***Supporting Information***

**Synthesis of functionalized γ-spiroiminolactones from isocyanides, acetylenic esters, and cyclopenta[*a*]acenaphthylen-8-ones**

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**X‐ray crystal‐structure determination of 4b.** Crystallographic data for the structure **4b** have been deposited with the Cambridge Crystallographic Data Centre with CCDC number 1970625. Copies of the data can be obtained, free of charge, on application to the Cambridge Crystallographic Data Centre, 12 Union Road, Cambridge, CB2 1EZ, UK, (fax: +44 (0)1223 336033 or e‐mail:deposit@ccdc.cam.ac.uk).

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**Fig. 1** X-ray crystal structure of compound **4b**

Table 1 - Crystal Data and Details of the Structure Determination

***Crystal data***

|  |  |
| --- | --- |
| Chemical formula | C32H31NO9 |
| *M*r | 573.58 |
| Crystal system, space group | Triclinic, *P*1 |
| Temperature (K) | 293 |
| *a*, *b*, *c* (Å) | 10.093 (2), 12.484 (3), 13.062 (3) |
| *α*, *β*, *γ* (°) | 66.37 (3), 85.19 (3), 83.10 (3) |
| *V* (Å3) | 1495.8 (7) |
| *Z* | 2 |
| Radiation type | Mo *Kα* |
| *μ* (mm−1) | 0.09 |
| Crystal size (mm) | 0.4 × 0.32 × 0.15 |

***Data collection***

|  |  |
| --- | --- |
| Diffractometer | MAR345 |
| Absorption correction | Multi-scan  R.H. Blessing, Acta Crystallogr., Sect A 1995, 51, 33-38 |
| *T*min, *T*max | 0.933, 1.069 |
| No. of measured, independent and  observed [*I* > 2*σ*(*I*)] reflections | 8868, 4477, 3968 |
| *R*int | 0.042 |
| (sin *θ*/*λ*)max (Å−1) | 0.583 |

***Refinement***

|  |  |
| --- | --- |
| *R*[*F*2 > 2*σ*(*F*2)], *wR*(*F*2), *S* | 0.079, 0.229, 1.07 |
| No. of reflections | 4477 |
| No. of parameters | 386 |
| No. of restraints | 6 |
| H-atom treatment | H-atom parameters constrained |
| Δ*ρ*max, Δ*ρ*min (e Å−3) | 0.74, −0.58 |

Experimental

*Materials*

The chemicals and solvents were purchased from Merck and used without additional purification. Melting points: *Electrothermal-9100* apparatus. FTIR spectra were recorded on a Shimadzu *IR‐460* instrument using the KBr self‐supported pellet technique. 1H and 13C NMR spectra: Bruker *DRX-300 Avance* (for compounds **4a-4d** and **4f-4i**) and *DRX-500 Avance* (for compounds **4e** and **4j**) instruments using CDCl3 as applied solvent; *δ* in ppm, *J* in Hz. Mass spectra obtained on a *Finnigan‐MAT‐8430 EI‐MS* apparatus at ionization potential of 70 eV. The meltingpoints of the products were determined in open capillarytubes by using the *Electrothermal‐9100* apparatus. Elementalanalyses for C, H, and N were performed usinga *Heraeus CHN‐O‐Rapid* analyzer.

***General procedure for the synthesis of compounds******4***

A mixture of alkyl isocyanides **1** (1.0 mmol), dialkyl acetylenedicarboxylates **2** (1.0 mmol), and dialkyl 8-oxo-8*H*-cyclopenta[*a*]acenaphthylene-7,9-dicarboxylates **3** (1.0 mmol), was stirred in MeCN (5 mL) at room temperature. After completion of the reaction as monitored by TLC (*n*‐hexane/EtOAc, 5:1), solvent was evaporated in vacuum, the resulting precipitate was filtered, and then washed with MeCN to give products **4**.

***Tetramethyl 5'-(tert-butylimino)-5'H-spiro[cyclopenta[a]acenaphthylene-8,2'-furan]-3',4',7,9-tetracarboxylate (4a)***

Yellow powder; yield: (0.44 g, 81%). Mp: 172–173 °C. IR (KBr) (*ν*max, cm−1): 1744 (C=O), 1717 (C=O), 1690 (C=N), 1265 (C-O). 1H NMR (300 MHz, CDCl3): *δ*H 1.29 (9 H, s, C*Me*3), 3.61 (3 H, s, MeO), 3.90 (6 H, s, 2 MeO), 3.97 (3 H, s, MeO), 7.74 (2 H, t, 3*J* = 7.5 Hz, CH), 8.01 (2 H, d, 3*J* = 7.5 Hz, CH), 8.62 (2 H, d, 3*J* = 7.5 Hz, CH). 13C NMR (75 MHz, CDCl3): *δ*C 29.4 (C*Me*3), 51.7 (2 MeO), 52.6 (MeO), 52.9 (MeO), 54.8 (C), 77.2 (Cspiro), 124.9 (C), 126.9 (2 CH), 128.5 (2 CH), 129.1 (2 C), 129.2 (2 CH), 131.3 (C), 139.6 (2C), 140.5 (C), 147.3 (C), 153.6 (C), 157.0 (2 C), 160.5 (C=O), 162.5 (2 C=O), 162.8 (C=O). EI/MS: *m*/*z* (%) = 545 (*M*+, 4), 529 (7), 393 (4), 337 (4), 282 (30), 193 (92), 105 (100). Anal. Calcd for C30H27NO9: (545.54): C, 66.05; H, 4.99; N, 2.57%. Found: C, 65.75; H, 5.01; N, 2.60%.

***7,9-Diethyl 3',4'-dimethyl 5'-(tert-butylimino)-5'H-spiro[cyclopenta[a]acenaphthylene-8,2'-furan]-3',4',7,9-tetracarboxylate (4b)***

Yellow powder; yield: (0.51 g, 89%). Mp: 174–175 °C. IR (KBr) (*ν*max, cm−1): 1749 (C=O), 1725 (C=O), 1682 (C=N), 1269 (C-O). 1H NMR (300 MHz, CDCl3): *δ*H 1.30 (9 H, s, C*M*e3), 1.40 (6 H, t, 3*J* = 7.1 Hz, 2 Me), 3.61 (3 H, s, MeO), 3.95 (3 H, s, MeO), 4.27-4.40 (4 H, m, 2 CH2O), 7.72 (2 H, t, 3*J* = 7.5 Hz, CH), 7.99 (2 H, d, 3*J* = 7.5 Hz, CH), 8.67 (2 H, d, 3*J* = 7.5 Hz, CH). 13C NMR (75 MHz, CDCl3): *δ*C 14.1 (2 Me), 29.7 (C*M*e3), 52.6 (MeO), 52.8 (MeO), 54.9 (C), 61.1 (2 CH2O), 77.2 (Cspiro), 125.2 (C), 127.0 (2 CH), 128.5 (2 CH), 129.2 (2 CH), 129.3 (2 C), 131.2 (C), 139.9 (2 C), 140.6 (C), 147.3 (C), 153.6 (C), 157.3 (2 C), 160.5 (C=O), 162.3 (2 C=O), 162.8 (C=O). EI/MS: *m*/*z* (%) = 573 (*M*+, 23), 558 (100), 453 (7), 408 (7), 324 (7), 279 (15). Anal. Calcd for C32H31NO9: (573.59): C, 67.01; H, 5.45; N, 2.44%. Found: C, 66.71; H, 5.48; N, 2.47%.

***3',4'-Diethyl 7,9-dimethyl 5'-(tert-butylimino)-5'H-spiro[cyclopenta[a]acenaphthylene-8,2'-furan]-3',4',7,9-tetracarboxylate (4c)***

Yellow powder; yield: (0.45 g, 79%). Mp: 181–182 °C. IR (KBr) (*ν*max, cm−1): 1749 (C=O), 1725 (C=O), 1688 (C=N), 1269 (C-O). 1H NMR (300 MHz, CDCl3): *δ*H 0.93 (3 H, t, 3*J* = 7.1 Hz, Me) 1.30 (9 H, s, C*Me*3), 1.40 (3 H, t, 3*J* = 7.1 Hz, Me), 3.89 (6 H, s, 2 MeO), 4.02 (2 H, q, 3*J* = 7.1 Hz, CH2O), 4.42 (2 H, q, 3*J* = 7.1 Hz, CH2O), 7.73 (2 H, t, 3*J* = 7.5 Hz, CH), 7.99 (2 H, d, 3*J* = 7.5 Hz, CH), 8.63 (2 H, d, 3*J* = 7.5 Hz, CH). 13C NMR (75 MHz, CDCl3): *δ*C 13.4 (Me), 14.1 (Me), 29.7 (C*Me*3), 51.7 (2 MeO), 54.9 (C), 61.4 (CH2O), 61.9 (CH2O), 77.2 (Cspiro), 124.9 (C), 126.9 (2 CH), 128.5 (2 CH), 129.1 (2 CH), 129.2 (2 C), 131.2 (C), 139.7 (2 C), 140.4 (C), 147.2 (C), 154.5 (C), 157.1 (2 C), 160.0 (C=O), 162.2 (C=O), 162.5 (2 C=O). EI/MS: *m*/*z* (%) = 573 (*M*+, 27), 558 (100), 517 (7), 439 (23), 407 (11), 338 (7), 278(7). Anal. Calcd for C32H31NO9: (573.59): C, 67.01; H, 5.45; N, 2.44%. Found: C, 66.71; H, 5.46; N, 2.47%.

***Tetraethyl 5'-(tert-butylimino)-5'H-spiro[cyclopenta[a]acenaphthylene-8,2'-furan]-3',4',7,9-tetracarboxylate (4d)***

Yellow powder; yield: (0.54 g, 91%). Mp: 184–185 °C. IR (KBr) (*ν*max, cm−1): 1745 (C=O), 1721 (C=O), 1687 (C=N), 1263 (C=O). 1H NMR (300 MHz, CDCl3): *δ*H 0.92 (3 H, t, 3*J* = 7.1 Hz, Me), 1.30 (9 H, s, C*Me*3), 1.37 (3 H, t, 3*J* = 7.1 Hz, Me), 1.39 (6 H, t, 3*J* = 7.1 Hz, 2 Me), 4.02 (2 H, q, 3*J* = 7.1 Hz, CH2O), 4.22-4.45 (6 H, m, 3 CH2O), 7.72 (2 H, t, 3*J* = 7.5 Hz, CH), 7.98 (2 H, d, 3*J* = 7.5 Hz, CH), 8.67 (2 H, d, 3*J* = 7.5 Hz, CH). 13C NMR (75 MHz, CDCl3): *δ*C 13.4 (Me), 14.0 (3 Me), 29.7 (C*Me*3), 54.8 (C), 61.0 (2 CH2O), 61.3 (CH2O), 61.7 (CH2O), 77.2 (Cspiro), 125.4 (C), 127.0 (2 CH), 128.5 (2 CH), 129.1 (2 CH), 129.2 (2 C), 131.2 (C), 139.9 (2 C), 140.6 (C), 147.2 (C), 153.9 (C), 157.2 (2 C), 160.1 (C=O), 162.2 (C=O), 162.3 (2 C=O). EI/MS: *m*/*z* (%) = 601 (*M*+, 27), 586 (100), 556 (4), 466 (7), 421 (7), 393 (7), 293 (15). Anal. Calcd for C34H35NO9: (601.64): C, 67.87; H, 5.86; N, 2.33%. Found: C, 67.57; H, 5.84; N, 2.36%.

***3',4'-Di-tert-butyl 7,9-diethyl 5'-(tert-butylimino)-5'H-spiro[cyclopenta[a]acenaphthylene-8,2'-furan]-3',4',7,9-tetracarboxylate (4e)***

Yellow powder; yield: (0.61 g, 94%). Mp: 188–189 °C. IR (KBr) (*ν*max, cm−1): 1735 (C=O), 1718 (C=O), 1654 (C=N), 1262 (C-O). 1H NMR (500 MHz, CDCl3): *δ*H 1.11 (9 H, s, C*Me*3), 1.29 (9 H, s, C*Me*3), 1.40 (6 H, s, 2 Me), 1.61 (9 H, s, C*Me*3), 4.22-4.33 (2 H, br m, CH2O), 4.34-4.44 (2 H, br m, CH2O), 7.73 (2 H, t, 3*J* = 7.5 Hz, CH), 7.98 (2 H, d, 3*J* = 7.5 Hz, CH), 8.70 (2 H, d, 3*J* = 7.5 Hz, CH). 13C NMR (125 MHz, CDCl3): *δ*C 13.1 (2 Me), 26.6 (C*Me*3), 27.2 (C*Me*3), 28.7 (C*Me*3), 53.3 (CHN), 59.8 (2 CH2O), 77.2 (Cspiro), 81.4 (C), 81.8 (C), 125.0 (C), 125.8 (2 CH), 127.4 (2 CH), 127.9 (2 C), 128.3 (2 CH), 130.1 (C), 139.4 (2 C), 139.5 (C), 145.9 (C), 152.7 (C), 155.8 (2 C), 158.3 (C=O), 160.4 (C=O), 161.4 (2 C=O). EI‐MS: *m*/*z* (%) = 657 (*M*+, 15), 642 (54), 586 (7), 530 (100), 440 (15), 394 (15), 310 (15). Anal. Calcd for C38H43NO9: (657.75): C, 69.39; H, 6.59; N, 2.13%. Found: C, 69.04; H, 6.57; N, 2.15%.

***Tetramethyl 5'-(cyclohexylimino)-5'H-spiro[cyclopenta[a]acenaphthylene-8,2'-furan]-3',4',7,9-tetracarboxylate (4f)***

Yellow powder; yield: (0.47 g, 83%). Mp: 171–173°C. IR (KBr) (*ν*max, cm−1): 1752 (C=O), 1727 (C=O), 1649 (C=N), 1268 (C-O). 1H NMR (300 MHz, CDCl3): *δ*H 1.17-1.74 (10 H, m, 5 CH2), 3.61 (3 H, s, MeO), 3.61 (1 H, br m, CHN, overlapping with MeO), 3.90 (6 H, s, 2 MeO), 3.97 (3 H, s, MeO), 7.73 (2 H, t, 3*J* = 7.5 Hz, CH), 7.99 (2 H, d, 3*J* = 7.5 Hz, CH), 8.60 (2 H, d, 3*J* = 7.5 Hz, CH). 13C NMR (75 MHz, CDCl3): *δ*C 24.8 (2 CH2), 25.7 (CH2), 33.2 (2 CH2), 51.8 (2 MeO), 52.6 (MeO), 53.0 (MeO), 56.4 (CHN), 77.2 (Cspiro), 124.8 (C), 126.9 (2 CH), 128.5 (2 CH), 129.1 (2 C), 129.3 (2 CH), 131.2 (C), 139.0 (2 C), 140.8 (C), 147.3 (C), 155.4 (C), 157.1 (2 C), 160.5 (C=O), 162.5 (2 C=O), 162.6 (C=O). EI/MS: *m*/*z* (%) = 571 (*M*+, 54), 539 (58), 507 (19), 474 (88), 446 (100), 426 (35), 383 (42). Anal. Calcd for C32H29NO9: (571.57): C, 67.24; H, 5.11; N, 2.45%. Found: C, 66.94; H, 5.10; N, 2.47%.

***7,9-Diethyl 3',4'-dimethyl 5'-(cyclohexylimino)-5'H-spiro[cyclopenta[a]acenaphthylene-8,2'-furan]-3',4',7,9-tetracarboxylate (4g)***

Yellow powder; yield: (0.55 g, 92%). Mp: 176–178 °C. IR (KBr) (*ν*max, cm−1): 1752 (C=O), 1735 (C=O), 1653 (C=N), 1267 (C-N). 1H NMR (300 MHz, CDCl3): *δ*H 1.16-1.30 (4 H, m, 2 CH2), 1.38 (6 H, t, 3*J* = 7.1 Hz, 2 Me), 1.52-1.64 (2 H, m, CH2), 1.65-1.84 (4 H, m, 2 CH2), 3.61 (3 H, s, MeO), 3.61 (1 H, br m, CHN, overlapping with MeO), 3.95 (3 H, s, MeO), 4.33 (4 H, q, 3*J* = 7.1 Hz, 2 CH2O), 7.72 (2 H, t, 3*J* = 7.5 Hz, CH), 7.99 (2 H, d, 3*J* = 7.5 Hz, CH), 8.67 (2 H, d, 3*J* = 7.5 Hz, CH). 13C NMR (75 MHz, CDCl3): *δ*C 14.0 (2 Me), 24.8 (2 CH2), 25.7 (CH2), 33.4 (2 CH2), 52.6 (MeO), 52.8 (MeO), 56.5 (CHN), 61.1 (2 CH2O), 77.2 (Cspiro), 125.2 (C), 127.0 (2 CH), 128.5 (2 CH), 129.2 (2 C), 129.3 (2 CH), 131.2 (C), 139.1 (2 C), 141.1 (C), 147.3 (C), 155.6 (C), 157.3 (2 C), 160.5 (C=O), 162.3 (2 C=O), 162.5 (C=O). EI/MS: *m*/*z* (%) = 599 (*M*+, 92), 566 (54), 501 (85), 473 (27), 441 (50), 397 (100), 309 (42). Anal. Calcd for C34H33NO9: (599.63): C, 68.10; H, 5.55; N, 2.34%. Found: C, 67.80; H, 5.54; N, 2.36%.

***3',4'-Diethyl 7,9-dimethyl 5'-(cyclohexylimino)-5'H-spiro[cyclopenta[a]acenaphthylene-8,2'-furan]-3',4',7,9-tetracarboxylate (4h)***

Yellow powder; yield: (0.49 g, 82%). Mp: 179–180 °C. IR (KBr) (*ν*max, cm−1): 1741 (C=O), 1727 (C=O), 1687 (C=N), 1269 (C-O). 1H NMR (300 MHz, CDCl3): *δ*H 0.94 (3 H, t, 3*J* = 7.1 Hz, Me), 1.12-1.33 (4 H, m, 2 CH2), 1.39 (3 H, t, 3*J* = 7.1 Hz, Me), 1.51-1.64 (2 H, m, CH2), 1.66-1.82 (4 H, m, 2 CH2), 3.59-3.66 (1 H, m, CHN), 3.89 (6 H, s, 2 MeO), 4.02 (2 H, q, 3*J* = 7.1 Hz, CH2O), 4.42 (2 H, q, 3*J* = 7.1 Hz, CH2O), 7.72 (2 H, t, 3*J* = 7.5 Hz, CH), 7.99 (2 H, d, 3*J* = 7.5 Hz, CH), 8.61 (2 H, d, 3*J* = 7.5 Hz, CH). 13C NMR (75 MHz, CDCl3): *δ*C 13.5 (Me), 14.1 (Me), 24.7 (2 CH2), 25.7 (CH2), 33.2 (2 CH2), 51.7 (2 MeO), 56.3 (CHN), 61.4 (CH2O), 62.0 (CH2O), 77.2 (Cspiro), 125.0 (C), 126.9 (2 CH), 128.5 (2 CH), 129.1 (2 C), 129.2 (2 CH), 131.2 (C), 139.2 (2 C), 140.7 (C), 147.2 (C), 155.5 (C), 157.0 (2 C), 160.1 (C=O), 162.1 (C=O), 162.6 (2 C=O). EI/MS: *m*/*z* (%) = 599 (*M*+, 42), 553 (30), 501 (100), 473 (19), 441 (77), 397 (38), 297 (23). Anal. Calcd for C34H33NO9: (599.63): C, 68.10; H, 5.55; N, 2.34%. Found: C, 68.38; H, 5.57; N, 2.35%.

***Tetraethyl 5'-(cyclohexylimino)-5'H-spiro[cyclopenta[a]acenaphthylene-8,2'-furan]-3',4',7,9-tetracarboxylate (4i)***

Yellow powder; yield: (0.56 g, 90%). Mp: 183–184 °C. IR (KBr) (*ν*max, cm−1): 1746 (C=O), 1728 (C=O), 1689 (C=N), 1265 (C=O). 1H NMR (300 MHz, CDCl3): *δ*H 0.92 (3 H, t, 3*J* = 7.1 Hz, Me), 1.12-1.31 (4 H, m, 2 CH2), 1.38 (9 H, t, 3*J* = 7.1 Hz, 3 Me), 1.50-1.63 (2 H, m, CH2), 1.65-1.83 (4 H, m, 2 CH2), 3.60-3.66 (1 H, m, CHN), 4.02 (2 H, q, 3*J* = 7.1 Hz, CH2O), 4.32 (2 H, q, 3*J* = 7.1 Hz, CH2O), 4.42 (4 H, q, 3*J* = 7.1 Hz, 2 CH2O), 7.72 (2 H, t, 3*J* = 7.5 Hz, CH), 7.98 (2 H, d, 3*J* = 7.5 Hz, CH), 8.68 (2 H, d, 3*J* = 7.5 Hz, CH). 13C NMR (75 MHz, CDCl3): *δ*C 13.5 (Me), 14.0 (3 Me), 24.7 (2 CH2), 25.7 (CH2), 33.4 (2 CH2), 56.3 (CHN), 61.0 (2 CH2O), 61.4 (CH2O), 61.9 (CH2O), 77.2 (Cspiro), 125.4 (C), 127.0 (2 CH), 128.5 (2 CH), 129.1 (2 C), 129.2 (2 CH), 131.2 (C), 139.2 (2 C), 141.0 (C), 147.2 (C), 155.7 (C), 157.3 (2 C), 160.0 (C=O), 162.0 (C=O), 162.3 (2 C=O). EI/MS: *m*/*z* (%) = 627 (*M*+, 61), 581 (100), 529 (92), 455 (88), 411 (77), 383 (23), 309 (46). Anal. Calcd for C36H37NO9: (627.68): C, 68.89; H, 5.94; N, 2.23%. Found: C, 68.59; H, 5.96; N, 2.25%.

***3',4'-Di-tert-butyl 7,9-diethyl 5'-(cyclohexylimino)-5'H-spiro[cyclopenta[a]acenaphthylene-8,2'-furan]-3',4',7,9-tetracarboxylate (4j)***

Yellow powder; yield: (0.64 g, 95%). Mp: 186–187 °C. IR (KBr) (*ν*max, cm−1): 1744 (C=O), 1717 (C=O), 1689 (C=N), 1265 (C-O). 1H NMR (500 MHz, CDCl3): *δ*H 1.11 (9 H, s, C*Me*3), 1.22-1.32 (4 H, m, CH2), 1.38 (6 H, t, 3*J* = 7.1 Hz, 2 Me), 1.40-1.50 (2 H, m, CH2), 1.61 (9 H, s, C*Me*3), 1.69-1.81 (4 H, m, CH2), 3.60-3.70 (1 H, m, CHN), 4.27-4.39 (4 H, m, 2 CH2O), 7.74 (2 H, t, 3*J* = 7.5 Hz, CH), 7.99 (2 H, d, 3*J* = 7.5 Hz, CH), 8.70 (2 H, d, 3*J* = 7.5 Hz, CH). 13C NMR(125 MHz, CDCl3): *δ*C 13.1 (2 Me), 23.4 (2 CH2), 24.9 (CH2), 26.5 (C*Me*3), 27.2 (C*Me*3), 32.4 (2 CH2), 54.6 (CHN), 59.8 (2 CH2O), 77.2 (Cspiro), 81.5 (C), 81.9 (C), 125.0 (C), 125.8 (2 CH), 127.5 (2 CH), 127.9 (2 C), 128.3 (2 CH), 130.1 (C), 137.6 (C), 141.2 (C), 145.9 (C), 154.4 (C), 155.9 (2 C), 158.4 (C=O), 160.0 (C=O), 161.4 (2 C=O). EI‐MS: *m*/*z* (%) = 683 (*M*+, 15), 642 (54), 586 (7), 530 (100), 440 (15), 394 (15), 310 (15). Anal. Calcd for C40H45NO9: (683.79): C, 70.26; H, 6.63; N, 2.05%. Found: C, 69.92; H, 6.65; N, 2.06%.

1H and 13C NMR spectra for compounds **4a-4j**

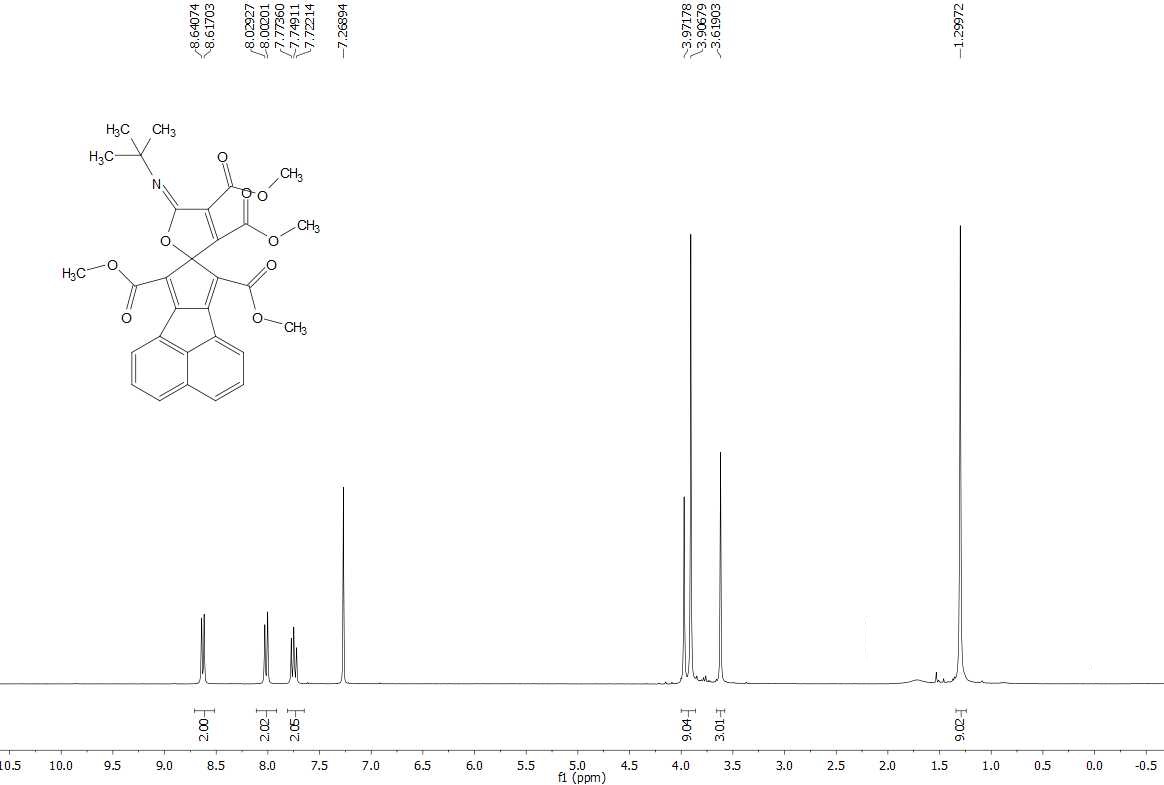


Figure S1 (300-MHz) 1H NMR spectrum of compound **4a** in CDCl3

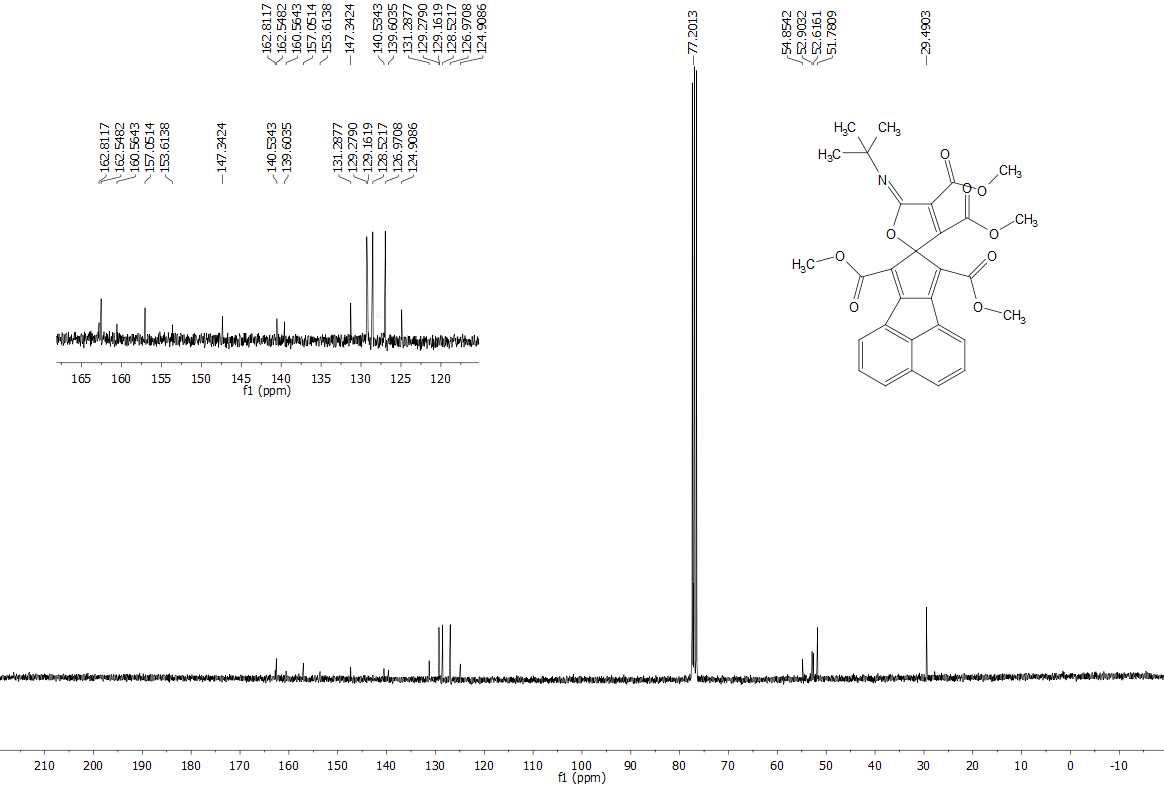


Figure S2 (75-MHz) 13C NMR spectrum of compound **4a** in CDCl3

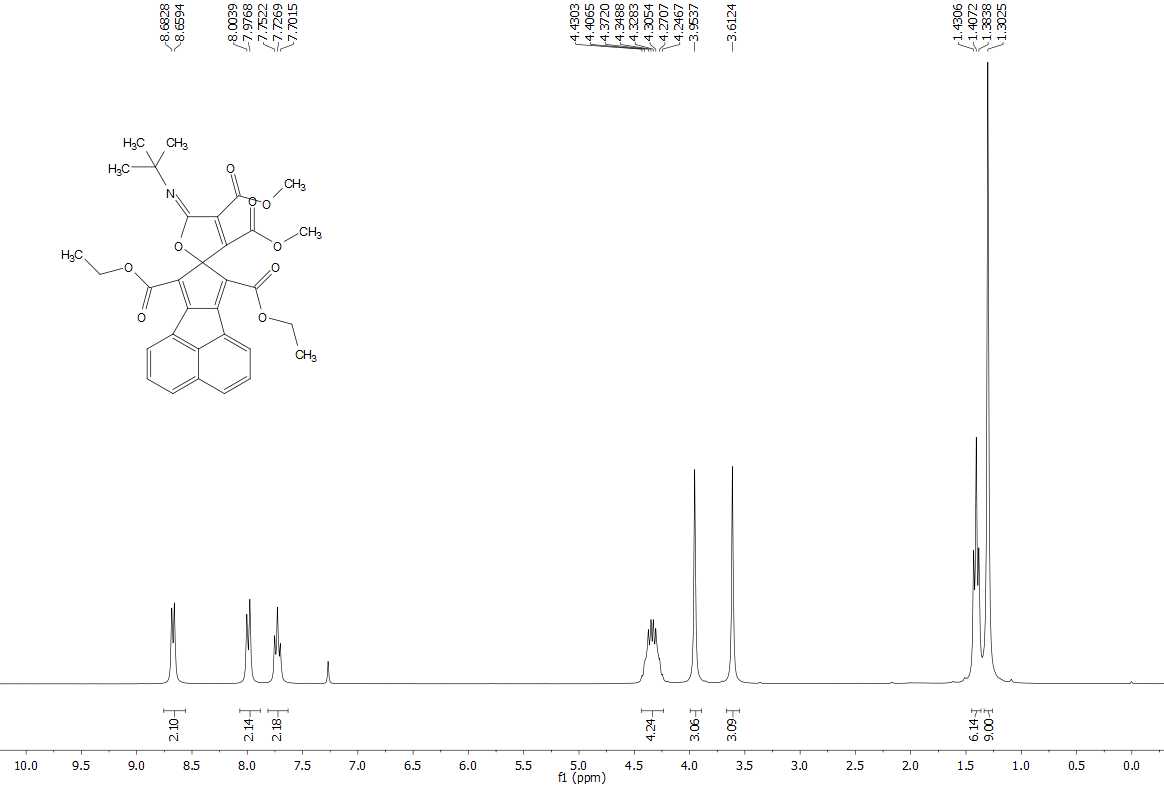


Figure S3 (300-MHz) 1H NMR spectrum of compound **4b** in CDCl3

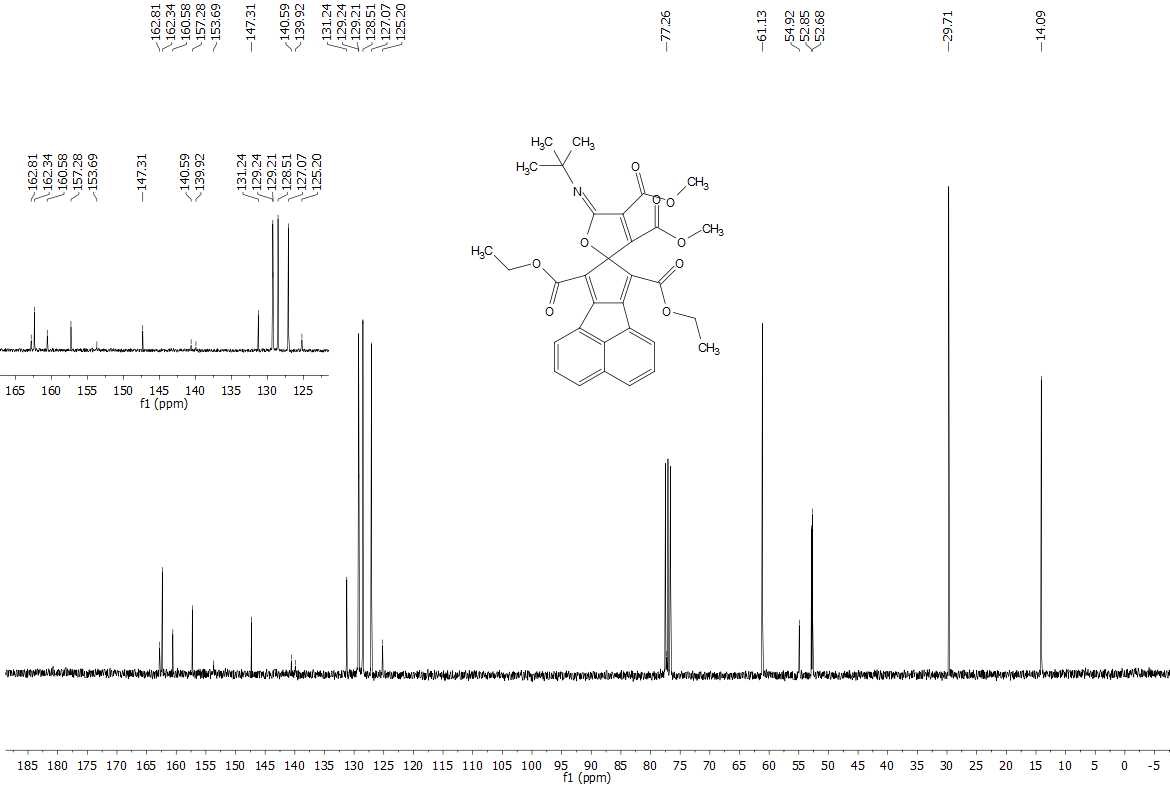


Figure S4 (75-MHz) 13C NMR spectrum of compound **4b** in CDCl3

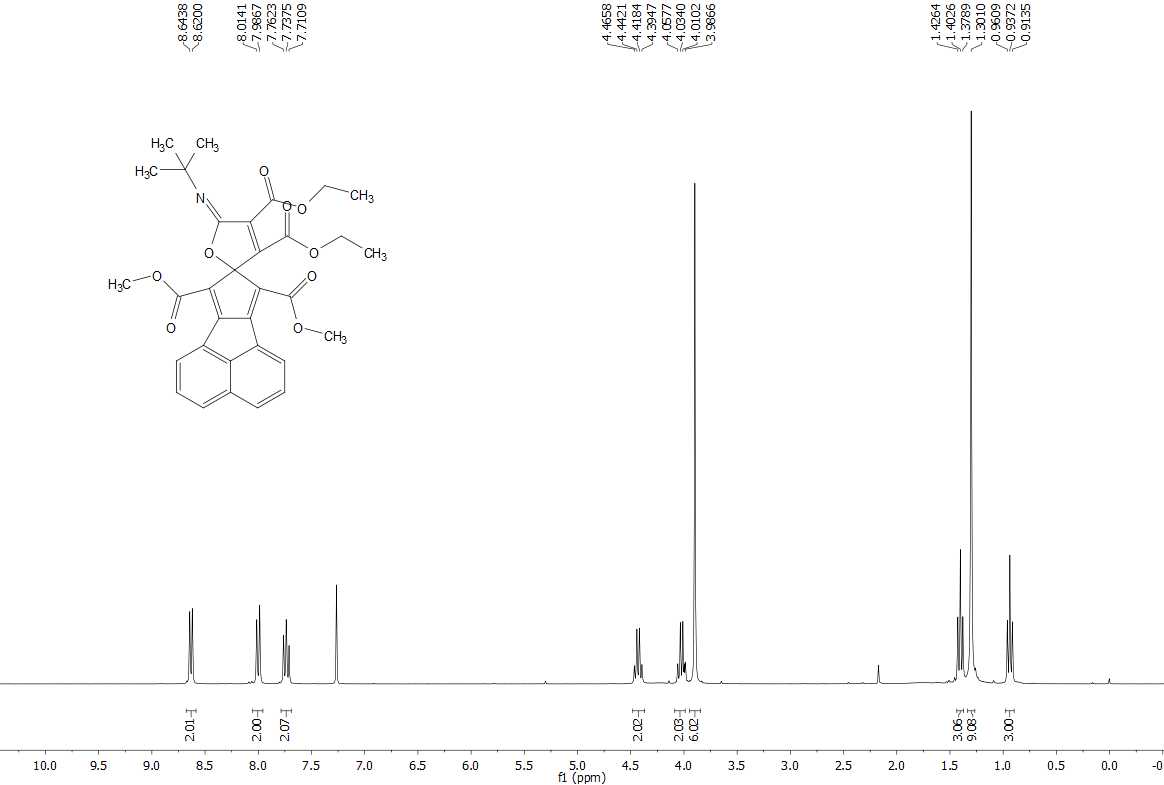


Figure S5 (300-MHz) 1H NMR spectrum of compound **4c** in CDCl3

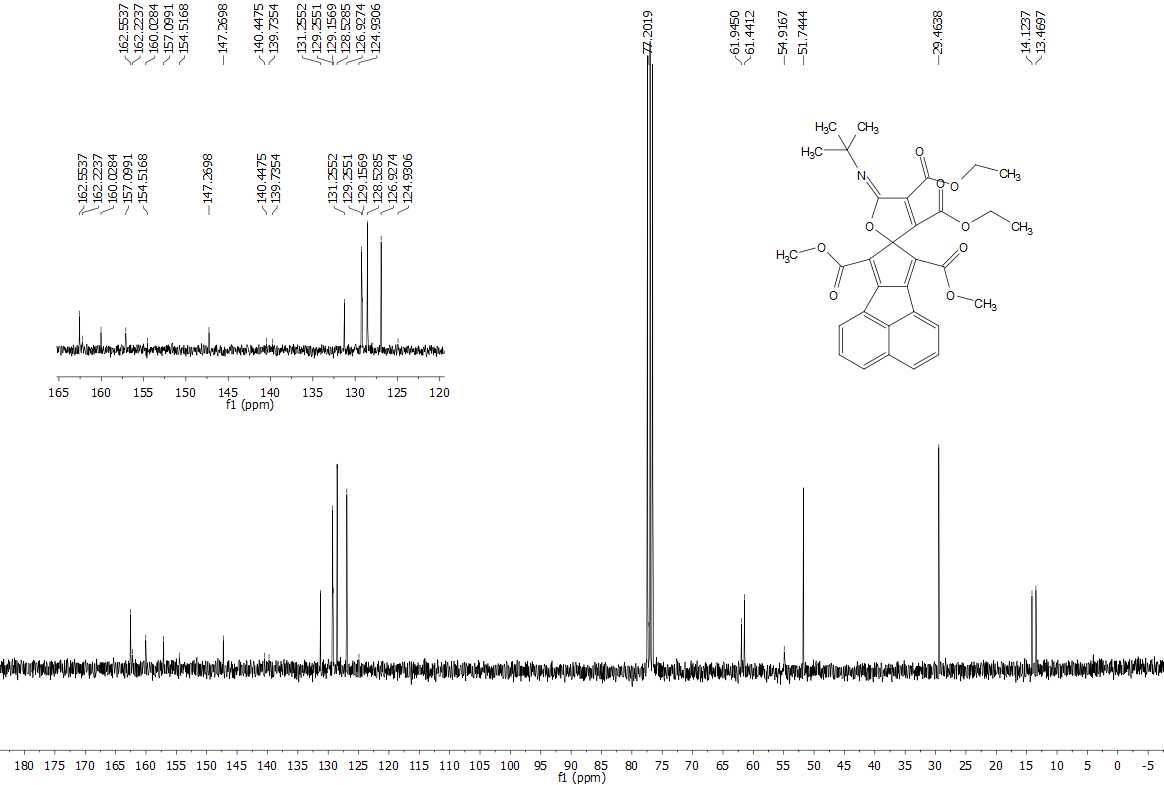


Figure S6 (75-MHz) 13C NMR spectrum of compound **4c** in CDCl3

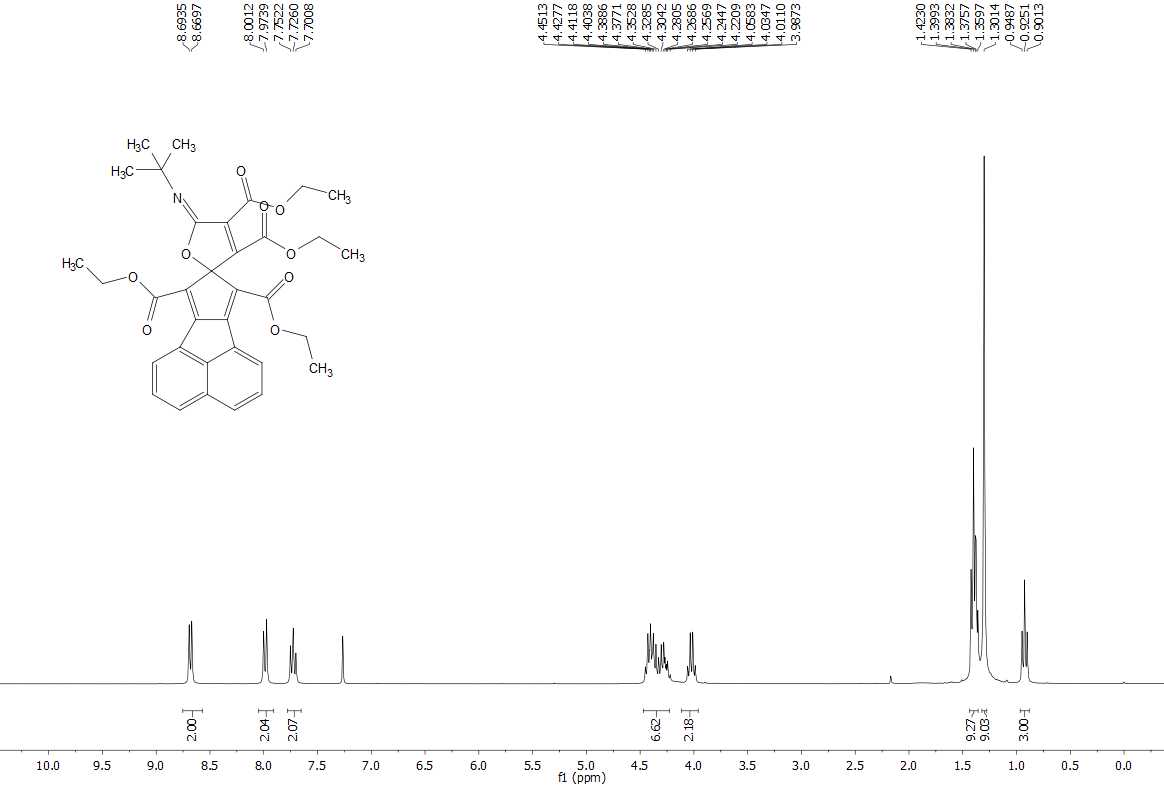


Figure S7 (300-MHz) 1H NMR spectrum of compound **4d** in CDCl3

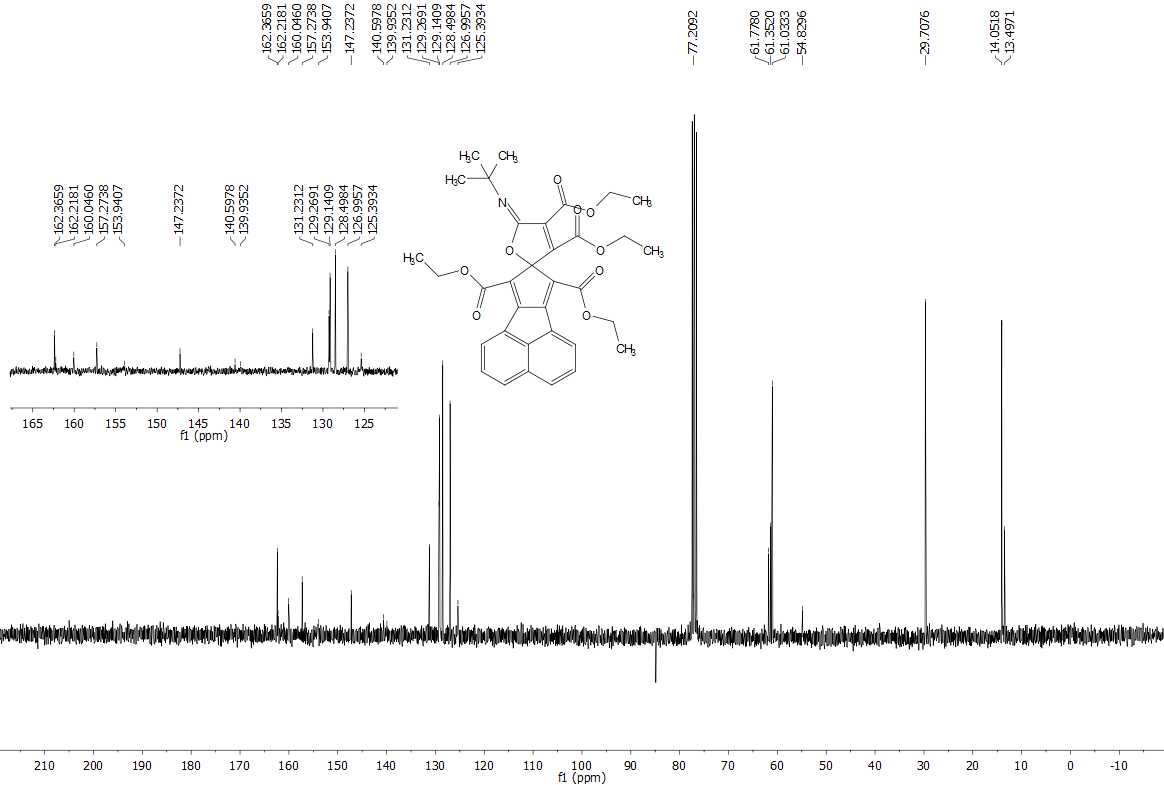


Figure S8 (75-MHz) 13C NMR spectrum of compound **4d** in CDCl3

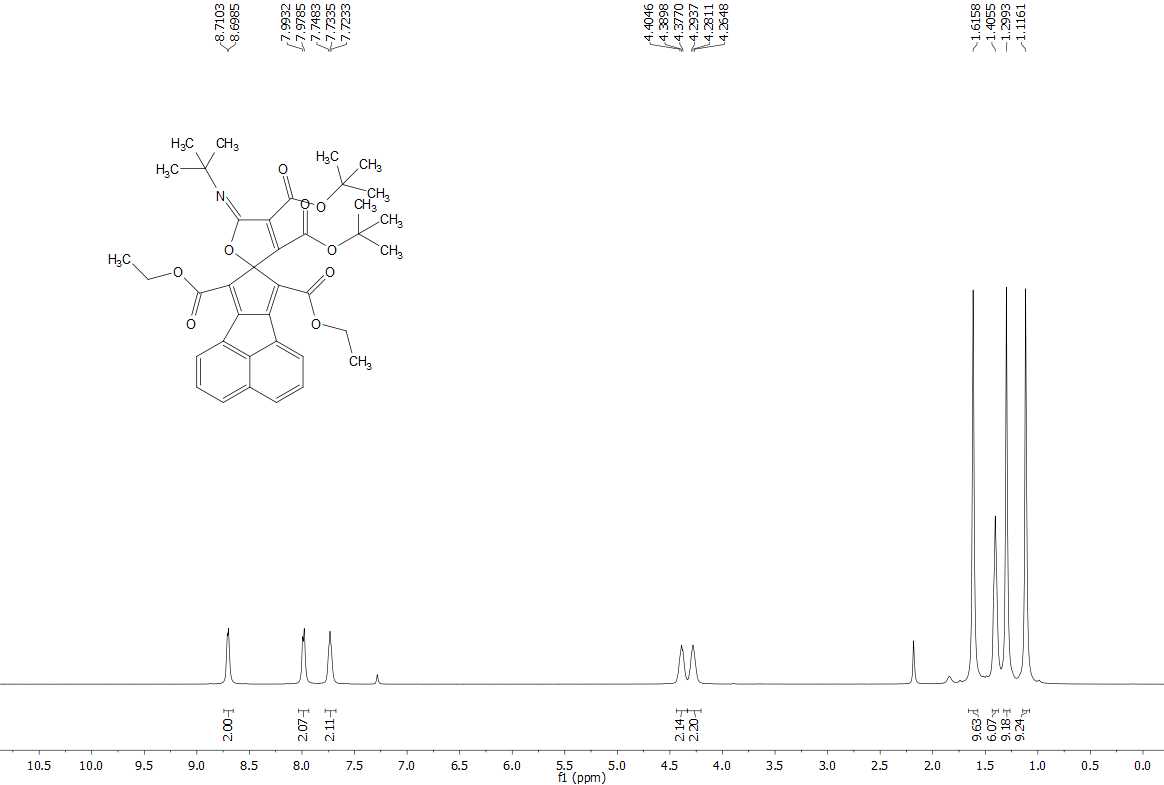


Figure S9 (500-MHz) 1H NMR spectrum of compound **4e** in CDCl3

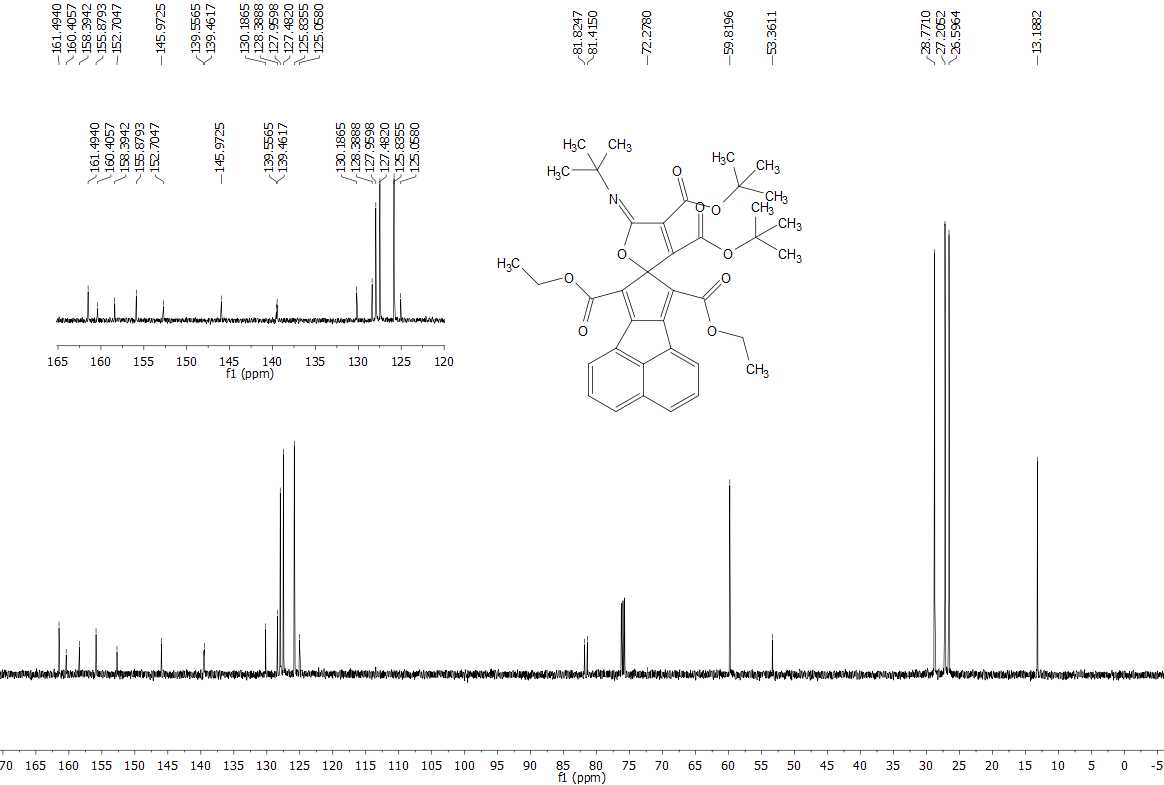


Figure S10 (125-MHz) 13C NMR spectrum of compound **4e** in CDCl3

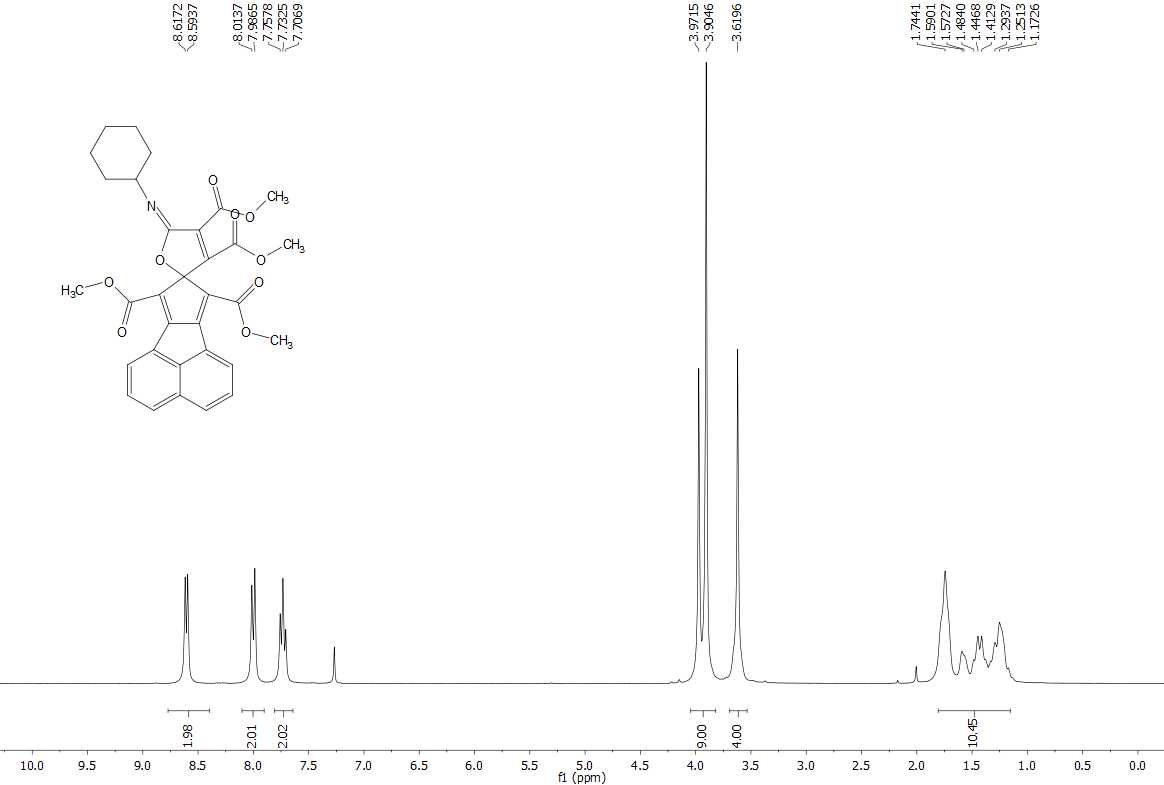


Figure S11 (300-MHz) 1H NMR spectrum of compound **4f** in CDCl3

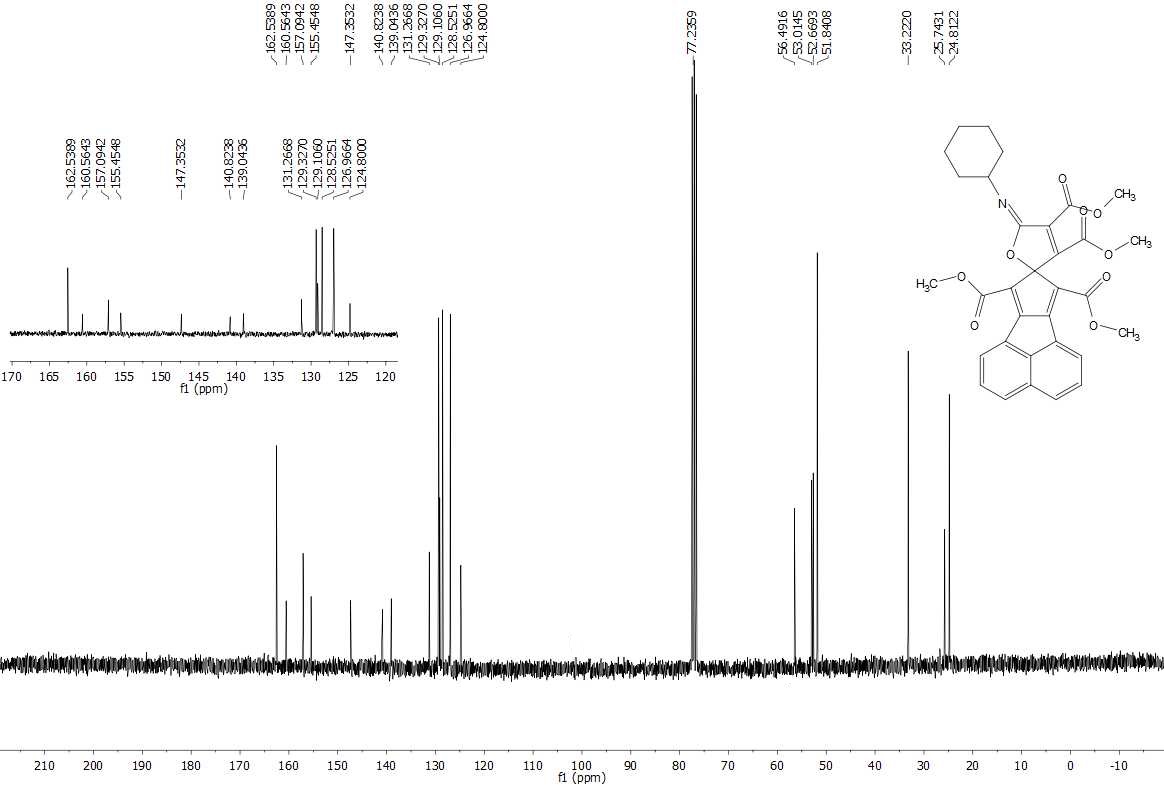


Figure S12 (75-MHz) 13C NMR spectrum of compound **4f** in CDCl3

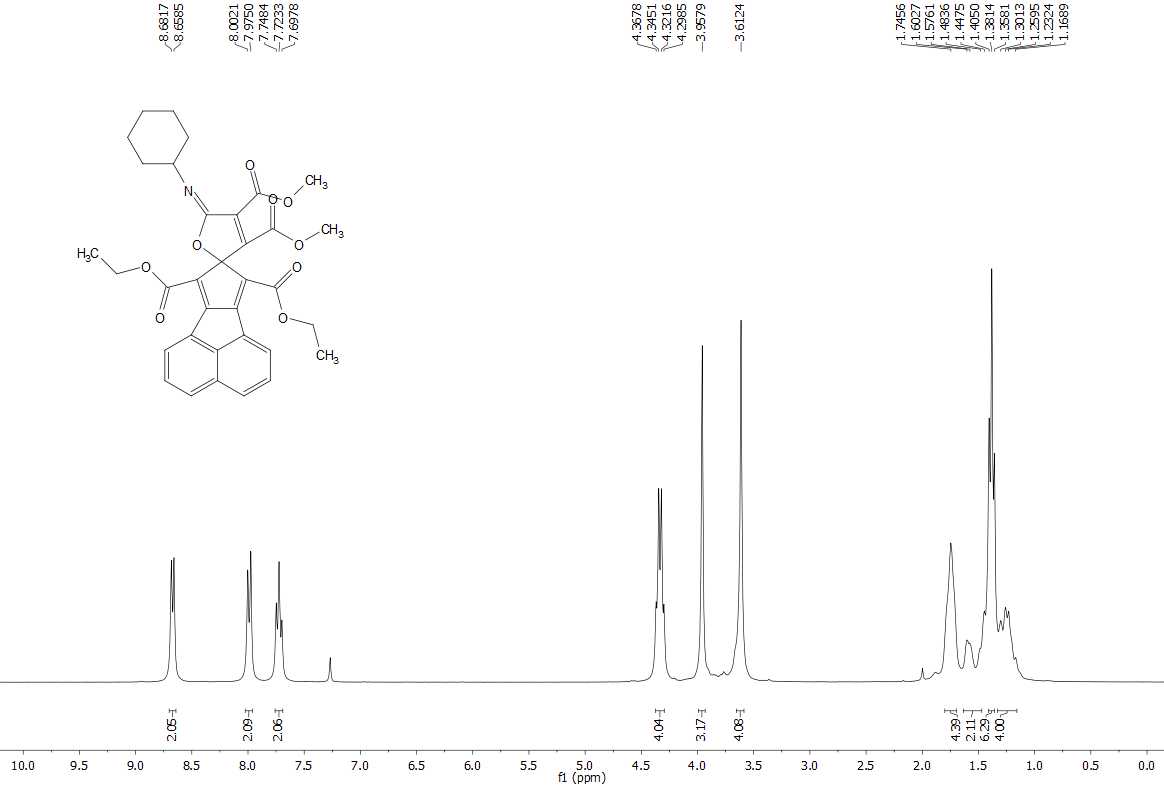


Figure S13 (300-MHz) 1H NMR spectrum of compound **4g** in CDCl3

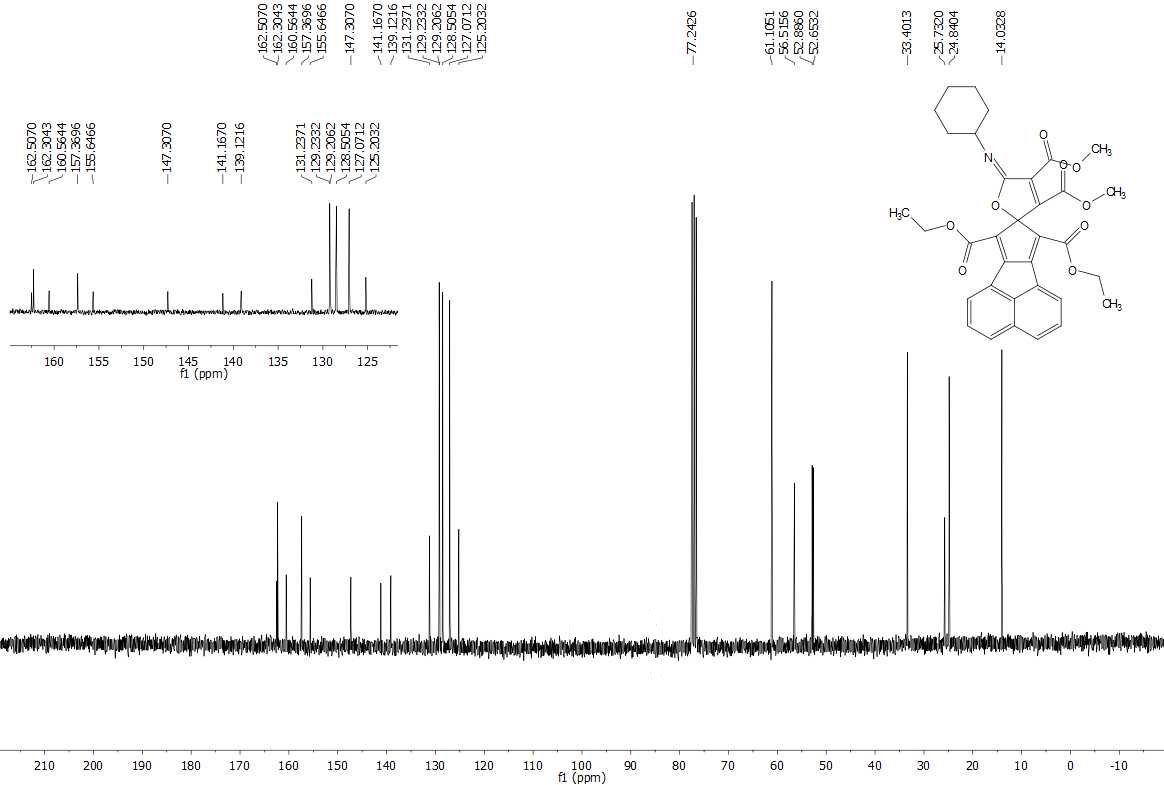


Figure S14 (75-MHz) 13C NMR spectrum of compound **4g** in CDCl3

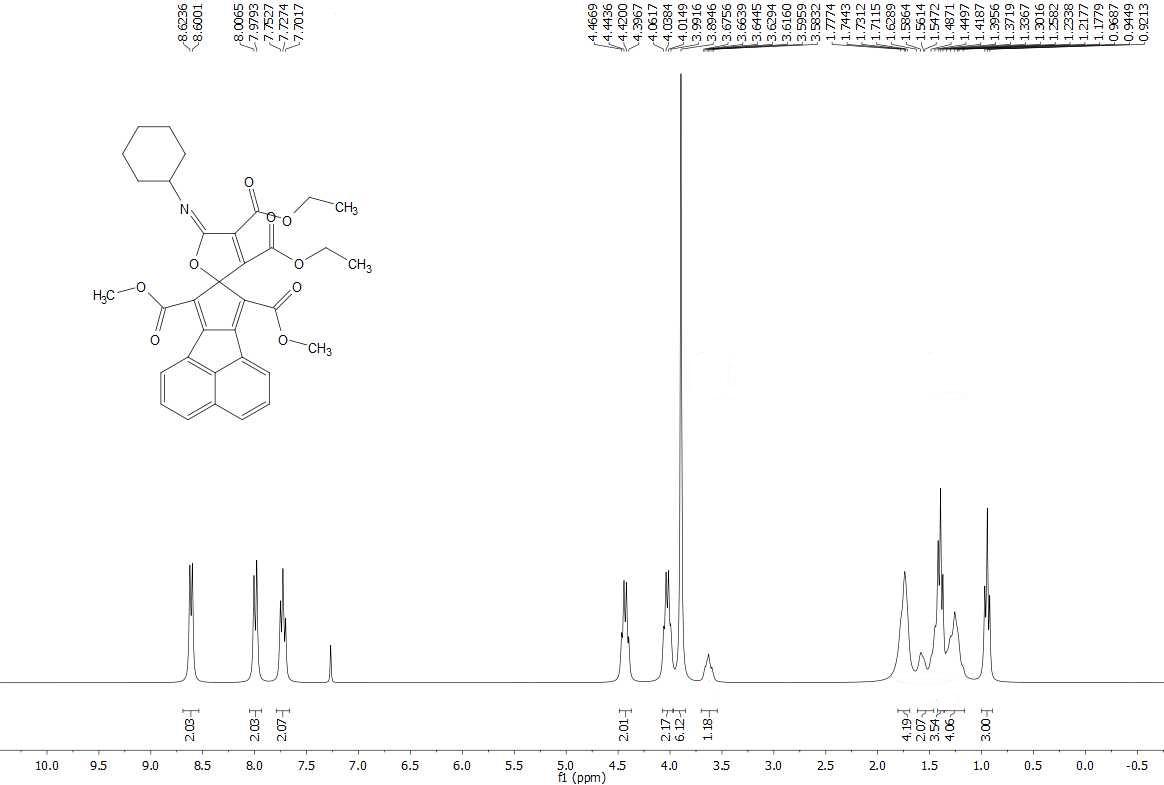


Figure S15 (300-MHz) 1H NMR spectrum of compound **4h** in CDCl3

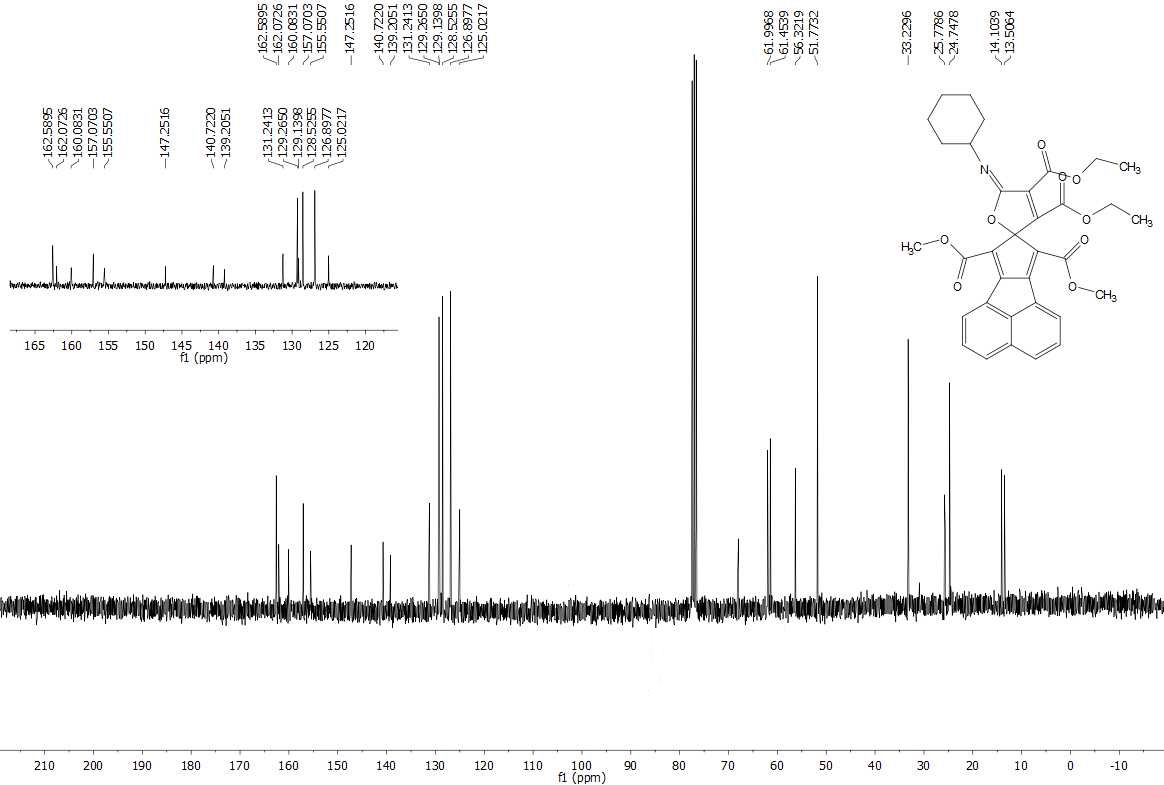


Figure S16 (75-MHz) 13C NMR spectrum of compound **4h** in CDCl3

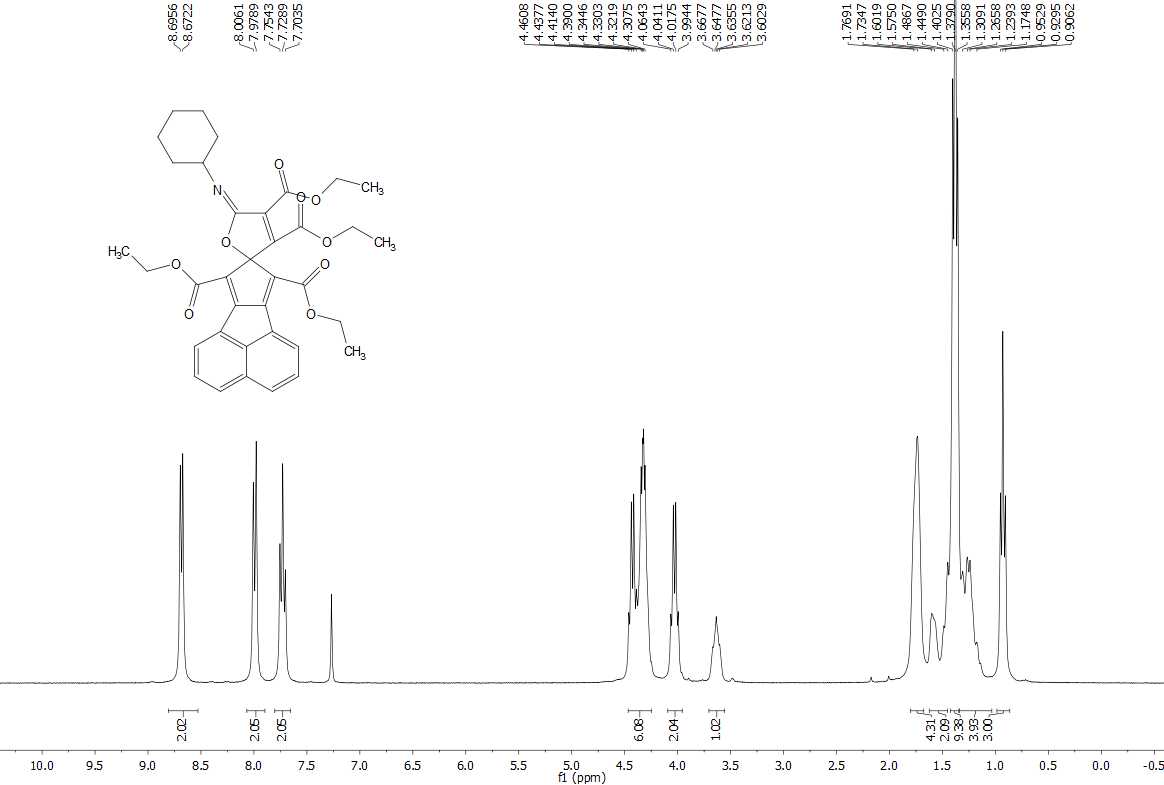
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Figure S17 (300-MHz) 1H NMR spectrum of compound **4i** in CDCl3

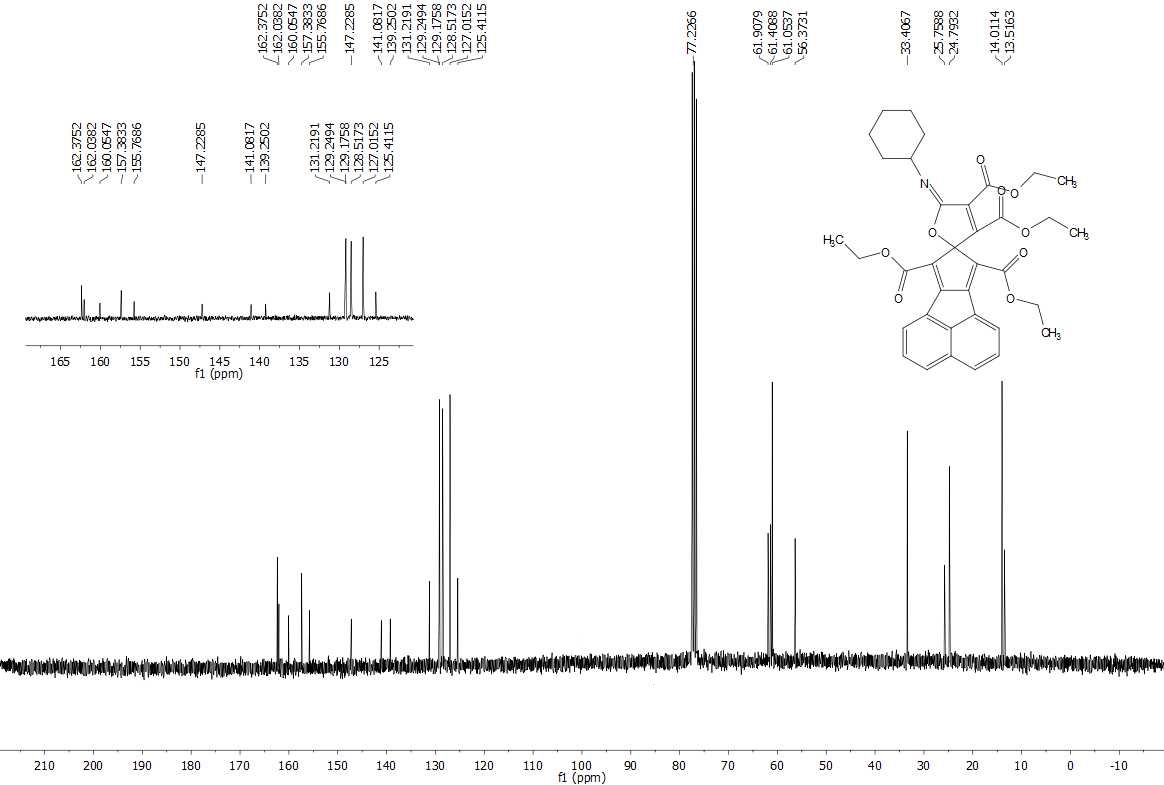


Figure S18 (75-MHz) 13C NMR spectrum of compound **4i** in CDCl3

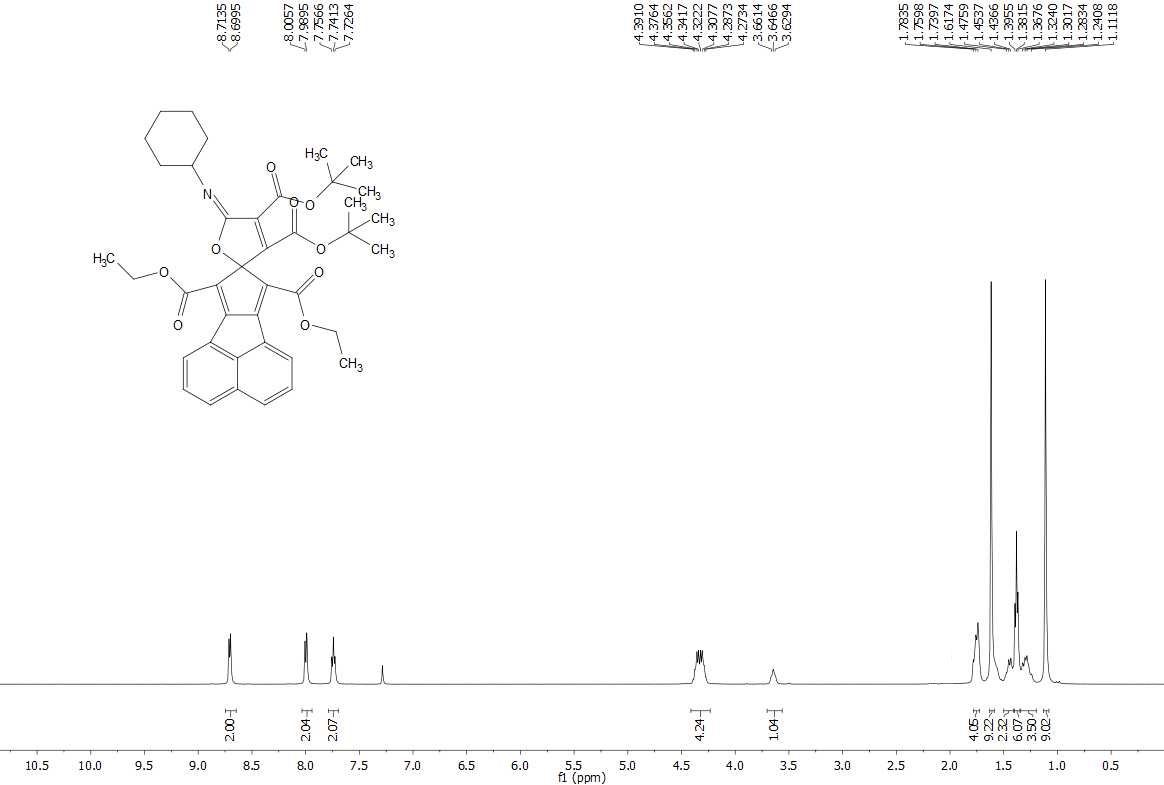
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Figure S19 (500-MHz) 1H NMR spectrum of compound **4j** in CDCl3

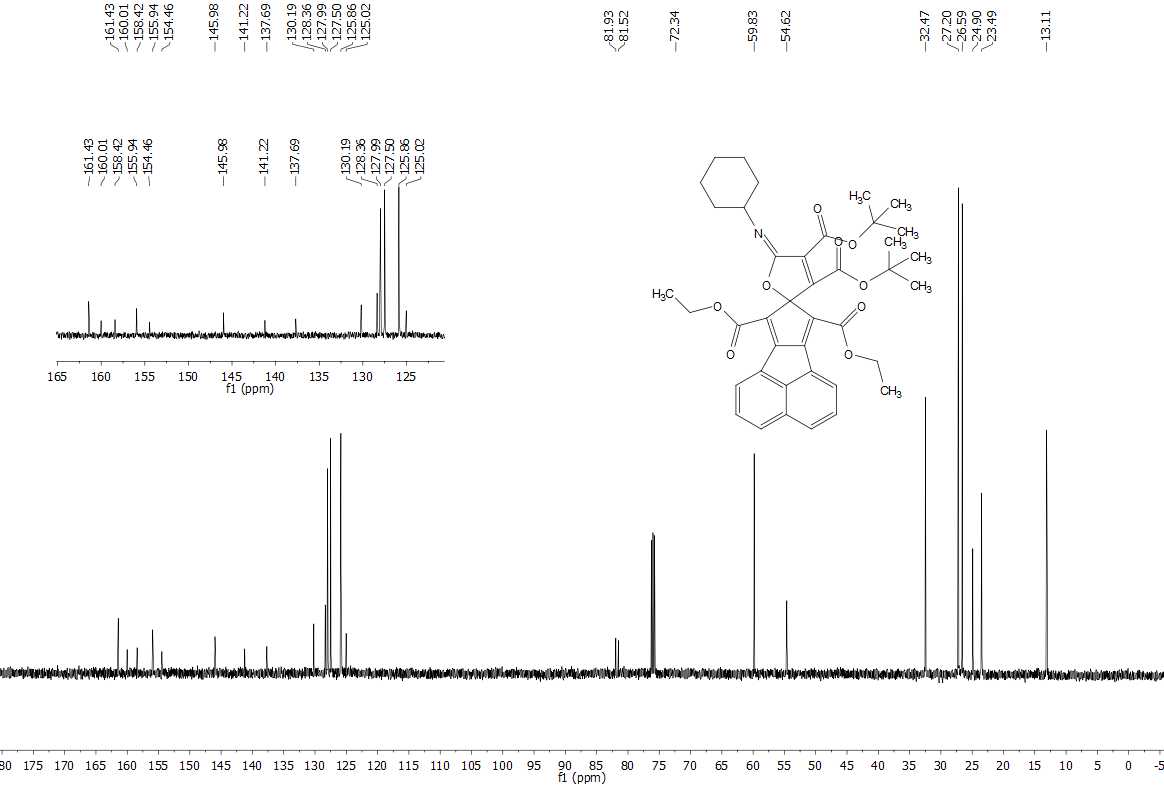


Figure S20 (125-MHz) 13C NMR spectrum of compound **4j** in CDCl3