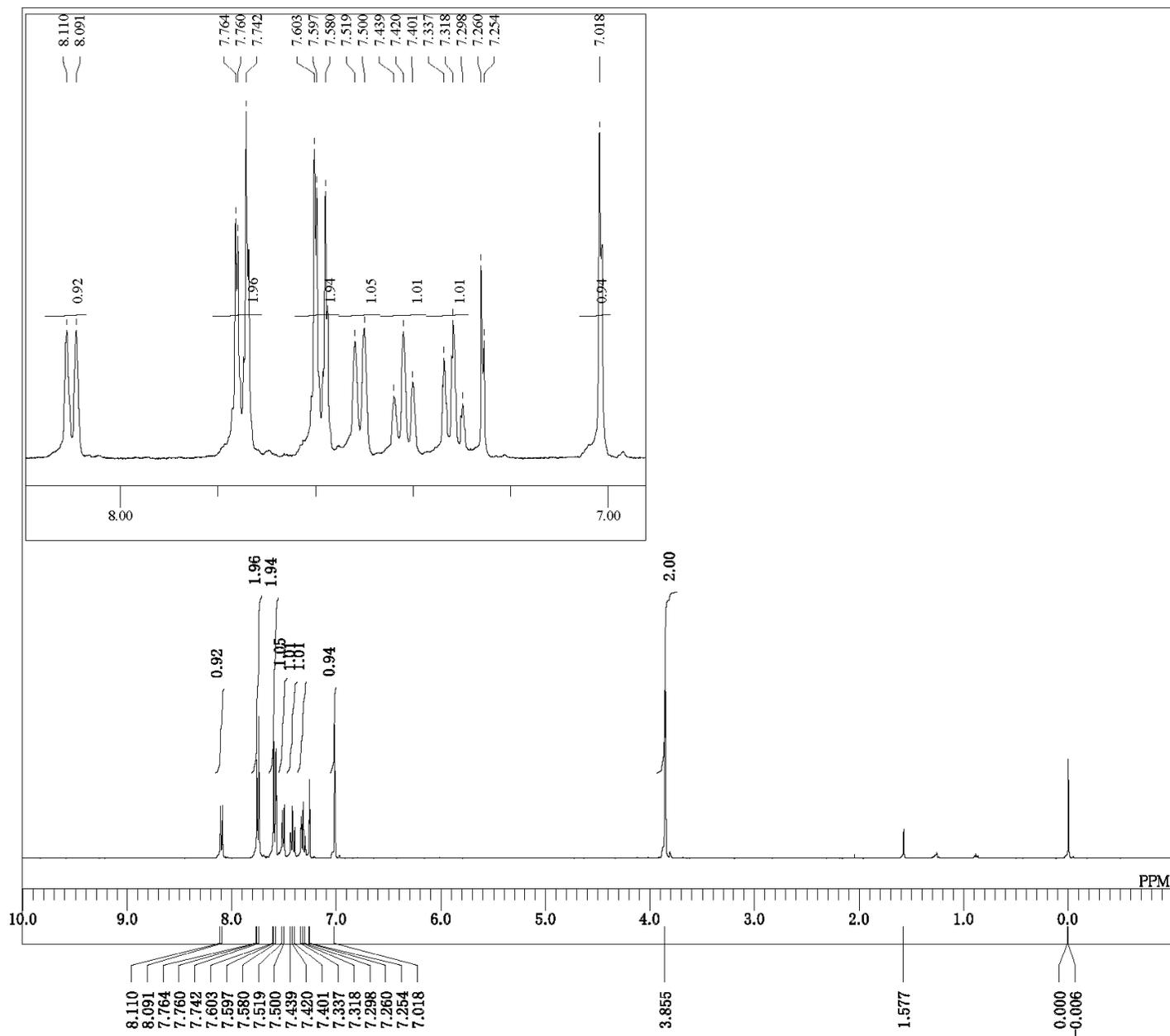
**2c**



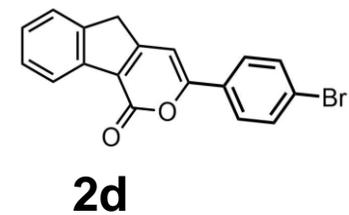
DFILE 20200316 p-methoxyphenyl-6ester  
 COMNT single pulse decoupled gated NOE  
 DATIM 2020-03-16 14:43:47  
 OBNUC 13C  
 EXMOD carbon.jxp  
 OBFRQ 99.55 MHz  
 OBSET 5.13 KHz  
 OBFIN 0.98 Hz  
 POINT 26214  
 FREQU 25000.00 Hz  
 SCANS 1024  
 ACQTM 1.0486 sec  
 PD 2.0000 sec  
 PW1 3.59 usec  
 IRNUC 1H  
 CTEMP 19.1 c  
 SLVNT CDCL3  
 EXREF 77.00 ppm  
 BF 0.12 Hz  
 RGAIN 50

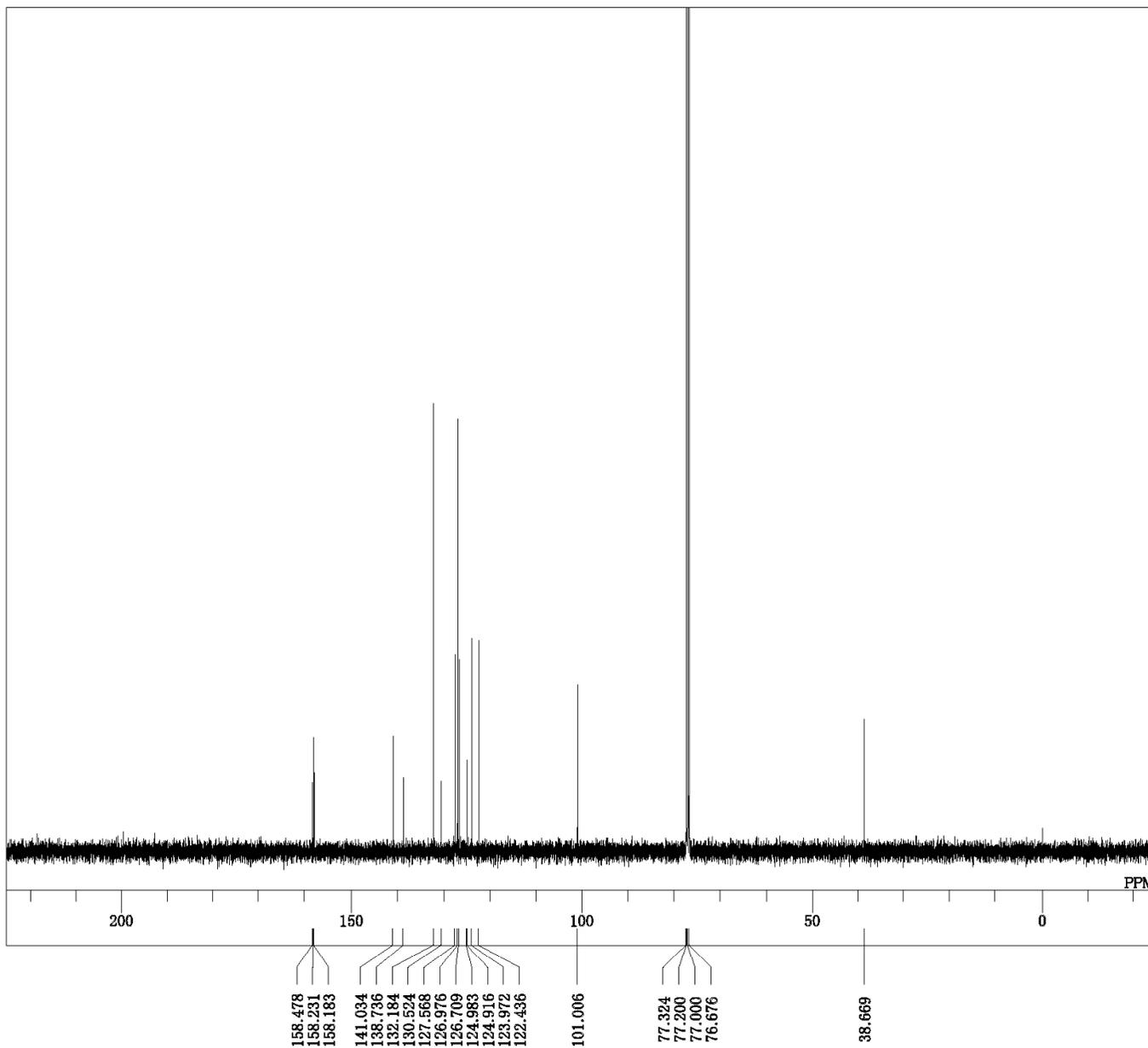


**2c**



DFILE 20191226 p-Br-Prod-6\_non-2.als  
 COMNT single\_pulse  
 DATIM 2019-12-26 10:21:05  
 OBNUC 1H  
 EXMOD single\_pulse.ex2  
 OBFRQ 391.78 MHz  
 OBSET 8.51 KHz  
 OBFIN 3.34 Hz  
 POINT 26214  
 FREQU 5882.26 Hz  
 SCANS 8  
 ACQTM 4.4564 sec  
 PD 3.0000 sec  
 PW1 5.90 usec  
 IRNUC 1H  
 CTEMP 19.1 c  
 SLVNT CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 50

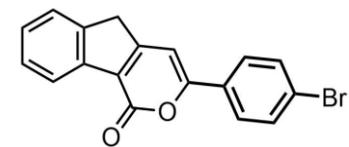




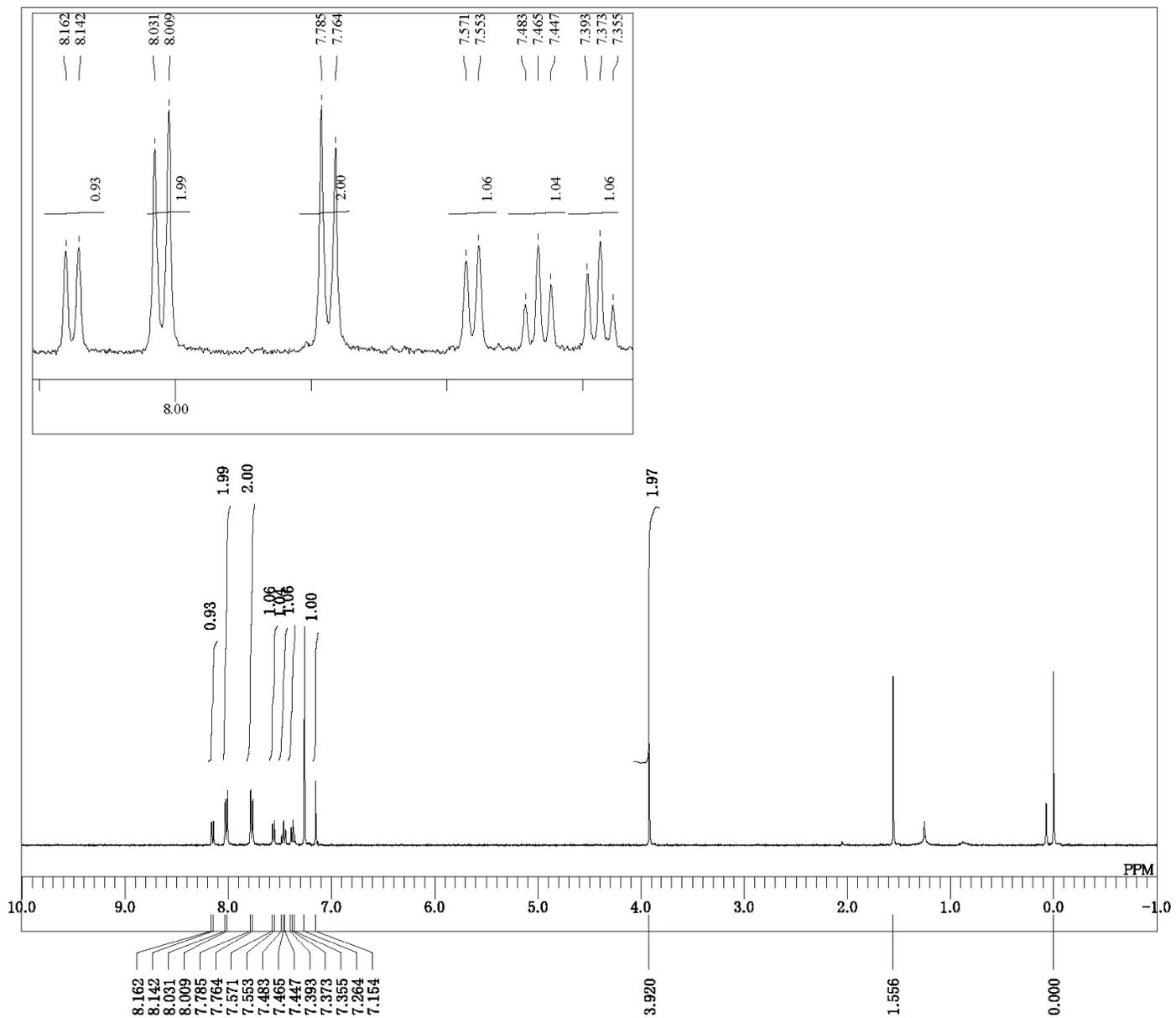
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DFILE 20191226 p-Br-Prod-6_bcm-1.als
COMNT single pulse decoupled gated NOE
DATIM 2019-12-26 10:14:46
OBNUC 13C
EXMOD single_pulse_dec
OBFRQ 98.52 MHz
OBSET 4.64 KHz
OBFIN 8.74 Hz
POINT 26214
FREQU 24630.17 Hz
SCANS 1024
ACQTM 1.0643 sec
PD 2.0000 sec
PW1 3.17 usec
IRNUC 1H
CTEMP 18.8 c
SLVNT CDCL3
EXREF 77.00 ppm
BF 0.12 Hz
RGAIN 36

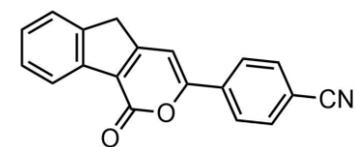
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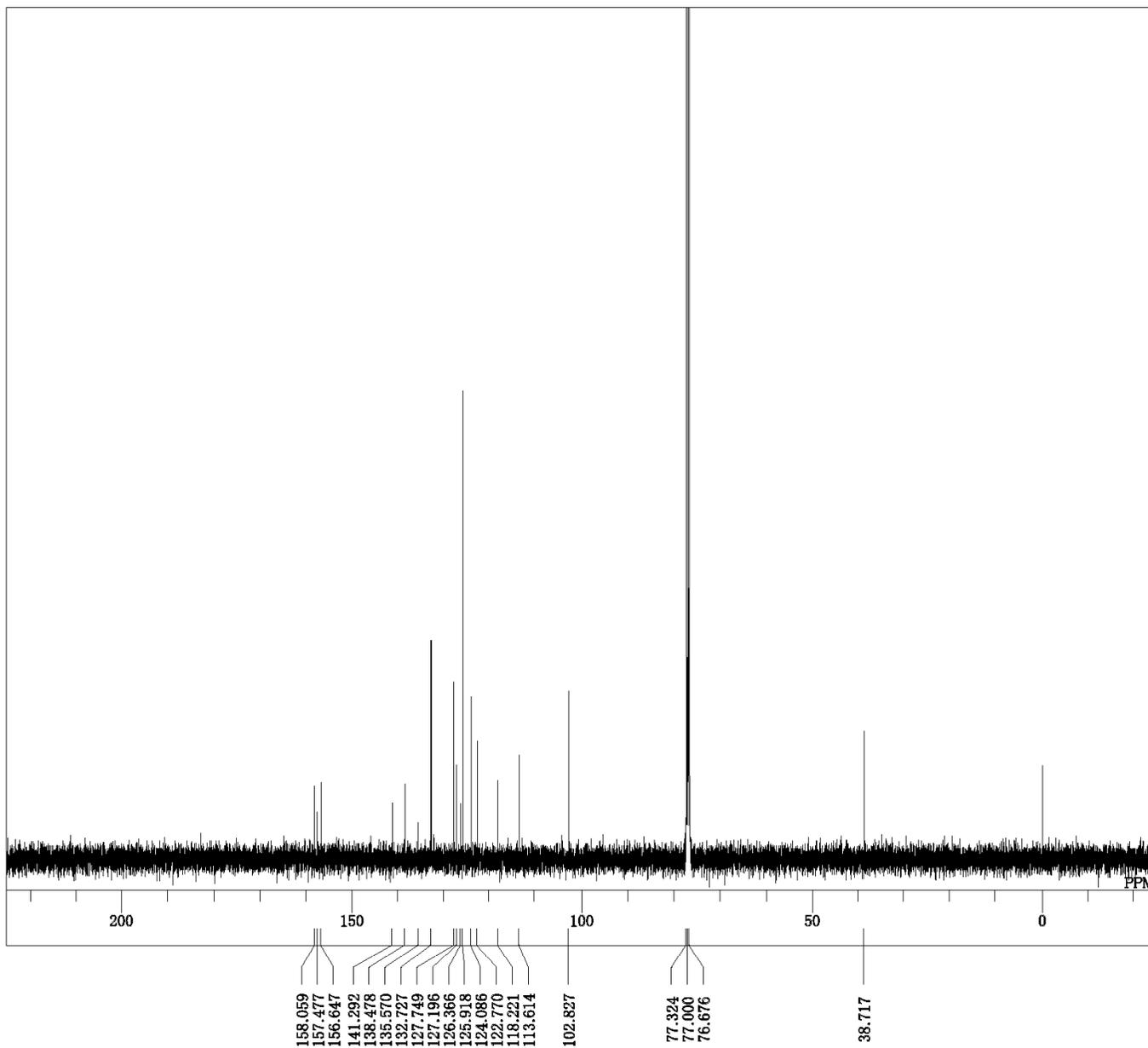
**2d**



DFILE 20200220 p-CN-Indene-Prod6.als  
 COMNT  
 DATIM Thu Feb 20 14:56:31 2020  
 OBNUC 1H  
 EXMOD NON  
 OBFRQ 399.65 MHz  
 OBSET 124.00 KHz  
 OBFIN 10500.00 Hz  
 POINT 16384  
 FREQU 7992.01 Hz  
 SCANS 8  
 ACQTM 2.0500 sec  
 PD 2.0000 sec  
 PW1 6.60 usec  
 IRNUC 1H  
 CTEMP 6348.8 c  
 SLVNT CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 27

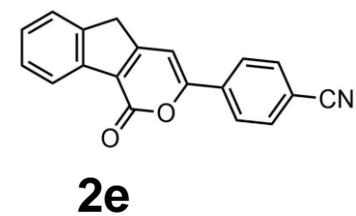


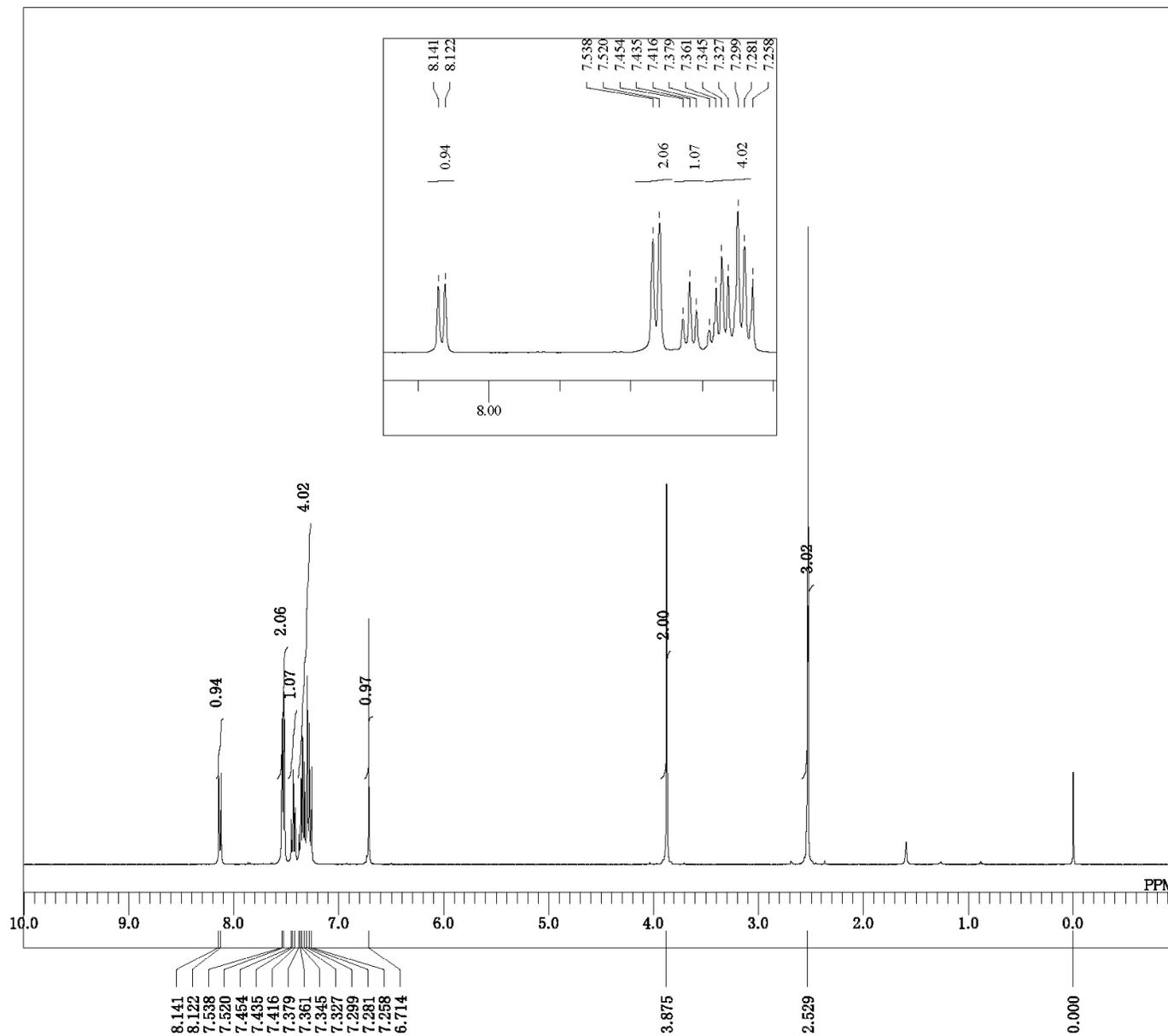
**2e**



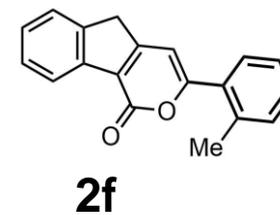
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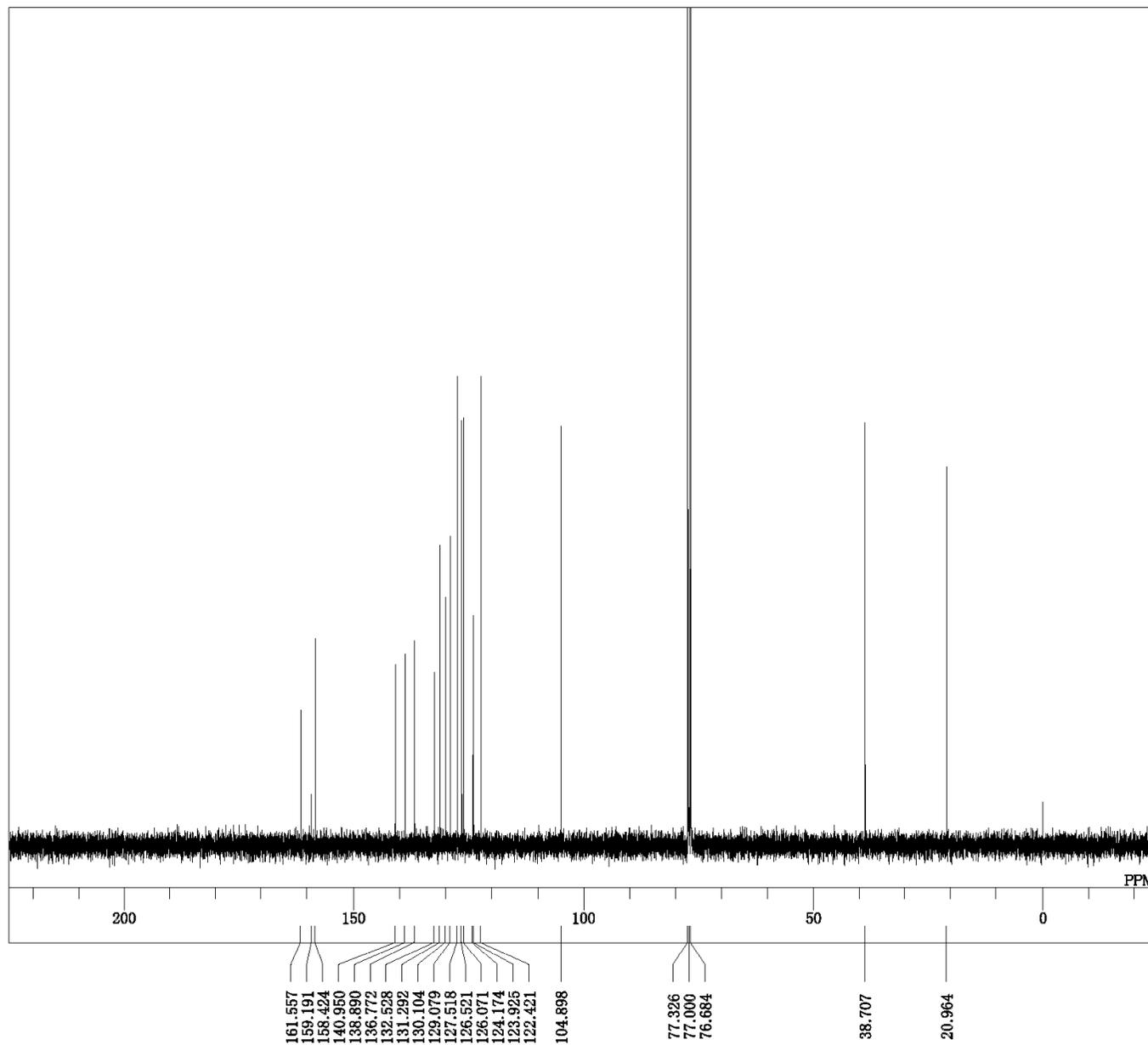
DFILE      20200220 p-CN-Indene-Prod6_bcn
COMNT      single pulse decoupled gated NOE
DATIM      2020-02-21 07:57:20
OBNUC      13C
EXMOD      single_pulse_dec
OBFRQ      98.52 MHz
OBSET      4.64 KHz
OBFIN      8.74 Hz
POINT      26214
FREQU      24630.17 Hz
SCANS      12288
ACQTM      1.0643 sec
PD         2.0000 sec
PW1        3.17 usec
IRNUC      1H
CTEMP      20.0 c
SLVNT      CDCL3
EXREF      77.00 ppm
BF         0.12 Hz
RGAIN      36
  
```





DFILE 20191216 2-tolyl ester-6\_Proton-1  
 COMNT single\_pulse  
 DATIM 2019-12-16 16:28:42  
 OBNUC 1H  
 EXMOD proton.jxp  
 OBFREQ 395.88 MHz  
 OBSET 6.28 KHz  
 OBFIN 0.87 Hz  
 POINT 13107  
 FREQU 5938.24 Hz  
 SCANS 8  
 ACQTM 2.2073 sec  
 PD 5.0000 sec  
 PW1 3.14 usec  
 IRNUC 1H  
 CTEMP 19.7 c  
 SLVNT CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 36

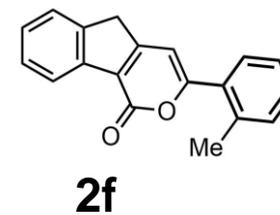


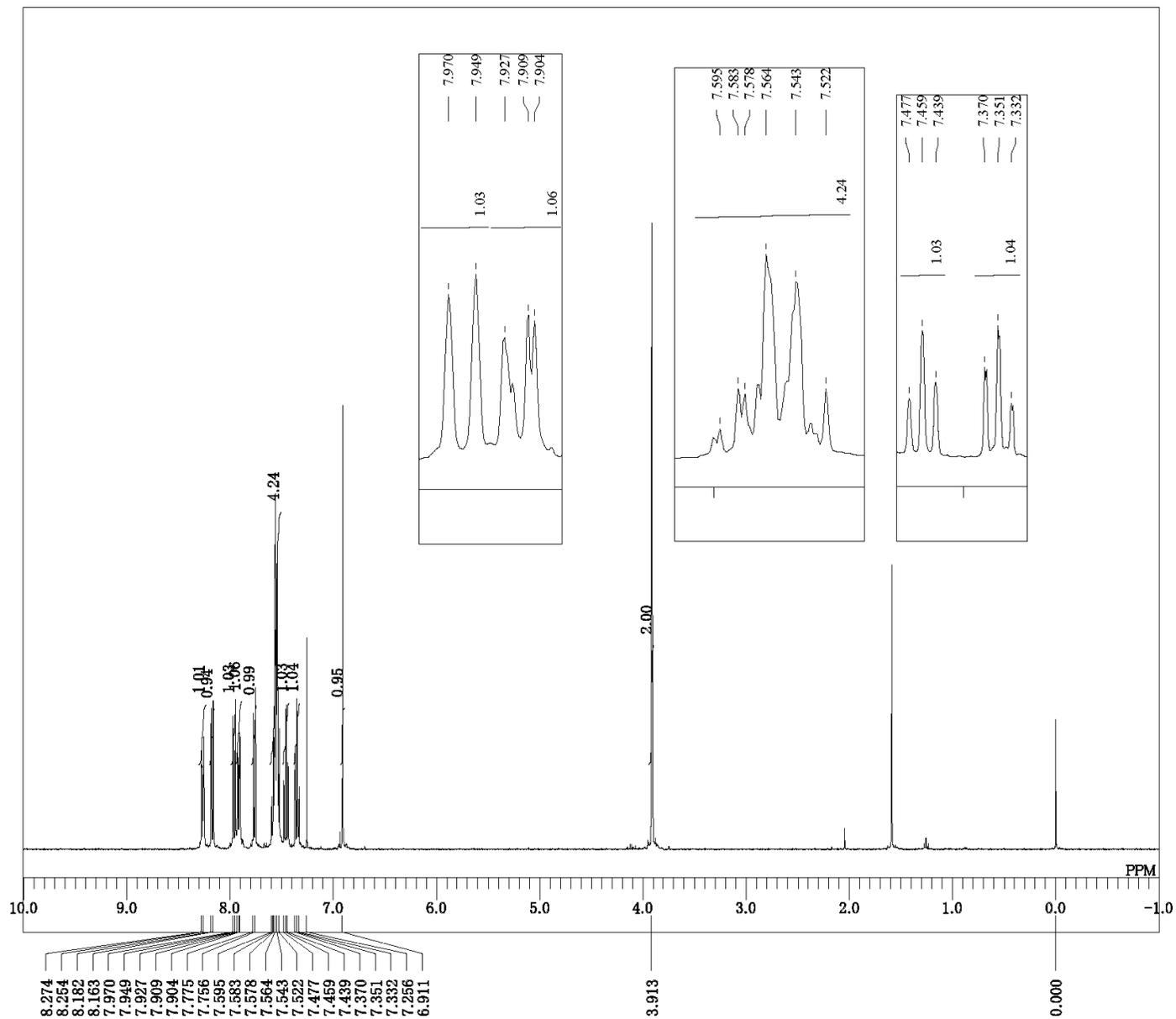


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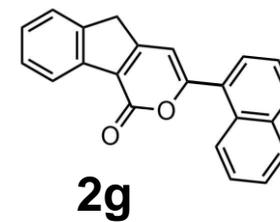
DFILE 20191216 2-tolyl ester-6_Carbon-
COMNT single pulse decoupled gated NOE
DATIM 2019-12-16 16:29:54
OBNUC 13C
EXMOD carbon.jxp
OBFRQ 99.55 MHz
OBSET 5.13 KHz
OBFIN 0.98 Hz
POINT 26214
FREQU 25000.00 Hz
SCANS 1024
ACQTM 1.0486 sec
PD 2.0000 sec
PW1 3.59 usec
IRNUC 1H
CTEMP 19.7 c
SLVNT CDCL3
EXREF 77.00 ppm
BF 0.12 Hz
RGAIN 50

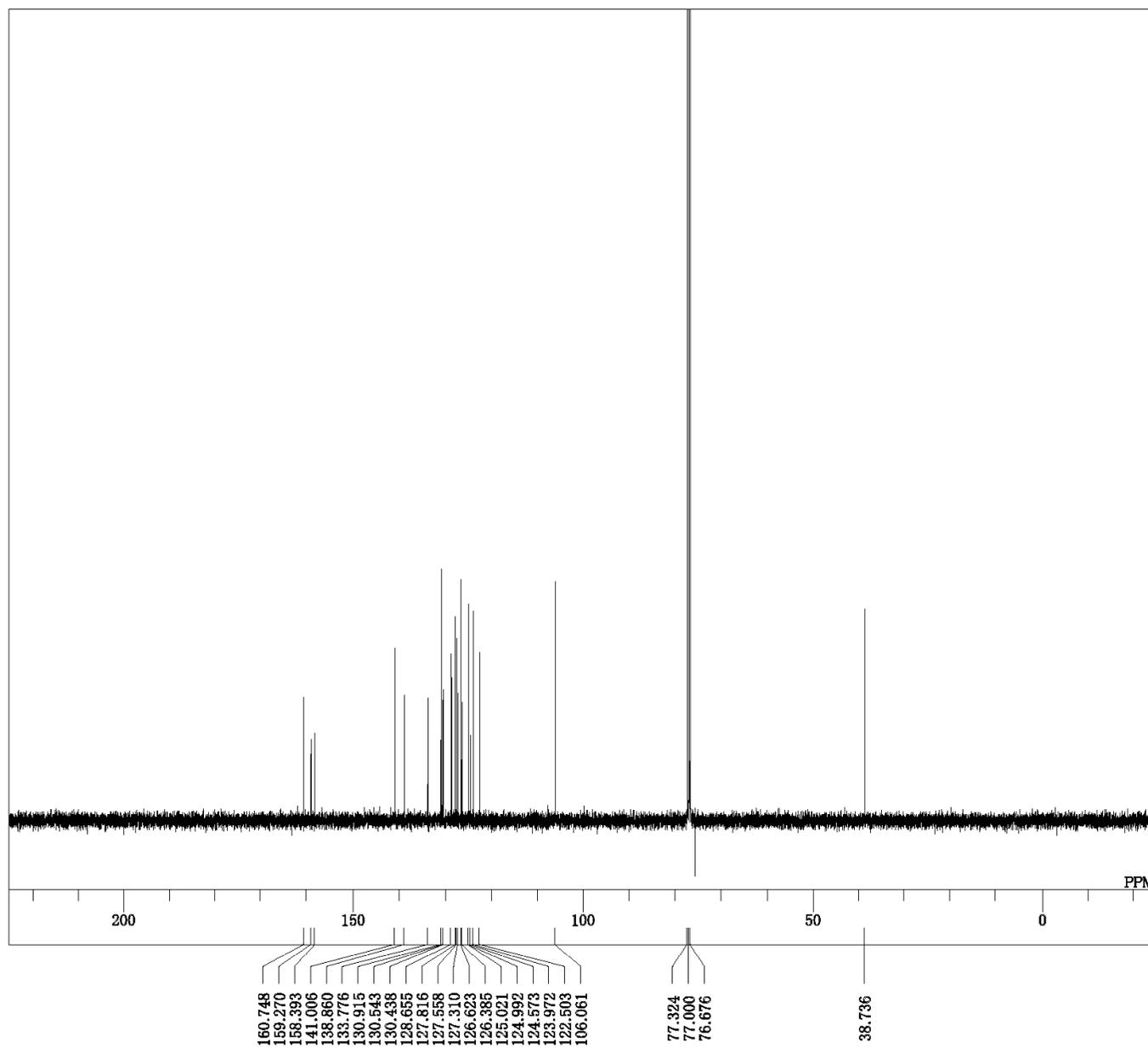
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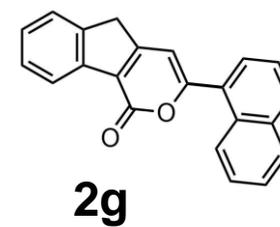
DFILE 20200226 1-naphthalene-ester-6-  
 COMNT  
 DATIM Wed Feb 26 15:52:27 2020  
 OBNUC 1H  
 EXMOD NON  
 OBFREQ 399.65 MHz  
 OBSET 124.00 KHz  
 OBFIN 10500.00 Hz  
 POINT 16384  
 FREQU 7992.01 Hz  
 SCANS 8  
 ACQTM 2.0500 sec  
 PD 2.0000 sec  
 PW1 6.60 usec  
 IRNUC 1H  
 CTEMP 6348.8 c  
 CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 20

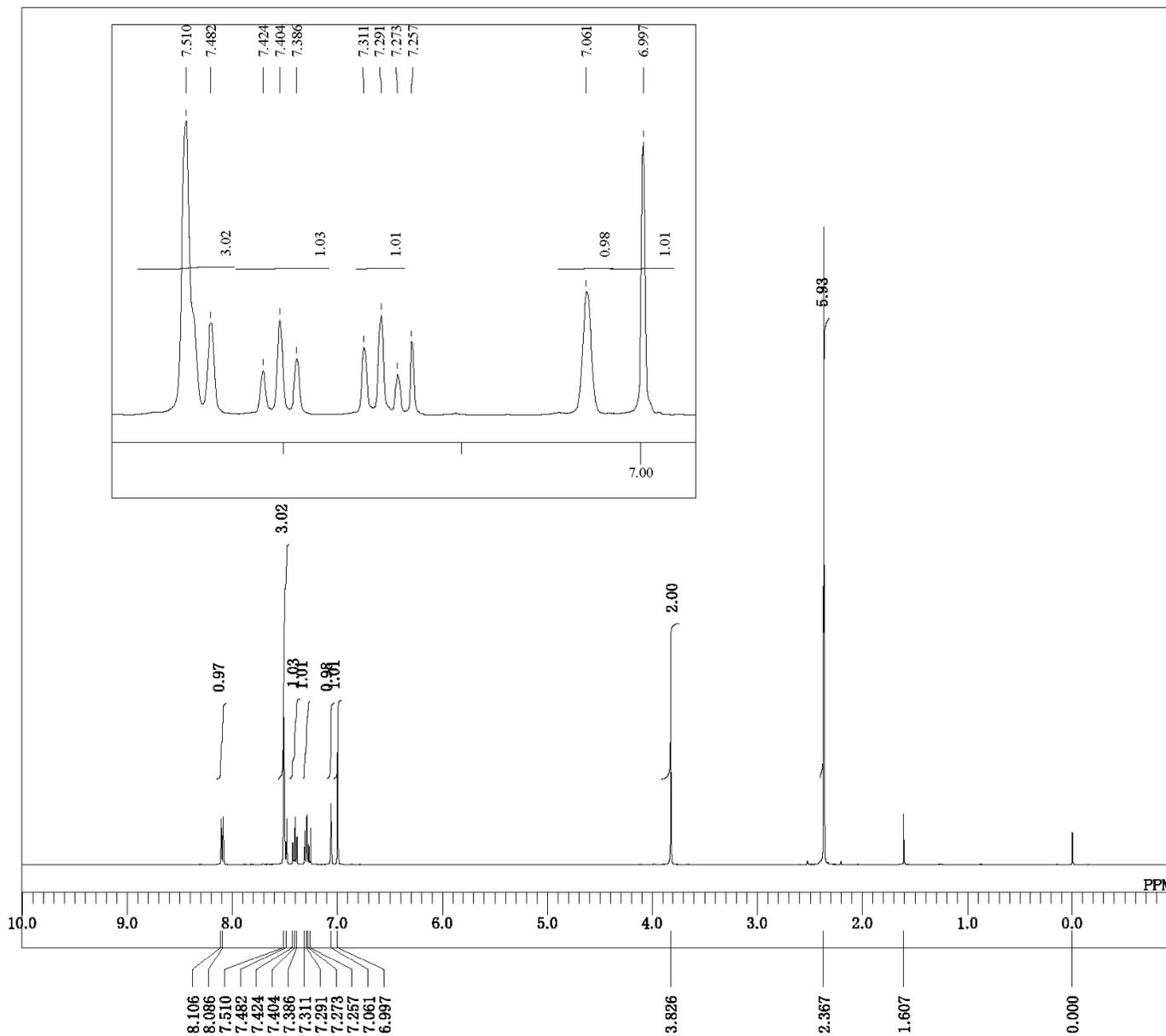




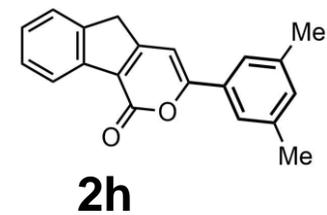
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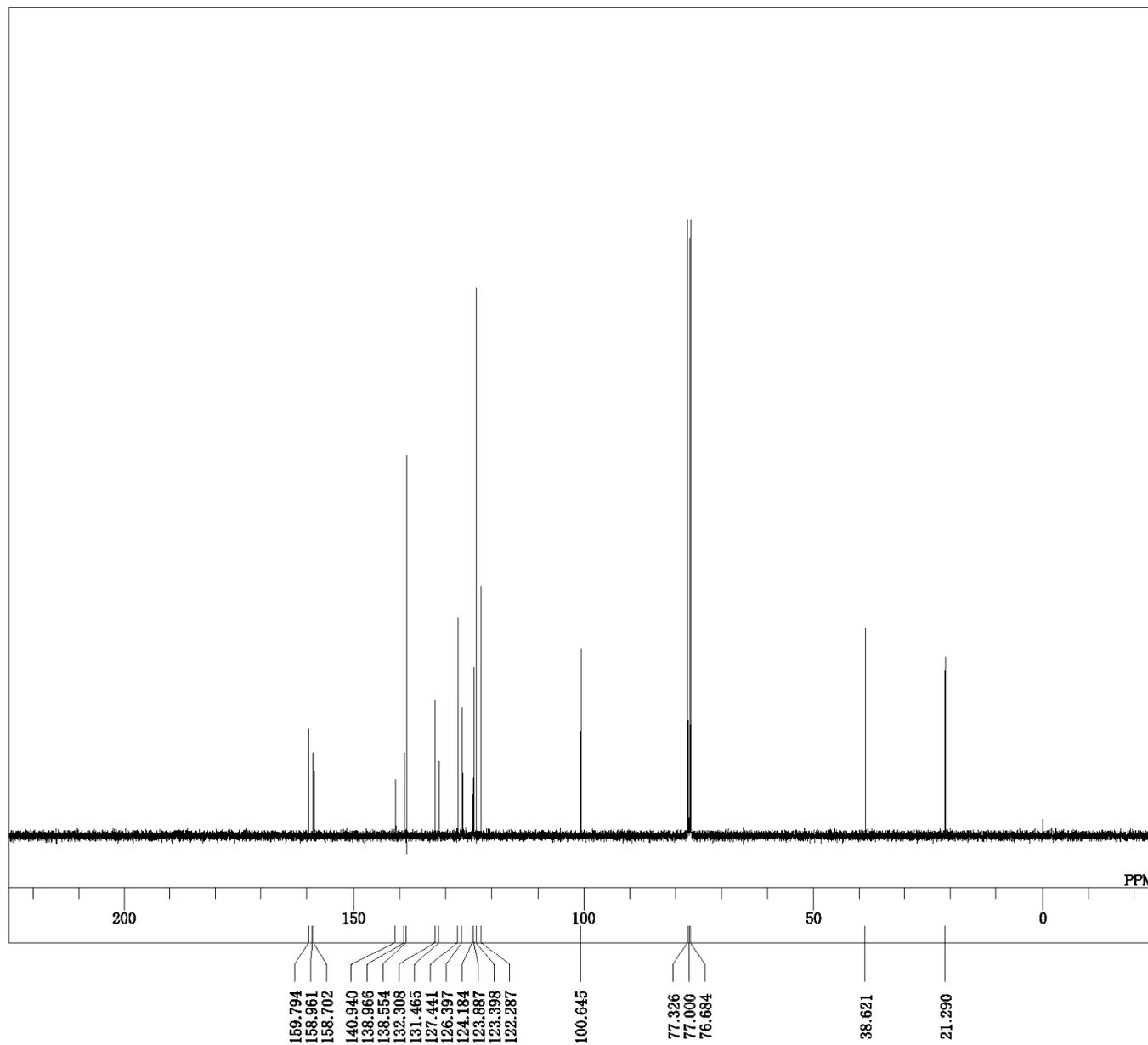
DFILE      20200226 1-naphthalene-6ester-c
COMNT      single pulse decoupled gated NOE
DATIM      2020-02-26 16:48:49
OBNUC      13C
EXMOD      single_pulse_dec
OBFRQ      98.52 MHz
OBSET      4.64 KHz
OBFIN      8.74 Hz
POINT      26214
FREQU      24630.17 Hz
SCANS      1024
ACQTM      1.0643 sec
PD         2.0000 sec
PW1        3.17 usec
IRNUC      1H
CTEMP      20.4 c
SLVNT      CDCL3
EXREF      77.00 ppm
BF         0.12 Hz
RGAIN      38
  
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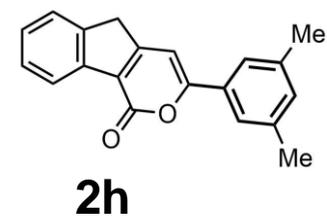


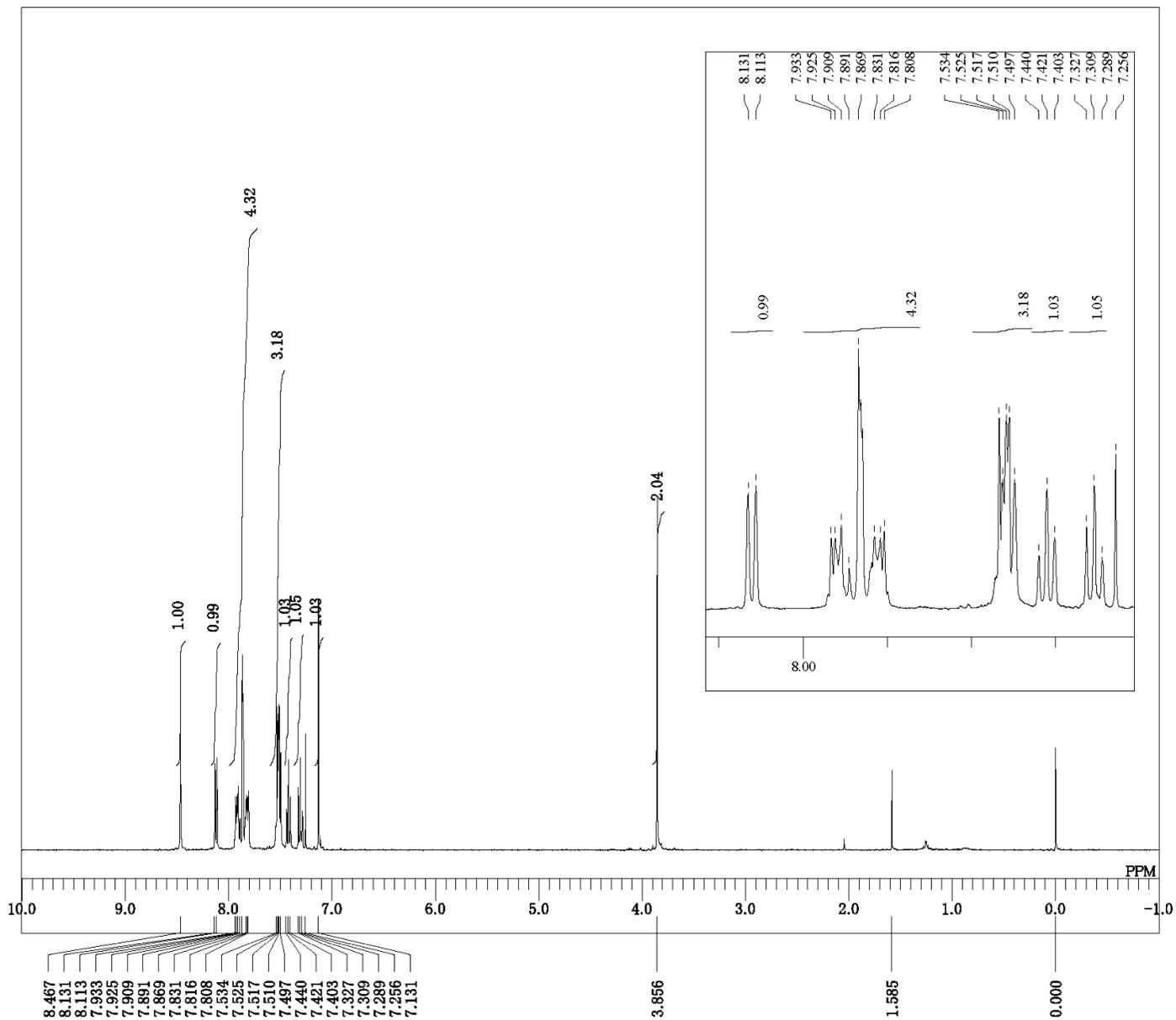
DFILE 20200128 3,5-Me2-Inden-Prod6\_P  
 COMNT single\_pulse  
 DATIM 2020-01-28 14:38:50  
 OBNUC 1H  
 EXMOD proton.jxp  
 OBFRQ 395.88 MHz  
 OBSET 6.28 KHz  
 OBFIN 0.87 Hz  
 POINT 13107  
 FREQU 5938.24 Hz  
 SCANS 8  
 ACQTM 2.2073 sec  
 PD 5.0000 sec  
 PW1 3.14 usec  
 IRNUC 1H  
 CTEMP 21.1 c  
 SLVNT CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 34



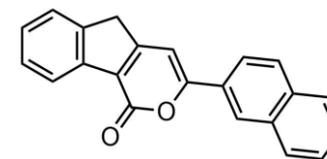


DFILE 20200128 3,5-Me2-Inden-Prod6\_C  
 COMNT single pulse decoupled gated NOE  
 DATIM 2020-01-28 14:41:31  
 OBNUC 13C  
 EXMOD carbon.jxp  
 OBFRQ 99.55 MHz  
 OBSET 5.13 KHz  
 OBFIN 0.98 Hz  
 POINT 26214  
 FREQU 25000.00 Hz  
 SCANS 1024  
 ACQTM 1.0486 sec  
 PD 2.0000 sec  
 PW1 3.59 usec  
 IRNUC 1H  
 CTEMP 20.2 c  
 SLVNT CDCL3  
 EXREF 77.00 ppm  
 BF 0.12 Hz  
 RGAIN 50

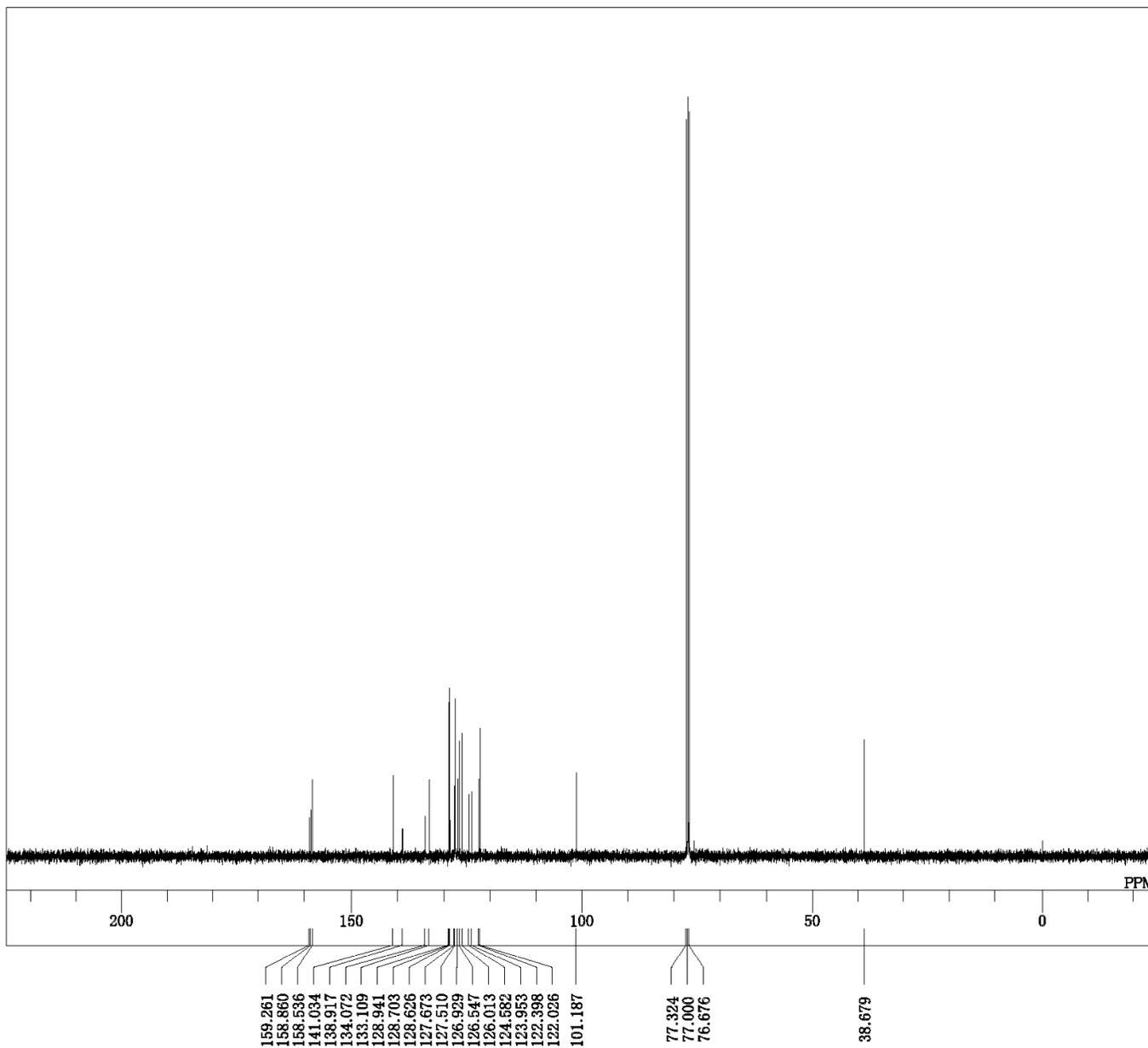




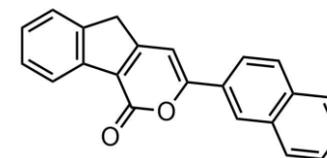
DFILE 20200316 2-Naph-Prod-6.als  
 COMNT  
 DATIM  
 OBNUC 1H  
 EXMOD NON  
 OBFRQ 399.65 MHz  
 OBSET 124.00 KHz  
 OBFIN 10500.00 Hz  
 POINT 16384  
 FREQU 7992.01 Hz  
 SCANS 8  
 ACQTM 2.0500 sec  
 PD 2.0000 sec  
 PW1 6.60 usec  
 IRNUC 1H  
 CTEMP 6348.8 c  
 CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 19



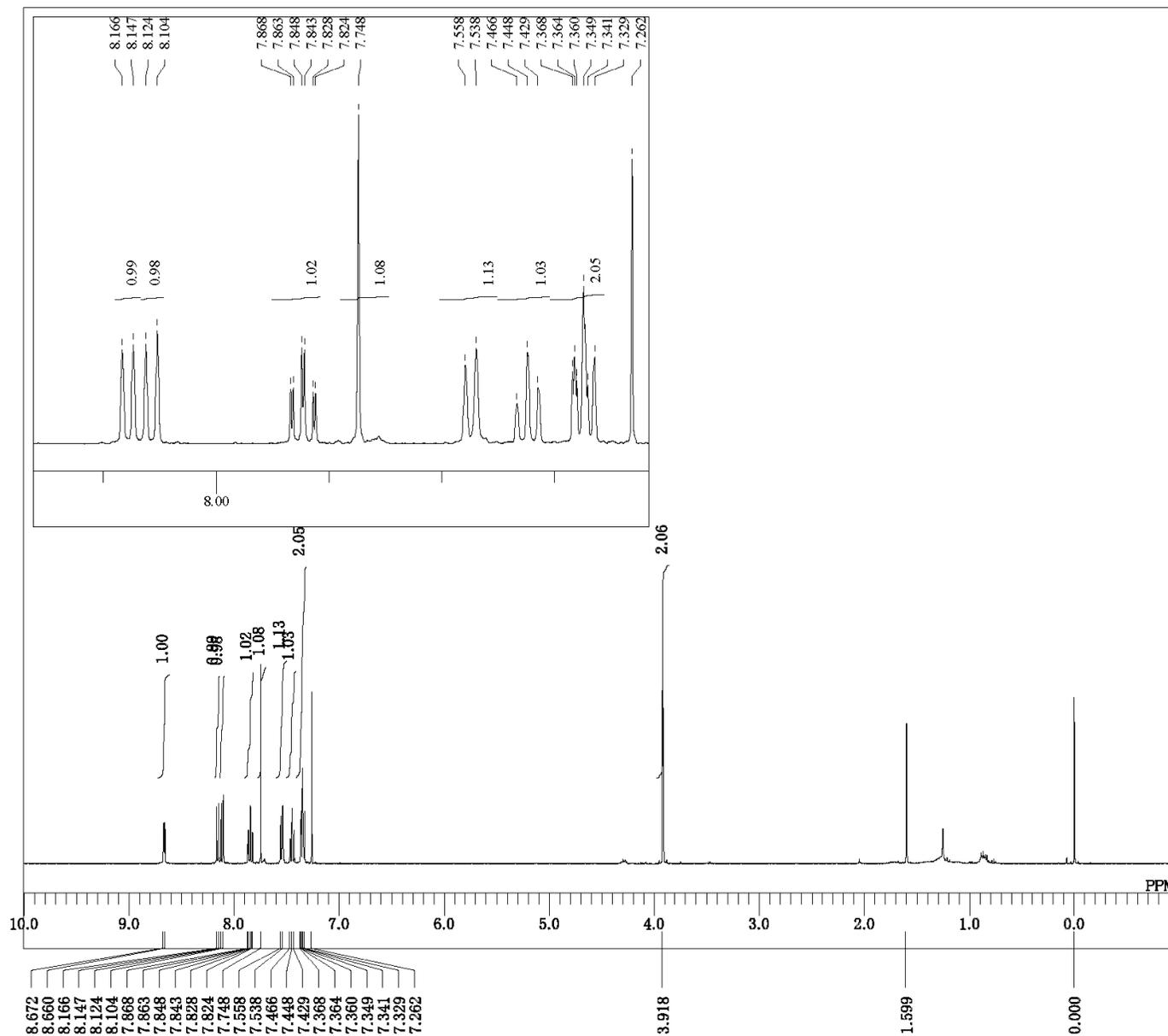
**2i**



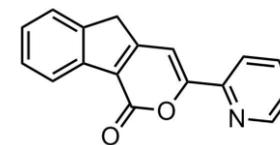
DFILE 20200317 2-Naph-Prod6\_bcm-1.al  
 COMNT single pulse decoupled gated NOE  
 DATIM 2020-03-17 09:46:34  
 OBNUC 13C  
 EXMOD single\_pulse\_dec  
 OBFRQ 98.52 MHz  
 OBSET 4.64 KHz  
 OBFIN 8.74 Hz  
 POINT 26214  
 FREQU 24630.17 Hz  
 SCANS 1024  
 ACQTM 1.0643 sec  
 PD 2.0000 sec  
 PW1 3.17 usec  
 IRNUC 1H  
 CTEMP 20.8 c  
 SLVNT CDCL3  
 EXREF 77.00 ppm  
 BF 0.12 Hz  
 RGAIN 38



**2i**

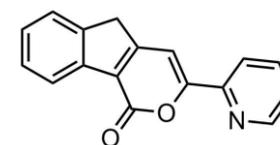
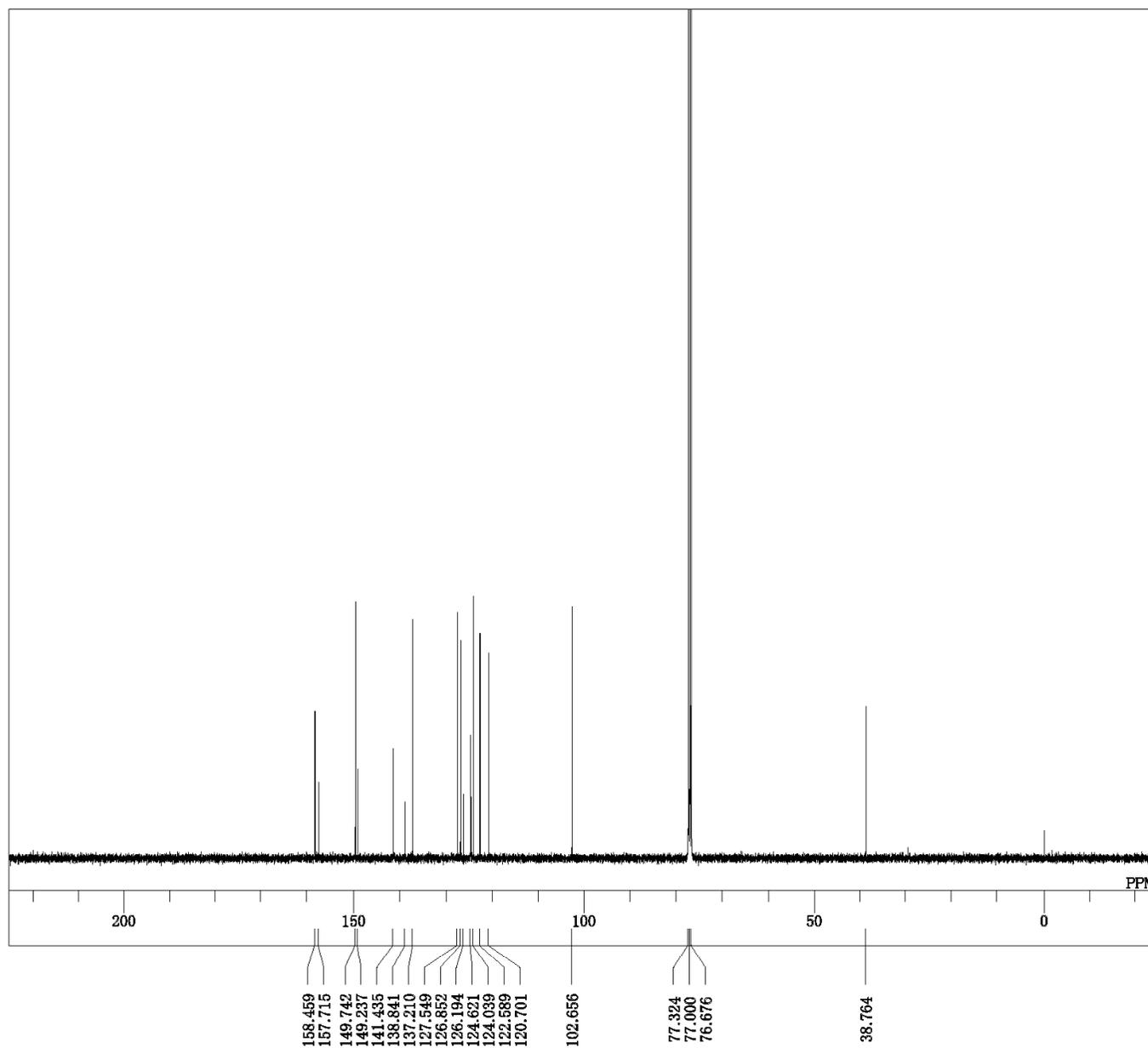


DFILE 20200312 2-py-Prod6\_non-1.als  
 COMNT single\_pul  
 DATIM 2020-03-12 15:58:54  
 OBNUC 1H  
 EXMOD single\_pulse.ex2  
 OBFRQ 391.78 MHz  
 OBSET 8.51 KHz  
 OBFIN 3.34 Hz  
 POINT 26214  
 FREQU 5882.26 Hz  
 SCANS 8  
 ACQTM 4.4564 sec  
 PD 3.0000 sec  
 PW1 5.90 usec  
 IRNUC 1H  
 CTEMP 19.6 c  
 SLVNT CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 50

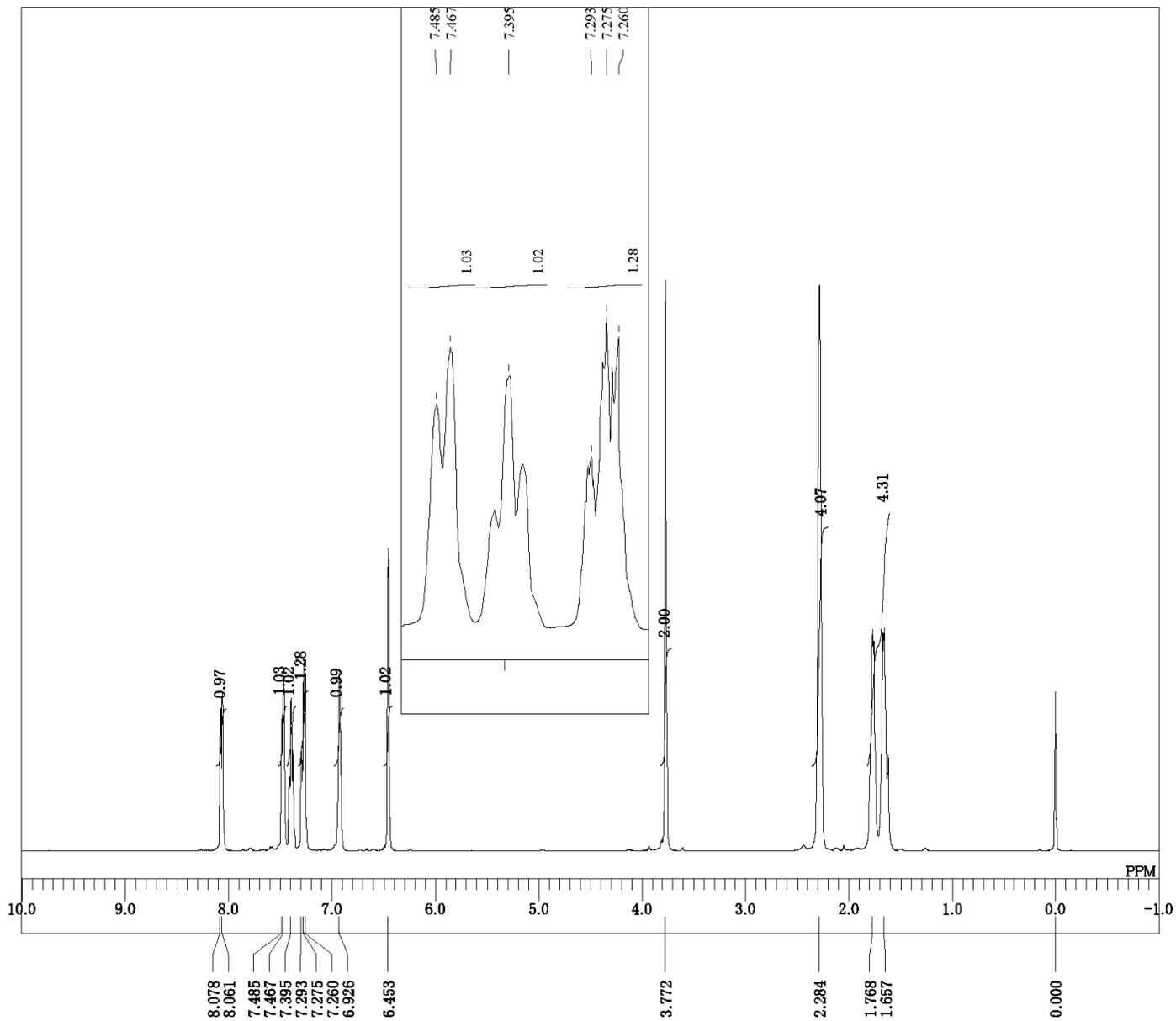


**2j**

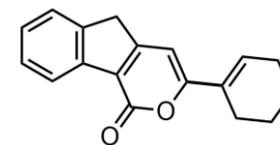
DFILE 20200312 2-py-Prod6\_bcm-1.als  
COMNT single pulse decoupled gated NOE  
DATIM 2020-03-13 07:51:48  
OBNUC 13C  
EXMOD single\_pulse\_dec  
OBFRQ 98.52 MHz  
OBSET 4.64 KHz  
OBFIN 8.74 Hz  
POINT 26214  
FREQU 24630.17 Hz  
SCANS 12288  
ACQTM 1.0643 sec  
PD 2.0000 sec  
PW1 3.17 usec  
IRNUC 1H  
CTEMP 20.2 c  
SLVNT CDCL3  
EXREF 77.00 ppm  
BF 0.12 Hz  
RGAIN 50



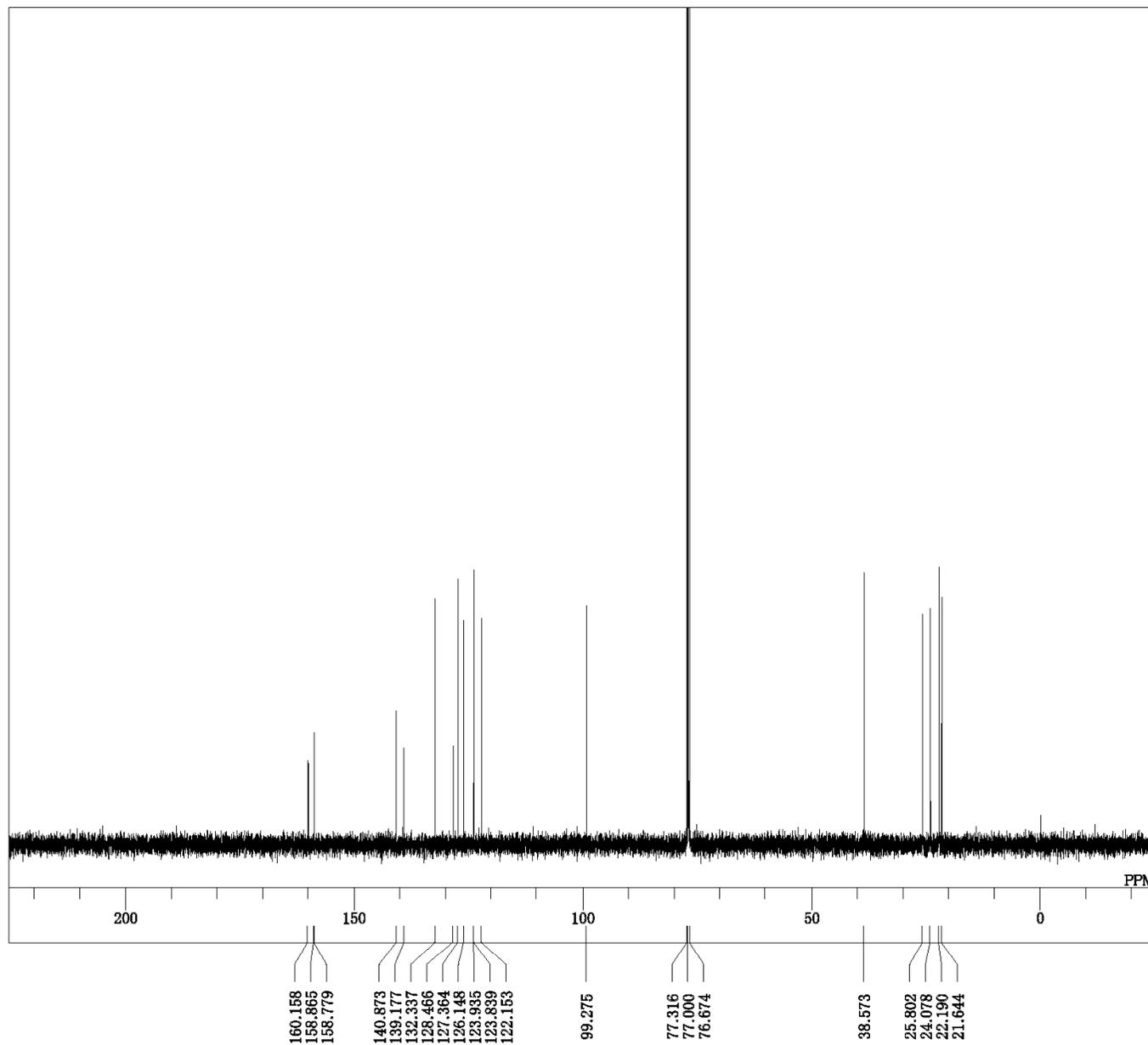
2j



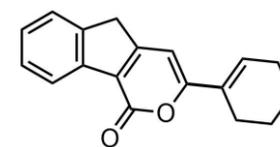
DFILE 20191213 cyclohexene ester-6\_Pro  
 COMNT single\_pulse  
 DATIM 2019-12-13 14:54:27  
 OBNUC 1H  
 EXMOD proton.jxp  
 OBFREQ 395.88 MHz  
 OBSET 6.28 KHz  
 OBFIN 0.87 Hz  
 POINT 13107  
 FREQU 5938.24 Hz  
 SCANS 8  
 ACQTM 2.2073 sec  
 PD 5.0000 sec  
 PW1 3.14 usec  
 IRNUC 1H  
 CTEMP 19.6 c  
 SLVNT CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 34



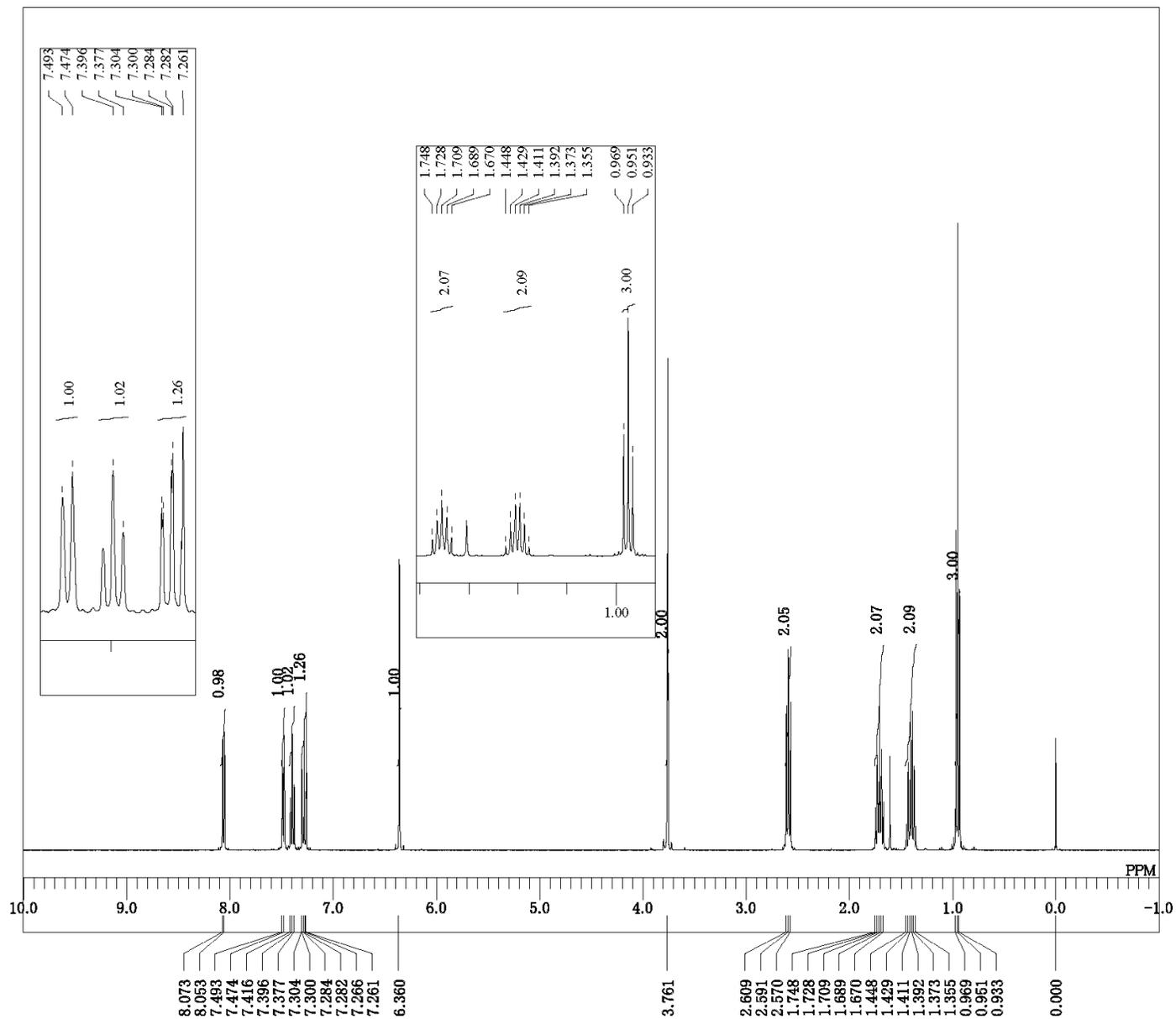
**2k**



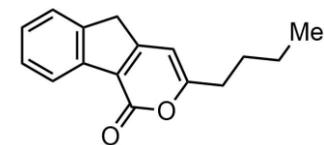
DFILE 20191213 cyclohexene ester-6\_Car  
 COMNT single pulse decoupled gated NOE  
 DATIM 2019-12-13 14:55:40  
 OBNUC 13C  
 EXMOD carbon.jxp  
 OBFRQ 99.55 MHz  
 OBSET 5.13 KHz  
 OBFIN 0.98 Hz  
 POINT 26214  
 FREQU 25000.00 Hz  
 SCANS 1024  
 ACQTM 1.0486 sec  
 PD 2.0000 sec  
 PW1 3.59 usec  
 IRNUC 1H  
 CTEMP 19.8 c  
 SLVNT CDCL3  
 EXREF 77.00 ppm  
 BF 0.12 Hz  
 RGAIN 50



**2k**

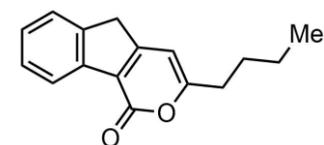
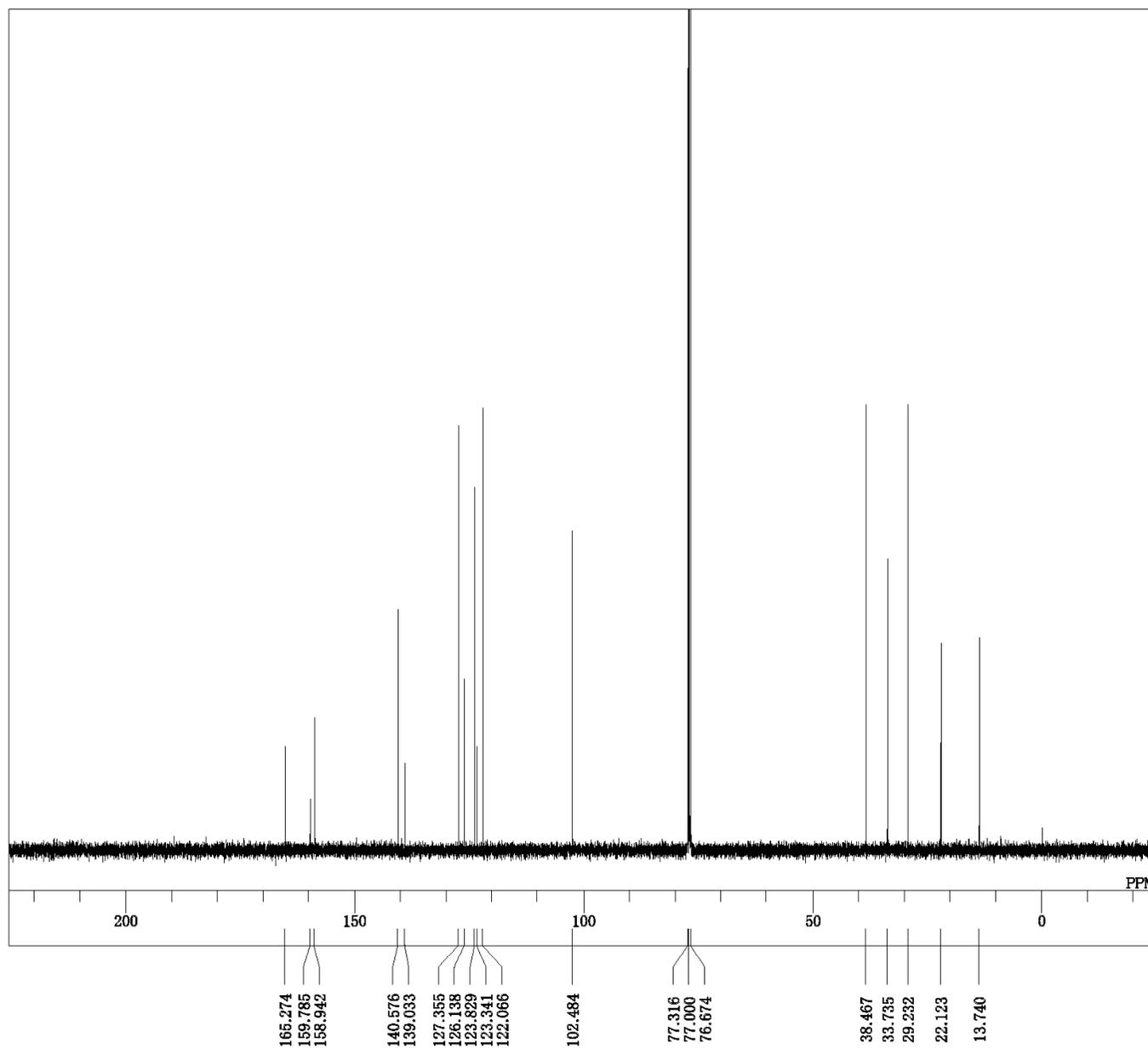


DFILE 20200120 n-butyl ester-6\_Proton-  
 COMNT single\_pulse  
 DATIM 2020-01-20 19:56:55  
 OBNUC 1H  
 EXMOD proton.jxp  
 OBFREQ 395.88 MHz  
 OBSET 6.28 KHz  
 OBFIN 0.87 Hz  
 POINT 13107  
 FREQU 5938.24 Hz  
 SCANS 8  
 ACQTM 2.2073 sec  
 PD 5.0000 sec  
 PW1 3.14 usec  
 IRNUC 1H  
 CTEMP 19.9 c  
 CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 34

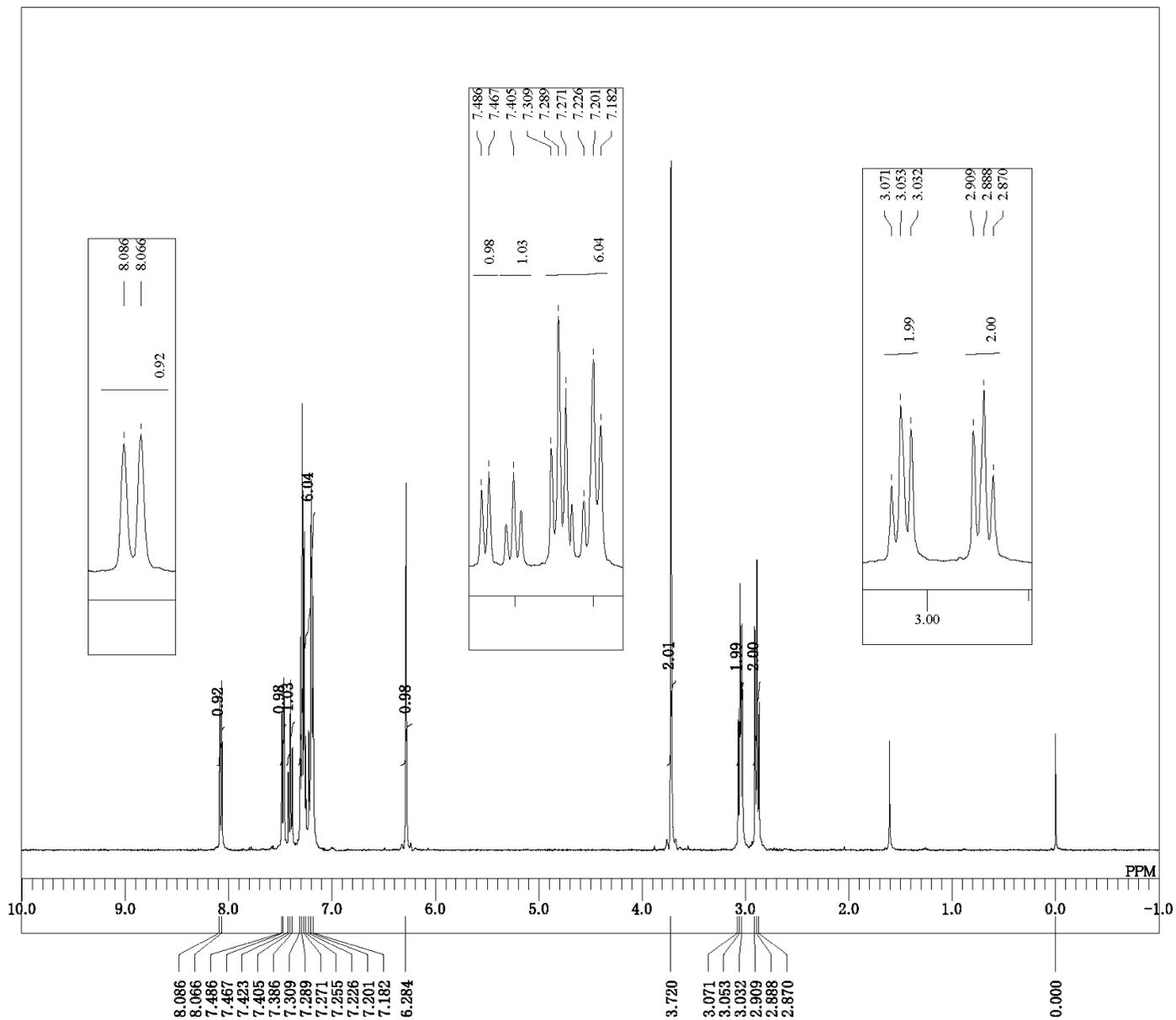


**21**

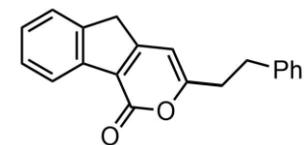
DFILE 20200120 n-butyl ester-6\_Carbon-  
 COMNT single pulse decoupled gated NOE  
 DATIM 2020-01-20 19:58:07  
 OBNUC 13C  
 EXMOD carbon.jxp  
 OBFRQ 99.55 MHz  
 OBSET 5.13 KHz  
 OBFIN 0.98 Hz  
 POINT 26214  
 FREQU 25000.00 Hz  
 SCANS 1024  
 ACQTM 1.0486 sec  
 PD 2.0000 sec  
 PW1 3.59 usec  
 IRNUC 1H  
 CTEMP 20.0 c  
 SLVNT CDCL3  
 EXREF 77.00 ppm  
 BF 0.12 Hz  
 RGAIN 50



**21**

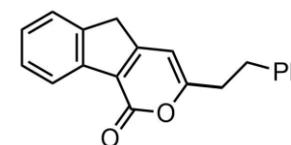
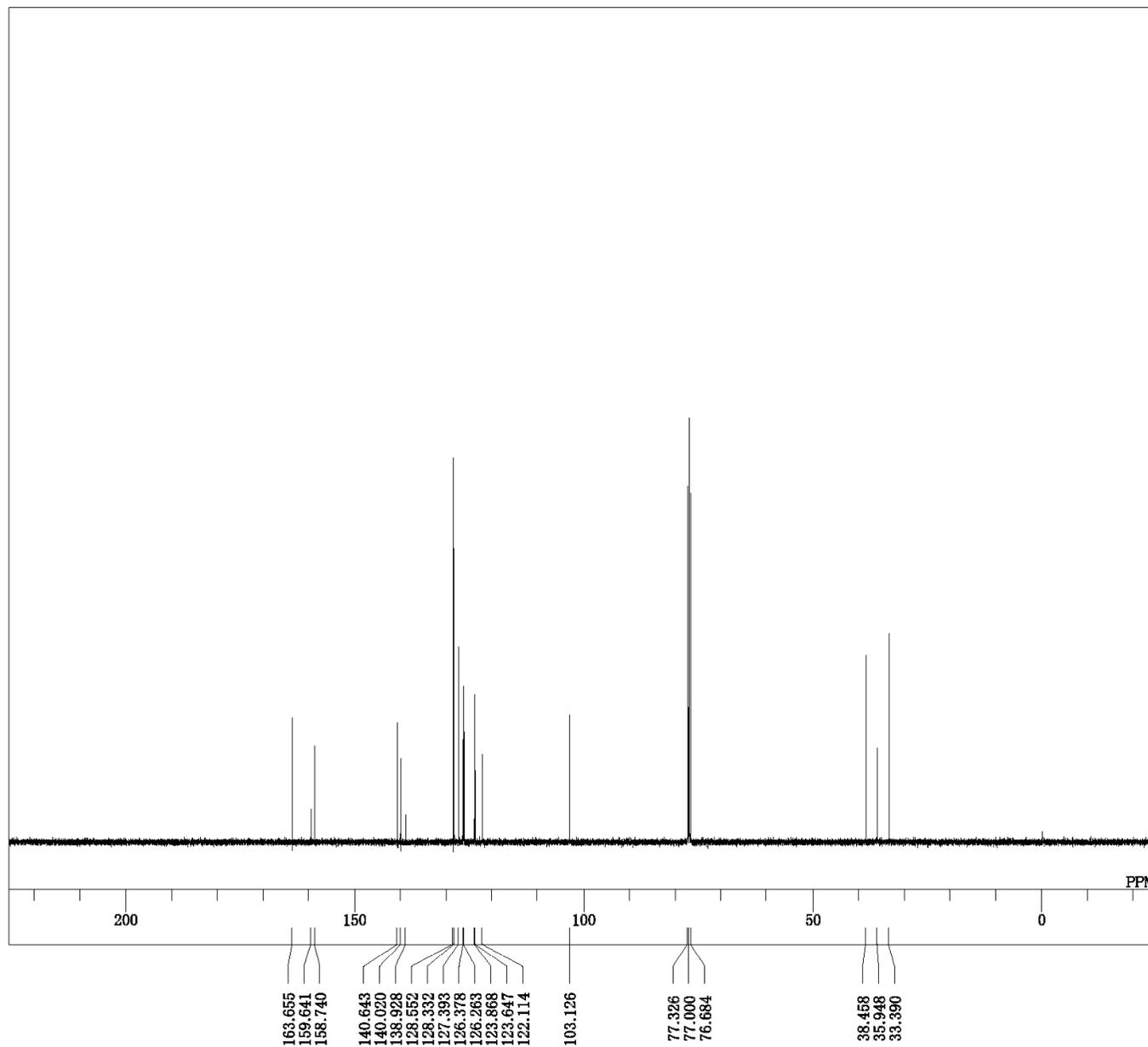


DFILE 20200108 phenethyl ester-6.als  
 COMNT  
 DATIM Wed Jan 08 19:19:18 2020  
 OBNUC 1H  
 EXMOD NON  
 OBFRQ 399.65 MHz  
 OBSET 124.00 KHz  
 OBFIN 10500.00 Hz  
 POINT 16384  
 FREQU 7992.01 Hz  
 SCANS 8  
 ACQTM 2.0500 sec  
 PD 2.0000 sec  
 PW1 6.60 usec  
 IRNUC 1H  
 CTEMP 6348.8 c  
 SLVNT CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 17

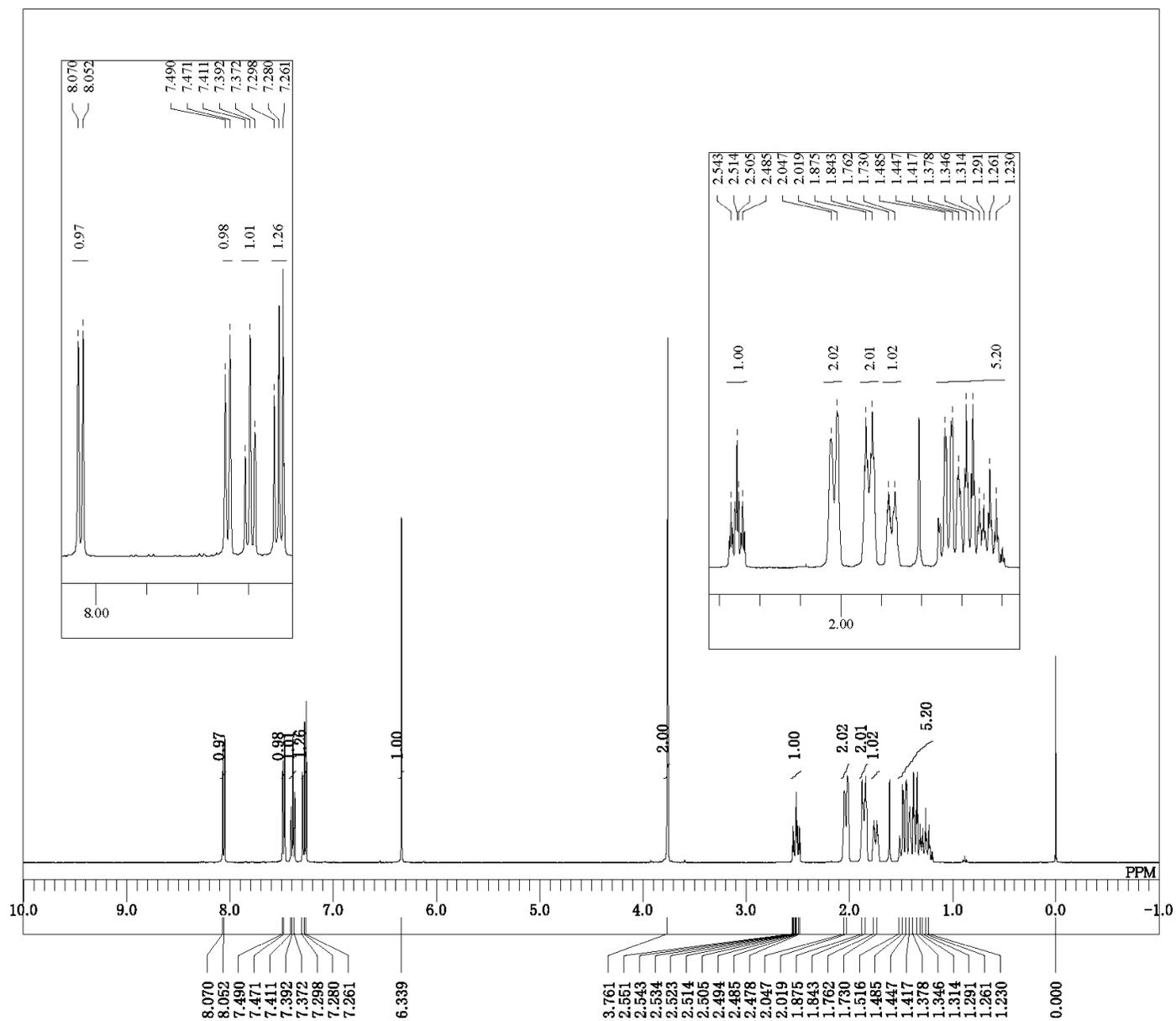


**2m**

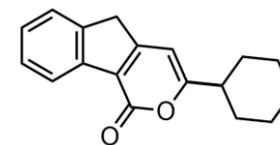
DFILE 20200109 phenethyl ester-6\_Carbo  
 COMNT single pulse decoupled gated NOE  
 DATIM 2020-01-09 09:41:45  
 OBNUC 13C  
 EXMOD carbon.jxp  
 OBFRQ 99.55 MHz  
 OBSET 5.13 KHz  
 OBFIN 0.98 Hz  
 POINT 26214  
 FREQU 25000.00 Hz  
 SCANS 1024  
 ACQTM 1.0486 sec  
 PD 2.0000 sec  
 PW1 3.59 usec  
 IRNUC 1H  
 CTEMP 19.6 c  
 SLVNT CDCL3  
 EXREF 77.00 ppm  
 BF 0.12 Hz  
 RGAIN 50



**2m**

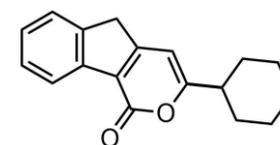
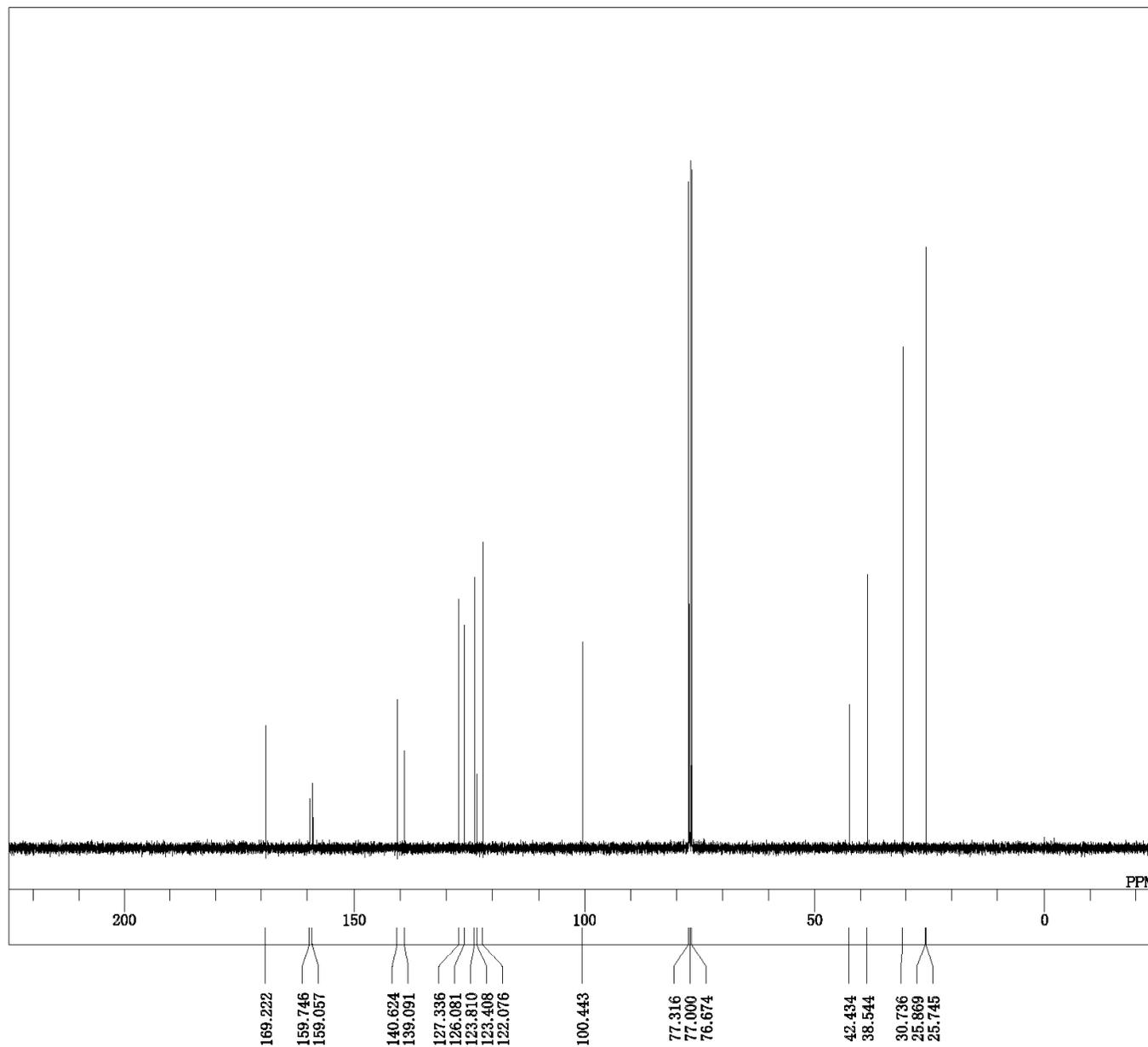


DFILE 20200108 cyclohexyl ester-6\_Proto  
 COMNT single\_pulse  
 DATIM 2020-01-08 13:26:56  
 OBNUC 1H  
 EXMOD proton.jxp  
 OBFRQ 395.88 MHz  
 OBSET 6.28 KHz  
 OBFIN 0.87 Hz  
 POINT 13107  
 FREQU 5938.24 Hz  
 SCANS 8  
 ACQTM 2.2073 sec  
 PD 5.0000 sec  
 PW1 3.14 usec  
 IRNUC 1H  
 CTEMP 20.0 c  
 SLVNT CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 34

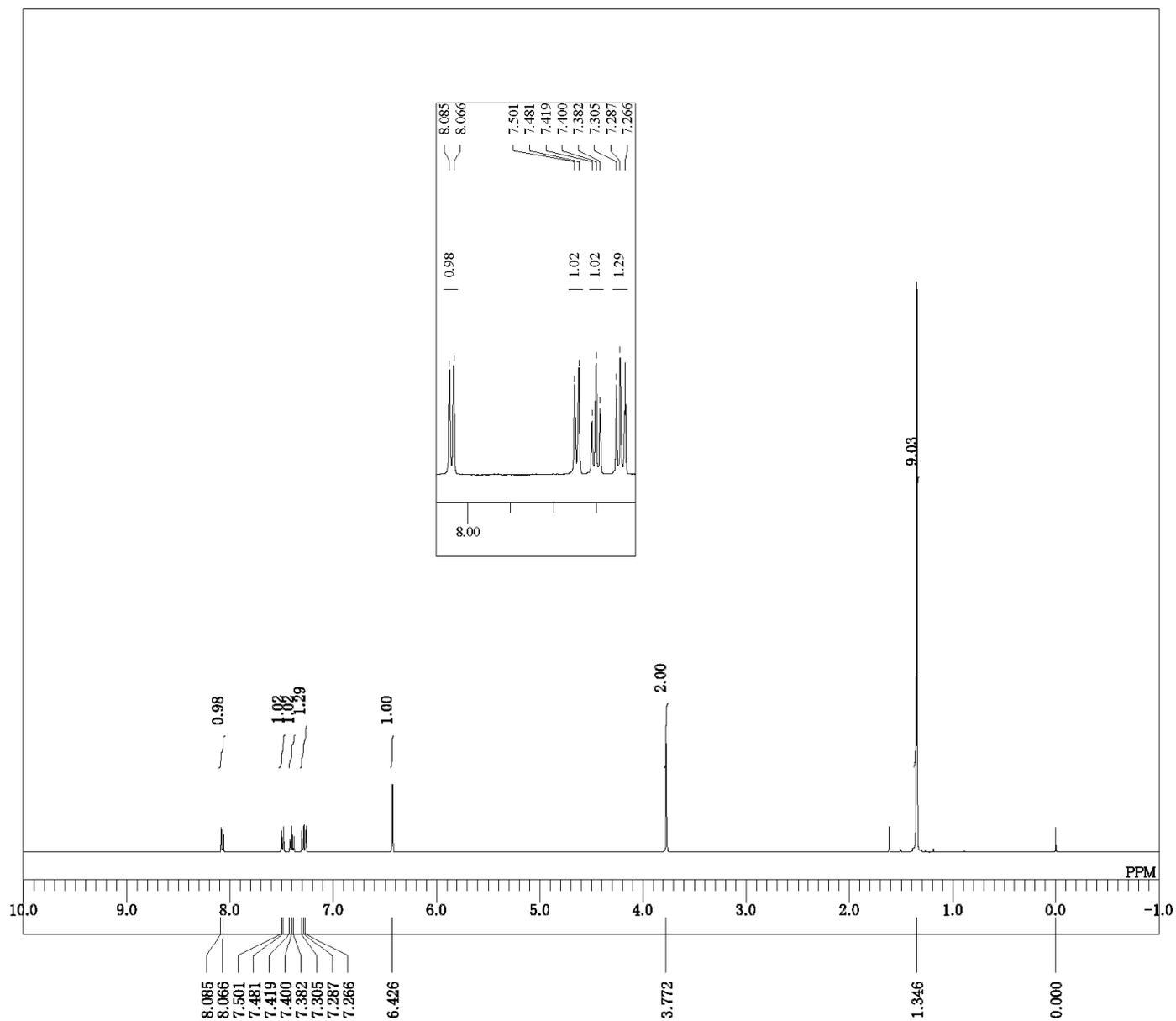


**2n**

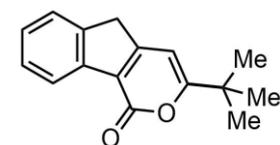
DFILE 20200107 cyclohexyl ester-6\_Carb  
 COMNT single pulse decoupled gated NOE  
 DATIM 2020-01-08 13:28:09  
 OBNUC 13C  
 EXMOD carbon.jxp  
 OBFRQ 99.55 MHz  
 OBSET 5.13 KHz  
 OBFIN 0.98 Hz  
 POINT 26214  
 FREQU 25000.00 Hz  
 SCANS 1024  
 ACQTM 1.0486 sec  
 PD 2.0000 sec  
 PW1 3.59 usec  
 IRNUC 1H  
 CTEMP 19.7 c  
 SLVNT CDCL3  
 EXREF 77.00 ppm  
 BF 0.12 Hz  
 RGAIN 50



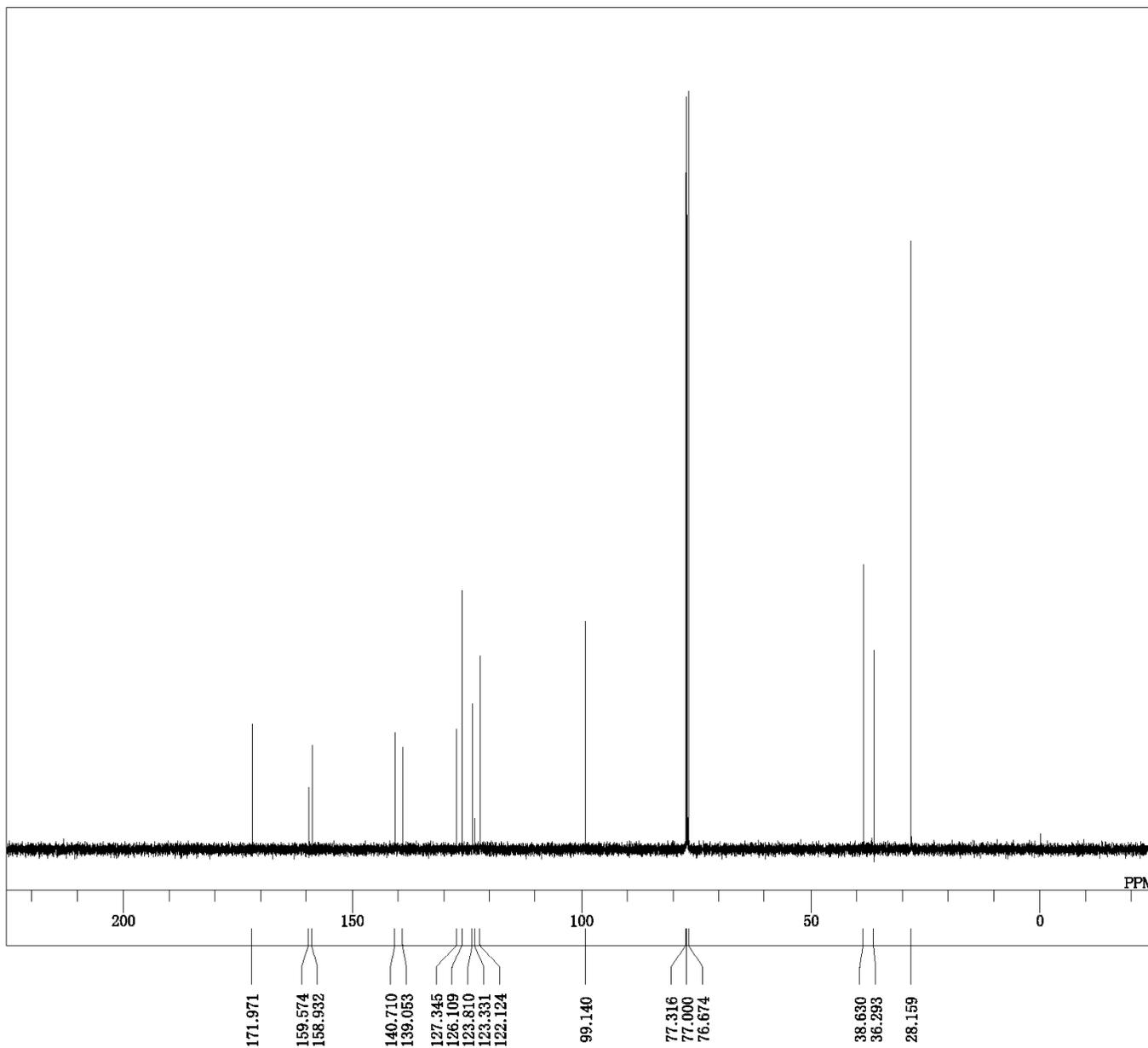
**2n**



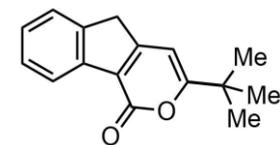
DFILE 20200109 t-butyl ester-6\_Proton-1  
 COMNT single\_pulse  
 DATIM 2020-01-09 10:39:37  
 OBNUC 1H  
 EXMOD proton.jxp  
 OBFRQ 395.88 MHz  
 OBSET 6.28 KHz  
 OBFIN 0.87 Hz  
 POINT 13107  
 FREQU 5938.24 Hz  
 SCANS 8  
 ACQTM 2.2073 sec  
 PD 5.0000 sec  
 PW1 3.14 usec  
 IRNUC 1H  
 CTEMP 19.6 c  
 CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 34



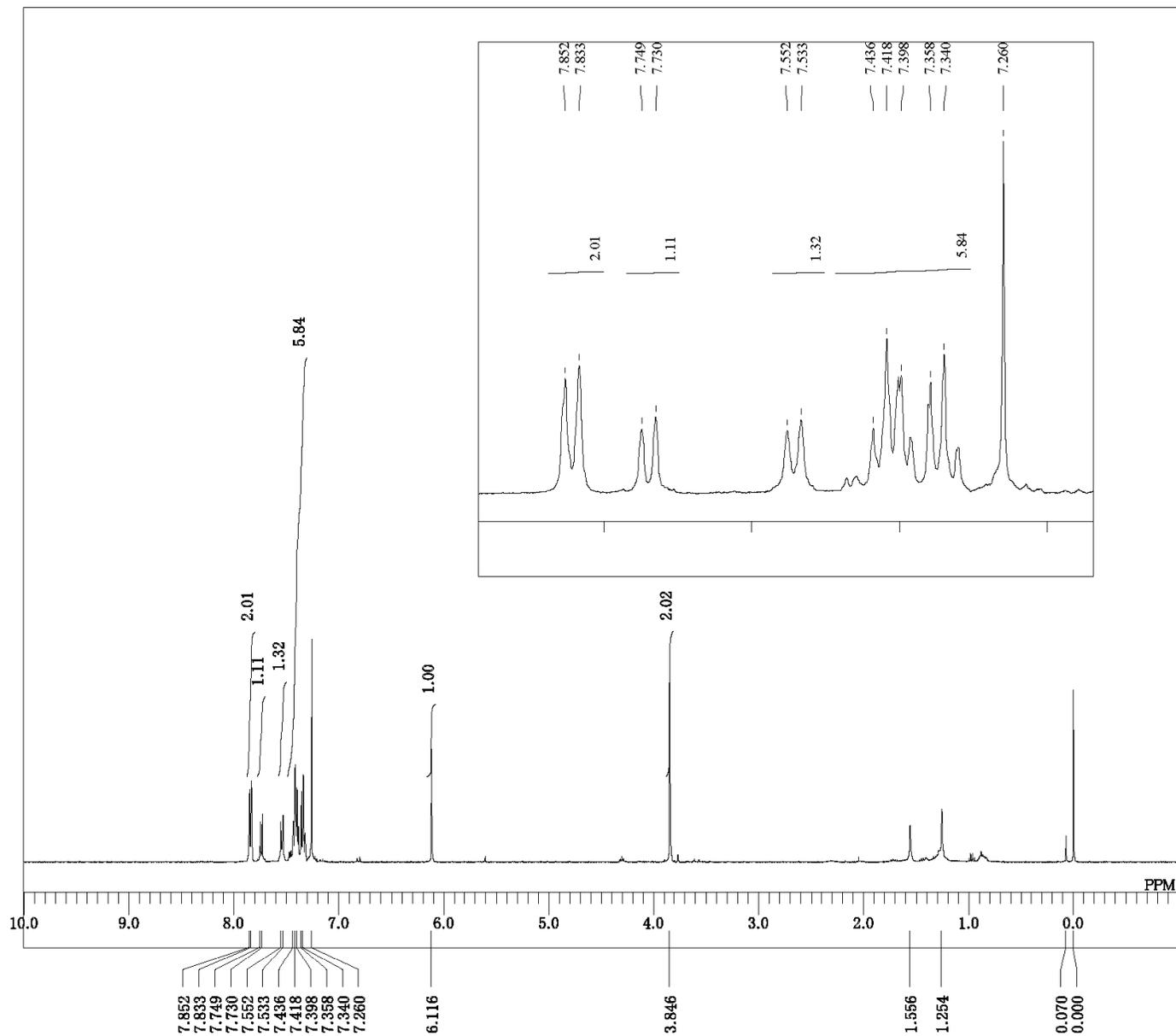
**20**



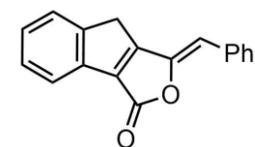
DFILE 20200109 t-butyl ester-6\_Carbon-  
 COMNT single pulse decoupled gated NOE  
 DATIM 2020-01-09 10:40:49  
 OBNUC 13C  
 EXMOD carbon.jxp  
 OBFRQ 99.55 MHz  
 OBSET 5.13 KHz  
 OBFIN 0.98 Hz  
 POINT 26214  
 FREQU 25000.00 Hz  
 SCANS 1024  
 ACQTM 1.0486 sec  
 PD 2.0000 sec  
 PW1 3.59 usec  
 IRNUC 1H  
 CTEMP 19.6 c  
 SLVNT CDCL3  
 EXREF 77.00 ppm  
 BF 0.12 Hz  
 RGAIN 50



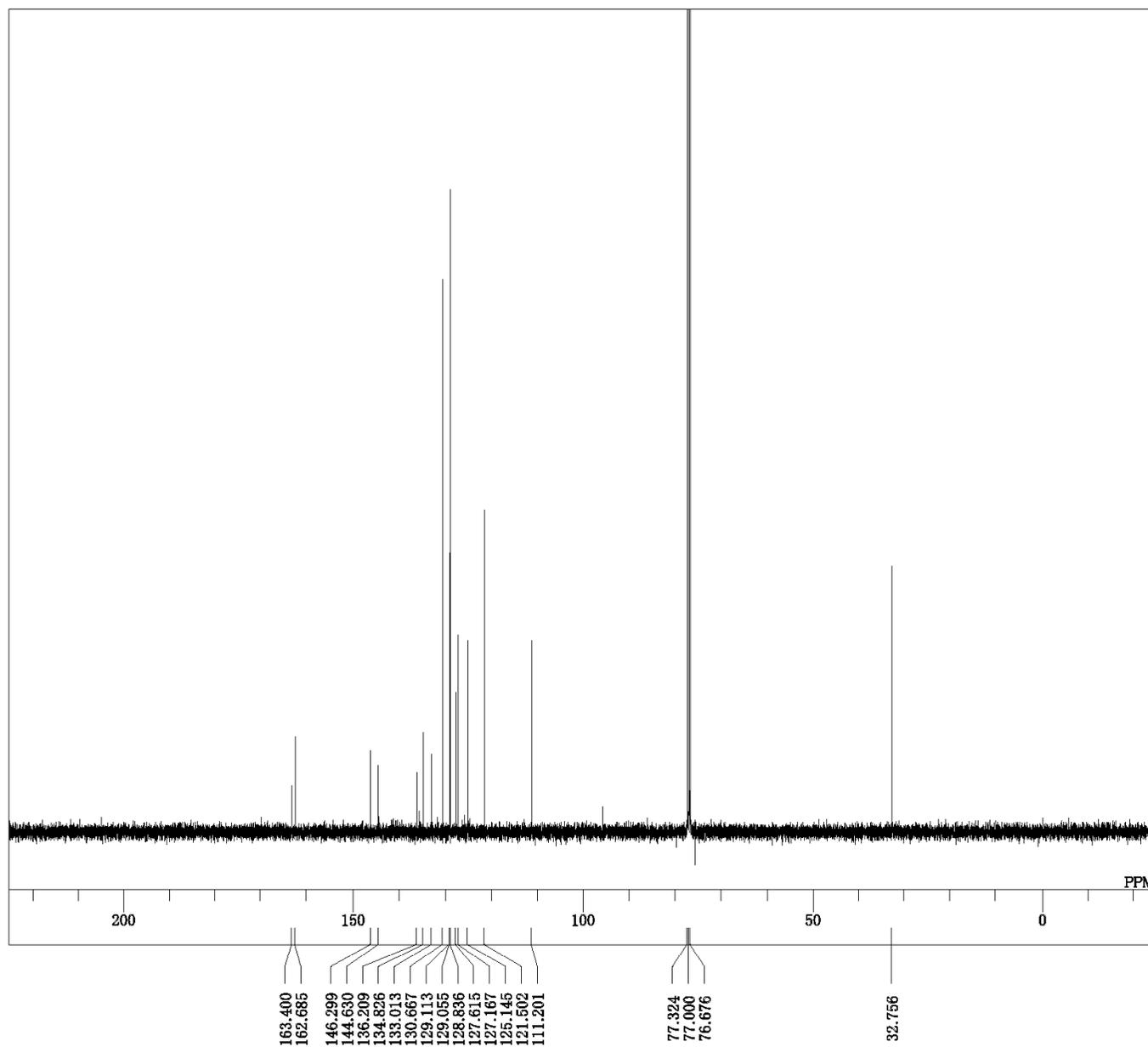
**20**



DFILE 20190128 Ph-Prod-5-1.als  
 COMNT single\_pulse  
 DATIM 2019-01-28 09:38:21  
 OBNUC 1H  
 EXMOD single\_pulse.ex2  
 OBFRQ 391.78 MHz  
 OBSET 8.51 KHz  
 OBFIN 3.34 Hz  
 POINT 26214  
 FREQU 5882.26 Hz  
 SCANS 8  
 ACQTM 4.4564 sec  
 PD 3.0000 sec  
 PW1 5.90 usec  
 IRNUC 1H  
 CTEMP 20.6 c  
 SLVNT CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 50



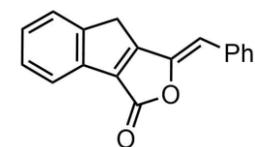
**3a**



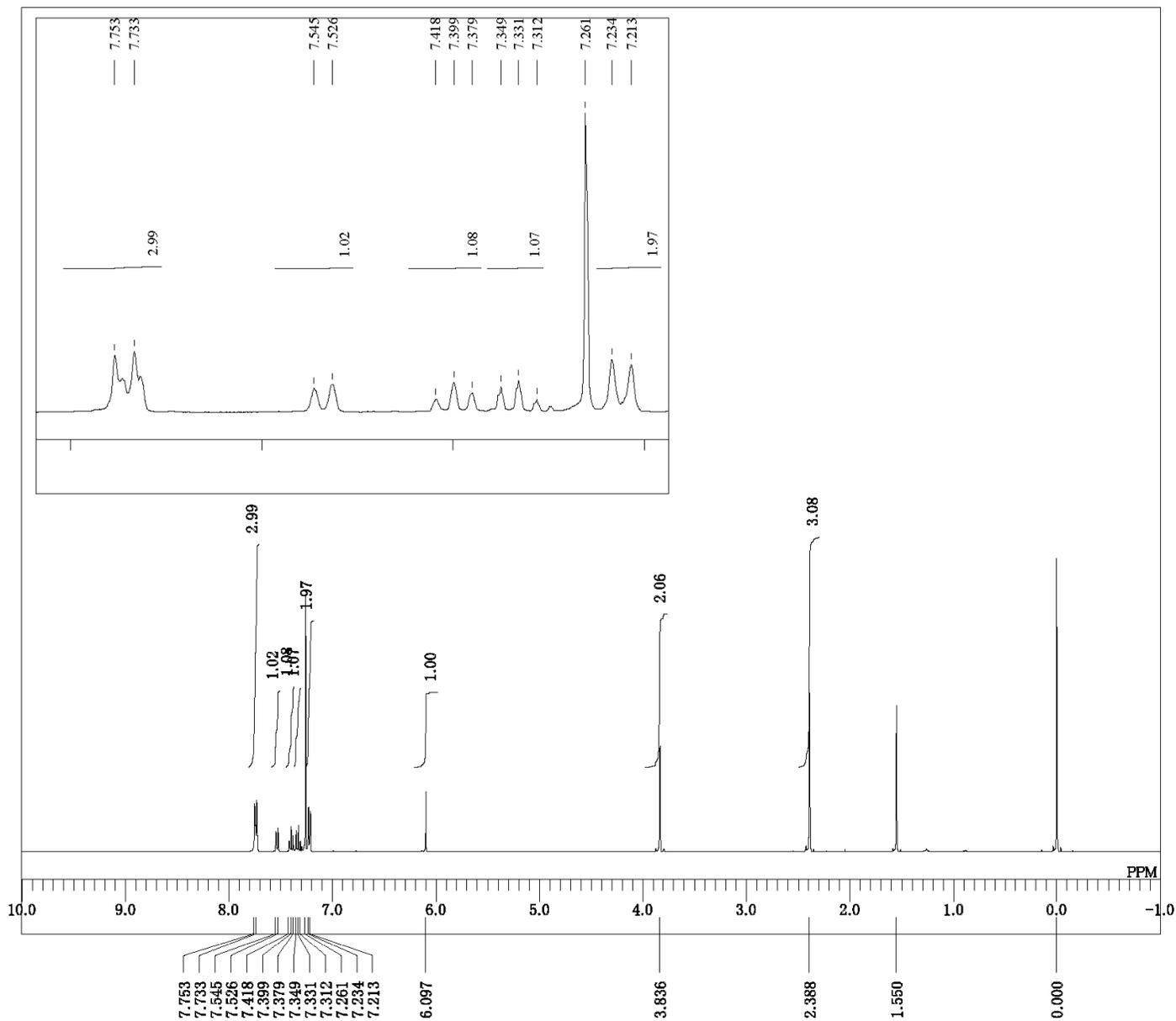
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DFILE 20181004 indeneprod5bcm-1.als
COMNT single pulse decoupled gated NOE
DATIM 2018-10-04 19:20:42
OBNUC 13C
EXMOD single_pulse_dec
OBFRQ 98.52 MHz
OBSET 4.64 KHz
OBFIN 8.74 Hz
POINT 26214
FREQU 24630.17 Hz
SCANS 512
ACQTM 1.0643 sec
PD 2.0000 sec
PW1 3.17 usec
IRNUC 1H
CTEMP 21.9 c
SLVNT CDCL3
EXREF 77.00 ppm
BF 0.12 Hz
RGAIN 34

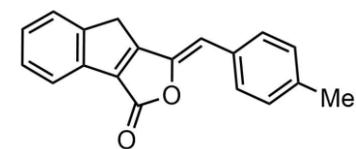
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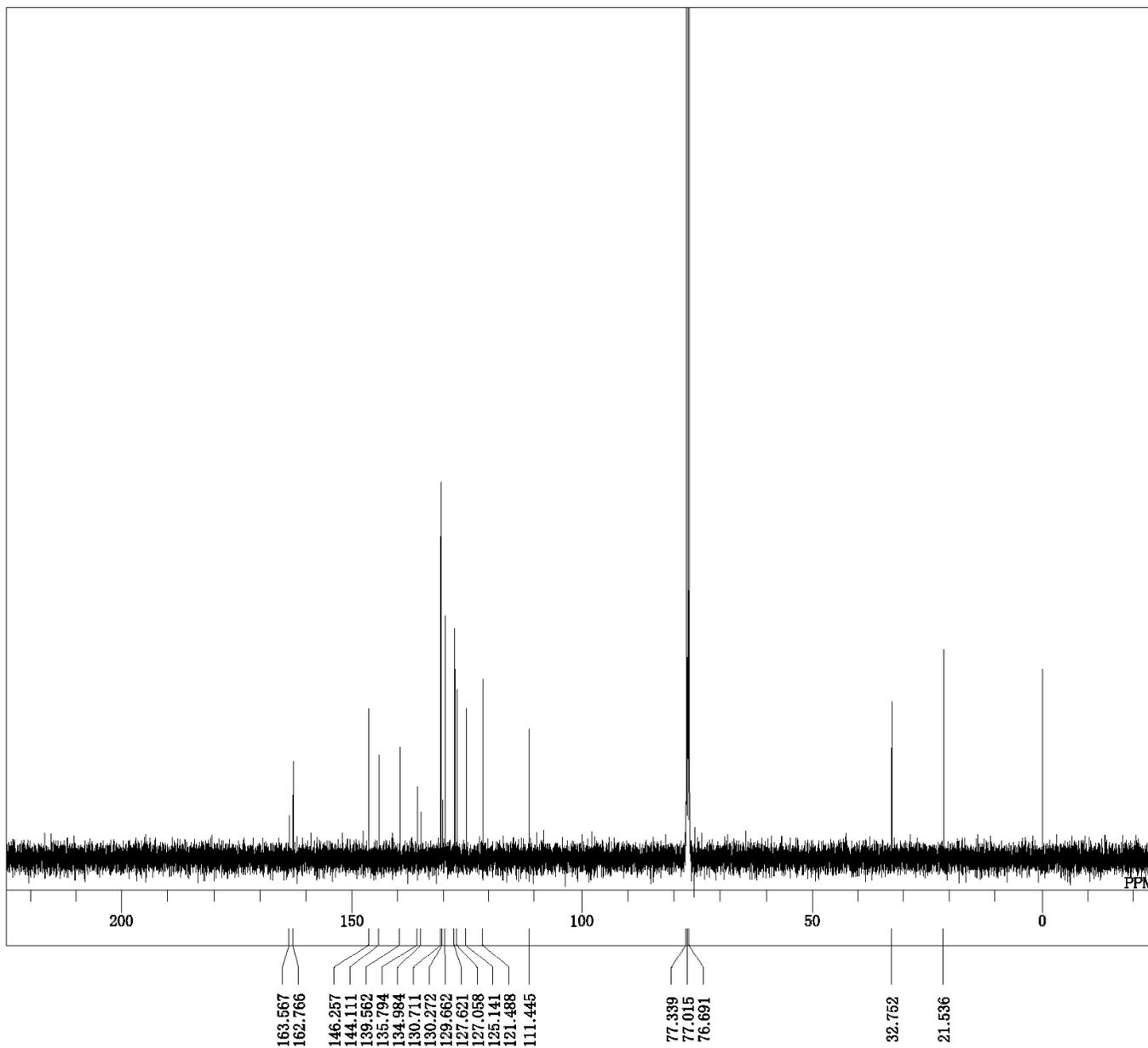
**3a**



DFILE 20200120 p-tol-indene-Prod-5\_Pr  
 COMNT single\_pulse  
 DATIM 2020-01-20 16:31:09  
 OBNUC 1H  
 EXMOD proton.jxp  
 OBFRQ 395.88 MHz  
 OBSET 6.28 KHz  
 OBFIN 0.87 Hz  
 POINT 13107  
 FREQU 5938.24 Hz  
 SCANS 33  
 ACQTM 2.2073 sec  
 PD 5.0000 sec  
 PW1 3.14 usec  
 IRNUC 1H  
 CTEMP 19.6 c  
 SLVNT CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 50



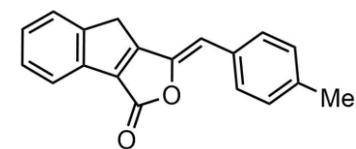
**3b**



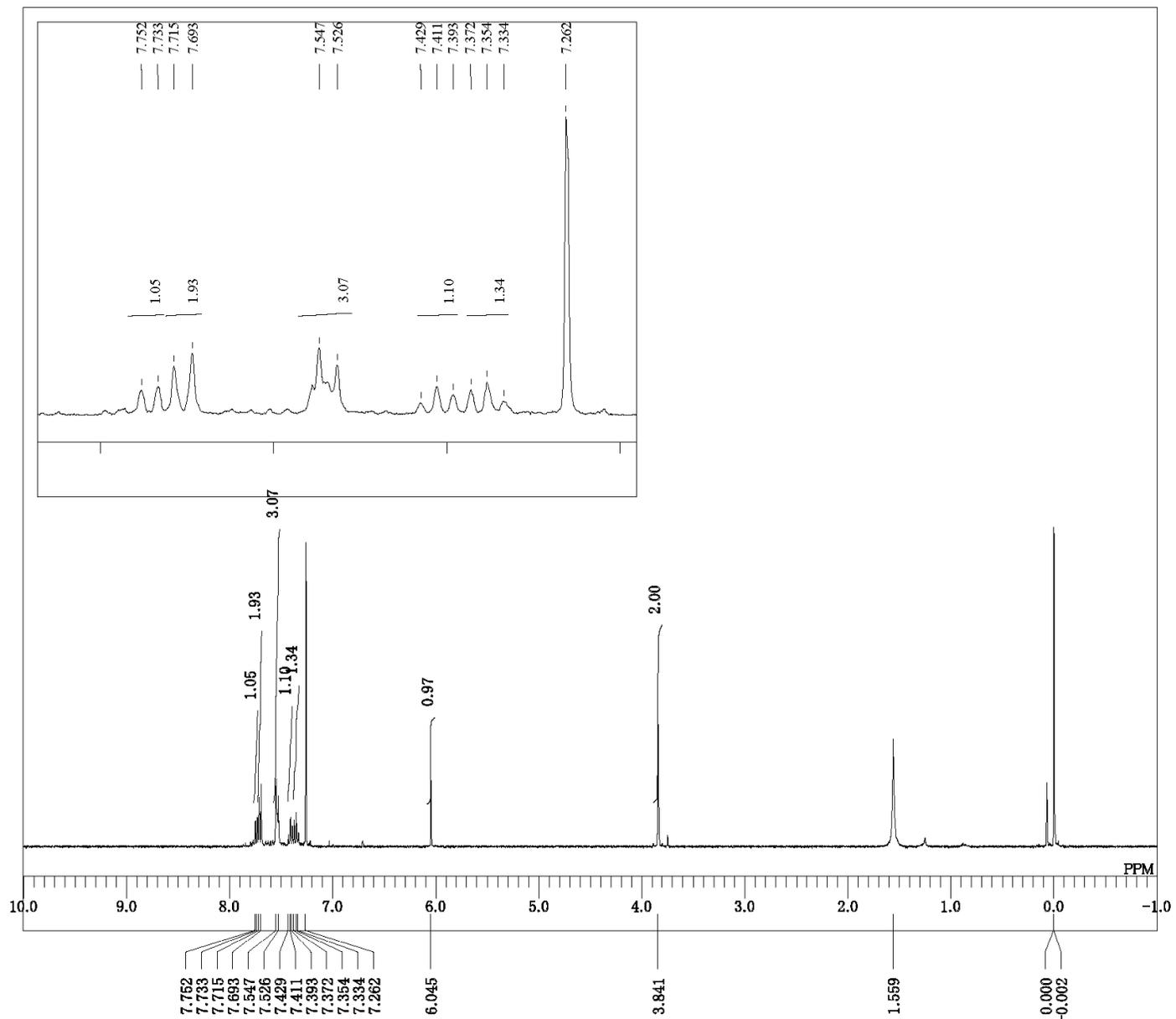
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DFILE 20200120 p-tol-Indene-prod5_bcm
COMNT single pulse decoupled gated NOE
DATIM 2020-01-21 08:26:46
OBNUC 13C
EXMOD single_pulse_dec
OBFRQ 98.52 MHz
OBSET 4.64 KHz
OBFIN 8.74 Hz
POINT 26214
FREQU 24630.17 Hz
SCANS 13312
ACQTM 1.0643 sec
PD 2.0000 sec
PW1 3.17 usec
IRNUC 1H
CTEMP 20.5 c
SLVNT CDCL3
EXREF 0.00 ppm
BF 0.12 Hz
RGAIN 44

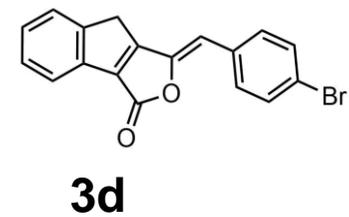
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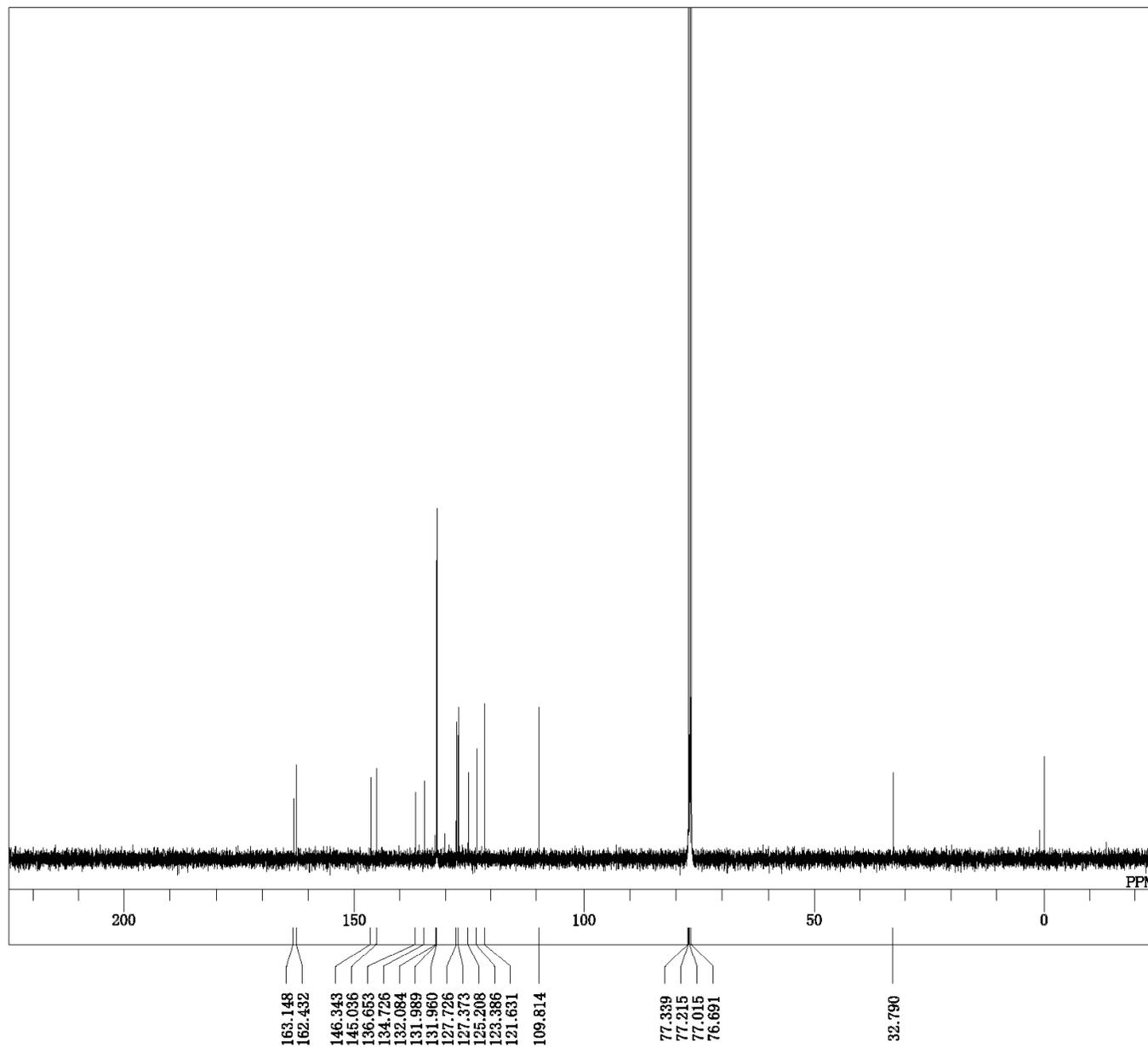


**3b**

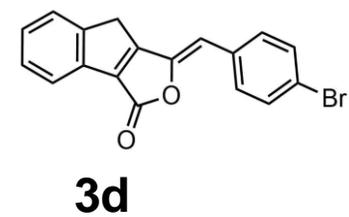


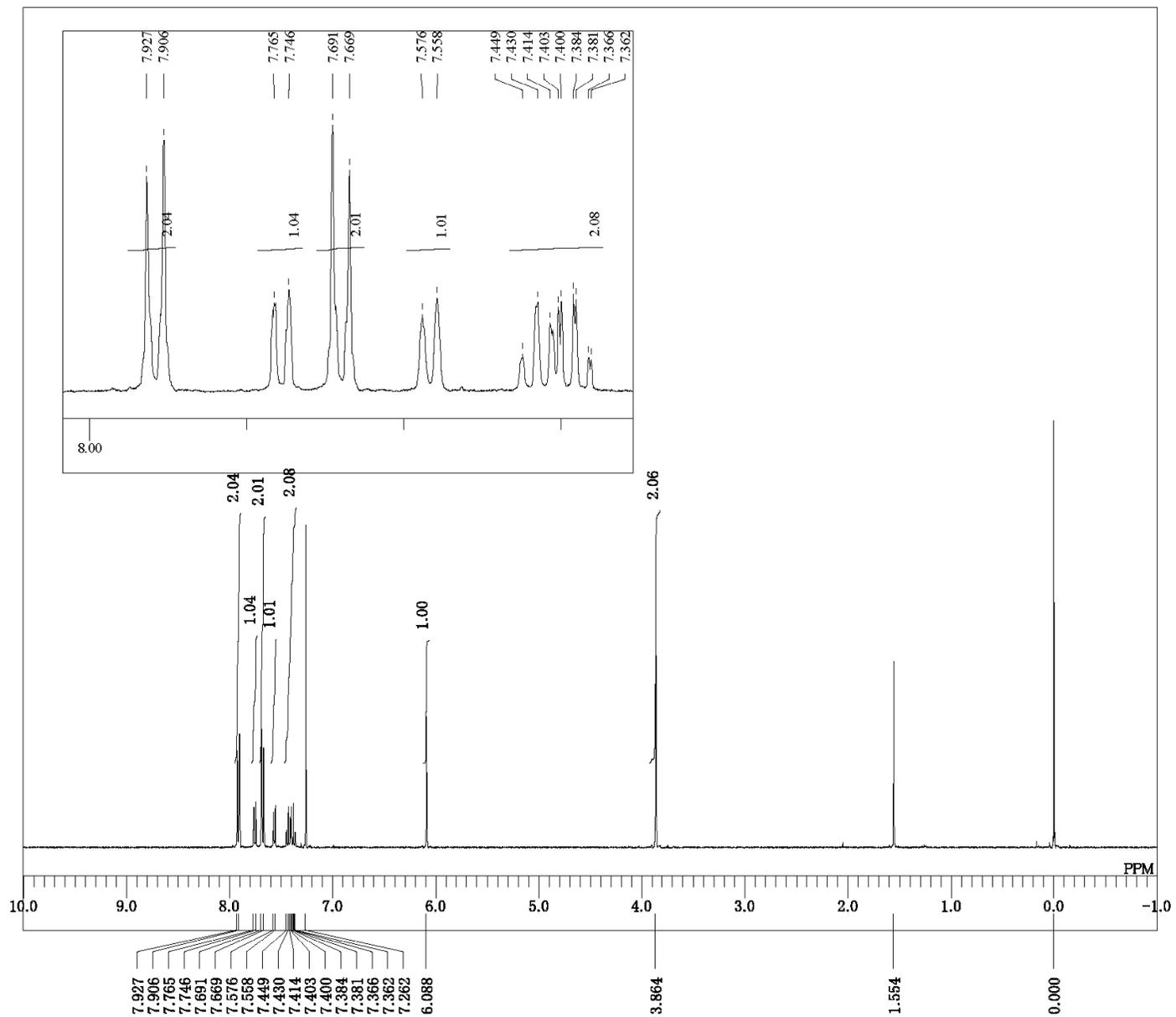
DFILE 20200124 p-Br-Indene-Prod5-rect  
 COMNT  
 DATIM Fri Jan 24 17:47:56 2020  
 OBNUC 1H  
 EXMOD NON  
 OBFRQ 399.65 MHz  
 OBSET 124.00 KHz  
 OBFIN 10500.00 Hz  
 POINT 16384  
 FREQU 7992.01 Hz  
 SCANS 8  
 ACQTM 2.0500 sec  
 PD 2.0000 sec  
 PW1 6.60 usec  
 IRNUC 1H  
 CTEMP 6348.8 c  
 SLVNT CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 25



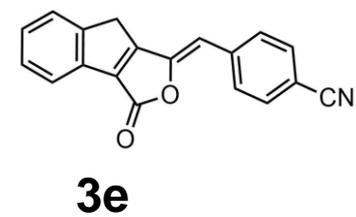


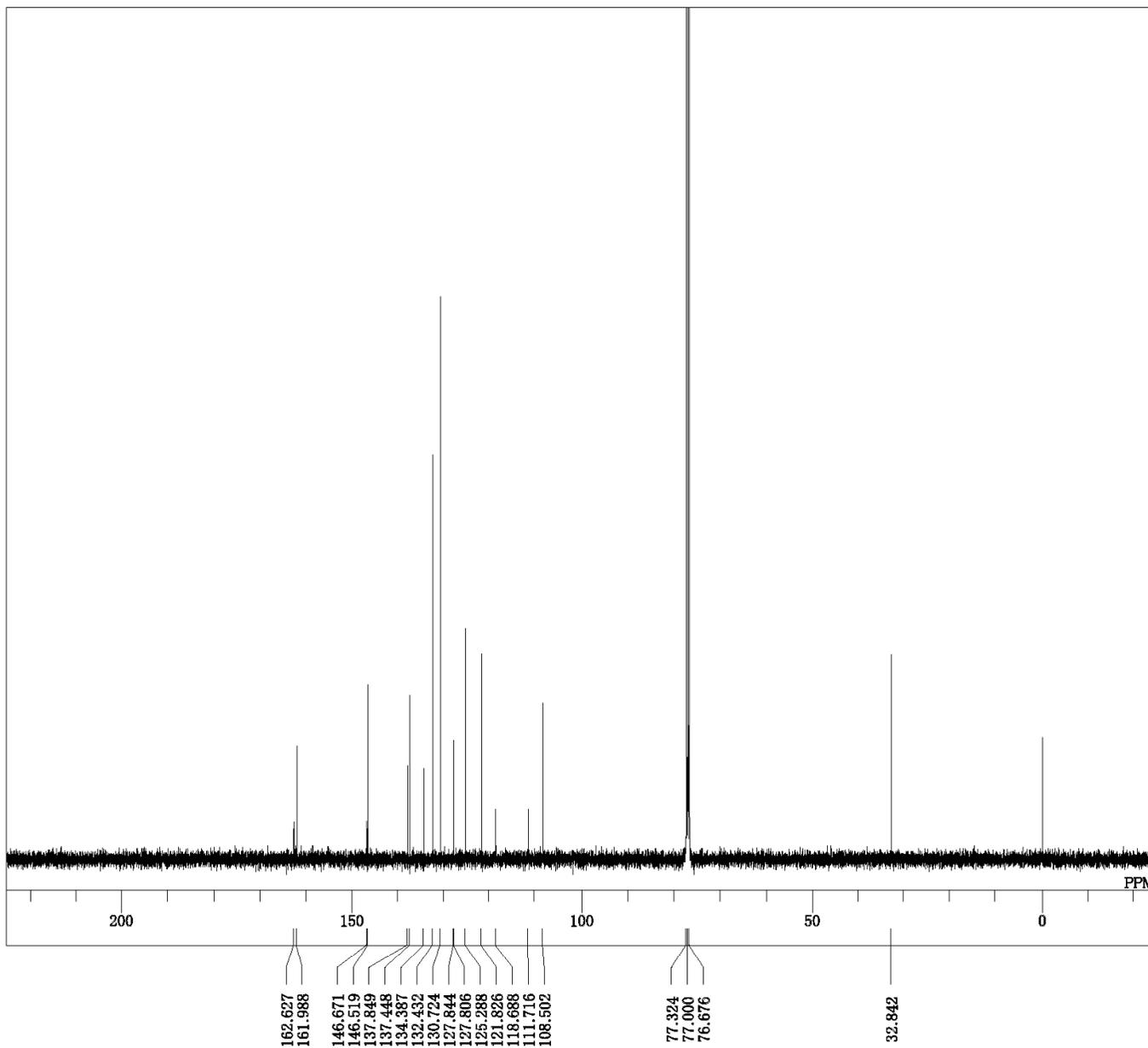
DFILE 20200125 p-Br-Indene-prod5\_bcm  
 COMNT single pulse decoupled gated NOE  
 DATIM 2020-01-26 08:18:35  
 OBNUC 13C  
 EXMOD single\_pulse\_dec  
 OBFRQ 98.52 MHz  
 OBSET 4.64 KHz  
 OBFIN 8.74 Hz  
 POINT 26214  
 FREQU 24630.17 Hz  
 SCANS 13312  
 ACQTM 1.0643 sec  
 PD 2.0000 sec  
 PW1 3.17 usec  
 IRNUC 1H  
 CTEMP 20.0 c  
 SLVNT CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 38





DFILE 20200225 p-CN-Indene-Prod5\_nor  
 COMNT single\_pulse  
 DATIM 2020-02-25 14:31:22  
 OBNUC 1H  
 EXMOD single\_pulse.ex2  
 OBFRQ 391.78 MHz  
 OBSET 8.51 KHz  
 OBFIN 3.34 Hz  
 POINT 26214  
 FREQU 5882.26 Hz  
 SCANS 8  
 ACQTM 4.4564 sec  
 PD 3.0000 sec  
 PW1 5.90 usec  
 IRNUC 1H  
 CTEMP 19.8 c  
 SLVNT CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 54

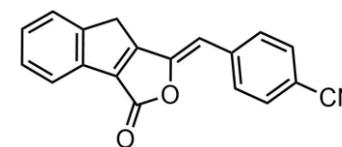




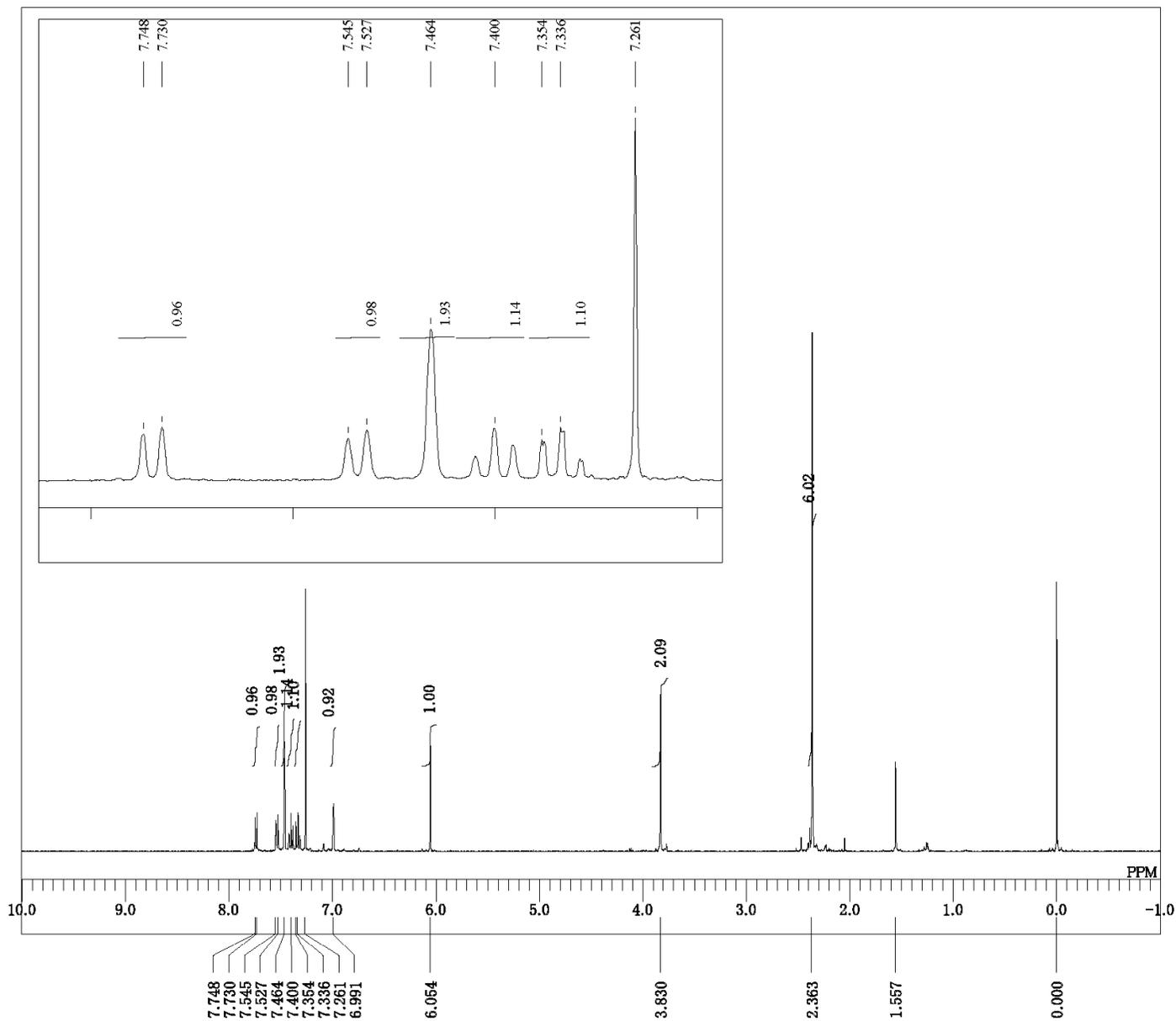
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DFILE 20200226 p-CN-Indene-Prod5_bcn
COMNT single pulse decoupled gated NOE
DATIM 2020-02-27 07:51:50
OBNUC 13C
EXMOD single_pulse_dec
OBFRQ 98.52 MHz
OBSET 4.64 KHz
OBFIN 8.74 Hz
POINT 26214
FREQU 24630.17 Hz
SCANS 12288
ACQTM 1.0643 sec
PD 2.0000 sec
PW1 3.17 usec
IRNUC 1H
CTEMP 20.7 c
SLVNT CDCL3
EXREF 77.00 ppm
BF 0.12 Hz
RGAIN 42

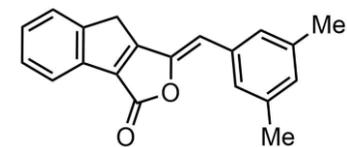
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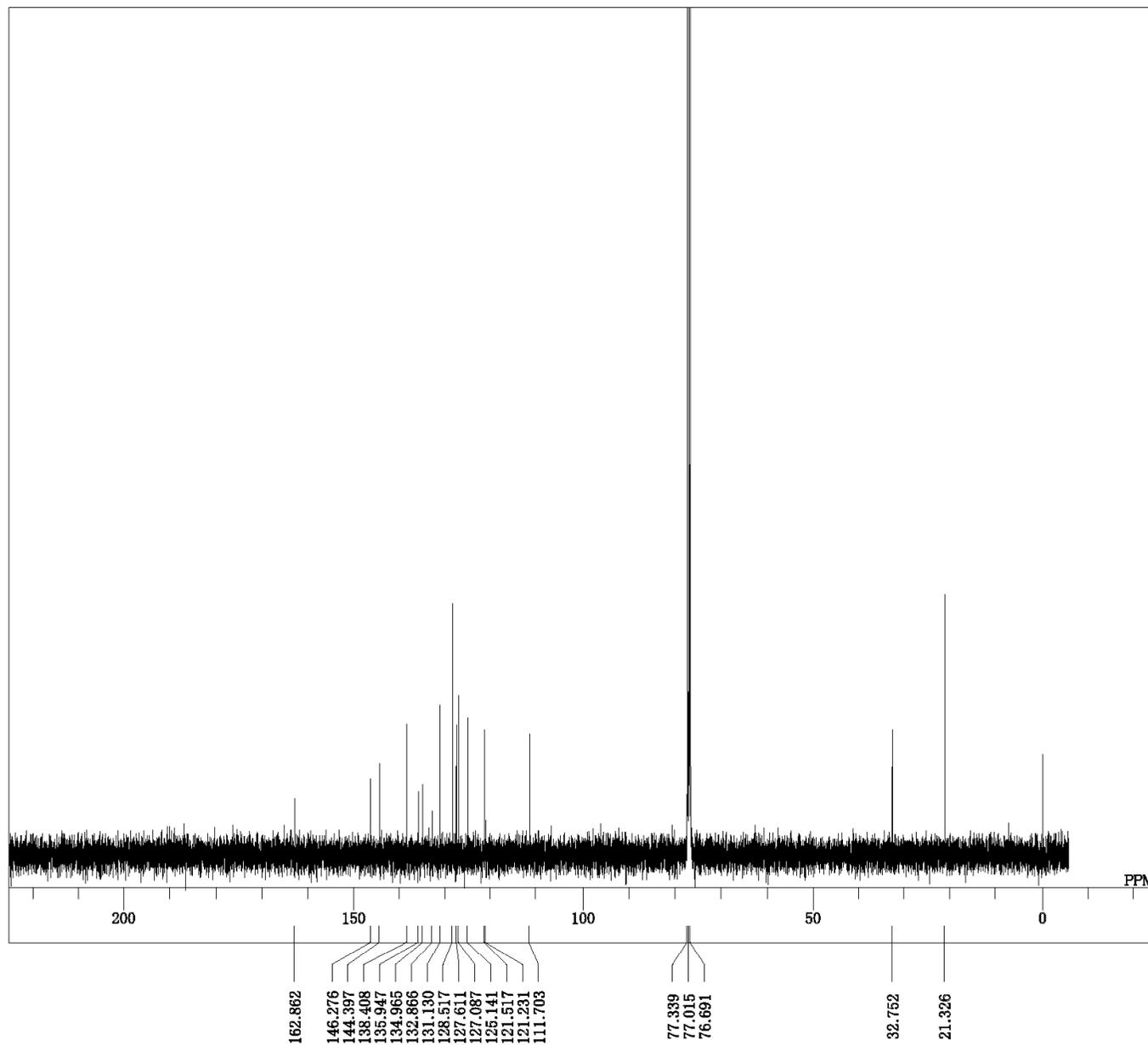
**3e**



DFILE 20200302 3,5-Me2-Indene-Prod5-  
 COMNT  
 DATIM Mon Mar 02 09:19:36 2020  
 OBNUC 1H  
 EXMOD NON  
 OBFRQ 399.65 MHz  
 OBSET 124.00 KHz  
 OBFIN 10500.00 Hz  
 POINT 16384  
 FREQU 7992.01 Hz  
 SCANS 8  
 ACQTM 2.0500 sec  
 PD 2.0000 sec  
 PW1 6.60 usec  
 IRNUC 1H  
 CTEMP 6348.8 c  
 SLVNT CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 25

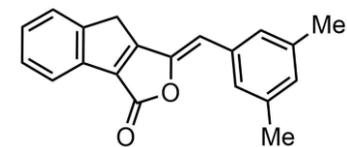


**3h**

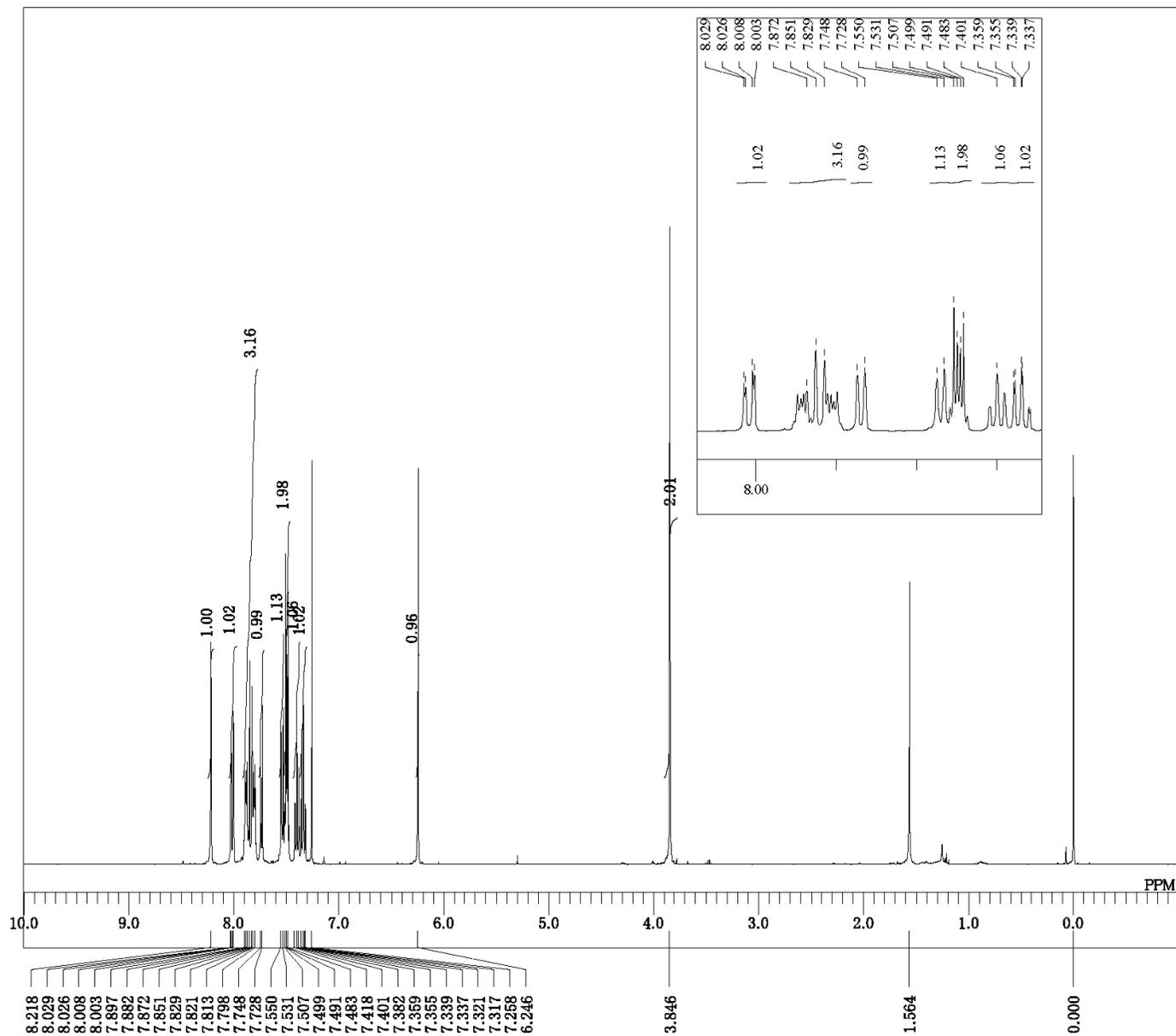


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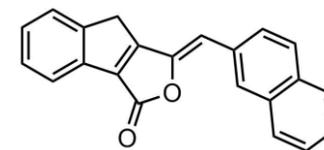
DFILE      20200126 3,5-Me2-Indene-prod5_1
COMNT      single pulse decoupled gated NOE
DATIM      2020-01-26 14:06:06
OBNUC      13C
EXMOD      single_pulse_dec
OBFRQ      98.52 MHz
OBSET      4.64 KHz
OBFIN      8.74 Hz
POINT      26214
FREQU      24630.17 Hz
SCANS      6593
ACQTM      1.0643 sec
PD         2.0000 sec
PW1        3.17 usec
IRNUC      1H
CTEMP      20.2 c
SLVNT      CDCL3
EXREF      0.00 ppm
BF         0.12 Hz
RGAIN      36
  
```



**3h**

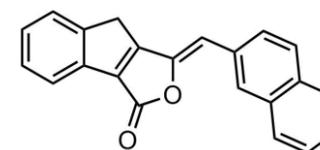
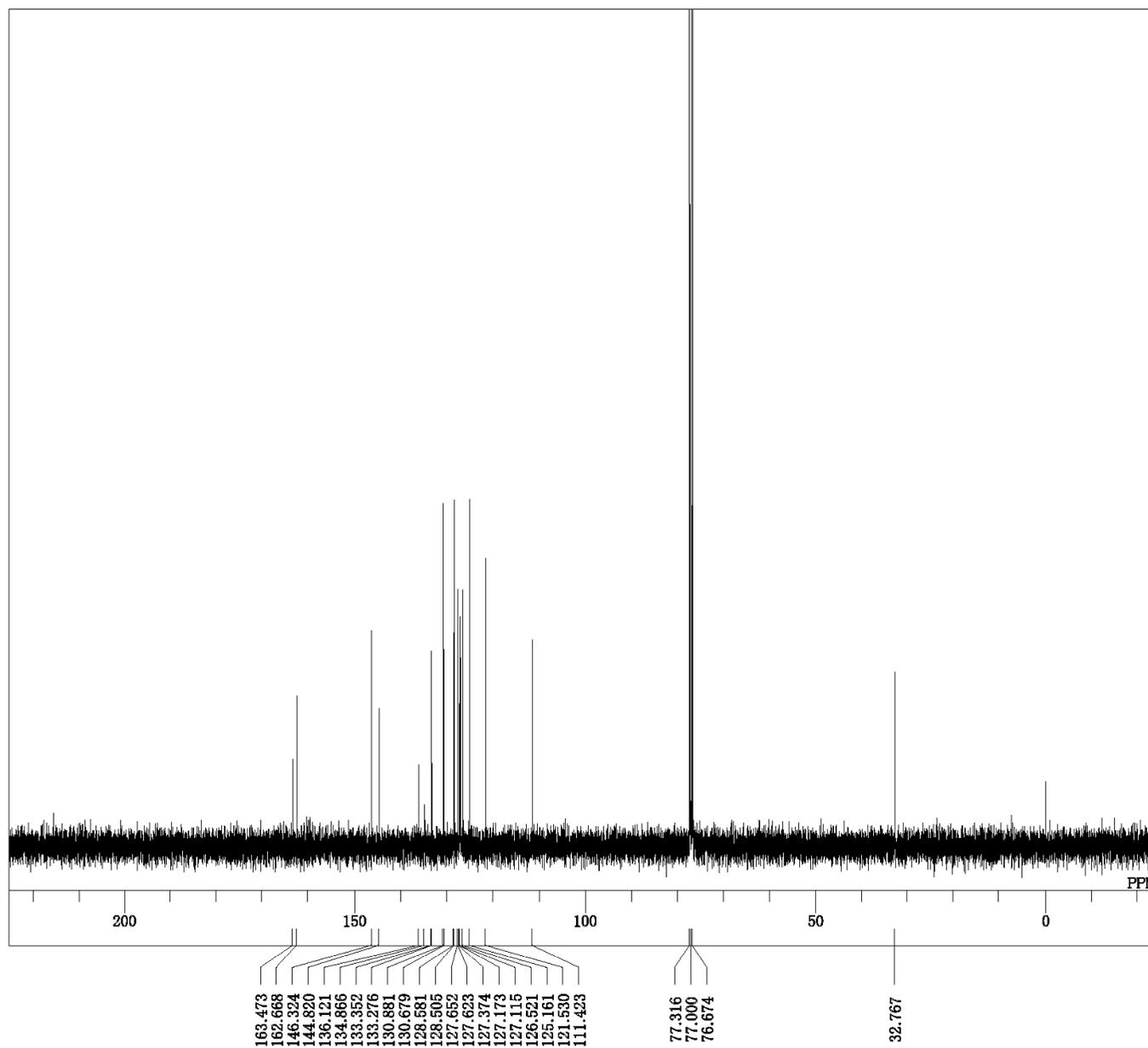


DFILE 20200323 2-Naph-Prod5\_Proton-1  
 COMNT single\_pulse  
 DATIM 2020-03-23 20:05:28  
 OBNUC 1H  
 EXMOD proton.jxp  
 OBFRQ 395.88 MHz  
 OBSET 6.28 KHz  
 OBFIN 0.87 Hz  
 POINT 13107  
 FREQU 5938.24 Hz  
 SCANS 8  
 ACQTM 2.2073 sec  
 PD 5.0000 sec  
 PW1 3.14 usec  
 IRNUC 1H  
 CTEMP 19.4 c  
 CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 42

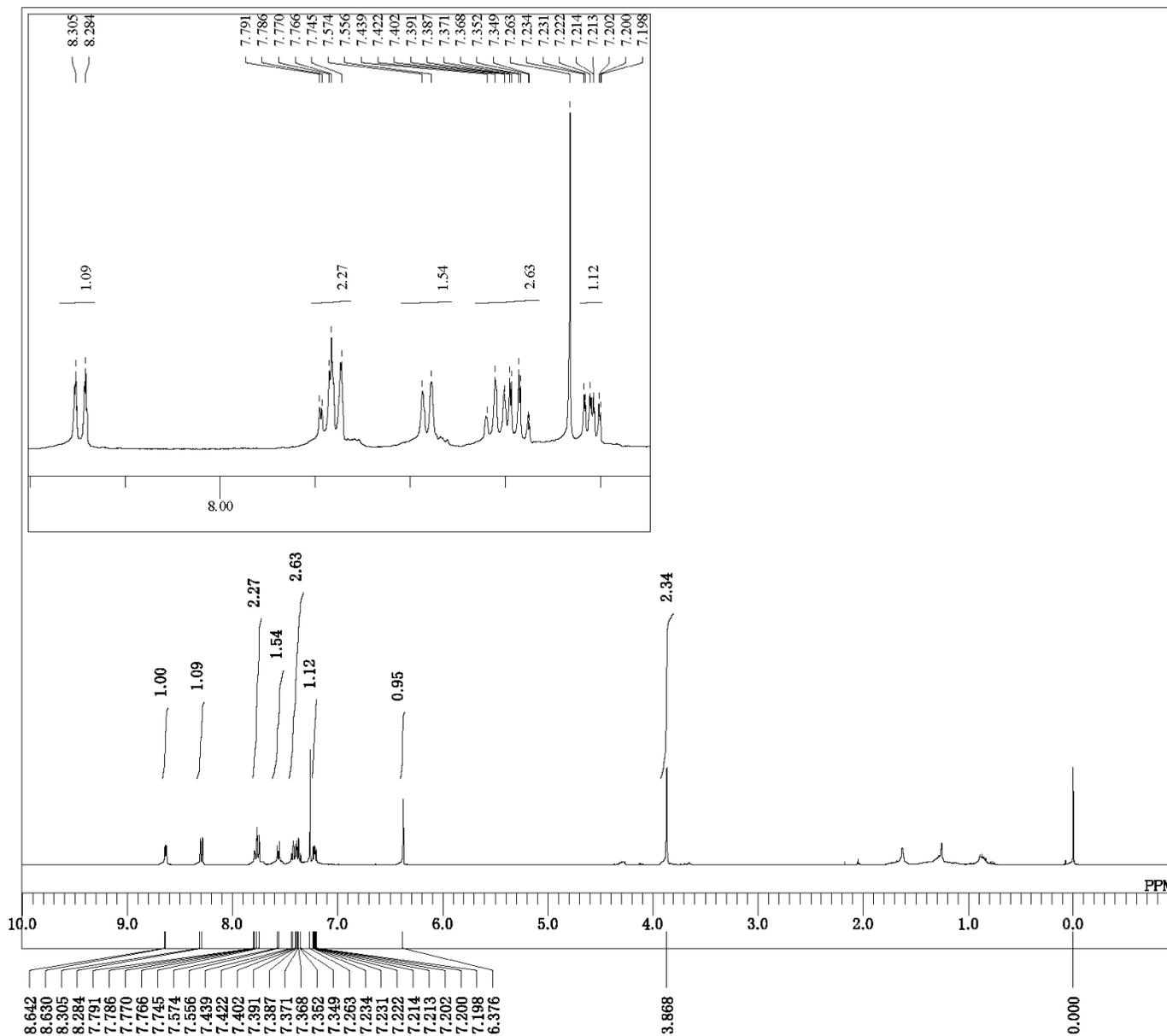


**3i**

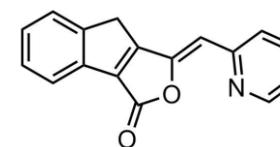
DFILE 20200323 2-Naph-Prod5\_Carbon-1  
COMNT single pulse decoupled gated NOE  
DATIM 2020-03-23 20:08:14  
OBNUC 13C  
EXMOD carbon\_jxp  
OBFRQ 99.55 MHz  
OBSET 5.13 KHz  
OBFIN 0.98 Hz  
POINT 26214  
FREQU 25000.00 Hz  
SCANS 1024  
ACQTM 1.0486 sec  
PD 2.0000 sec  
PW1 3.59 usec  
IRNUC 1H  
CTEMP 19.5 c  
SLVNT CDCL3  
EXREF 77.00 ppm  
BF 0.12 Hz  
RGAIN 50



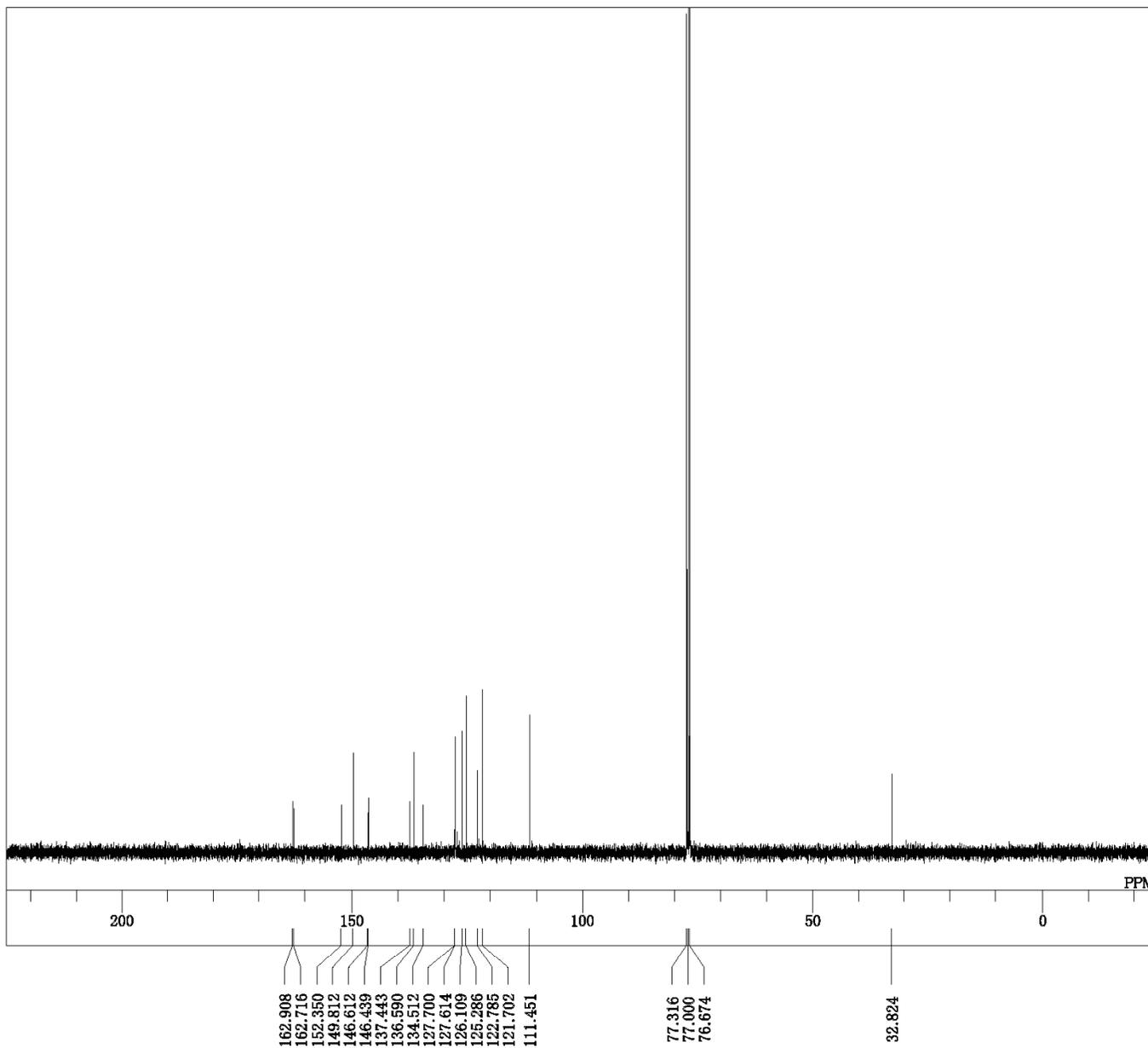
**3i**



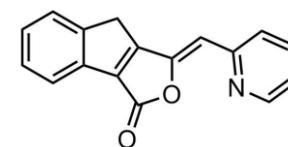
DFILE 20200313 2-py-Prod5\_non-1.als  
 COMNT single\_pulse  
 DATIM 2020-03-13 16:44:19  
 OBNUC 1H  
 EXMOD single\_pulse.ex2  
 OBFRQ 391.78 MHz  
 OBSET 8.51 KHz  
 OBFIN 3.34 Hz  
 POINT 26214  
 FREQU 5882.26 Hz  
 SCANS 256  
 ACQTM 4.4564 sec  
 PD 3.0000 sec  
 PW1 5.90 usec  
 IRNUC 1H  
 CTEMP 19.6 c  
 SLVNT CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 50



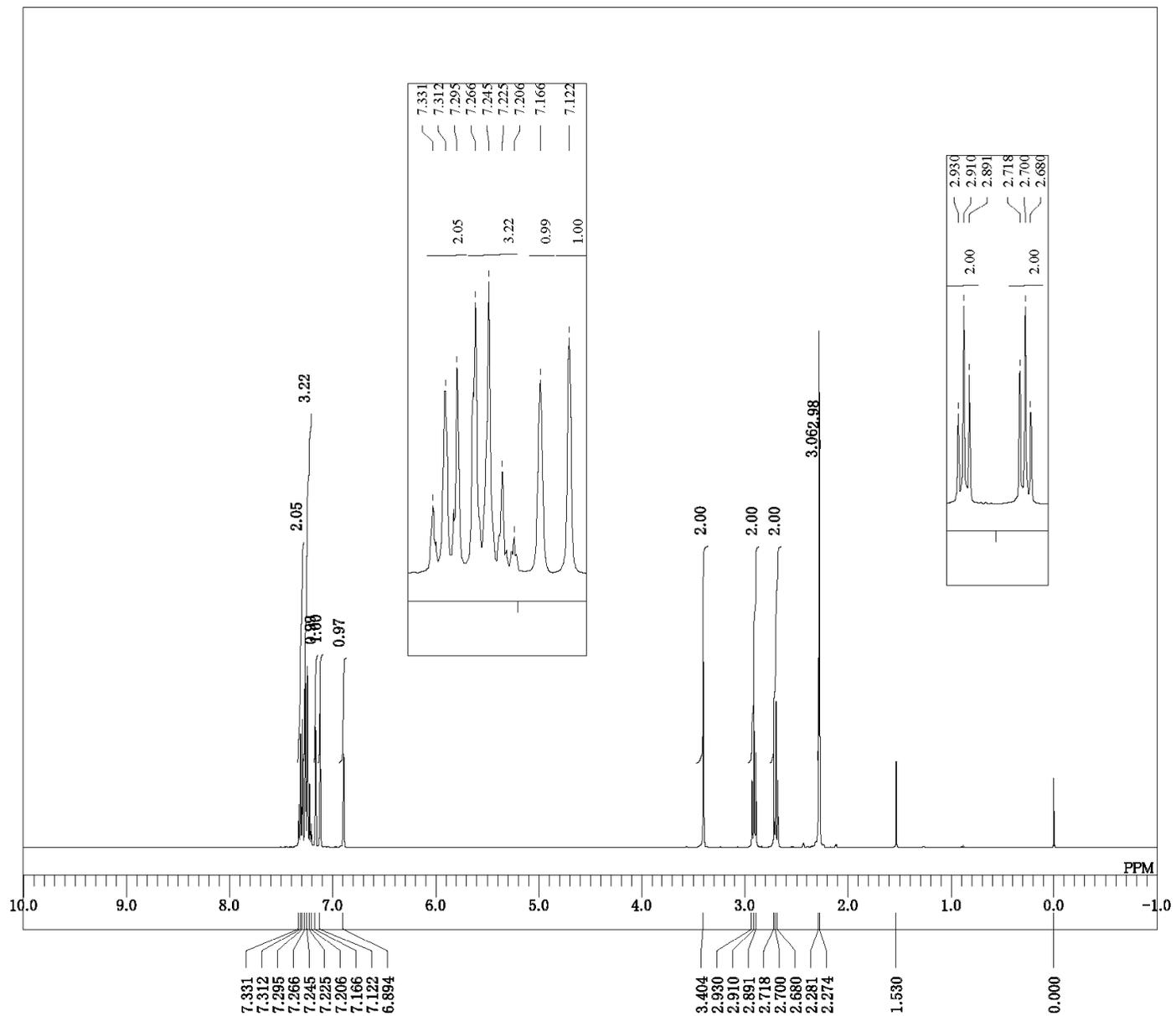
**3j**



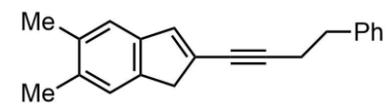
DFILE 20200306 2py-prod5\_Carbon-1-1.t  
 COMNT single pulse decoupled gated NOE  
 DATIM 2020-03-06 16:45:59  
 OBNUC 13C  
 EXMOD carbon.jxp  
 OBFRQ 99.55 MHz  
 OBSET 5.13 KHz  
 OBFIN 0.98 Hz  
 POINT 26214  
 FREQU 25000.00 Hz  
 SCANS 1024  
 ACQTM 1.0486 sec  
 PD 2.0000 sec  
 PW1 3.59 usec  
 IRNUC 1H  
 CTEMP 19.4 c  
 SLVNT CDCL3  
 EXREF 77.00 ppm  
 BF 0.12 Hz  
 RGAIN 50



**3j**

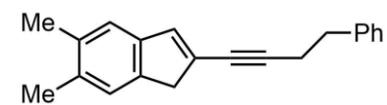
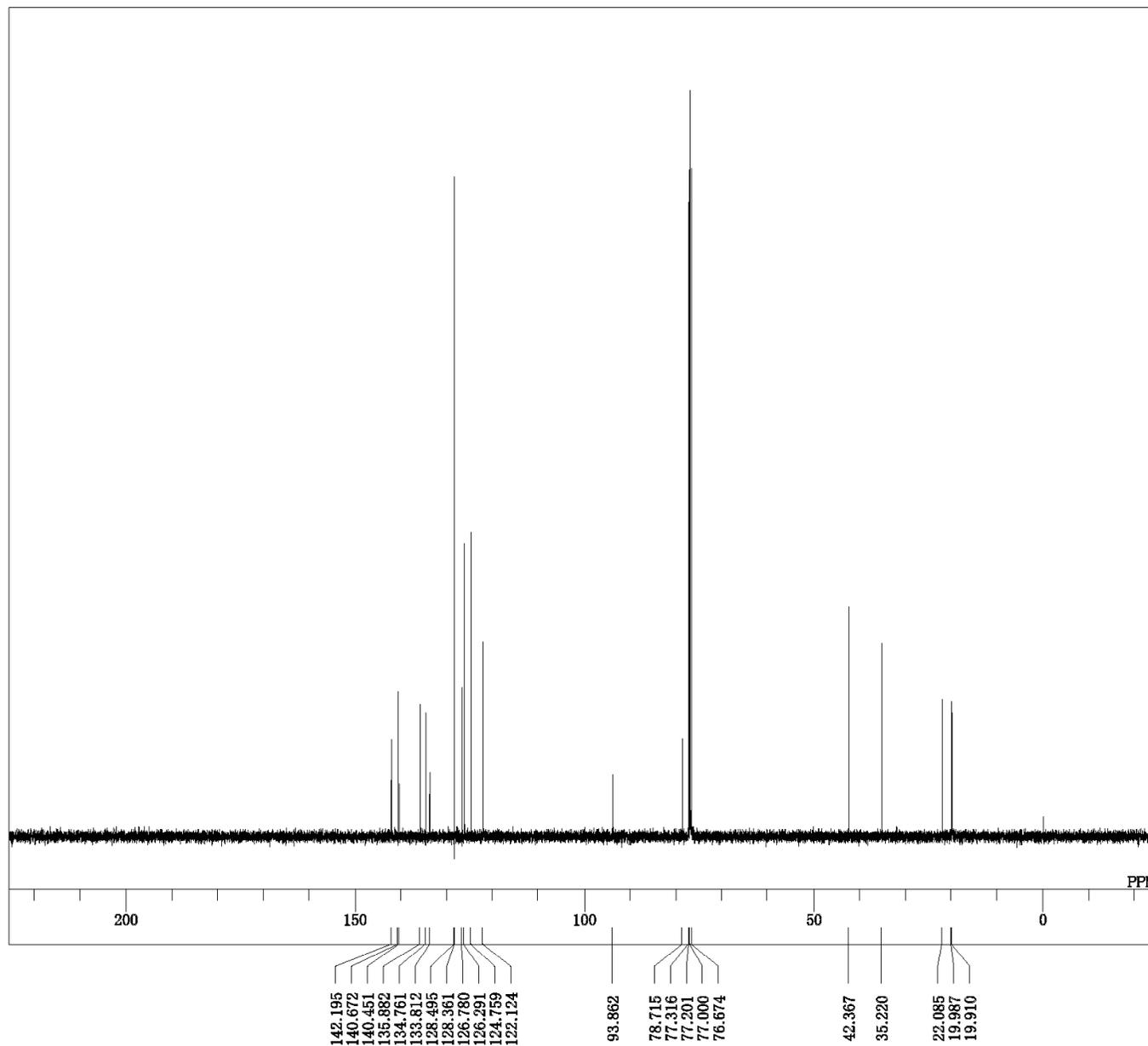


DFILE 20200203 5,6-dimethyl phenethyl i  
 COMNT single\_pulse  
 DATIM 2020-02-03 09:57:17  
 OBNUC 1H  
 EXMOD proton.jxp  
 OBFREQ 395.88 MHz  
 OBSETE 6.28 KHz  
 OBFIN 0.87 Hz  
 POINT 13107  
 FREQU 5938.24 Hz  
 SCANS 8  
 ACQTM 2.2073 sec  
 PD 5.0000 sec  
 PW1 3.14 usec  
 IRNUC 1H  
 CTEMP 20.7 c  
 CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 34

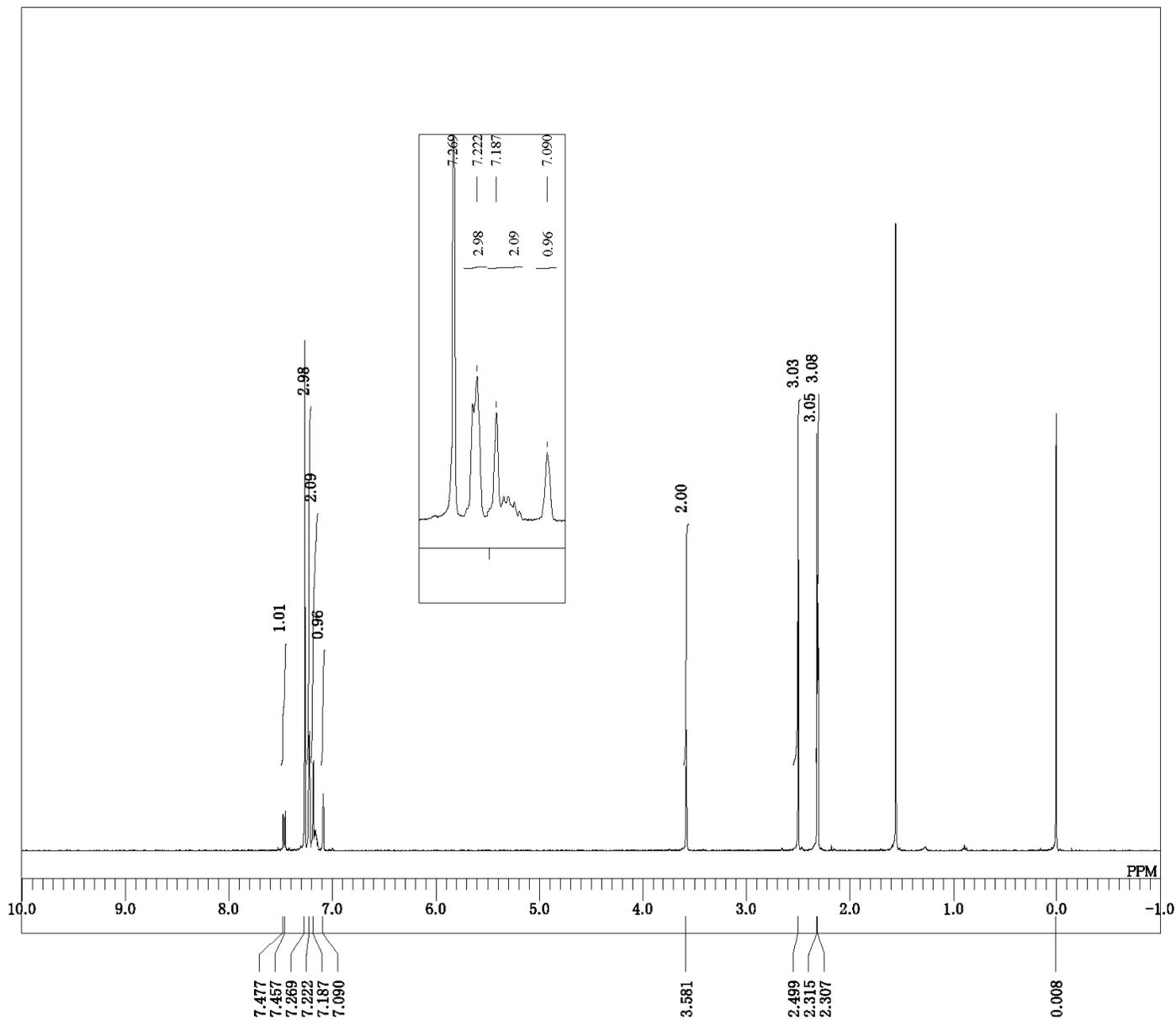


**4a**

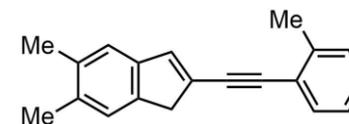
DFILE 20200203 5,6-dimethyl phenethyl i  
 COMNT single pulse decoupled gated NOE  
 DATIM 2020-02-03 09:58:30  
 OBNUC 13C  
 EXMOD carbon\_jxp  
 OBFRQ 99.55 MHz  
 OBSET 5.13 KHz  
 OBFIN 0.98 Hz  
 POINT 26214  
 FREQU 25000.00 Hz  
 SCANS 1024  
 ACQTM 1.0486 sec  
 PD 2.0000 sec  
 PW1 3.59 usec  
 IRNUC 1H  
 CTEMP 19.9 c  
 SLVNT CDCL3  
 EXREF 77.00 ppm  
 BF 0.12 Hz  
 RGAIN 50



**4a**

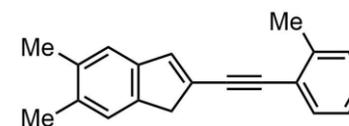
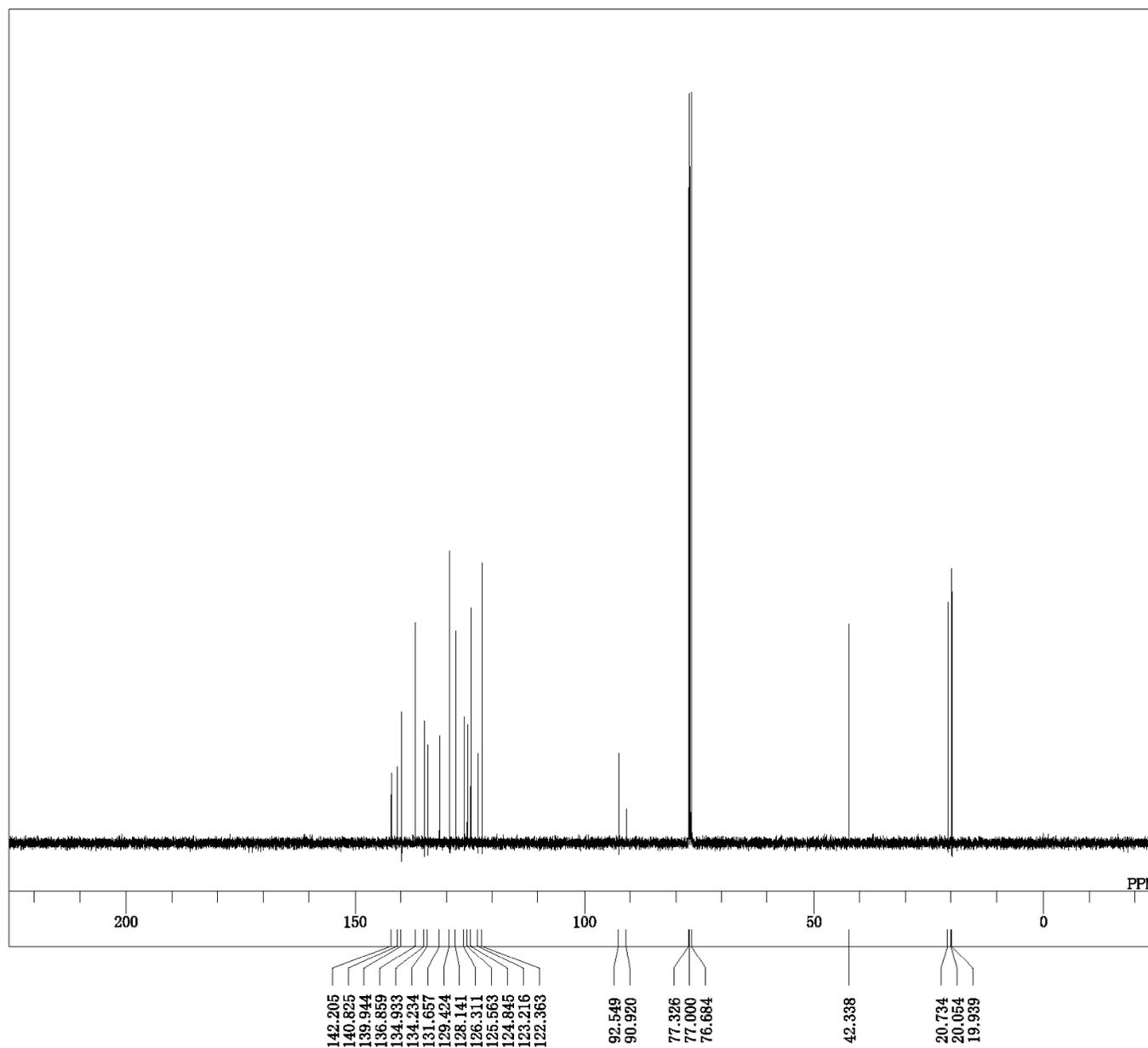


DFILE 20200201 o-tol-Me2-Indene\_Proto  
 COMNT single\_pulse  
 DATIM 2020-01-28 16:30:56  
 OBNUC 1H  
 EXMOD proton.jxp  
 OBFRQ 395.88 MHz  
 OBSET 6.28 KHz  
 OBFIN 0.87 Hz  
 POINT 13107  
 FREQU 5938.24 Hz  
 SCANS 8  
 ACQTM 2.2073 sec  
 PD 5.0000 sec  
 PW1 3.14 usec  
 IRNUC 1H  
 CTEMP 21.0 c  
 SLVNT CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 48

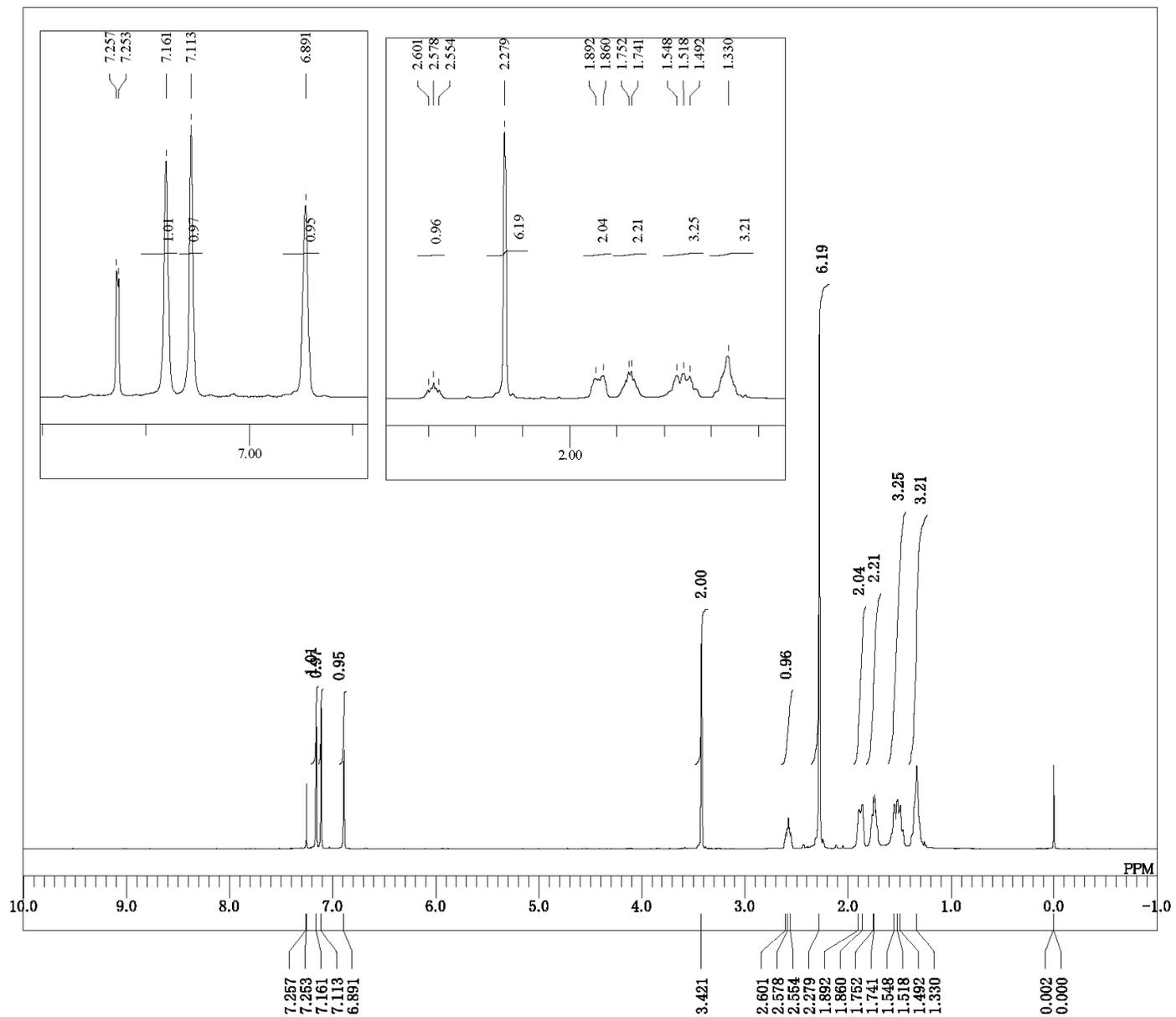


**4b**

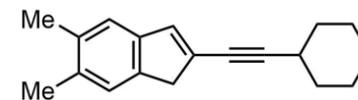
DFILE 20200201 o-tol-Me2-Indene\_Carb  
COMNT single pulse decoupled gated NOE  
DATIM 2020-02-01 15:13:42  
OBNUC 13C  
EXMOD carbon\_jxp  
OBFRQ 99.55 MHz  
OBSET 5.13 KHz  
OBFIN 0.98 Hz  
POINT 26214  
FREQU 25000.00 Hz  
SCANS 1024  
ACQTM 1.0486 sec  
PD 2.0000 sec  
PW1 3.59 usec  
IRNUC 1H  
CTEMP 20.3 c  
SLVNT CDCL3  
EXREF 77.00 ppm  
BF 0.12 Hz  
RGAIN 50



**4b**

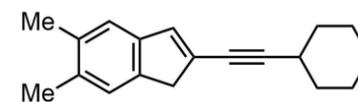
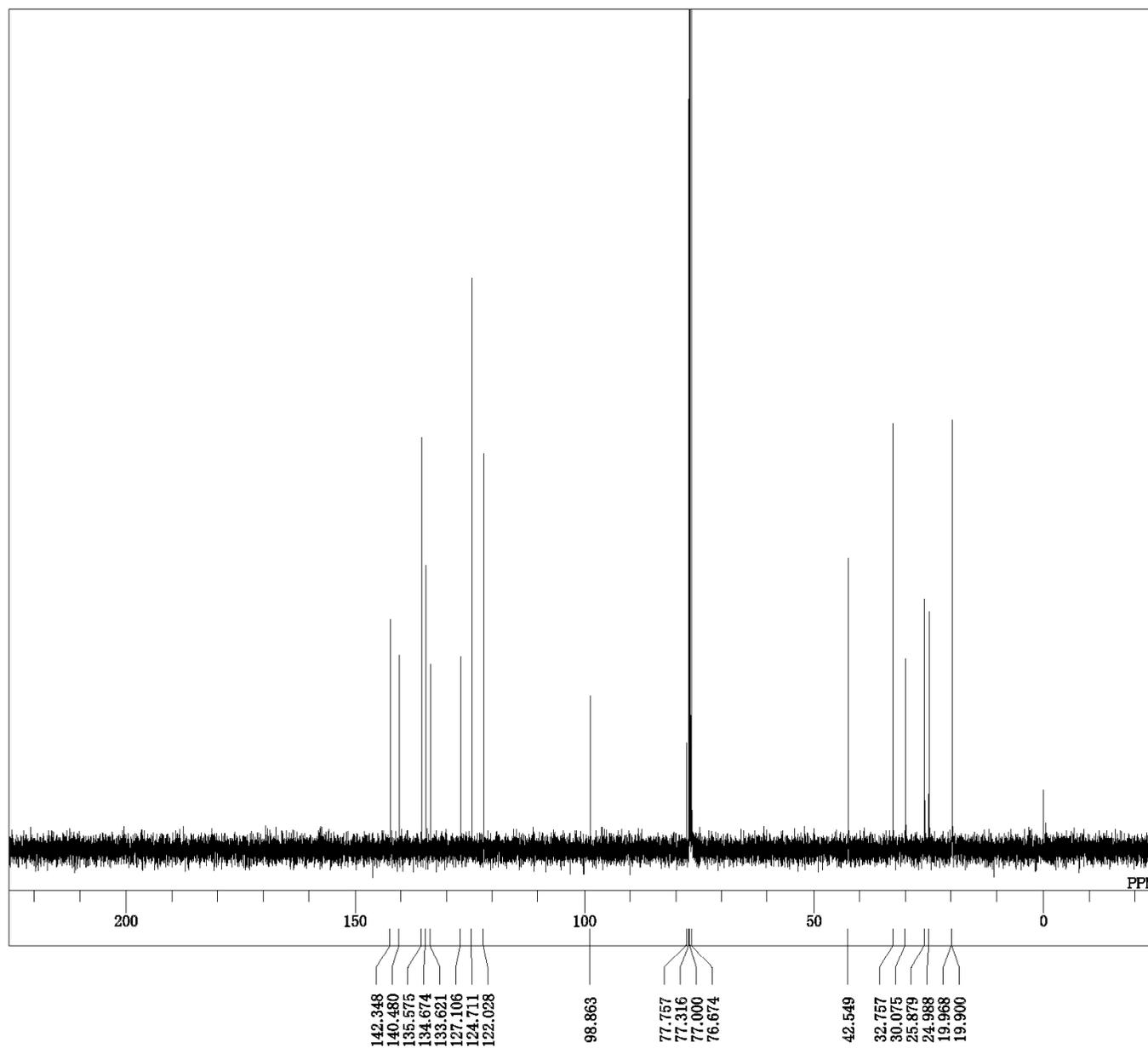


DFILE 20191218 Cy-Me2-Indene\_Proton-  
 COMNT single\_pulse  
 DATIM 2019-12-18 16:01:53  
 OBNUC 1H  
 EXMOD proton.jxp  
 OBFRQ 395.88 MHz  
 OBSET 6.28 KHz  
 OBFIN 0.87 Hz  
 POINT 13107  
 FREQU 5938.24 Hz  
 SCANS 8  
 ACQTM 2.2073 sec  
 PD 5.0000 sec  
 PW1 3.14 usec  
 IRNUC 1H  
 CTEMP 20.5 c  
 SLVNT CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 34

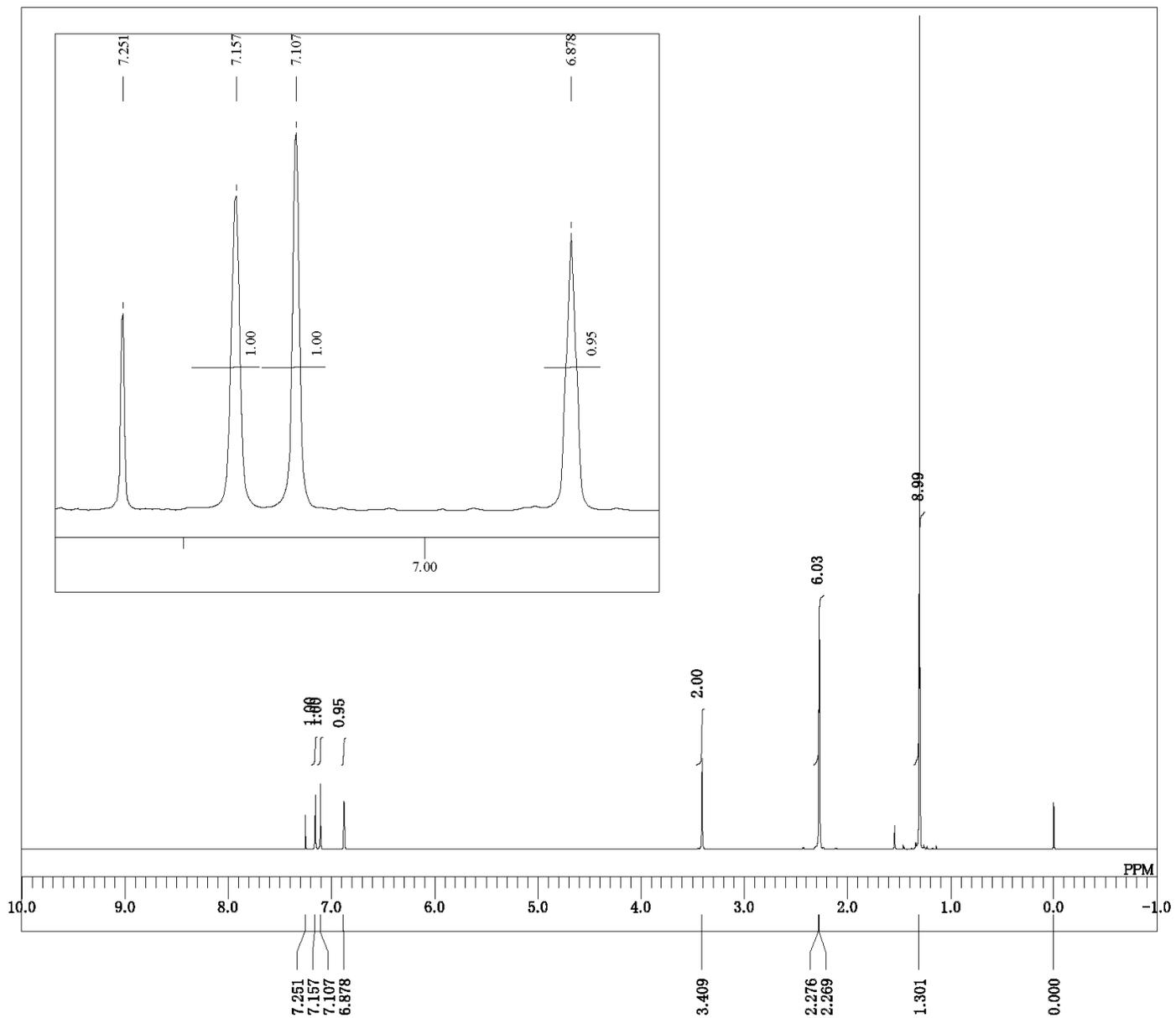


**4c**

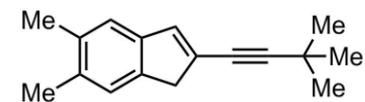
DFILE 20191218 Cy-Me2-Indene\_Carbon  
COMNT single pulse decoupled gated NOE  
DATIM 2019-12-18 16:04:41  
OBNUC 13C  
EXMOD carbon\_jxp  
OBFRQ 99.55 MHz  
OBSET 5.13 KHz  
OBFIN 0.98 Hz  
POINT 26214  
FREQU 25000.00 Hz  
SCANS 1024  
ACQTM 1.0486 sec  
PD 2.0000 sec  
PW1 3.59 usec  
IRNUC 1H  
CTEMP 20.1 c  
SLVNT CDCL3  
EXREF 77.00 ppm  
BF 0.12 Hz  
RGAIN 50



**4c**

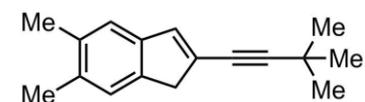
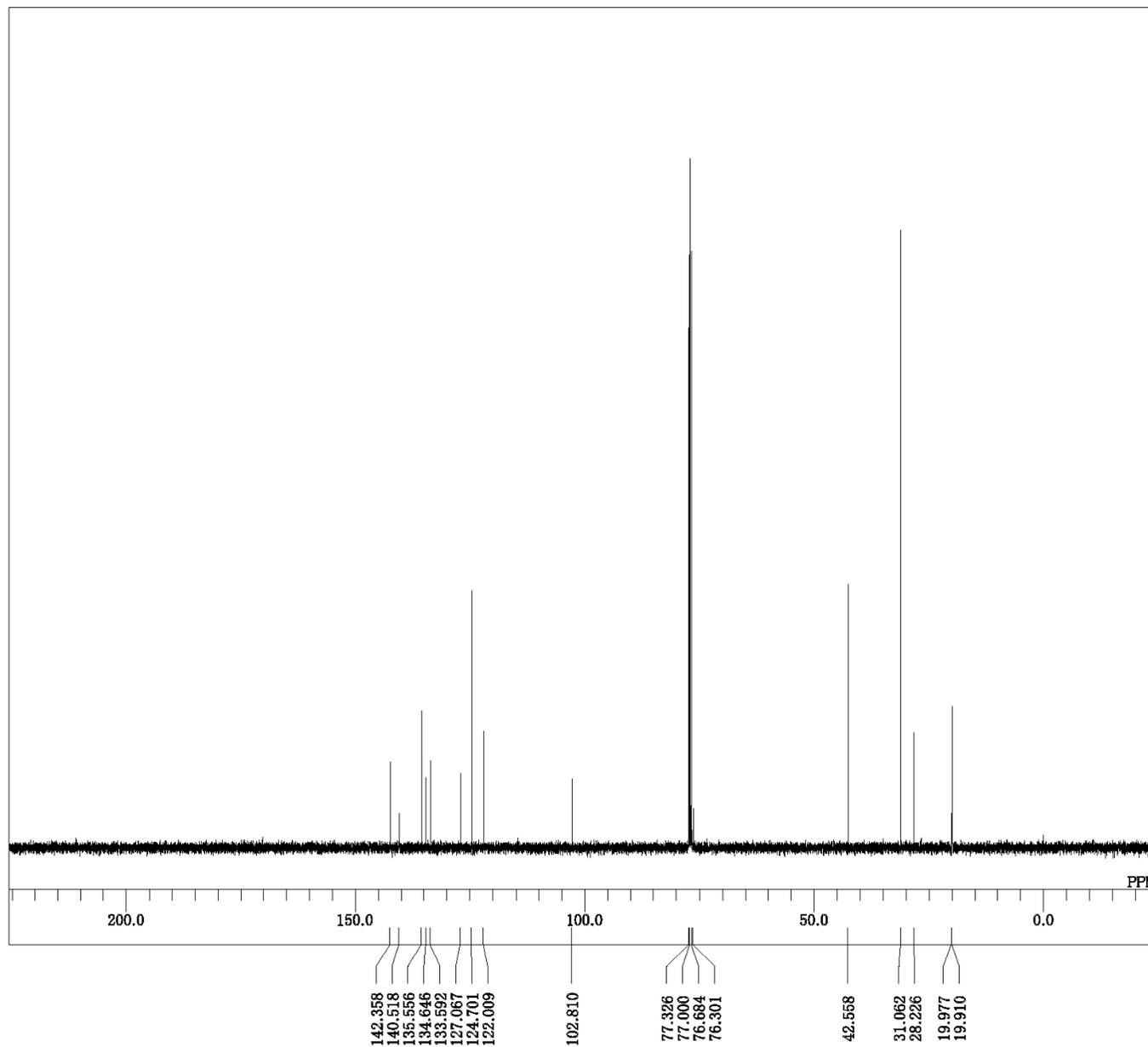


DFILE 20191219 tBu-Me2-Indene\_Proton  
 COMNT single\_pulse  
 DATIM 2019-12-19 09:17:54  
 OBNUC 1H  
 EXMOD proton.jxp  
 OBFRQ 395.88 MHz  
 OBSET 6.28 KHz  
 OBFIN 0.87 Hz  
 POINT 13107  
 FREQU 5938.24 Hz  
 SCANS 8  
 ACQTM 2.2073 sec  
 PD 5.0000 sec  
 PW1 3.14 usec  
 IRNUC 1H  
 CTEMP 19.1 c  
 SLVNT CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 34

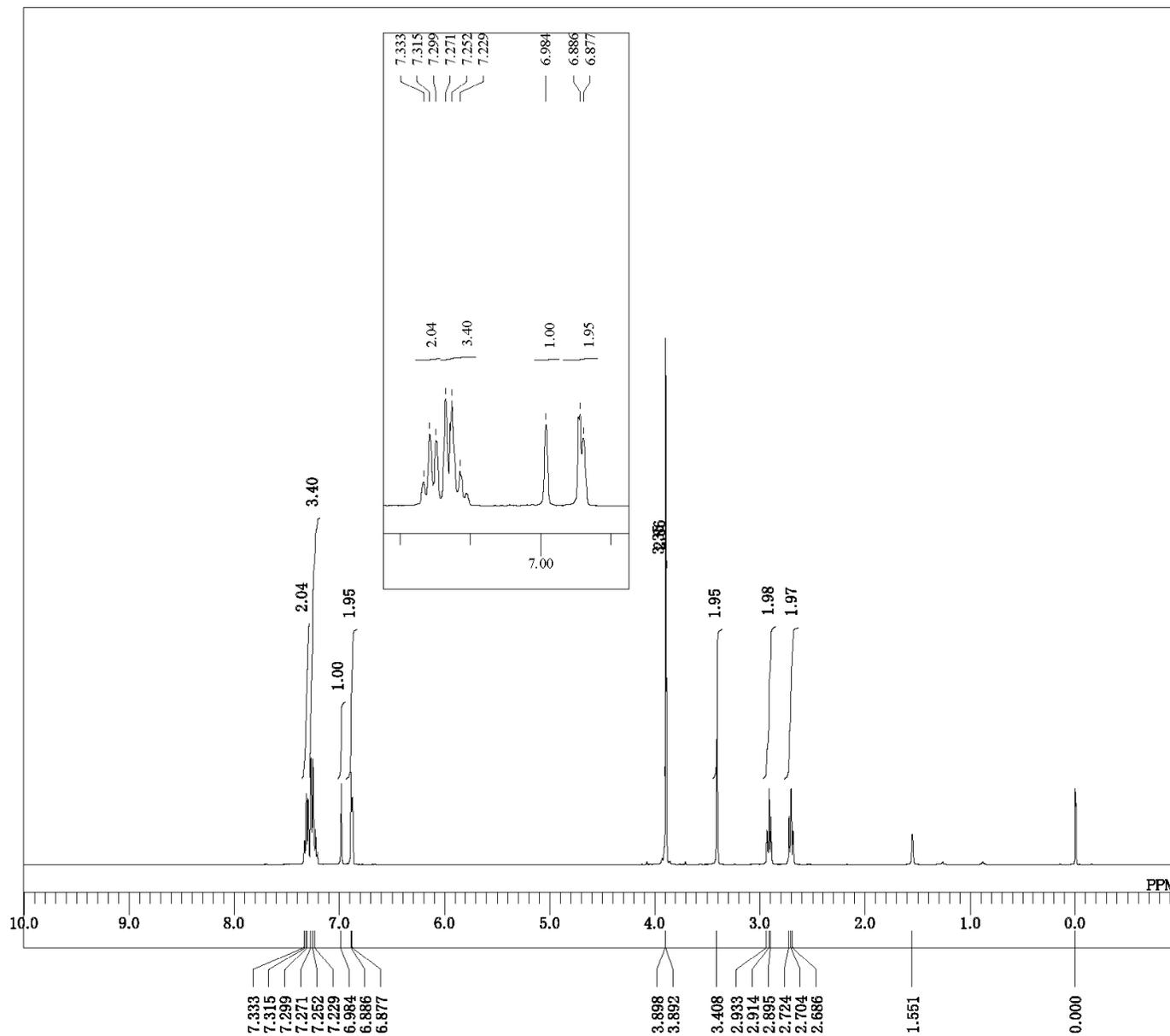


**4d**

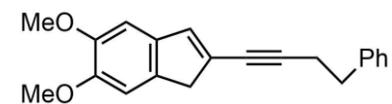
DFILE 20191219 tBu-Me2-Indene\_Carbon  
 COMNT single pulse decoupled gated NOE  
 DATIM 2019-12-19 09:20:42  
 OBNUC 13C  
 EXMOD carbon\_jxp  
 OBFRQ 99.55 MHz  
 OBSET 5.13 KHz  
 OBFIN 0.98 Hz  
 POINT 26214  
 FREQU 25000.00 Hz  
 SCANS 909  
 ACQTM 1.0486 sec  
 PD 2.0000 sec  
 PW1 3.59 usec  
 IRNUC 1H  
 CTEMP 17.0 c  
 SLVNT CDCL3  
 EXREF 77.00 ppm  
 BF 0.12 Hz  
 RGAIN 50



**4d**

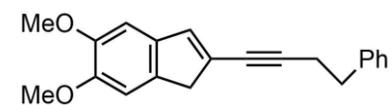
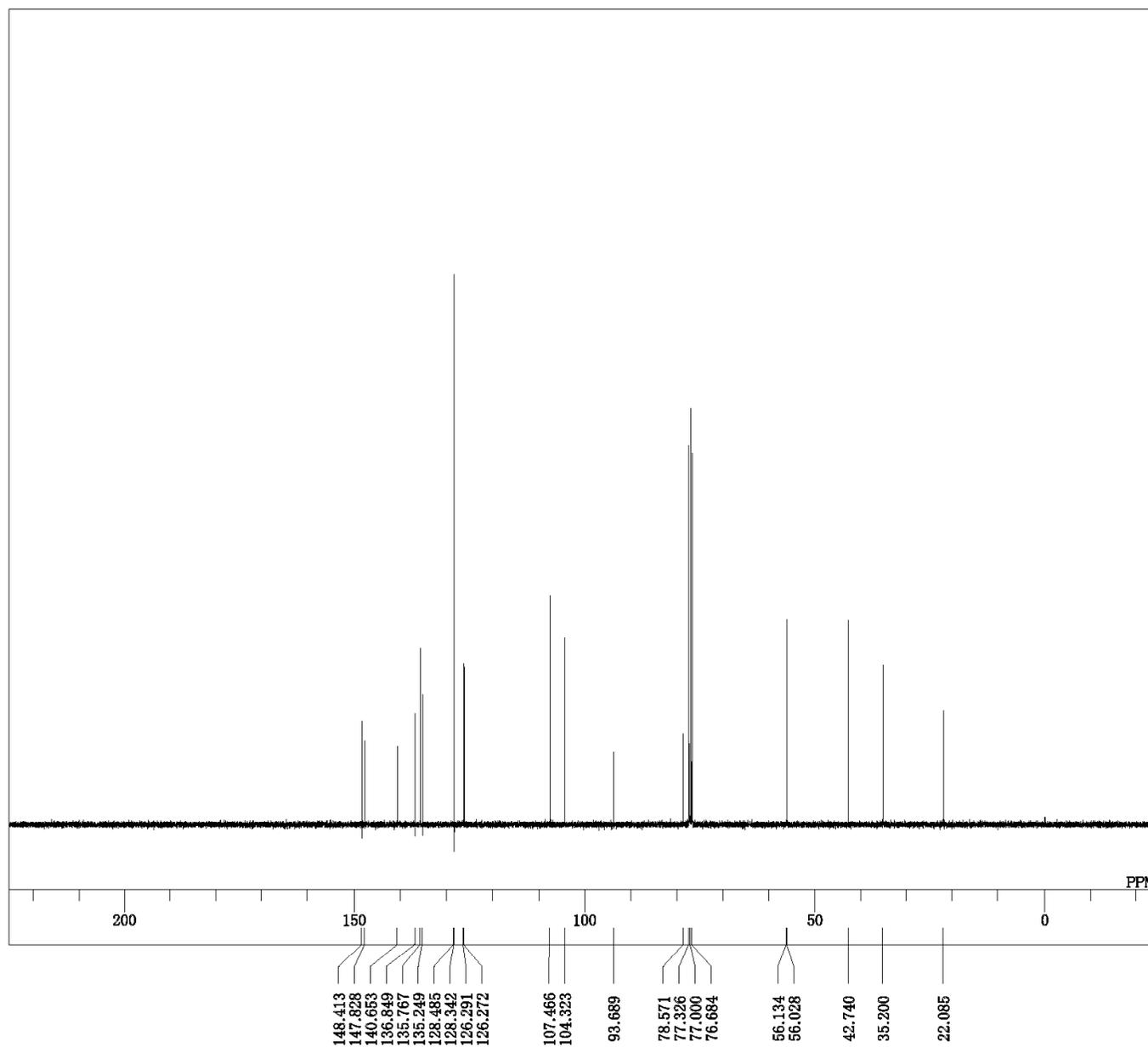


DFILE 20191213 Phenetyl-Ome2-Indene\_  
 COMNT single\_pulse  
 DATIM 2019-12-13 12:50:13  
 OBNUC 1H  
 EXMOD proton\_jxp  
 OBFRQ 395.88 MHz  
 OBSET 6.28 KHz  
 OBFIN 0.87 Hz  
 POINT 13107  
 FREQU 5938.24 Hz  
 SCANS 8  
 ACQTM 2.2073 sec  
 PD 5.0000 sec  
 PW1 3.14 usec  
 IRNUC 1H  
 CTEMP 19.8 c  
 SLVNT CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 38

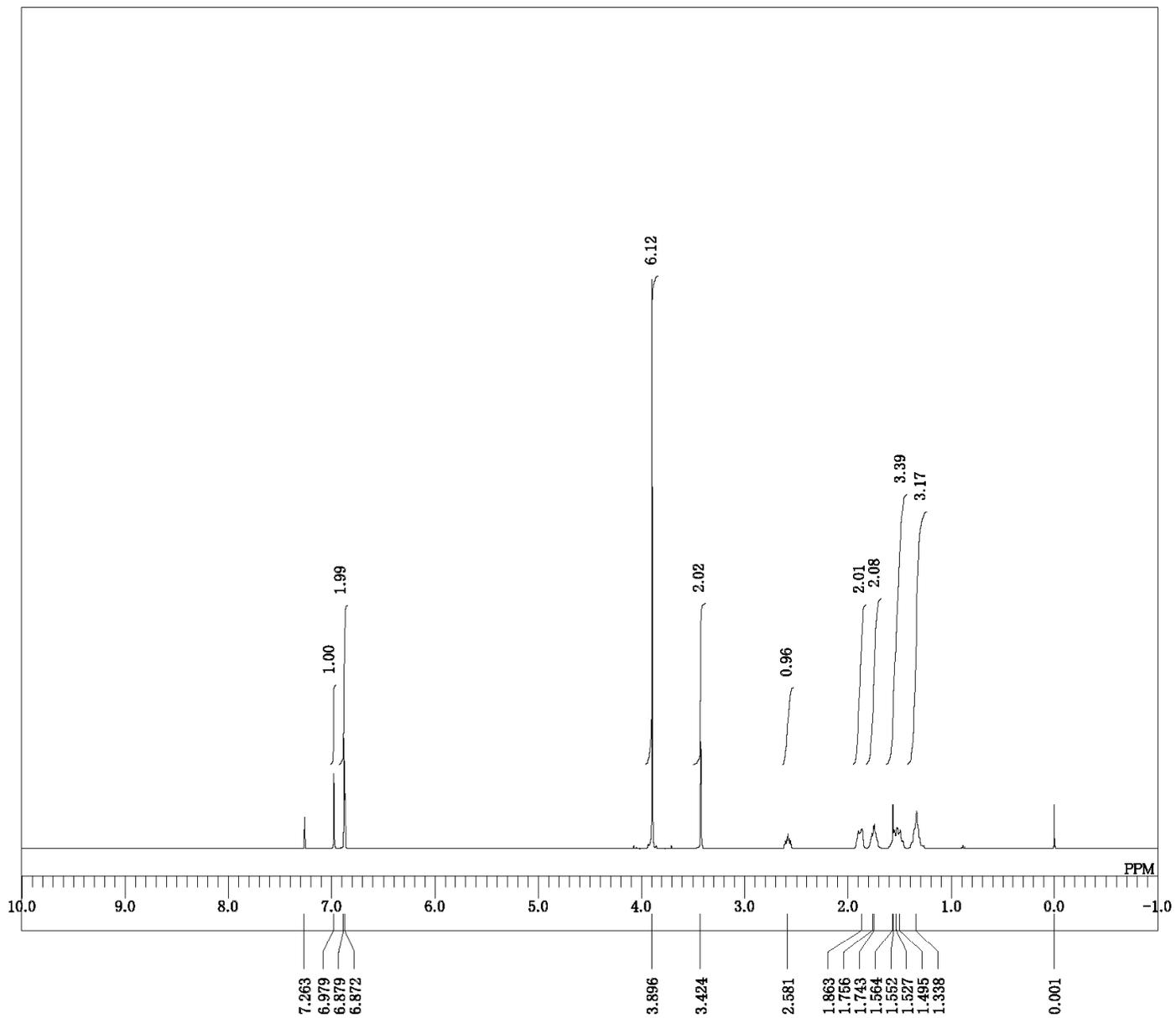


**4e**

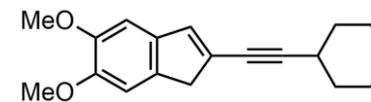
DFILE 20191218 Phenethyl-OMe2-Indene  
 COMNT single pulse decoupled gated NOE  
 DATIM 2019-12-18 20:14:22  
 OBNUC 13C  
 EXMOD carbon.jpg  
 OBFRQ 99.55 MHz  
 OBSET 5.13 KHz  
 OBFIN 0.98 Hz  
 POINT 26214  
 FREQU 25000.00 Hz  
 SCANS 1024  
 ACQTM 1.0486 sec  
 PD 2.0000 sec  
 PW1 3.59 usec  
 IRNUC 1H  
 CTEMP 19.6 c  
 SLVNT CDCL3  
 EXREF 77.00 ppm  
 BF 0.12 Hz  
 RGAIN 50



**4e**

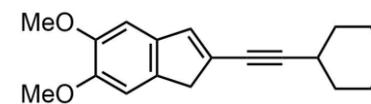
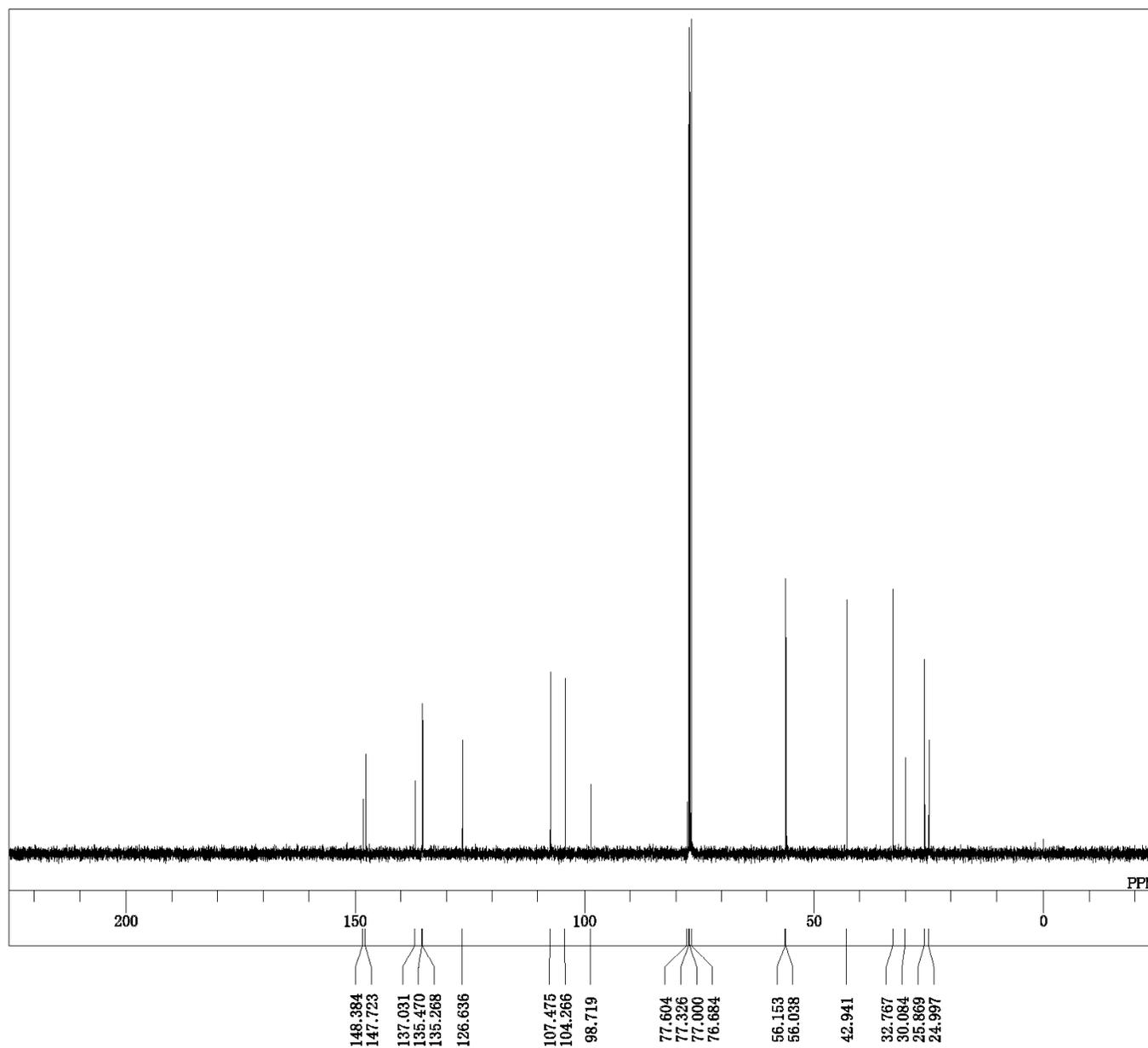


DFILE 20191213 cyclohexyl-OMe2-Inden  
 COMNT single\_pulse  
 DATIM 2019-12-13 17:02:04  
 OBNUC 1H  
 EXMOD proton\_jxp  
 OBFRQ 395.88 MHz  
 OBSET 6.28 KHz  
 OBFIN 0.87 Hz  
 POINT 13107  
 FREQU 5938.24 Hz  
 SCANS 8  
 ACQTM 2.2073 sec  
 PD 5.0000 sec  
 PW1 3.14 usec  
 IRNUC 1H  
 CTEMP 20.6 c  
 SLVNT CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 32

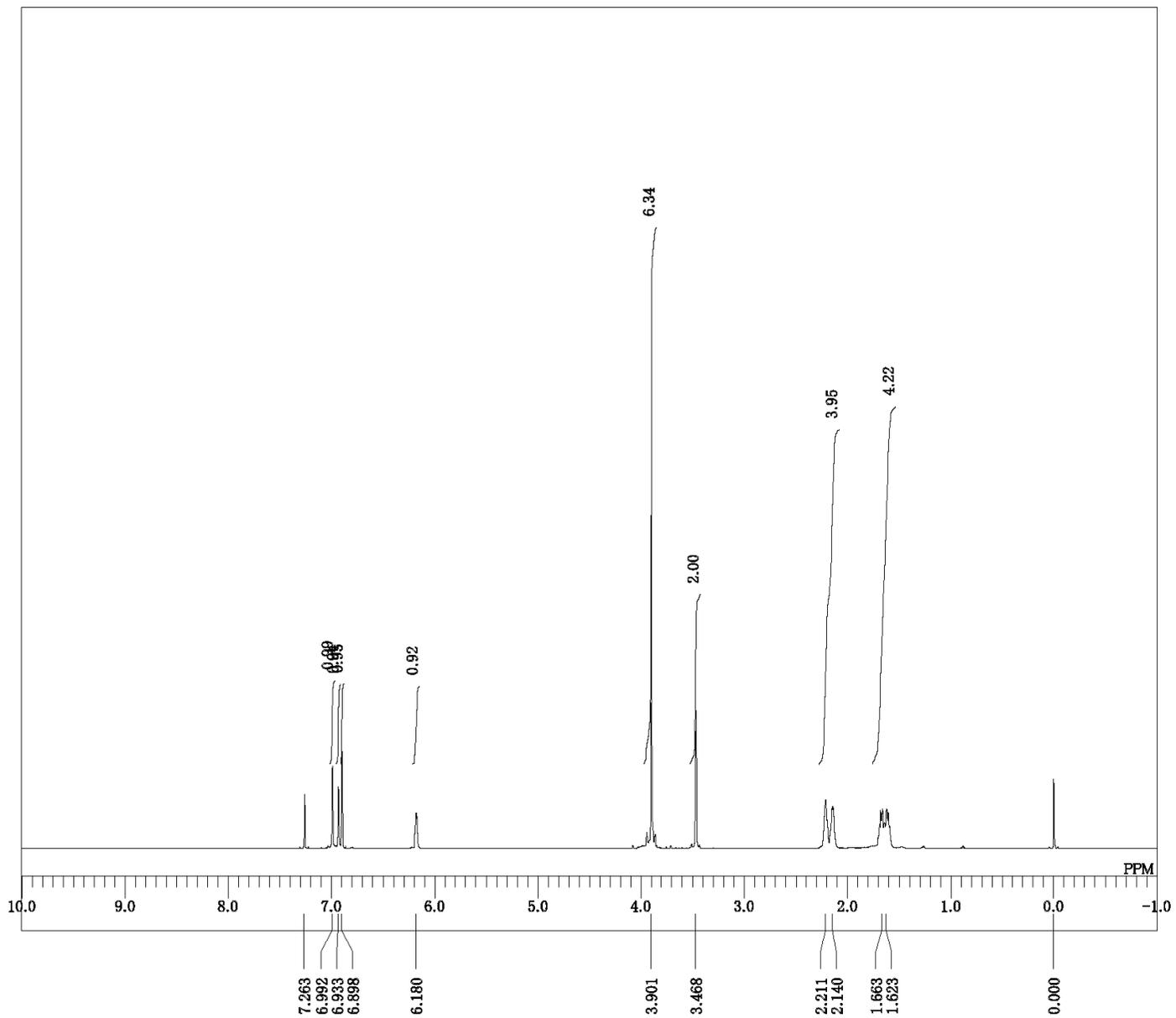


**4f**

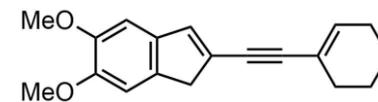
DFILE 20191213 cyclohexyl-Ome2-Inden  
 COMNT single pulse decoupled gated NOE  
 DATIM 2019-12-13 17:04:54  
 OBNUC 13C  
 EXMOD carbon\_jxp  
 OBFRQ 99.55 MHz  
 OBSET 5.13 KHz  
 OBFIN 0.98 Hz  
 POINT 26214  
 FREQU 25000.00 Hz  
 SCANS 1024  
 ACQTM 1.0486 sec  
 PD 2.0000 sec  
 PW1 3.59 usec  
 IRNUC 1H  
 CTEMP 19.4 c  
 SLVNT CDCL3  
 EXREF 77.00 ppm  
 BF 0.12 Hz  
 RGAIN 50



**4f**

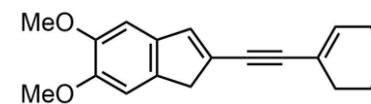
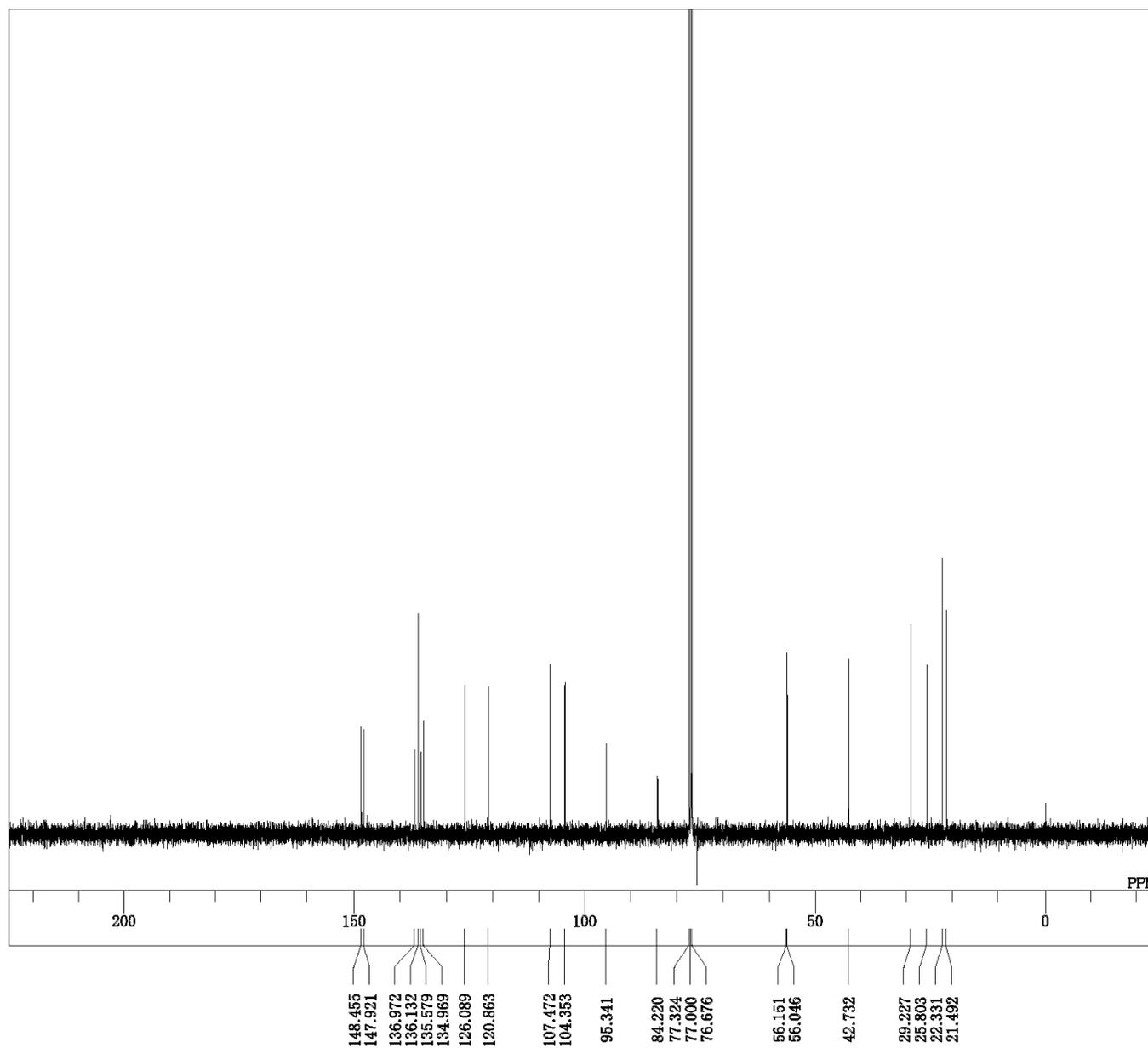


DFILE 20191213 cyclohexenyl-OMe2-Ind  
 COMNT single\_pulse  
 DATIM 2019-12-13 13:57:08  
 OBNUC 1H  
 EXMOD single\_pulse.ex2  
 OBFRQ 391.78 MHz  
 OBSET 8.51 KHz  
 OBFIN 3.34 Hz  
 POINT 26214  
 FREQU 5882.26 Hz  
 SCANS 8  
 ACQTM 4.4564 sec  
 PD 3.0000 sec  
 PW1 5.90 usec  
 IRNUC 1H  
 CTEMP 19.5 c  
 SLVNT CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 46

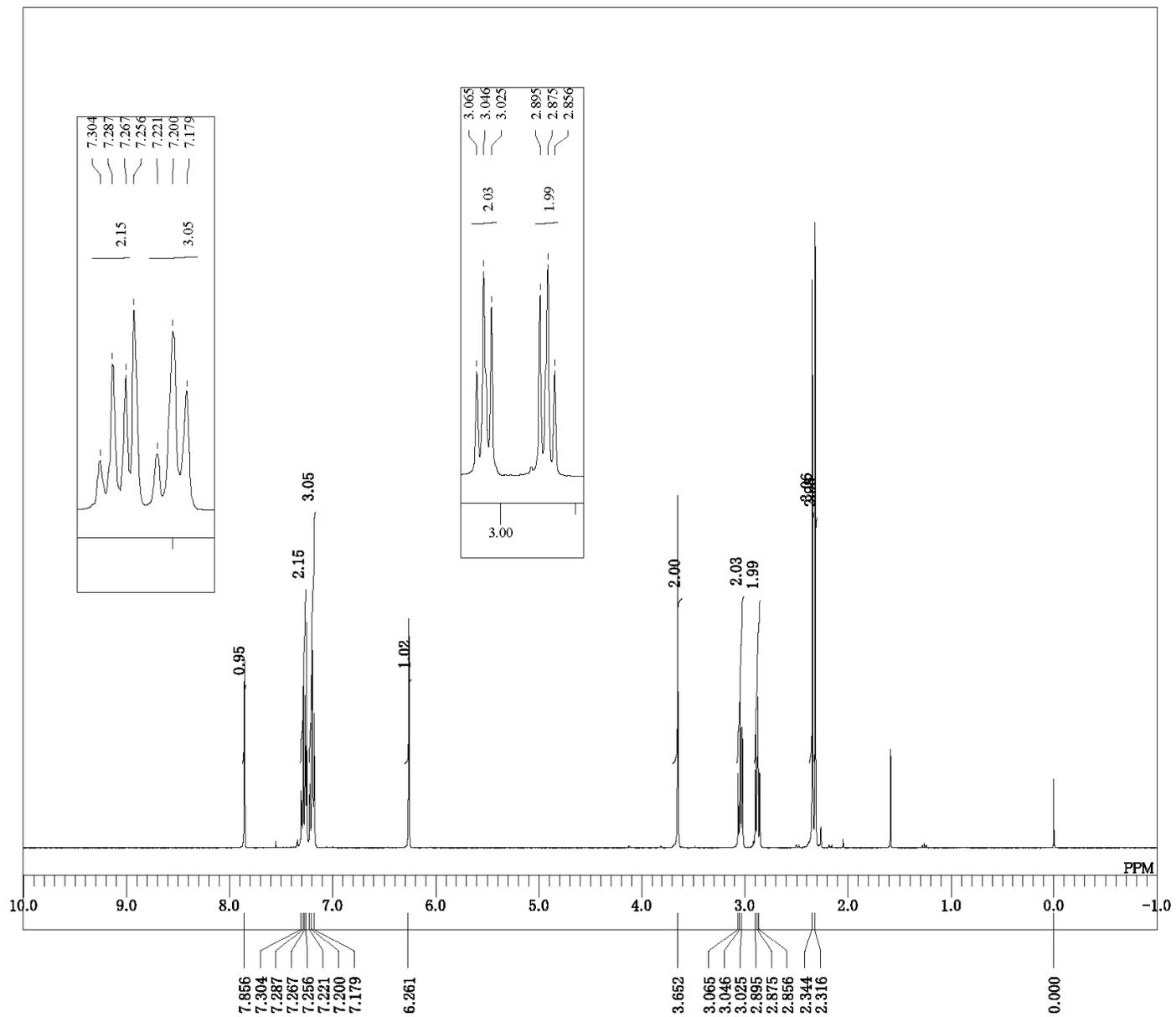


**4g**

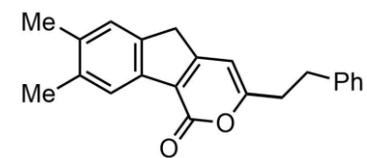
DFILE 20191213 cyclohexenyl-OMe2-Ind  
COMNT single pulse decoupled gated NOE  
DATIM 2019-12-13 14:52:46  
OBNUC 13C  
EXMOD single\_pulse\_dec  
OBFRQ 98.52 MHz  
OBSET 4.64 KHz  
OBFIN 8.74 Hz  
POINT 26214  
FREQU 24630.17 Hz  
SCANS 1024  
ACQTM 1.0643 sec  
PD 2.0000 sec  
PW1 3.17 usec  
IRNUC 1H  
CTEMP 20.0 c  
SLVNT CDCL3  
EXREF 77.00 ppm  
BF 0.12 Hz  
RGAIN 36



**4g**

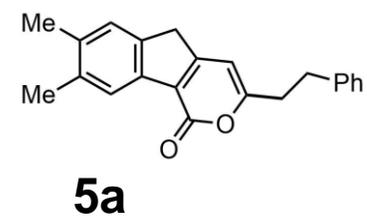
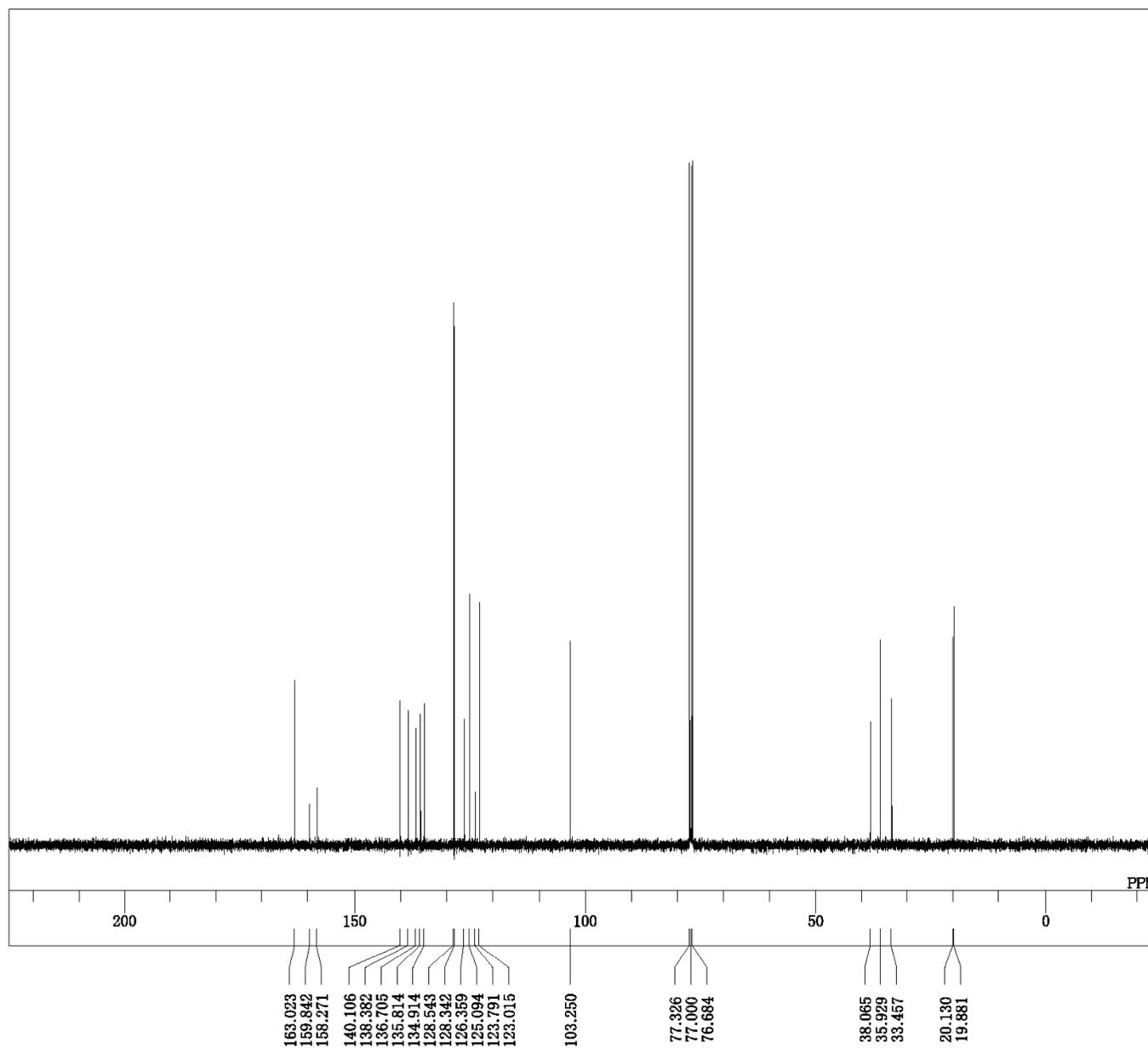


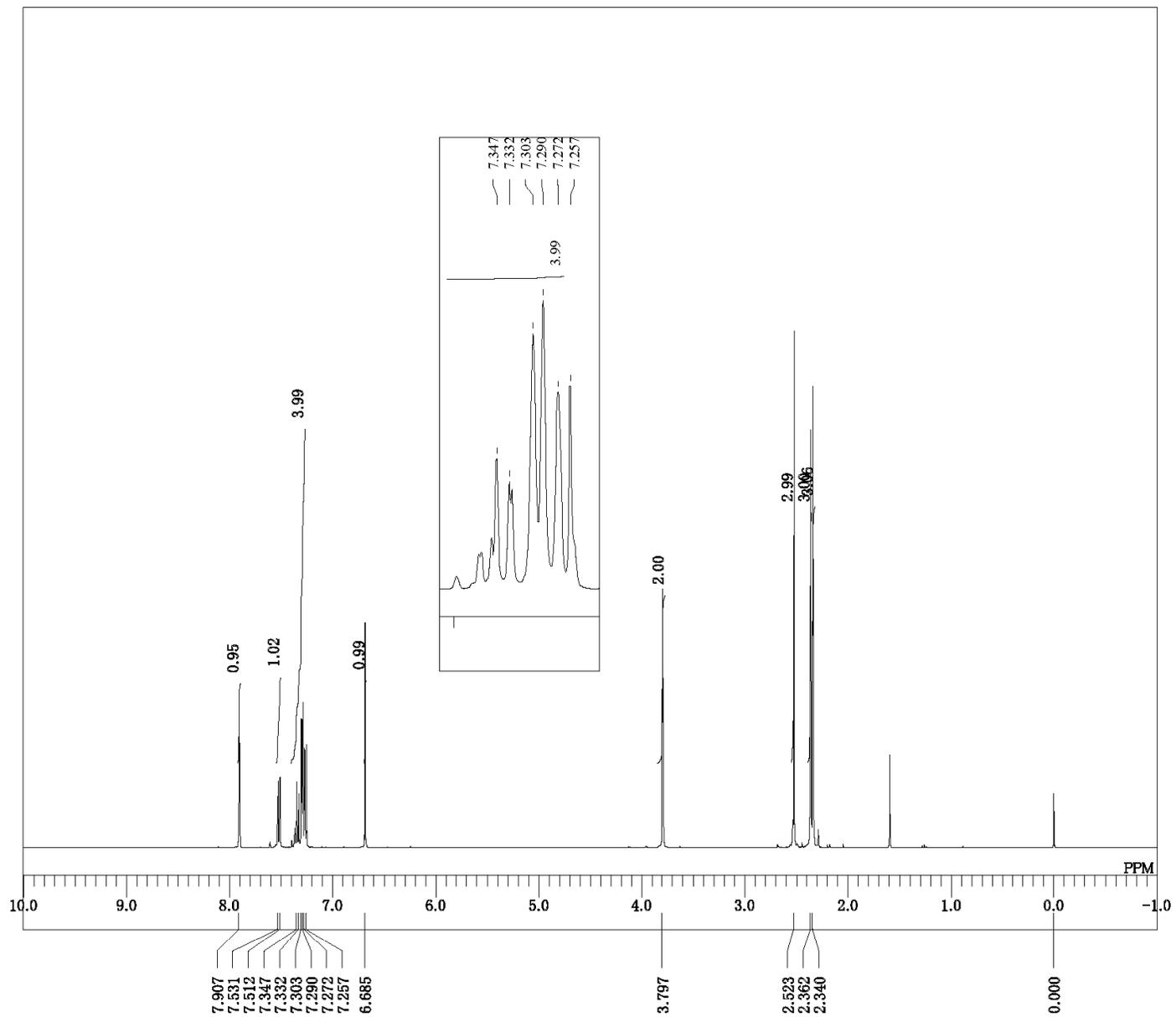
DFILE 20200131 Me2 phenethyl ester-6.F  
 COMNT single\_pulse  
 DATIM 2020-01-31 17:39:06  
 OBNUC 1H  
 EXMOD proton.jxp  
 OBFRQ 395.88 MHz  
 OBSET 6.28 KHz  
 OBFIN 0.87 Hz  
 POINT 13107  
 FREQU 5938.24 Hz  
 SCANS 8  
 ACQTM 2.2073 sec  
 PD 5.0000 sec  
 PW1 3.14 usec  
 IRNUC 1H  
 CTEMP 20.1 c  
 SLVNT CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 34



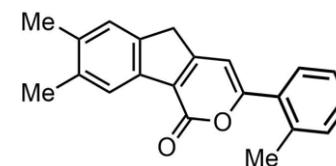
**5a**

DFILE 20200131 Me2 phenethyl ester-6.C  
 COMNT single pulse decoupled gated NOE  
 DATIM 2020-01-31 17:40:18  
 OBNUC 13C  
 EXMOD carbon.jpg  
 OBFRQ 99.55 MHz  
 OBSET 5.13 KHz  
 OBFIN 0.98 Hz  
 POINT 26214  
 FREQU 25000.00 Hz  
 SCANS 1024  
 ACQTM 1.0486 sec  
 PD 2.0000 sec  
 PW1 3.59 usec  
 IRNUC 1H  
 CTEMP 20.2 c  
 SLVNT CDCL3  
 EXREF 77.00 ppm  
 BF 0.12 Hz  
 RGAIN 50

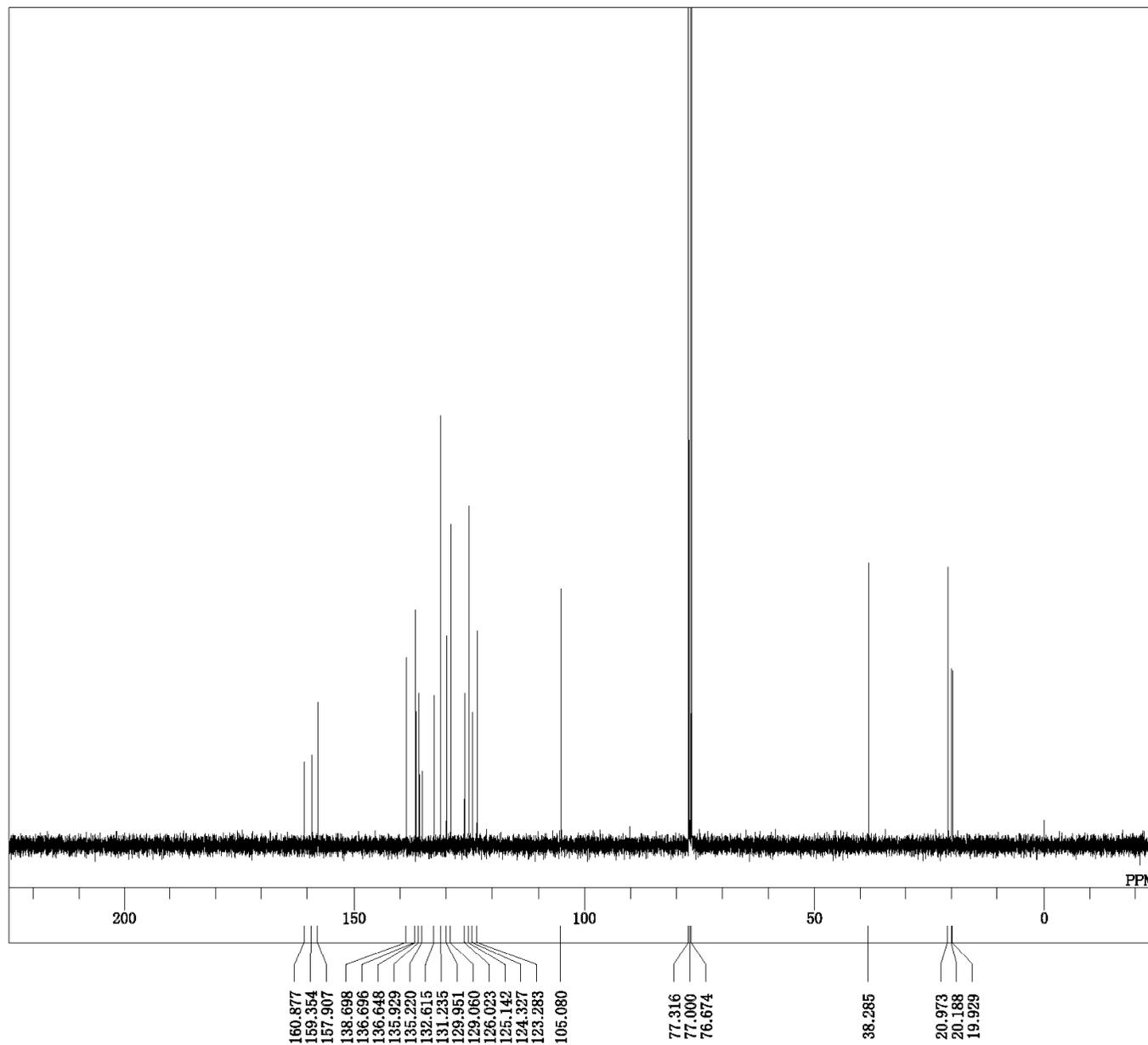




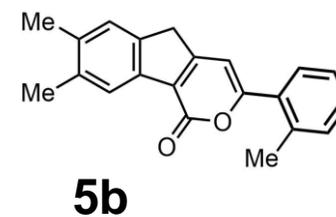
DFILE 20200203 Me2-o-toly-ester6\_Prot  
 COMNT single\_pulse  
 DATIM 2020-02-03 17:16:57  
 OBNUC 1H  
 EXMOD proton.jxp  
 OBFRQ 395.88 MHz  
 OBSET 6.28 KHz  
 OBFIN 0.87 Hz  
 POINT 13107  
 FREQU 5938.24 Hz  
 SCANS 8  
 ACQTM 2.2073 sec  
 PD 5.0000 sec  
 PW1 3.14 usec  
 IRNUC 1H  
 CTEMP 19.7 c  
 SLVNT CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 36

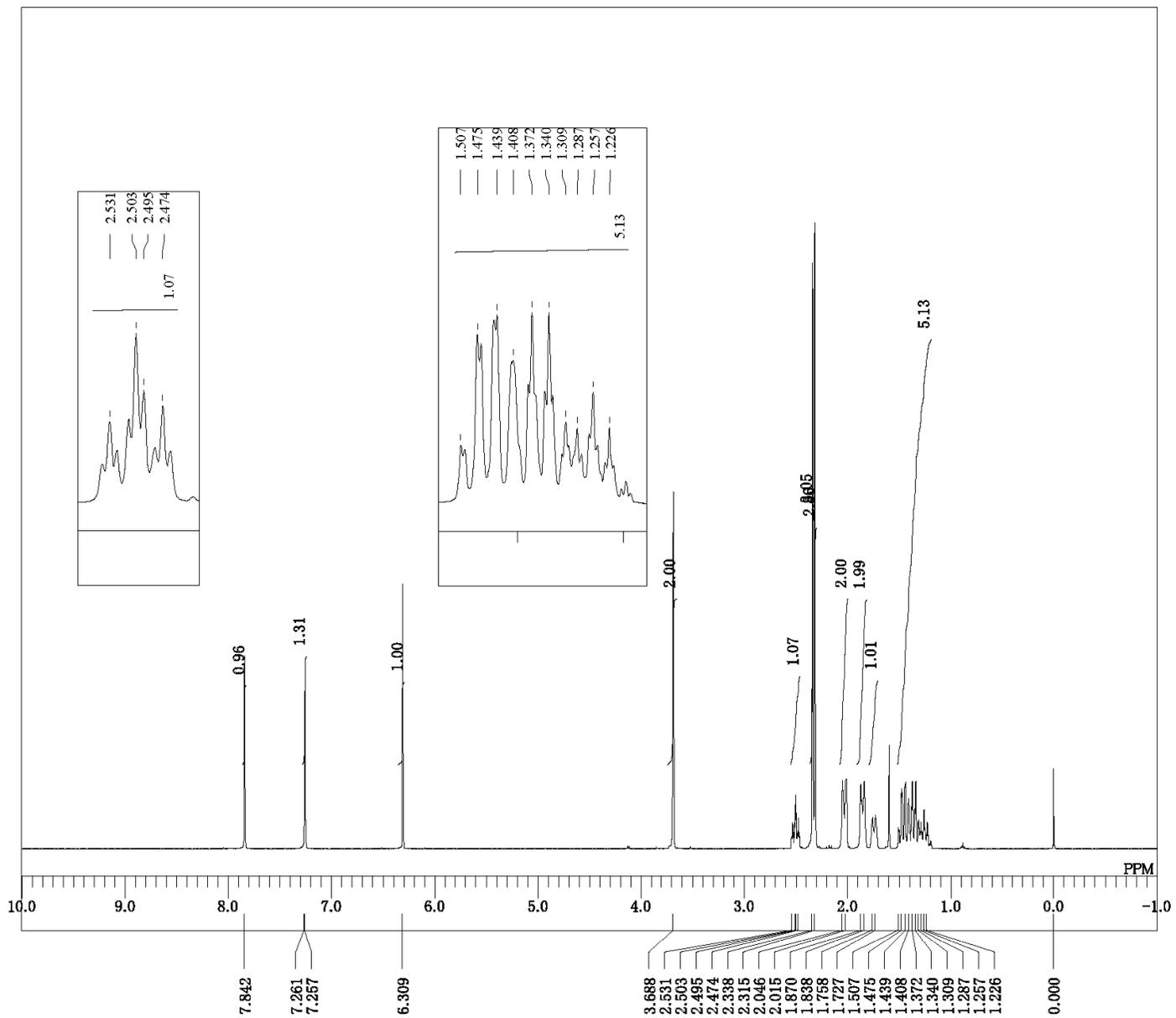


**5b**

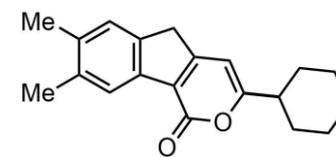


DFILE 20200203 Me2-o-toly-ester6\_Carl  
 COMNT single pulse decoupled gated NOE  
 DATIM 2020-02-03 17:18:09  
 OBNUC 13C  
 EXMOD carbon.jpg  
 OBFRQ 99.55 MHz  
 OBSET 5.13 KHz  
 OBFIN 0.98 Hz  
 POINT 26214  
 FREQU 25000.00 Hz  
 SCANS 1024  
 ACQTM 1.0486 sec  
 PD 2.0000 sec  
 PW1 3.59 usec  
 IRNUC 1H  
 CTEMP 20.1 c  
 SLVNT CDCL3  
 EXREF 77.00 ppm  
 BF 0.12 Hz  
 RGAIN 50



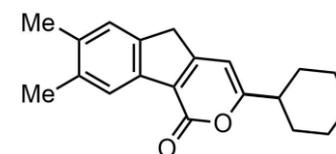
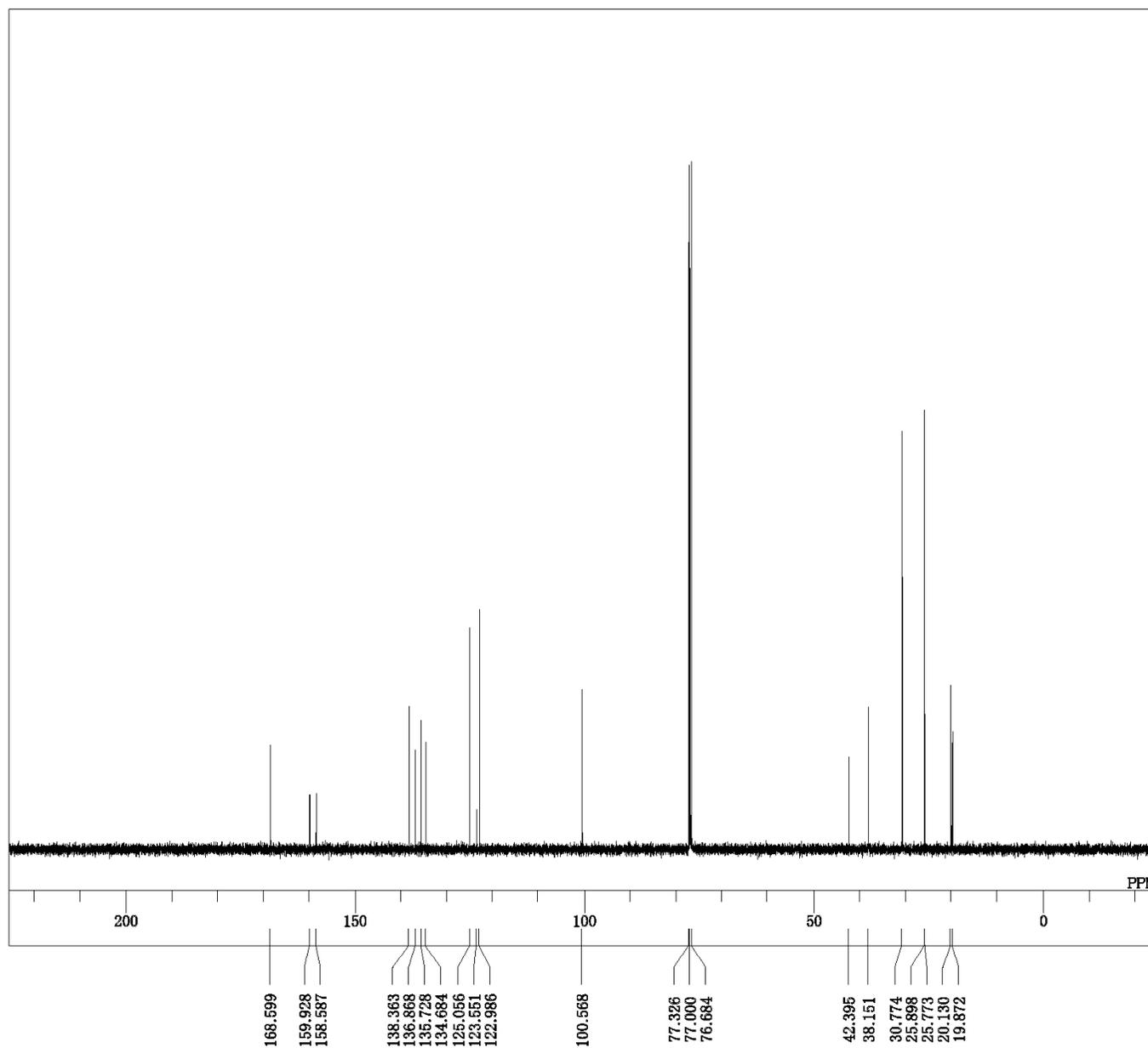


DFILE 20200203 Me2-Cy-ester6\_Proton-  
 COMNT single\_pulse  
 DATIM 2020-02-03 10:58:00  
 OBNUC 1H  
 EXMOD proton.jxp  
 OBFRQ 395.88 MHz  
 OBSET 6.28 KHz  
 OBFIN 0.87 Hz  
 POINT 13107  
 FREQU 5938.24 Hz  
 SCANS 8  
 ACQTM 2.2073 sec  
 PD 5.0000 sec  
 PW1 3.14 usec  
 IRNUC 1H  
 CTEMP 19.8 c  
 SLVNT CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 34

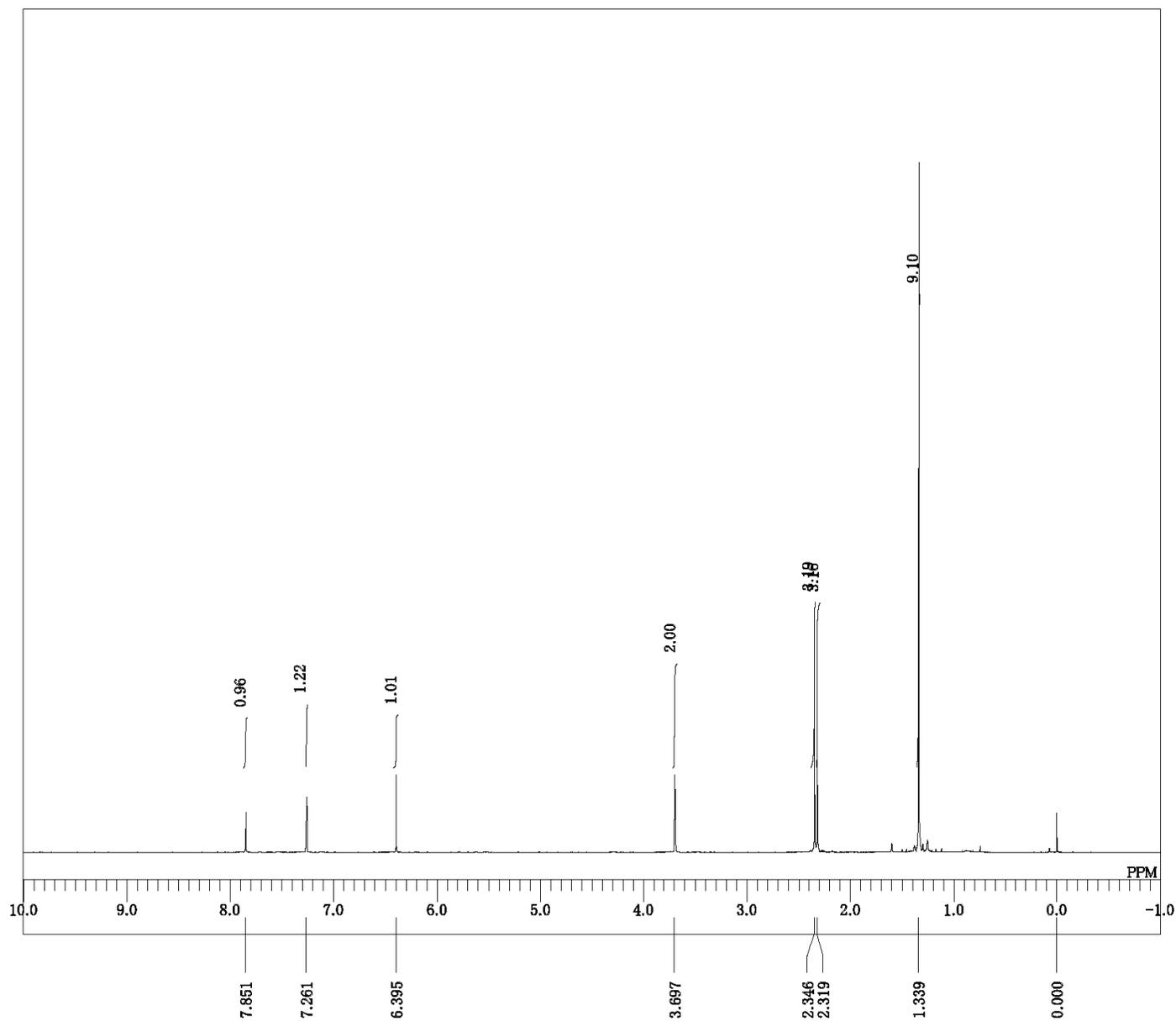


**5c**

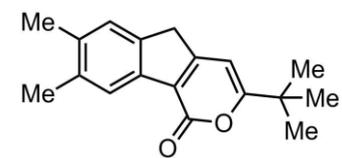
DFILE 20200203 Me2-Cy-ester6\_Carbon-  
 COMNT single pulse decoupled gated NOE  
 DATIM 2020-02-03 10:59:13  
 OBNUC 13C  
 EXMOD carbon.jpg  
 OBFRQ 99.55 MHz  
 OBSET 5.13 KHz  
 OBFIN 0.98 Hz  
 POINT 26214  
 FREQU 25000.00 Hz  
 SCANS 1024  
 ACQTM 1.0486 sec  
 PD 2.0000 sec  
 PW1 3.59 usec  
 IRNUC 1H  
 CTEMP 19.7 c  
 SLVNT CDCL3  
 EXREF 77.00 ppm  
 BF 0.12 Hz  
 RGAIN 50



**5c**

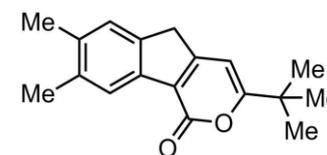
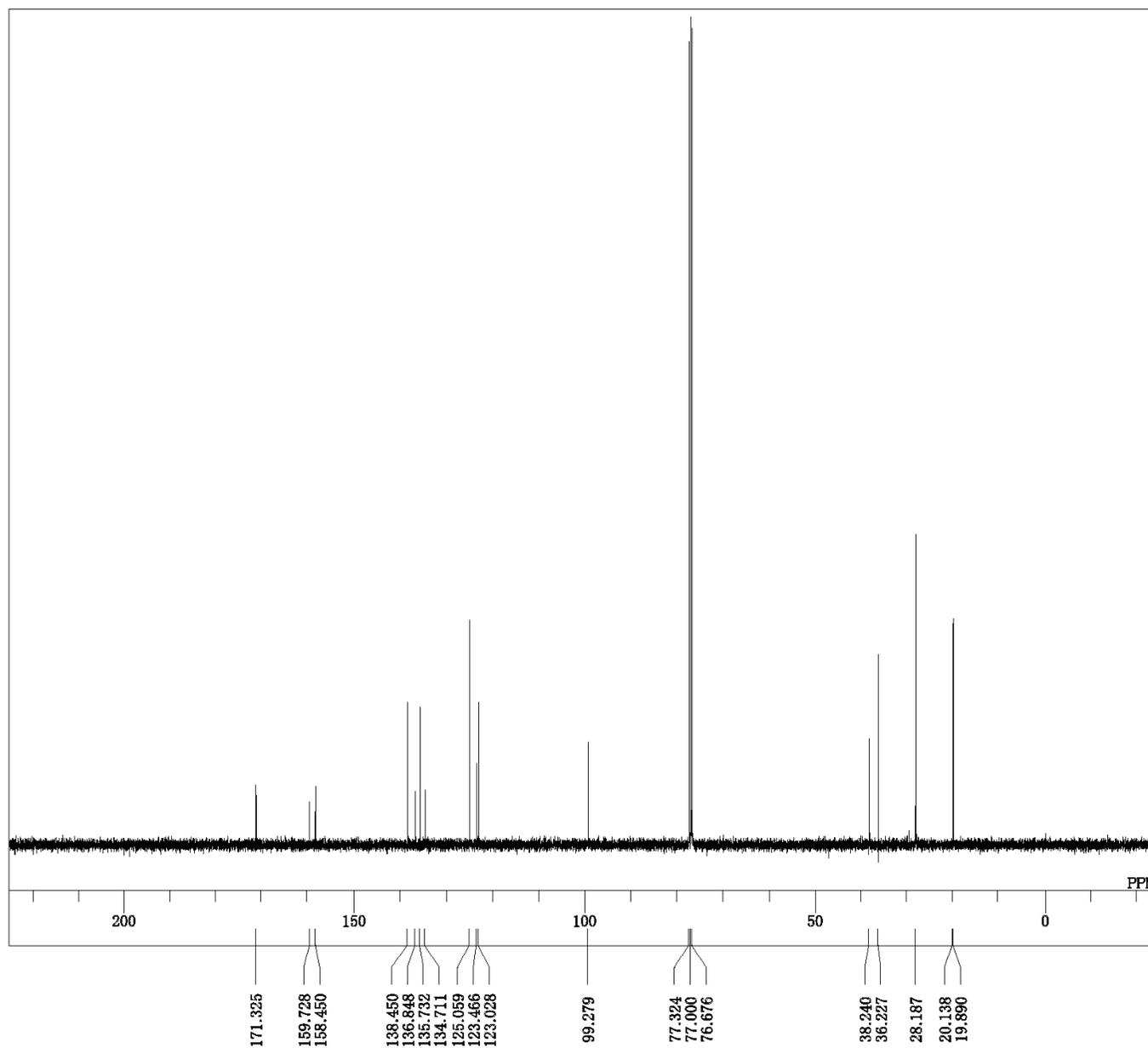


DFILE 20200228 Me2 t-Bu-Indene-Prod6  
 COMNT single\_pulse  
 DATIM 2020-02-28 17:15:59  
 OBNUC 1H  
 EXMOD single\_pulse.ex2  
 OBFRQ 391.78 MHz  
 OBSET 8.51 KHz  
 OBFIN 3.34 Hz  
 POINT 26214  
 FREQU 5882.26 Hz  
 SCANS 8  
 ACQTM 4.4564 sec  
 PD 3.0000 sec  
 PW1 5.90 usec  
 IRNUC 1H  
 CTEMP 19.4 c  
 SLVNT CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 44

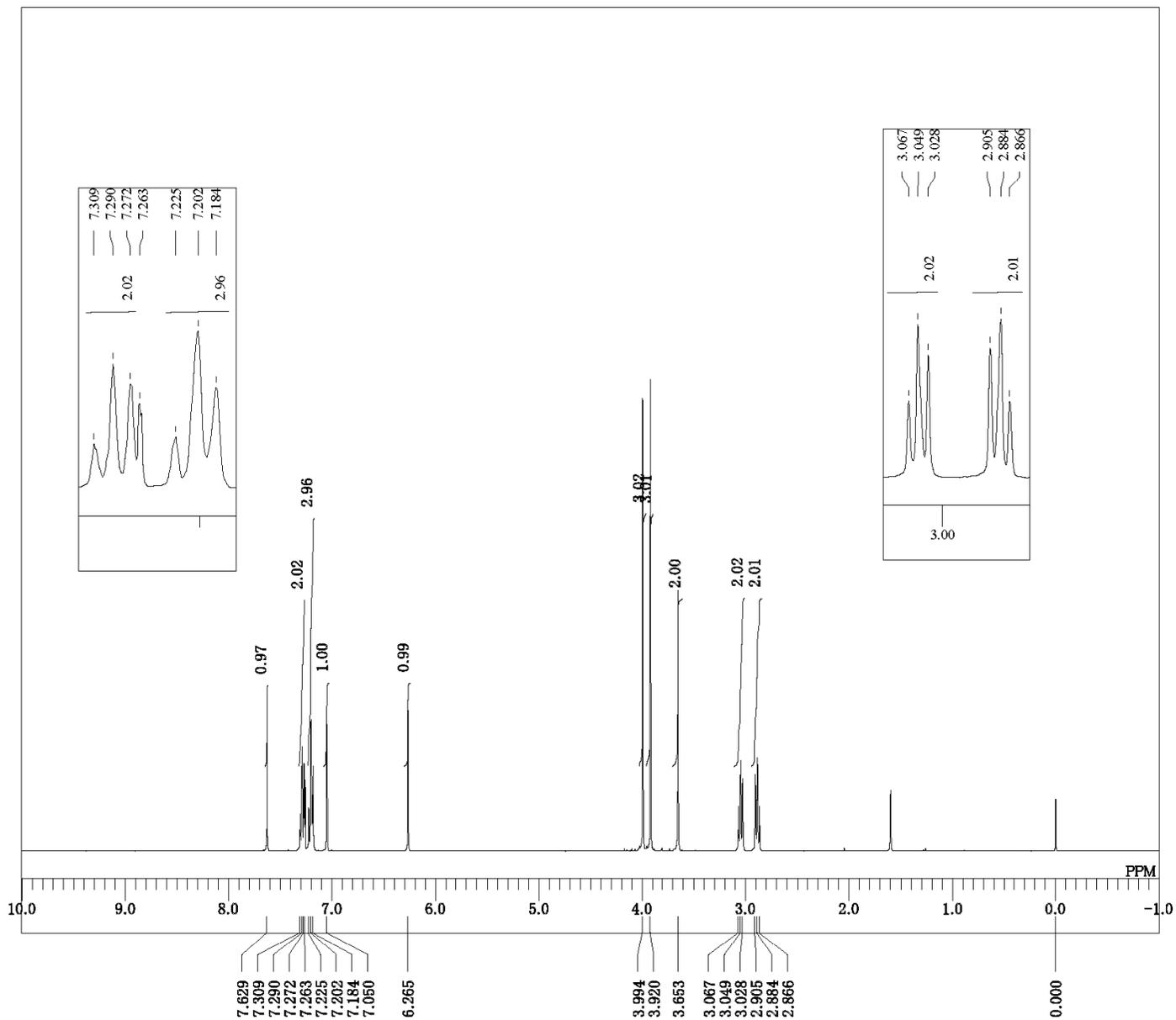


**5d**

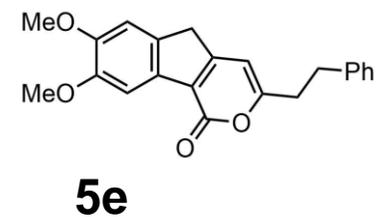
DFILE 20200228 Me2-t-Bu-Indene-Prod  
 COMNT single pulse decoupled gated NOE  
 DATIM 2020-02-28 18:11:07  
 OBNUC 13C  
 EXMOD single\_pulse\_dec  
 OBFRQ 98.52 MHz  
 OBSET 4.64 KHz  
 OBFIN 8.74 Hz  
 POINT 26214  
 FREQU 24630.17 Hz  
 SCANS 1024  
 ACQTM 1.0643 sec  
 PD 2.0000 sec  
 PW1 3.17 usec  
 IRNUC 1H  
 CTEMP 20.3 c  
 SLVNT CDCL3  
 EXREF 77.00 ppm  
 BF 0.12 Hz  
 RGAIN 46

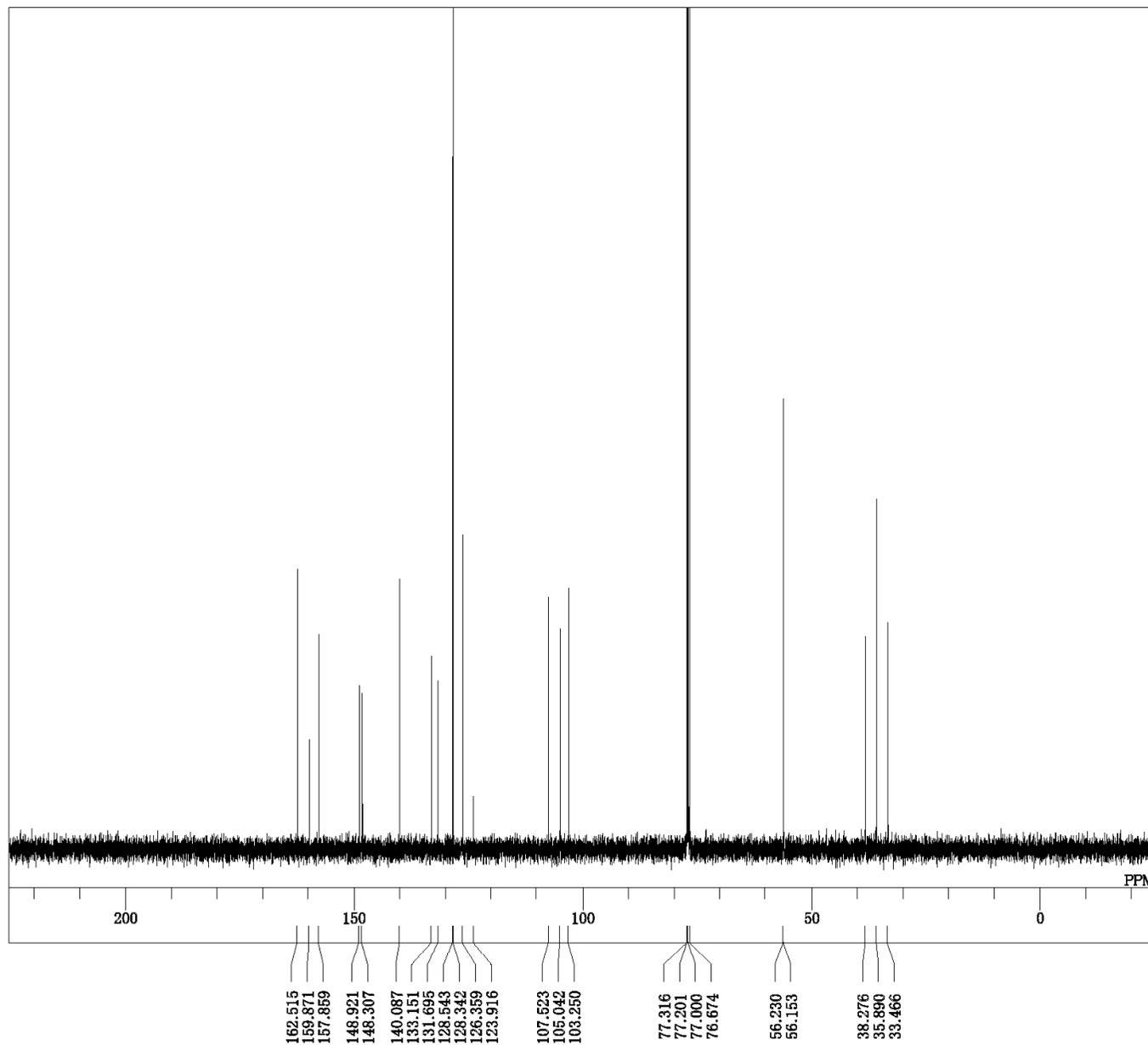


**5d**

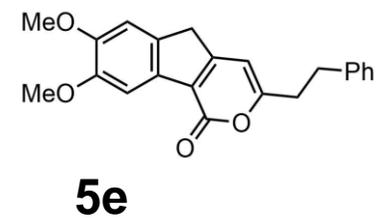


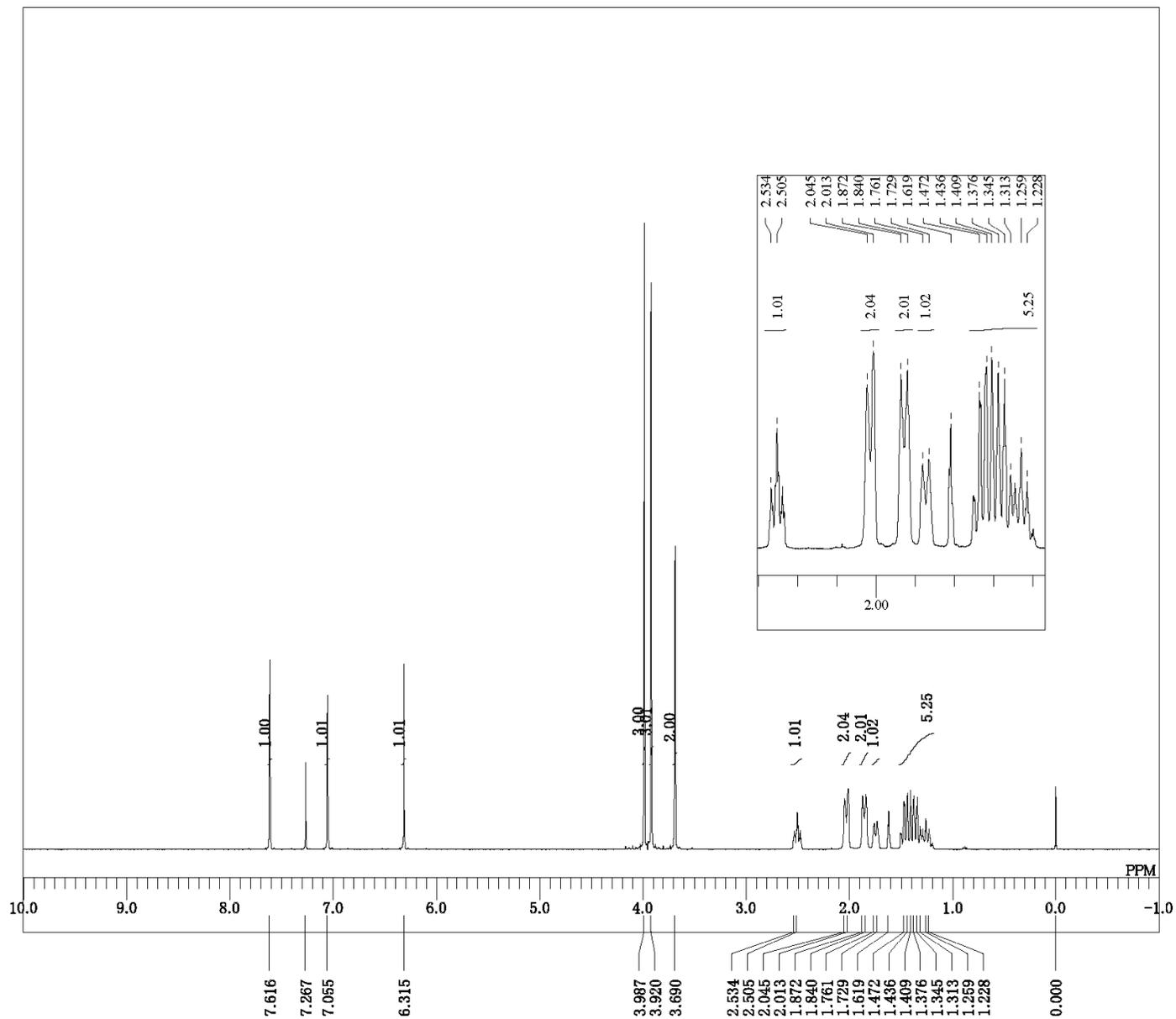
DFILE 20200131 OMe2 phenethyl ester-6  
 COMNT single\_pulse  
 DATIM 2020-01-31 10:56:23  
 OBNUC 1H  
 EXMOD proton.jxp  
 OBFREQ 395.88 MHz  
 OBSET 6.28 KHz  
 OBFIN 0.87 Hz  
 POINT 13107  
 FREQU 5938.24 Hz  
 SCANS 8  
 ACQTM 2.2073 sec  
 PD 5.0000 sec  
 PW1 3.14 usec  
 IRNUC 1H  
 CTEMP 19.8 c  
 CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 36



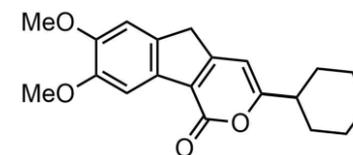


DFILE 20200131 OMe2 phenethyl ester-6  
 COMNT single pulse decoupled gated NOE  
 DATIM 2020-01-31 10:57:35  
 OBNUC 13C  
 EXMOD carbon.jxp  
 OBFRQ 99.55 MHz  
 OBSET 5.13 KHz  
 OBFIN 0.98 Hz  
 POINT 26214  
 FREQU 25000.00 Hz  
 SCANS 1024  
 ACQTM 1.0486 sec  
 PD 2.0000 sec  
 PW1 3.59 usec  
 IRNUC 1H  
 CTEMP 20.5 c  
 SLVNT CDCL3  
 EXREF 77.00 ppm  
 BF 0.12 Hz  
 RGAIN 50

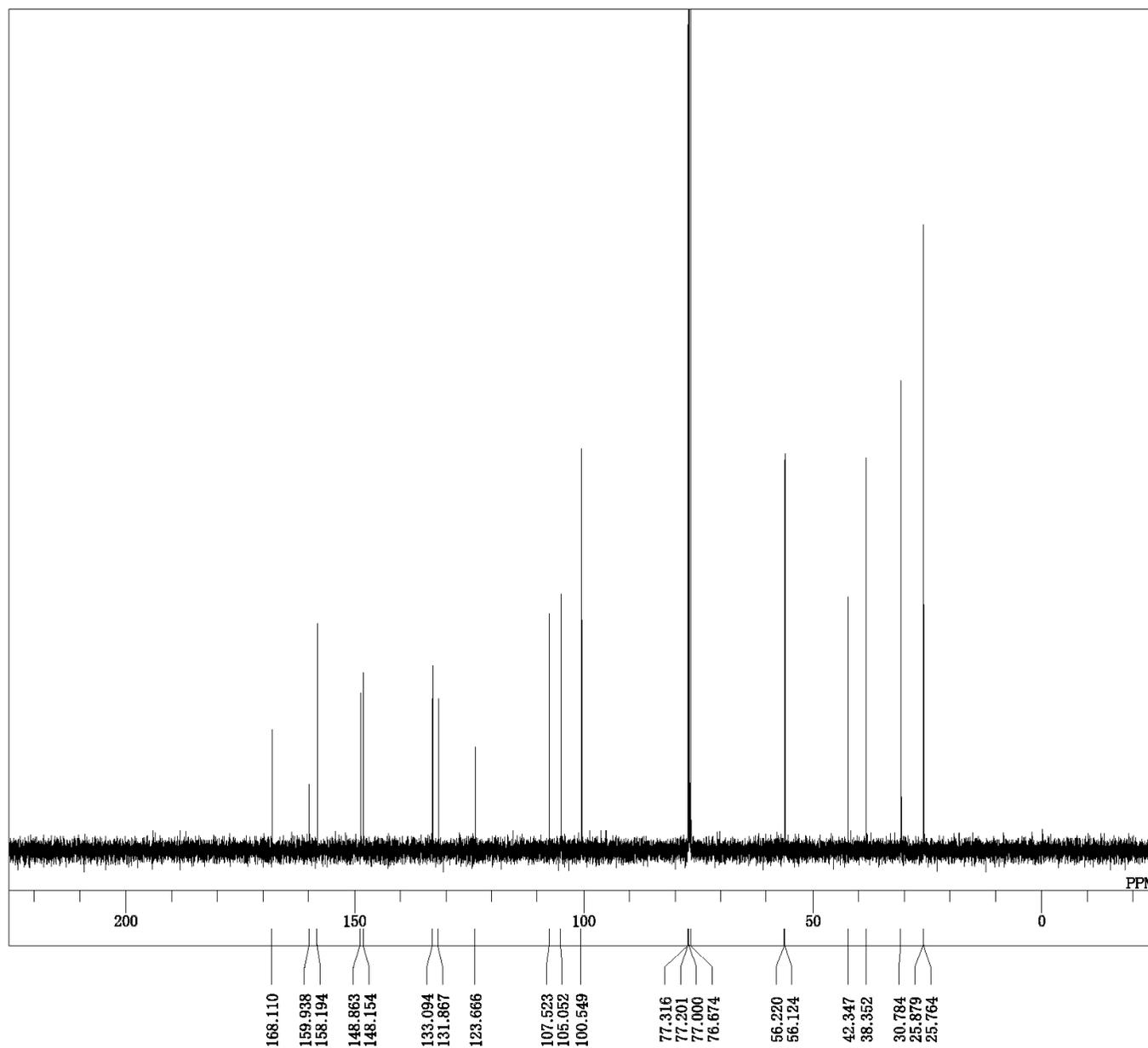




DFILE 20200128 OMe2 cyclohexyl ester-1  
 COMNT single\_pulse  
 DATIM 2020-01-28 16:37:50  
 OBNUC 1H  
 EXMOD proton.jxp  
 OBFRQ 395.88 MHz  
 OBSET 6.28 KHz  
 OBFIN 0.87 Hz  
 POINT 13107  
 FREQU 5938.24 Hz  
 SCANS 8  
 ACQTM 2.2073 sec  
 PD 5.0000 sec  
 PW1 3.14 usec  
 IRNUC 1H  
 CTEMP 20.1 c  
 SLVNT CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 34



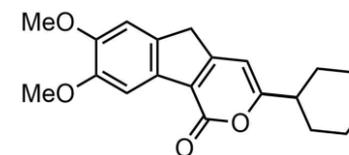
**5f**



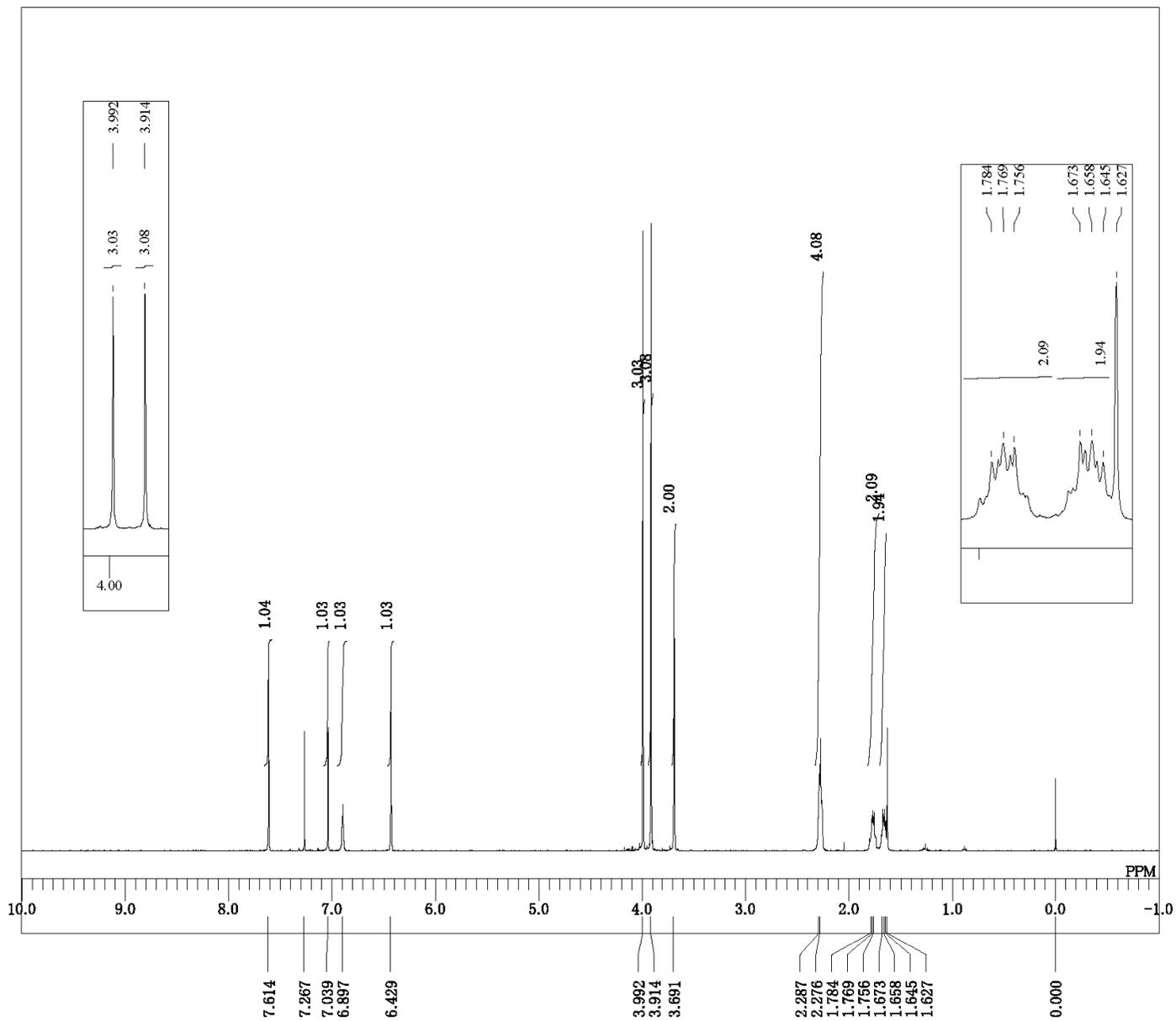
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DFILE 20200128 OMe2 cyclohexyl ester-1
COMNT single pulse decoupled gated NOE
DATIM 2020-01-28 16:40:01
OBNUC 13C
EXMOD carbon.jxp
OBFRQ 99.55 MHz
OBSET 5.13 KHz
OBFIN 0.98 Hz
POINT 26214
FREQU 25000.00 Hz
SCANS 1024
ACQTM 1.0486 sec
PD 2.0000 sec
PW1 3.59 usec
IRNUC 1H
CTEMP 20.3 c
SLVNT CDCL3
EXREF 77.00 ppm
BF 0.12 Hz
RGAIN 50

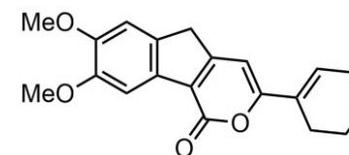
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**5f**

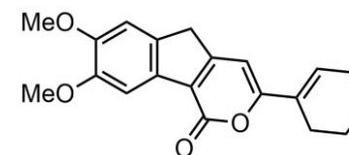
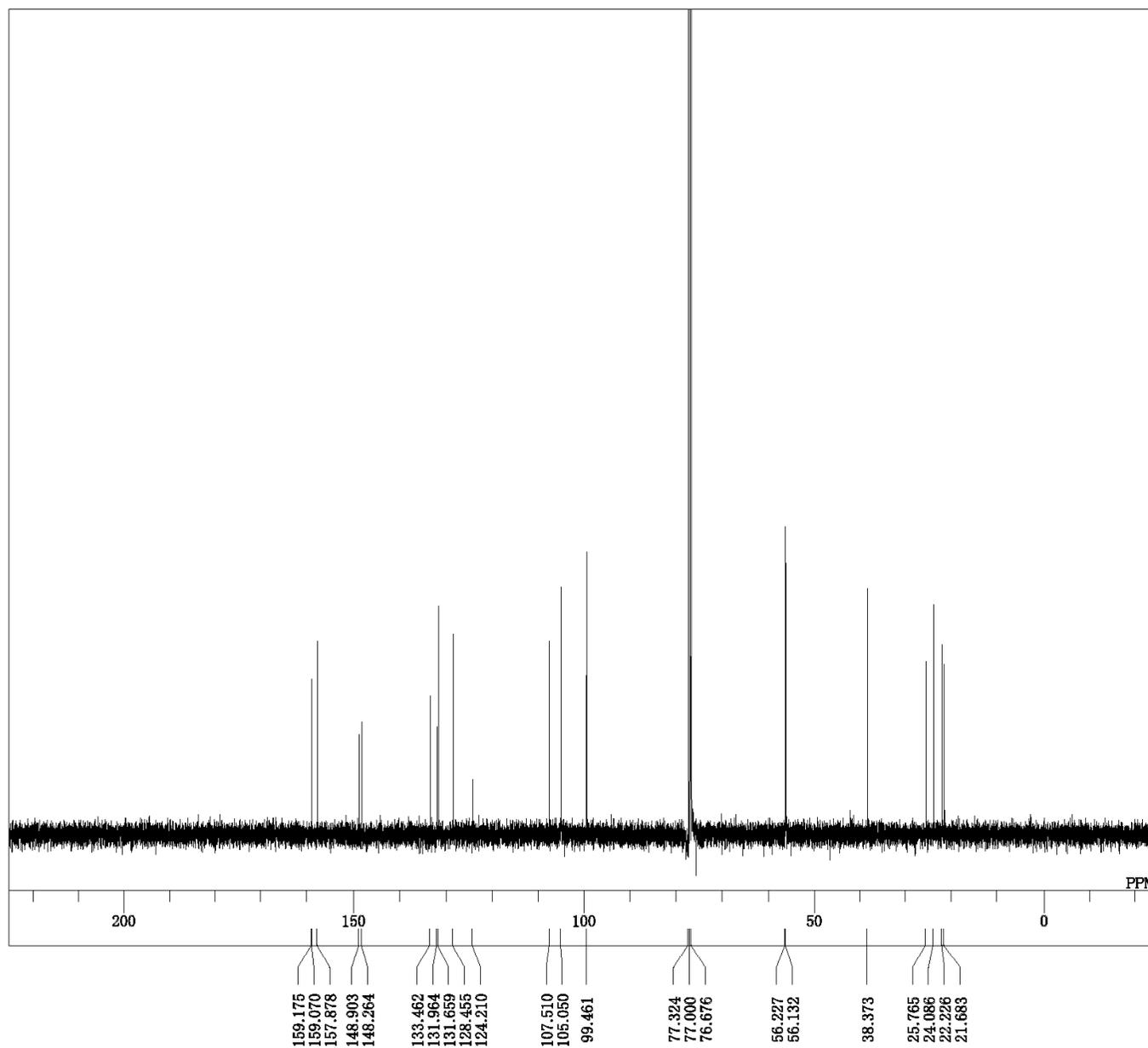


DFILE 20200225 OMe2-cyclohexene-6este  
 COMNT single\_pulse  
 DATIM 2020-02-25 18:51:13  
 OBNUC 1H  
 EXMOD proton.jxp  
 OBFREQ 395.88 MHz  
 OBSET 6.28 KHz  
 OBFIN 0.87 Hz  
 POINT 13107  
 FREQU 5938.24 Hz  
 SCANS 8  
 ACQTM 2.2073 sec  
 PD 5.0000 sec  
 PW1 3.14 usec  
 IRNUC 1H  
 CTEMP 19.8 c  
 CDCL3  
 EXREF 0.00 ppm  
 BF 0.12 Hz  
 RGAIN 50



**5g**

DFILE 20200226 OMe2-cyclohexene-este  
 COMNT single pulse decoupled gated NOE  
 DATIM 2020-02-26 13:14:18  
 OBNUC 13C  
 EXMOD single\_pulse\_dec  
 OBFRQ 98.52 MHz  
 OBSET 4.64 KHz  
 OBFIN 8.74 Hz  
 POINT 26214  
 FREQU 24630.17 Hz  
 SCANS 1024  
 ACQTM 1.0643 sec  
 PD 2.0000 sec  
 PW1 3.17 usec  
 IRNUC 1H  
 CTEMP 20.5 c  
 SLVNT CDCL3  
 EXREF 77.00 ppm  
 BF 0.12 Hz  
 RGAIN 44



**5g**