

第七章 衍生物之光譜資料

cpd 2

$^1\text{H NMR}$ (500 MHz, CDCl_3) 的 δ ppm 爲

1.06 (3H, s) 1.09 (3H, s) 1.28 (3H, s) 1.54 (3H, bs) 1.61 (1H, m)
1.95-2.25 (5H, m) 2.58 (1H, m) 4.96 (1H, t) 5.16 (1H, d) 5.23 (1H, dd) 5.98 (1H, dd)

IR : 1239, 822, 785 cm^{-1}

cpd 3

$^1\text{H NMR}$ (500 MHz, CDCl_3) 的 δ ppm 爲

1.06 (3H, s) 1.17 (3H, s) 1.29 (6H, s) 1.54-1.60 (3H, m) 2.11-2.25 (3H, m) 1.95-2.25 (5H, m) 2.48 (1H, d) 2.65 (1H, dd) 2.74 (1H, dd) 5.30 (1H, d) 5.55 (1H, dd)

m.p. : 97-101 $^{\circ}\text{C}$

cpd 5

$^1\text{H NMR}$ (500 MHz, CDCl_3) 的 δ ppm 爲

1.06 (3H, s) 1.12 (3H, s) 1.24 (3H, s) 1.74 (3H, bs) 4.7 (1H, d, $J=6.5$)
5.06 (1H, d $J=16$) 5.22 (1H, d, $J=11$) 5.67 (1H, d, $J=8.5$) 5.98 (1H, dd,

J=8)

IR : 3600-3100 cm^{-1}

cpd 7

^1H NMR (500 MHz, CDCl_3) 的 δ ppm 爲

1.04 (3H, s) 1.12 (3H, s) 1.34 (3H, s) 1.45 (3H, bs) 1.96-2.21 (6H, m) 3.35 (1H, d, J=6) 3.43 (1H, d, J=2.5) 5.06 (1H, m) 5.38 (1H, m)

IR 3500, 1660, 1370, 1180, 1060, 955, 870, 840, 770 cm^{-1}

cpd 8

1.04 (6H, s) 1.45 (3H, s) 1.84 (3H, s) 2.35-2.53 (6H, m) 5.13 (2H, m)

5.84 (2H, m)

^{13}C NMR (500 MHz, CDCl_3) 的 δ ppm 爲

16.53, 19.05, 27.18, 27.55, 35.97, 38.29, 38.96, 39.23, 41.41, 124.58, 124.95, 127.14, 135.67, 141.19, 141.35, 211.29

IR

EI-MASS

cpd 9

^1H NMR (500 MHz, CDCl_3) 的 δ ppm 爲

0.90 (3H, s) 1.10 (3H, s) 1.60 (3H, s) 1.50 (3H, bs) 1.80 (2H, m)

2.28-2.90 (4H, m) 3.44 (1H, d, J=6) 4.92 (2H, m) 5.48 (1H, d, J=16)

IR : 1720, 1390, 1370, 1230, 980, 860, 825, 770 cm^{-1}

cpd 10

^1H NMR (500 MHz, CDCl_3) 的 δ ppm 爲

1.07 (3H, s) 1.08 (3H, s) 1.58 (3H, s) 1.65 (3H, s) 1.80-2.20 (6H, m)
4.63 (1H, d, $J=7$) 4.82 (1H, dd, $J=4.75$) 5.25 (1H, m) 5.56 (1H, dd,
 $J=8.5$)

IR



cpd 12

^1H NMR (500 MHz, CDCl_3) 的 δ ppm 爲

1.04 (3H, s) 1.08 (3H, s) 1.61 (3H, s) 1.85-2.20 (8H, m) 2.58 (1H, d,
 $J=4.5$) 2.88 (1H, d, $J=4.5$) 3.92 (1H, d, $J=5$) 5.12 (3H, m)

^{13}C NMR (500 MHz, CDCl_3) 的 δ ppm 爲

17.411, 25.840, 28.467, 32.124, 36.835, 38.469, 41.256, 48.831, 60.964,
67.377, 120.268, 123.888, 136.234, 143.526

IR

EI-MASS

cpd 13

^1H NMR (500 MHz, CDCl_3) 的 δ ppm 爲

1.08 (3H, s) 1.22 (3H, s) 1.29 (3H, s) 1.86 (3H, s) 1.45 (2H, t, $J=11.5$)
1.92 (1H, d, $J=14$) 2.27 (1H, d, $J=14$) 2.40 (2H, m) 2.73 (1H, d, $J=11.5$)
6.09-6.11 (3H, m)

cpd 14

^1H NMR (500 MHz, CDCl_3) 的 δ ppm 爲

1.06 (3H, s) 1.07 (3H, s) 1.43 (3H, s) 1.54 (3H, s) 1.67 (3H, s)
1.99-2.22 (8H, m) 4.91 (1H, t, $J=7$) 5.16 (1H, bs) 5.26 (1H, d, $J=16.5$)
5.66 (1H, dd, $J=8$)

^{13}C NMR (500 MHz, CDCl_3) 的 δ ppm 爲

12.74, 15.10, 23.59, 25.99, 27.78, 29.71, 37.20, 39.73, 42.16, 75.74,
124.35, 124.64, 126.99, 133.69, 137.50, 138.60, 144.43

IR

cpd 15

^1H NMR (500 MHz, CDCl_3) 的 δ ppm 爲

0.89 (3H, t, $J=6.5$) 1.05 (3H, s) 1.07 (3H, s) 1.43 (3H, s) 1.65 (3H, s)
1.73-2.21 (8H, m) 4.90 (1H, dd, $J=5$) 5.06 (1H, t, $J=6.75$) 5.37 (1H, d,
 $J=16.5$) 5.63 (1H, d, $J=16.5$)

IR

EI-MASS

cpd 16

^1H NMR (500 MHz, CDCl_3) 的 δ ppm 爲

1.05 (3H, s) 1.07 (3H, s) 1.52 (3H, s) 1.65 (3H, s) 1.76-2.19 (6H, m)
4.60 (1H, d, $J=6$) 4.81 (1H, d, $J=4.5$) 5.22 (3H, m) 5.52 (1H, dd,
 $J=3.5$)

^{13}C NMR (500 MHz, CDCl_3) 的 δ ppm 爲

12.73, 15.06, 22.96, 24.24, 29.43, 29.71, 37.17, 39.19, 41.99, 78.67,
102.53, 124.88, 131.44, 133.03, 139.36, 139.80, 141.88

IR

cpd 17

^1H NMR (500 MHz, CDCl_3) 的 δ ppm 爲

1.09 (3H, s) 1.12 (3H, s) 1.45 (3H, s) 1.55 (3H, s) 2.09-2.22 (6H, m)
4.99 (1H, dd, $J=5.6$) 5.39 (1H, t, $J=3.5$) 5.60 (1H, d, $J=16$) 5.93 (1H, d,
 $J=16$) 7.30 (3 H, m) 7.45 (2H, d, $J=8$)

^{13}C NMR (500 MHz, CDCl_3) 的 δ ppm 爲

13.30, 15.09, 23.22, 23.89, 30.09, 37.73, 39.46, 42.20, 80.29, 124.48,
126.45, 126.56, 127.05, 127.83, 128.26, 128.76, 129.53, 134.26, 135.32,
140.52, 142.72

IR

EI-MASS : 296.2146(M^+)

cpd 18

^1H NMR (500 MHz, CDCl_3) 的 δ ppm 爲

0.97 (3H, d, $J=5$) 1.07 (3H, d, $J=5$) 1.14 (3H, s) 1.17 (3H, s) 1.54 (3H, s) 1.63-2.46 (7H, m) 2.46 (1H, dd, $J=3.37$) 5.01 (1H, dd, $J=5.75$) 6.07 (1H, d, $J=16$) 6.19 (1H, d, $J=16$)

^{13}C NMR (500 MHz, CDCl_3) 的 δ ppm 爲

6.91, 16.66, 20.34, 23.02, 28.17, 29.09, 29.71, 34.65, 38.55, 39.92, 41.56, 52.45, 121.81, 128.27, 138.28, 151.03, 204.02

IR

EI-MASS : 234.1989(M^+)

cpd 19

^1H NMR (500 MHz, CDCl_3) 的 δ ppm 爲

0.92 (3H, t, $J=6$) 1.11 (3H, s) 1.17 (3H, s) 1.29 (3H, s) 1.54 (3H, bs) 1.56-2.20 (13H, m) 2.53 (1H, m) 5.03 (1H, dd, $J=3.5$) 6.01 (1H, m) 6.26 (1H, m)

^{13}C NMR (500 MHz, CDCl_3) 的 δ ppm 爲

7.40, 7.89, 16.27, 16.38, 22.82, 23.04, 23.46, 25.19, 25.66, 25.97, 28.95, 29.00, 29.71, 30.41, 31.07, 39.79, 40.21, 40.28, 40.34, 41.66, 44.29, 44.60, 48.05, 48.46, 48.60, 49.09, 67.22, 67.80, 81.96, 84.42, 121.79, 122.33, 127.42, 127.70, 138.12, 138.66, 151.13, 151.74, 202.71, 203.90

IR

cpd 20

^1H NMR (500 MHz, CDCl_3) 的 δ ppm 爲

1.04 (3H, s) 1.09 (3H, s) 1.25 (3H, s) 1.55 (3H, s) 1.64 (3H, bs) 2.06 (3H, s) 1.33 (2H, m) 1.77-1.89 (4H, m) 2.27 (1H, d, J=13) 4.88 (3H, m)

^{13}C NMR (500 MHz, CDCl_3) 的 δ ppm 爲

15.70, 22.28, 23.41, 26.52, 30.12, 33.50, 35.50, 38.59, 39.61, 57.16, 75.91, 126.43, 129.17, 136.24, 143.62

IR

EI-MASS : 250.1931(M^+)

cpd 21

^1H NMR (500 MHz, CDCl_3) 的 δ ppm 爲

0.97 (3H, t) 1.12 (3H, s) 1.03 (3H, s) 1.08 (3H, s) 1.64 (3H, bs) 1.77-2.88 (8H, m) 4.84 (3H, m)

IR

EI-MASS : 264.2092(M^+)

cpd 22

^1H NMR (500 MHz, CDCl_3) 的 δ ppm 爲

0.9 (3H, s) 1.16 (3H, s) 1.37 (3H, s) 1.68 (3H, s) 1.75-2.35 (7H, m) 4.95-5.38 (2H, m) 5.34 (1H, d, J=17) 7.25-7.44 (5H, m)

^{13}C NMR (500 MHz, CDCl_3) 的 δ ppm 爲

17.58, 22.33, 23.60, 26.66, 30.09, 32.10, 33.53, 35.55, 38.80, 39.69, 55.58, 126.49, 127.27, 127.88, 127.95, 130.10, 130.32, 132.11, 135.47, 136.45, 143.45

IR

EI-MASS : 312.2(M^+)

cpd 23

^1H NMR (500 MHz, CDCl_3) 的 δ ppm 爲

1.07 (3H, s) 1.10 (3H, s) 1.23 (3H, s) 1.68 (3H, bs) 1.63-2.34 (6H, m) 2.61 (2H, d, $J=6$) 2.66 (2H, d, $J=5.5$) 5.07 (1H, d, $J=11.5$) 5.30 (1H, d, $J=7$) 5.62 (1H, d, $J=6$) 5.71 (1H, d, $J=8.5$) 5.99 (1H, dd, $J=8$)

^{13}C NMR (500 MHz, CDCl_3) 的 δ ppm 爲

14.89, 17.00, 23.99, 28.62, 29.19, 30.46, 30.67, 39.27, 39.69, 42.72, 74.37, 124.17, 124.75, 125.88, 134.89, 136.46, 137.03, 171.53, 175.39

IR

cpd 24

^1H NMR (500 MHz, CDCl_3) 的 δ ppm 爲

1.09-1.12 (6H, bs) 1.49 (3H, s) 1.89 (3H, s) 2.02-2.33 (6H, m) 5.13 (1H, t, $J=7.5$) 5.44 (1H, bs) 5.64 (1H, d, $J=16.5$) 6.29 (1H, d, $J=16$)

IR

cpd 25

^1H NMR (500 MHz, CDCl_3) 的 δ ppm 爲

1.07-1.10 (6H, d) 1.48 (3H, s) 1.86 (3H, s) 2.02-2.19 (6H, m) 3.85

(3H, s) 5.10 (1H, t, J=8) 5.33 (1H, bs) 5.50 (1H, d, J=16.5) 6.19 (1H, d, J=16.5)

^{13}C NMR (500 MHz, CDCl_3) 的 δ ppm 爲 (Z+E)

14.10, 14.83, 15.14, 15.23, 15.38, 22.69, 23.74, 23.87, 29.36, 29.66, 29.70, 31.94, 36.65, 37.53, 39.92, 40.04, 42.90, 61.71, 61.83, 120.41, 123.99, 124.03, 124.31, 132.40, 133.18, 135.66, 135.82, 138.20, 140.41, 154.09, 155.48, 161.97, 162.26

IR

EI-MASS

cpd 26

^1H NMR (500 MHz, CDCl_3) 的 δ ppm 爲



IR

EI-MASS

cpd 27

^1H NMR (500 MHz, CDCl_3) 的 δ ppm 爲

1.10 (6H, s) 1.30 (3H, s) 1.52 (3H, s) 1.86-2.22 (6H, m) 2.71 (1H, dd, J=5.25) 4.18 (1H, d, J=4.5) 4.95 (1H, t, J=7) 5.25 (1H, dd, J=8) 5.43 (1H, d, J=16)

^{13}C NMR (500 MHz, CDCl_3) 的 δ ppm 爲

15.27, 15.68, 24.12, 28.63, 29.71, 36.36, 36.56, 40.15, 58.32, 64.54, 70.48,
125.84, 126.91, 131.78, 138.24

IR

cpd 30

^1H NMR (500 MHz, CDCl_3) 的 δ ppm 爲

1.12 (6H, d) 1.51 (3H, s) 1.67 (3H, s) 1.91-2.42 (6H, m) 2.57 (1H, d, $J=10$) 5.11 (1H, d, $J=9$) 5.71 (1H, d, $J=17$) 6.51 (1H, d, $J=17$)

^{13}C NMR (500 MHz, CDCl_3) 的 δ ppm 爲

15.43, 15.80, 24.12, 25.24, 29.44, 36.37, 37.56, 41.94, 63.77, 65.15,
123.57, 124.53, 136.38, 161.12, 199.70

IR

EI-MASS



cpd 31

^1H NMR (500 MHz, CDCl_3) 的 δ ppm 爲

1.15 (3H, s) 1.18 (3H, s) 1.35 (3H, s) 1.60 (3H, s) 1.35 (2H, m) 1.93 (1H, dd, $J=12.5$) 2.01 (1H, m) 2.30 (1H, m) 2.60 (1H, d, $J=9$) 2.69 (1H, d, $J=10$) 5.93 (1H, d, $J=17$) 6.85 (1H, d, $J=16.5$)

^{13}C NMR (500 MHz, CDCl_3) 的 δ ppm 爲

15.83, 16.52, 22.71, 25.36, 30.29, 35.25, 36.59, 41.79, 60.91, 61.81, 63.42,
64.46, 126.81, 159.85, 198.62

IR

EI-MASS

cpd 32

$^1\text{H NMR}$ (500 MHz, CDCl_3) 的 δ ppm 爲

0.90 (3H, d, $J=7.5$) 0.94 (3H, s) 0.95 (3H, s) 1.34 (3H, s) 1.82-2.22
(7H, m) 3.04 (1H, dd, $J=3.25$) 3.39 (3H, s) 5.05 (1H, dd, $J=5.75$) 6.03
(1H, d, $J=16$) 6.15 (1H, d, $J=16$)

IR

cpd 33

$^1\text{H NMR}$ (500 MHz, CDCl_3) 的 δ ppm 爲

0.78 (3H, s) 1.09 (3H, s) 1.39 (3H, s) 1.40 (3H, s) 1.65 (3H, s)
1.56-2.33 (8H, m) 2.92 (1H, dd, $J=5$) 5.11 (1H, d, $J=9.5$)

IR

EI-MASS : 266.189(M^+)



cpd 34

$^1\text{H NMR}$ (500 MHz, CDCl_3) 的 δ ppm 爲

0.90 (3H, s) 1.14 (3H, s) 1.16 (3H, s) 1.55 (3H, s) 1.94-2.40 (8H, m)
3.07 (1H, dd, $J=5$) 5.20 (1H, d, $J=10.5$) 7.28 (1H, m) 7.34 (2H, t,
 $J=7.5$) 7.63 (2H, d, $J=8$)

IR

FAB-MASS : 329.2126(MH^+)

cpd 35

^1H NMR (500 MHz, CDCl_3) 的 δ ppm 爲

0.76 (3H, t, $J=7$) 0.78 (3H, s) 0.79 (3H, s) 1.30 (3H, s) 1.55 (3H, s)
1.63-2.32 (9H, m) 3.27 (1H, bs) 5.05-5.36 (3H, m)

^{13}C NMR (500 MHz, CDCl_3) 的 δ ppm 爲

12.91, 18.59, 21.07, 23.95, 26.00, 29.68, 31.42, 35.73, 37.33, 42.34, 54.16,
75.50, 79.67, 125.28, 131.66, 132.58, 133.44

cpd 36

^1H NMR (500 MHz, CDCl_3) 的 δ ppm 爲

1.05 (3H, s) 1.09 (3H, s) 1.53 (3H, s) 1.81-2.09 (6H, m) 4.03 (1H, bs)
4.84 (2H, m) 5.09 (3H, m) 5.35 (1H, d, $J=15.5$)



cpd 37

^1H NMR (500 MHz, CDCl_3) 的 δ ppm 爲

1.10-1.19 (6H, bs) 1.48 (3H, s) 1.85 (3H, s) 2.20 (6H, bs) 5.08 (3H,
m) 5.34 (1H, bs) 5.50 (1H, d, $J=16.5$) 6.24 (1H, d, $J=16.5$) 7.24-7.34
(5H, m)

^{13}C NMR (500 MHz, CDCl_3) 的 δ ppm 爲

15.158, 15.258, 23.893, 37.507, 39.928, 42.929, 72.157, 75.876, 120.650,
124.353, 127.484, 127.805, 127.988, 128.225, 128.423, 133.287, 135.700,
138.532, 140.380, 154.017

IR

EI-MASS

cpd 38

^1H NMR (500 MHz, CDCl_3) 的 δ ppm 爲

1.06 (6H, bs) 1.49 (3H, s) 1.93 (3H, s) 2.12-2.49 (6H, m) 2.16 (3H, s)
5.12 (1H, t, $J=7.5$) 5.49 (1H, bs) 5.83 (1H, d, $J=16$) 6.20 (1H, d,
 $J=16$)

^{13}C NMR (500 MHz, CDCl_3) 的 δ ppm 爲

15.10, 15.17, 19.85, 24.06, 37.68, 39.76, 42.71, 64.90, 119.89, 124.27,
130.00, 131.46, 143.84, 156.91, 169.12

IR

EI-MASS

cpd 39

^1H NMR (500 MHz, CDCl_3) 的 δ ppm 爲

1.13 (6H, bs) 1.51 (3H, s) 1.95 (3H, s) 2.22-2.29 (6H, m) 5.15 (1H, t,
 $J=8$) 5.57 (1H, bs) 5.66 (1H, d, $J=16$) 6.41 (1H, d, $J=16$) 7.06 (1H, t,
 $J=7.5$) 7.29 (2H, t, $J=7.5$) 7.51 (2H, d, $J=7.5$) 8.32 (1H, bs)

^{13}C NMR (500 MHz, CDCl_3) 的 δ ppm 爲

15.11, 15.20, 24.15, 37.04, 37.79, 39.73, 39.85, 42.80, 60.39, 119.52,
119.71, 119.93, 128.91, 129.07, 131.86, 135.74, 137.25, 140.60, 144.47,

152.64, 158.01, 166.57

IR

EI-MASS

cpd 40

^1H NMR (500 MHz, CDCl_3) 的 δ ppm 爲

0.98 (6H, bs) 1.38 (3H, s) 1.74 (3H, s) 1.96-2.09 (6H, m) 4.50 (3H, s) 5.02 (1H, t, $J=8$) 5.41 (1H, bs) 5.45 (1H, d, $J=16.5$) 6.17 (1H, d, $J=16.5$) 8.55 (1H, bs)

^{13}C NMR (500 MHz, CDCl_3) 的 δ ppm 爲

14.112, 14.204, 14.807, 15.067, 15.158, 15.403, 21.045, 23.802, 23.909, 29.368, 29.711, 36.767, 39.836, 39.989, 42.837, 60.452, 70.355, 71.035, 120.085, 123.460, 123.949, 124.384, 132.584, 135.730, 135.921, 138.922, 141.999, 147.978, 155.445, 156.980, 164.508, 171.258, 174.190

IR

EI-MASS

cpd 41

^1H NMR (500 MHz, CDCl_3) 的 δ ppm 爲

1.07 (3H, s) 1.10 (3H, s) 1.23 (3H, s) 1.69 (3H, s) 2.01 (3H, s) 1.71-2.32 (6H, m) 5.06 (1H, d, $J=16.5$) 5.31 (1H, t, $J=5.25$) 5.60 (1H, d, $J=5.5$) 5.70 (1H, d, $J=8.5$) 5.99 (1H, dd, $J=8$)

^{13}C NMR (500 MHz, CDCl_3) 的 δ ppm 爲

14.91, 17.04, 21.22, 23.97, 30.55, 30.67, 39.27, 39.66, 42.74, 73.66,

124.15, 124.60, 125.94, 135.17, 136.47, 136.99, 170.38

IR

EI-MASS

cpd 42

^1H NMR (500 MHz, CDCl_3) 的 δ ppm 爲

1.06 (6H, bs) 1.09 (3H, s) 1.22 (3H, s) 1.70 (3H, s) 1.80-2.37 (6H, m) 5.06 (1H, d, $J=16.5$) 5.31 (1H, dd, $J=5.5$) 5.61 (1H, d, $J=6$) 5.71 (1H, d, $J=8.5$) 6.02 (1H, dd, $J=8$) 6.55 (1H, bs) 6.98 (1H, t, $J=7$) 7.22 (2H, m) 7.32 (2H, d, $J=8$)

^{13}C NMR (500 MHz, CDCl_3) 的 δ ppm 爲

14.93, 17.14, 24.03, 30.69, 30.71, 39.36, 39.72, 42.78, 74.64, 118.76, 123.36, 124.23, 124.75, 126.03, 129.04, 135.10, 136.47, 136.99, 138.05, 148.02, 153.21

IR

EI-MASS

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