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Supporting Materials

Highly Active CO_2 Fixation into Cyclic Carbonates Catalyzed by Tetranuclear Aluminum Benzodiimidazole-Diylidene Adducts

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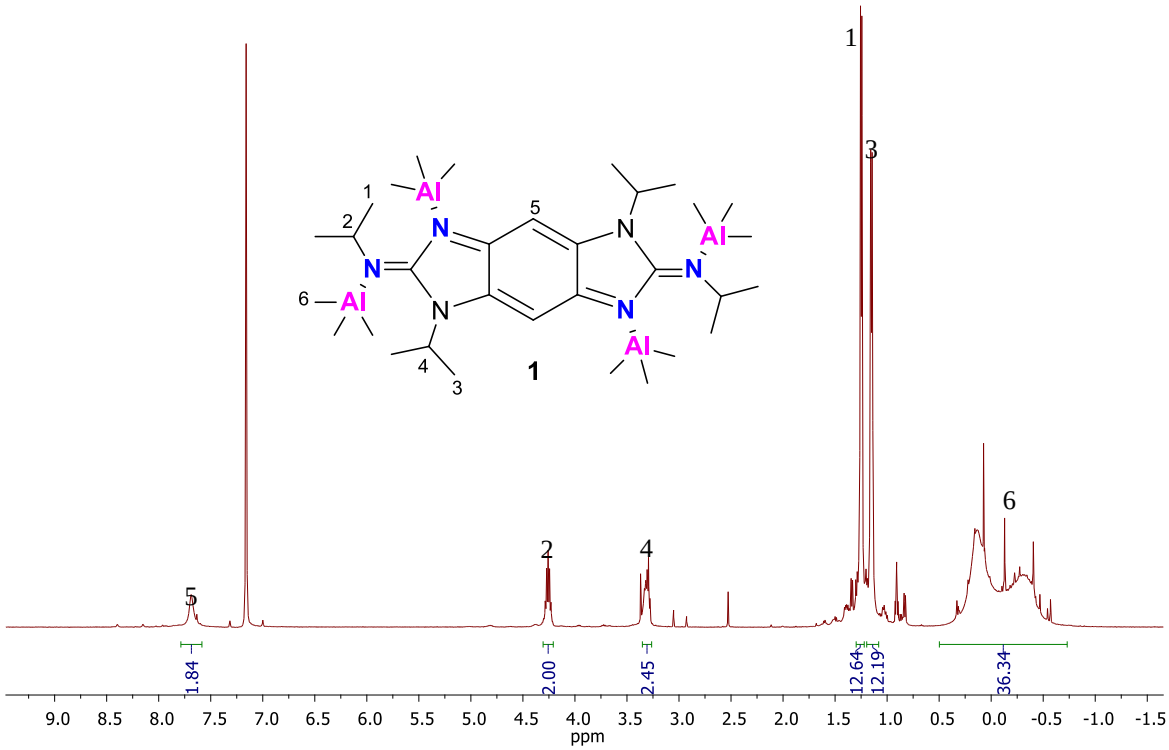


Figure S1. ^{1}H NMR spectrum for alkyl aluminum adduct **1** in C_6D_6.

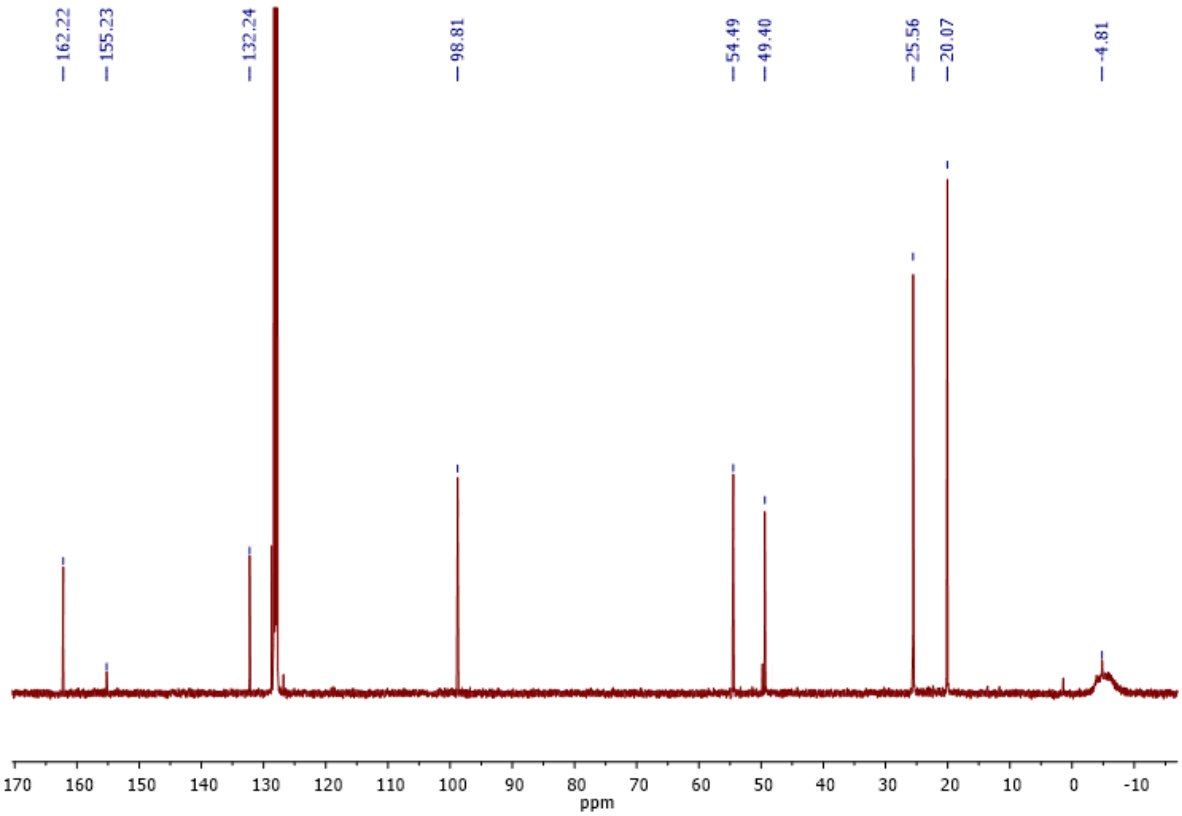


Figure S2. ^{13}C{^{1}H} NMR spectrum for alkyl aluminum adduct **1** in C_6D_6.

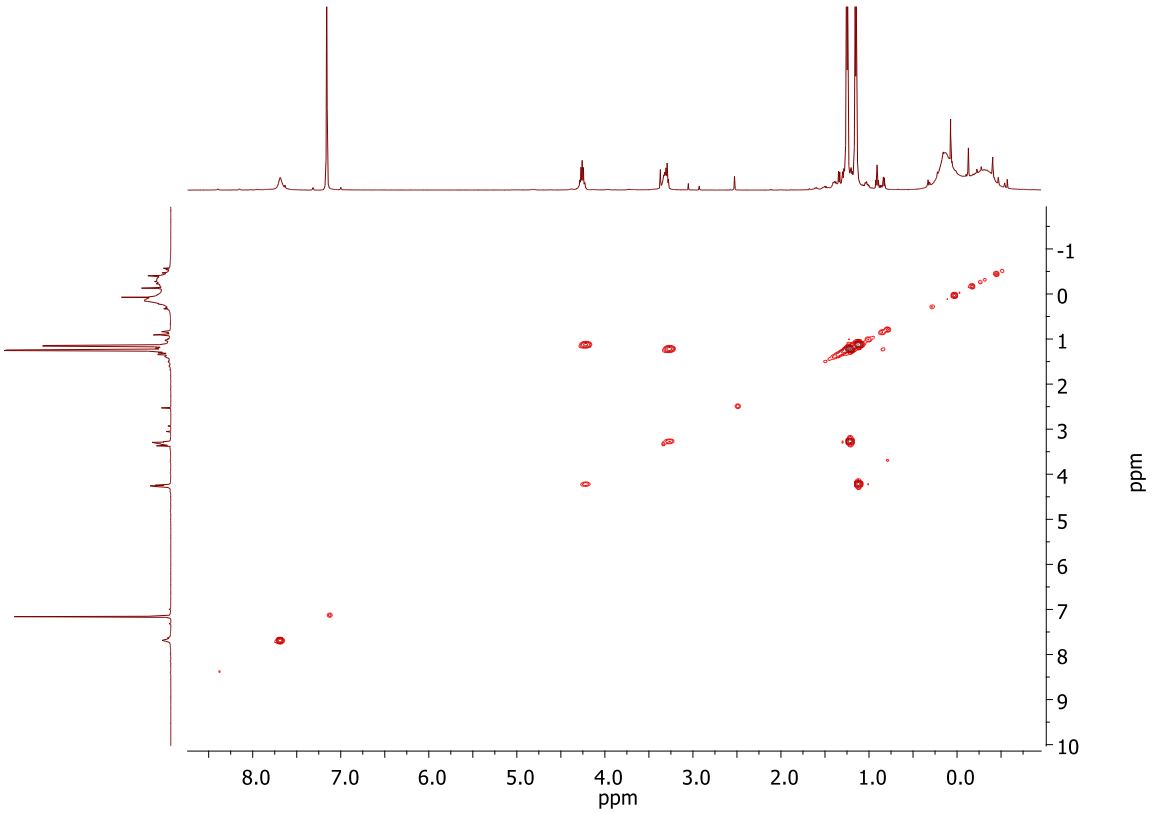


Figure S3. ^{1}H–^{1}H COSY NMR spectrum for alkyl aluminum adduct **1** in C_6D_6.

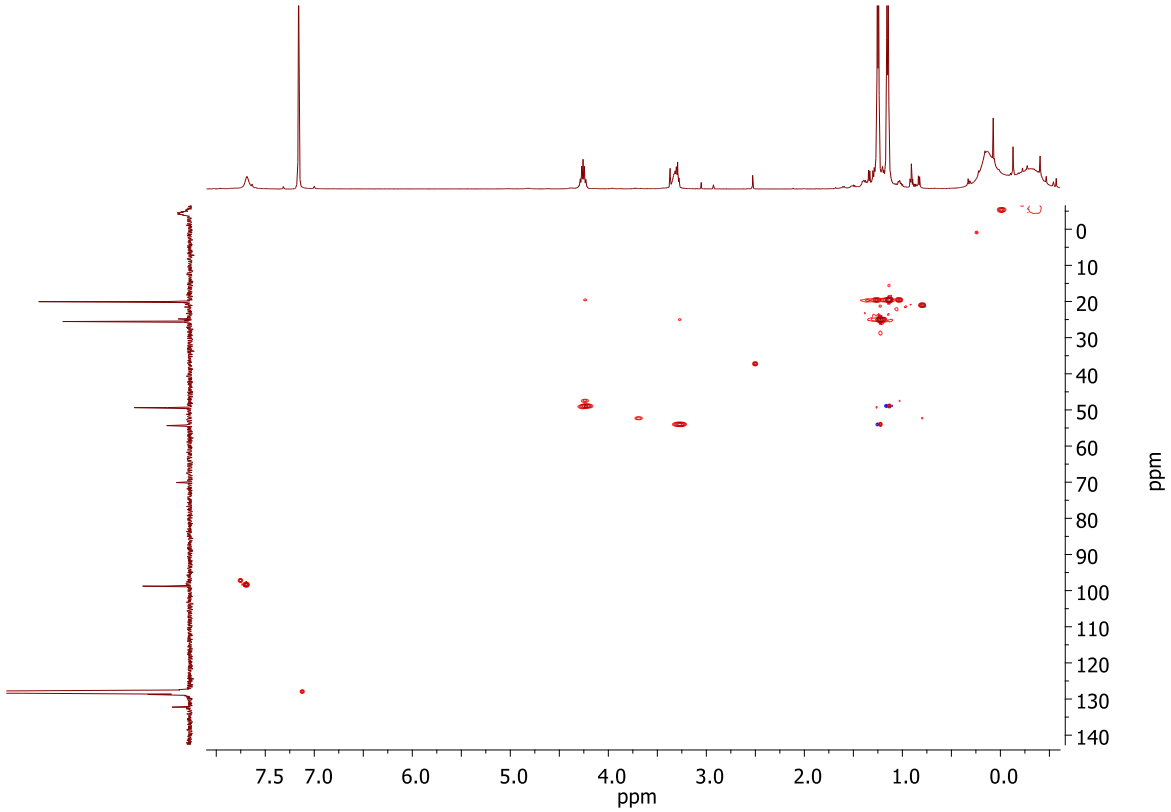


Figure S4. $^{13}C\{^{1}H\}$-HMQC NMR spectrum for alkyl aluminum adduct **1** in C_6D_6.

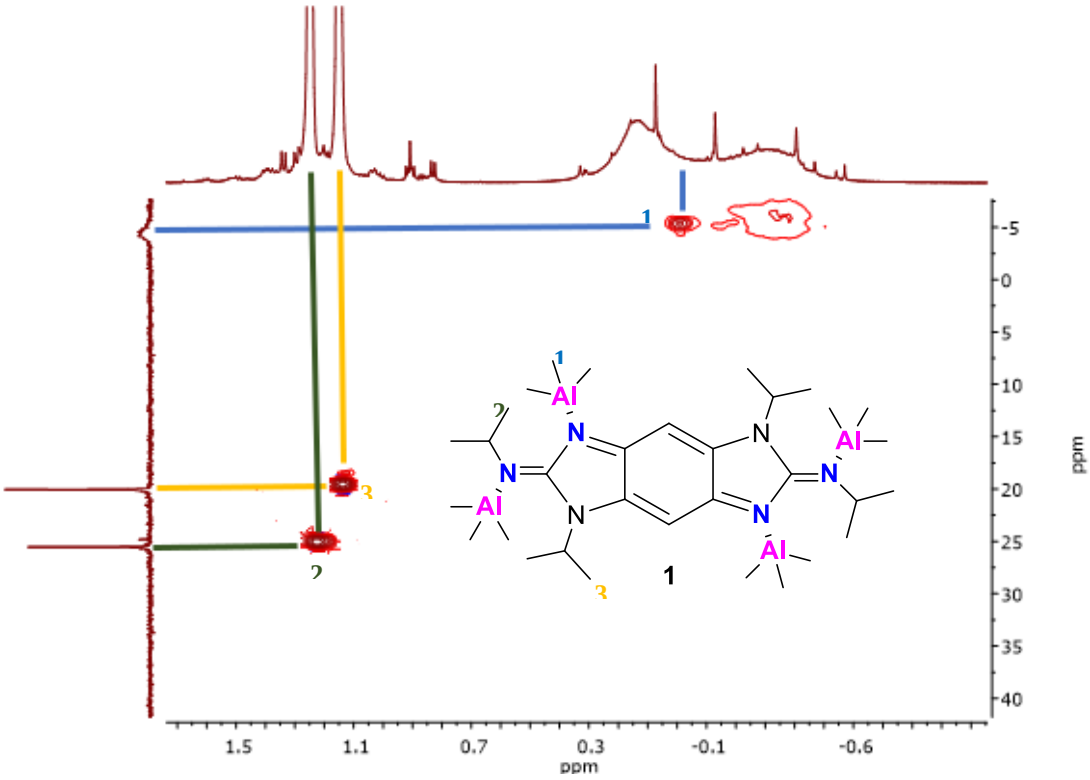


Figure S5. $^{13}C\{^{1}H\}$–HMQC NMR spectrum for alkyl aluminum adduct **1** in C_6D_6 (range (–1.1)–1.7 ppm in ^{1}H-NMR and (–7.5)–42.0 ppm in ^{13}C-NMR).

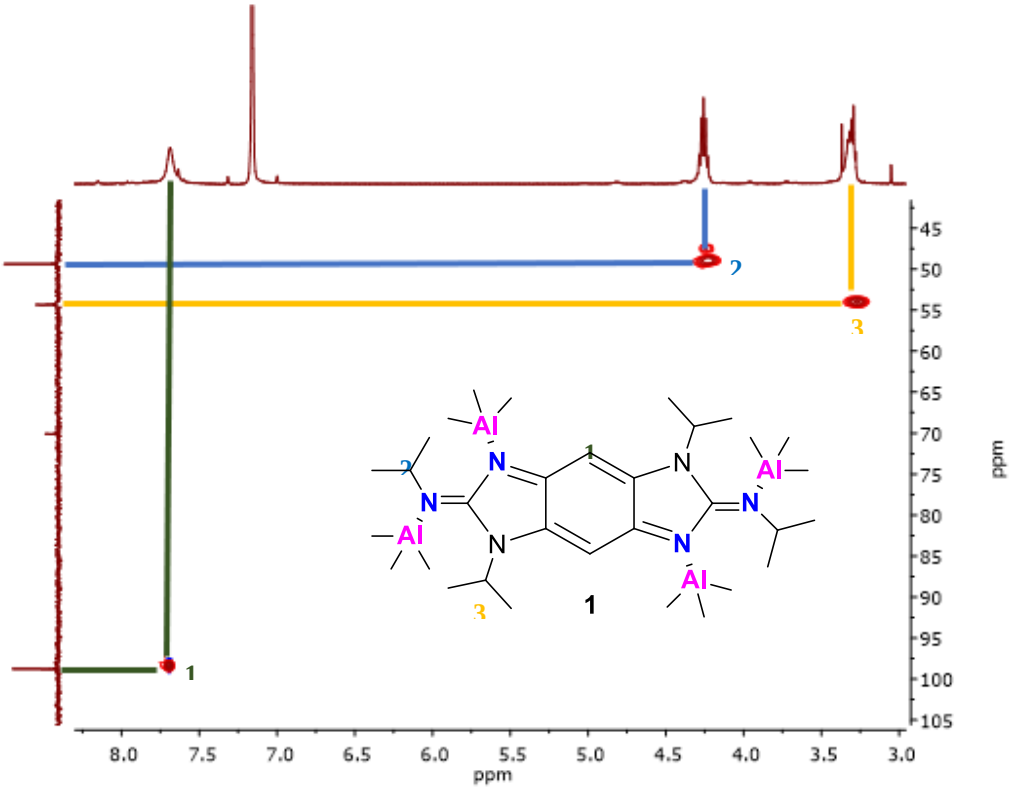


Figure S6. $^{13}C\{^{1}H\}$–HMQC NMR spectrum for alkyl aluminum adduct **1** in C_6D_6 (range 3.0–8.2 ppm in ^{1}H-NMR and 42.0–105.0 ppm in ^{13}C-NMR).

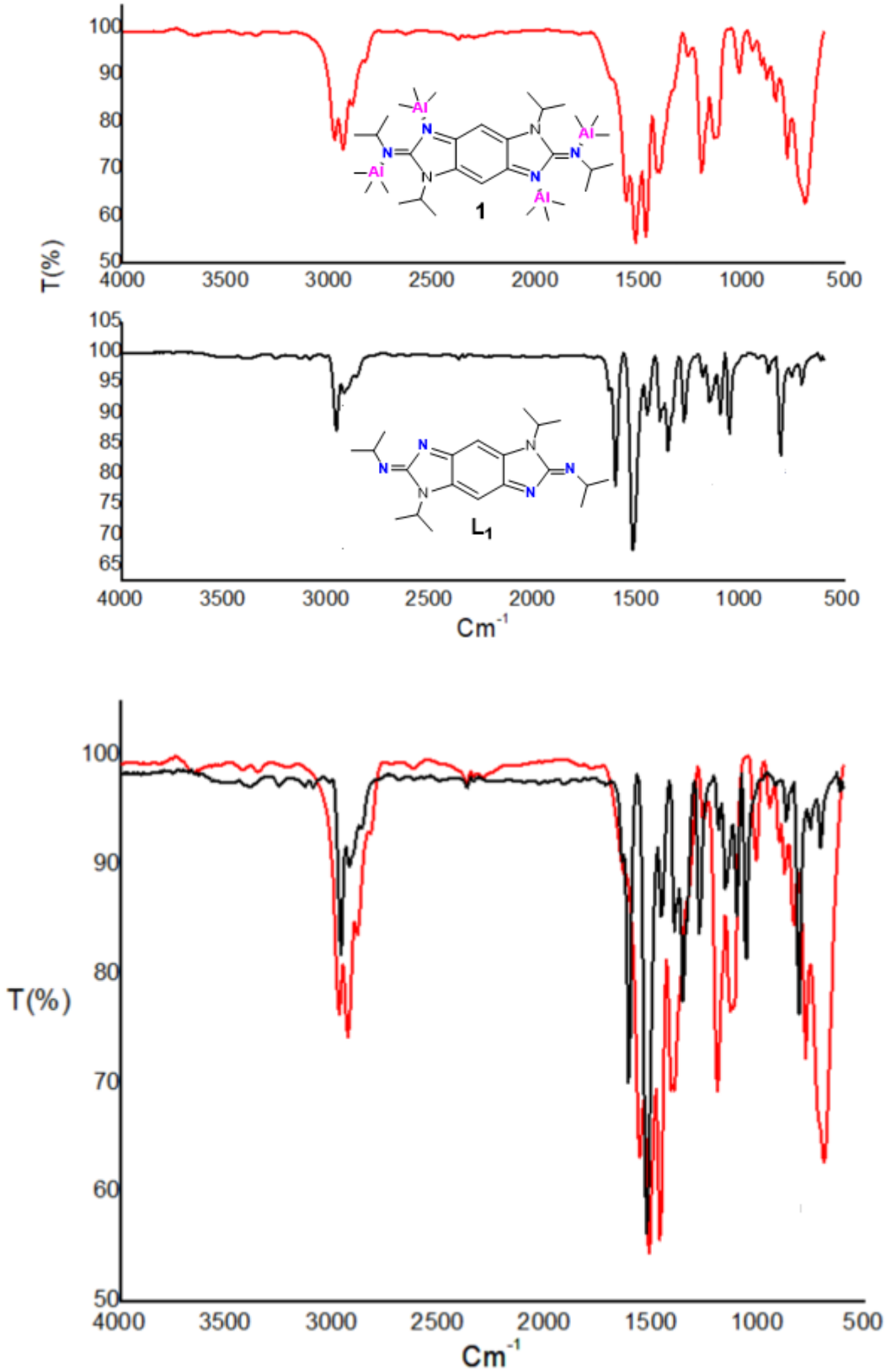


Figure S7. FT-IR spectrum for alkyl aluminum adduct **1** (red) versus benzodiimidazole-diylidenes ligand **L1** (black).

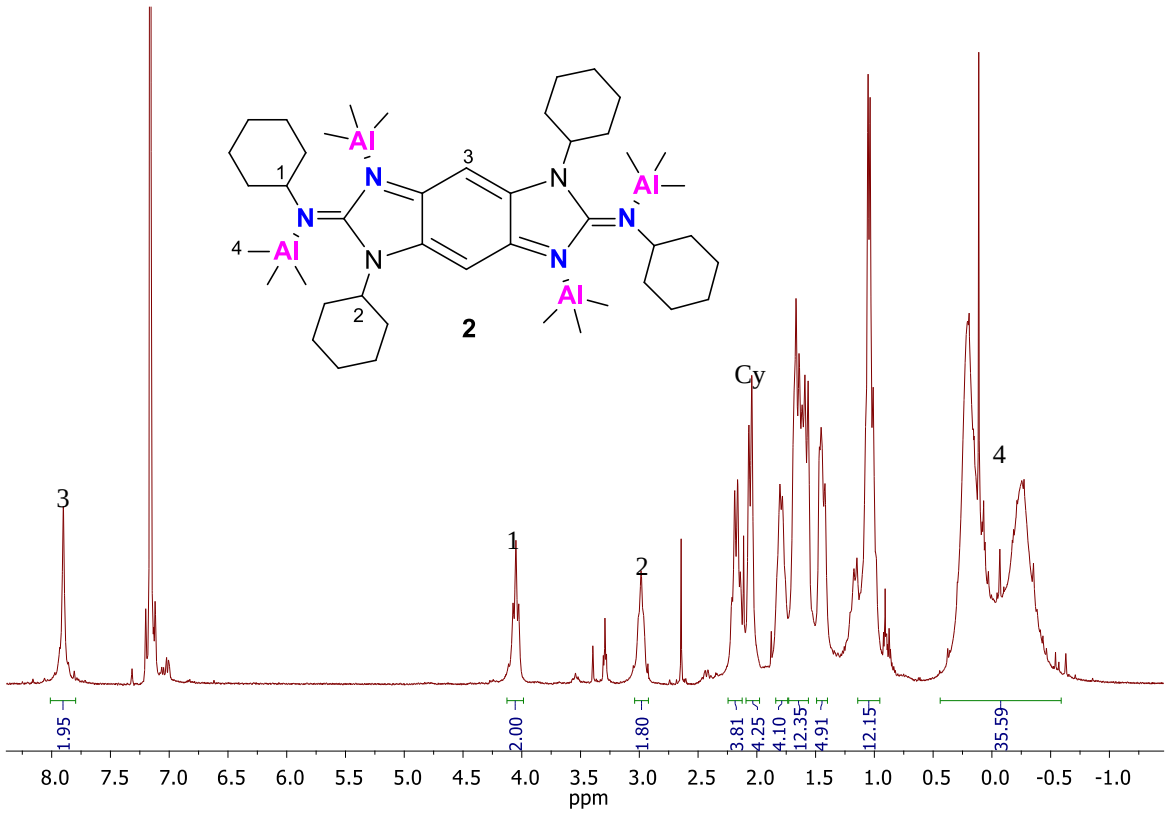


Figure S8. ^{1}H NMR spectrum for alkyl aluminum adduct **2** in C_6D_6.

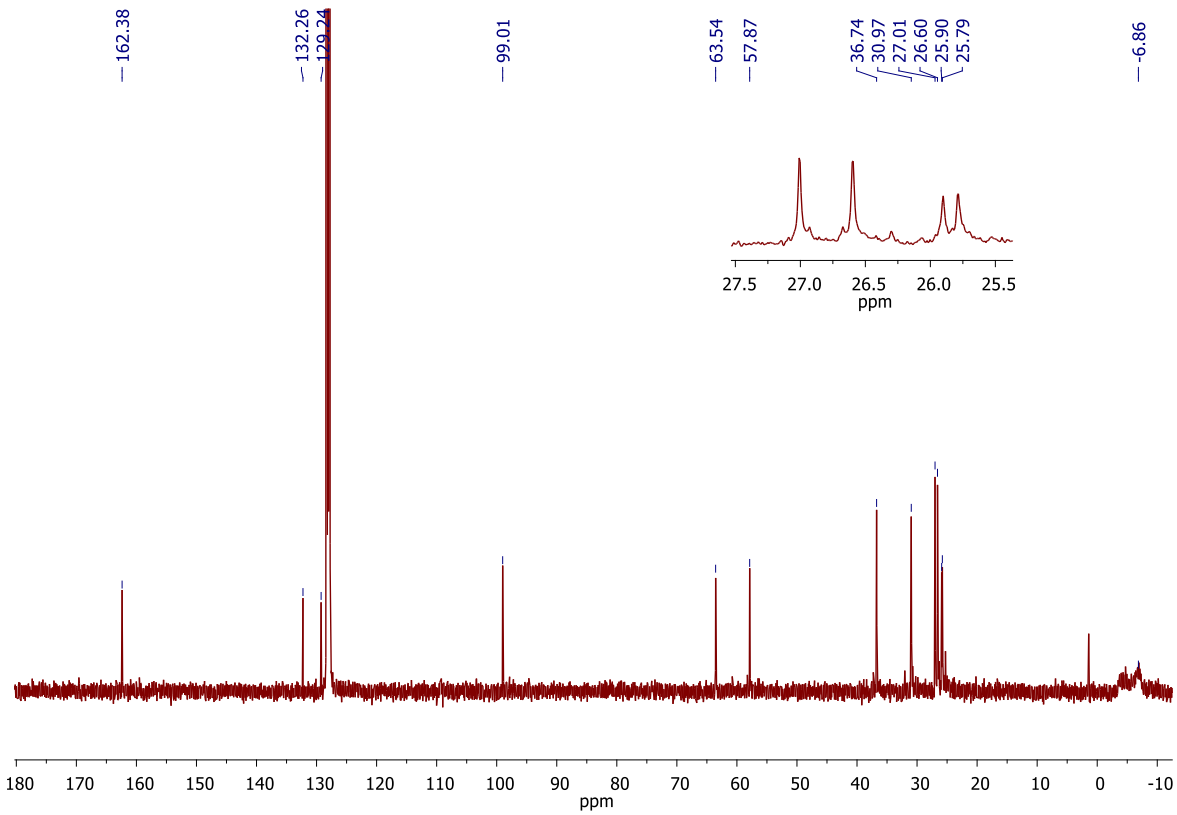


Figure S9. ^{13}C{^{1}H} NMR spectrum for alkyl aluminum adduct **2** in C_6D_6.

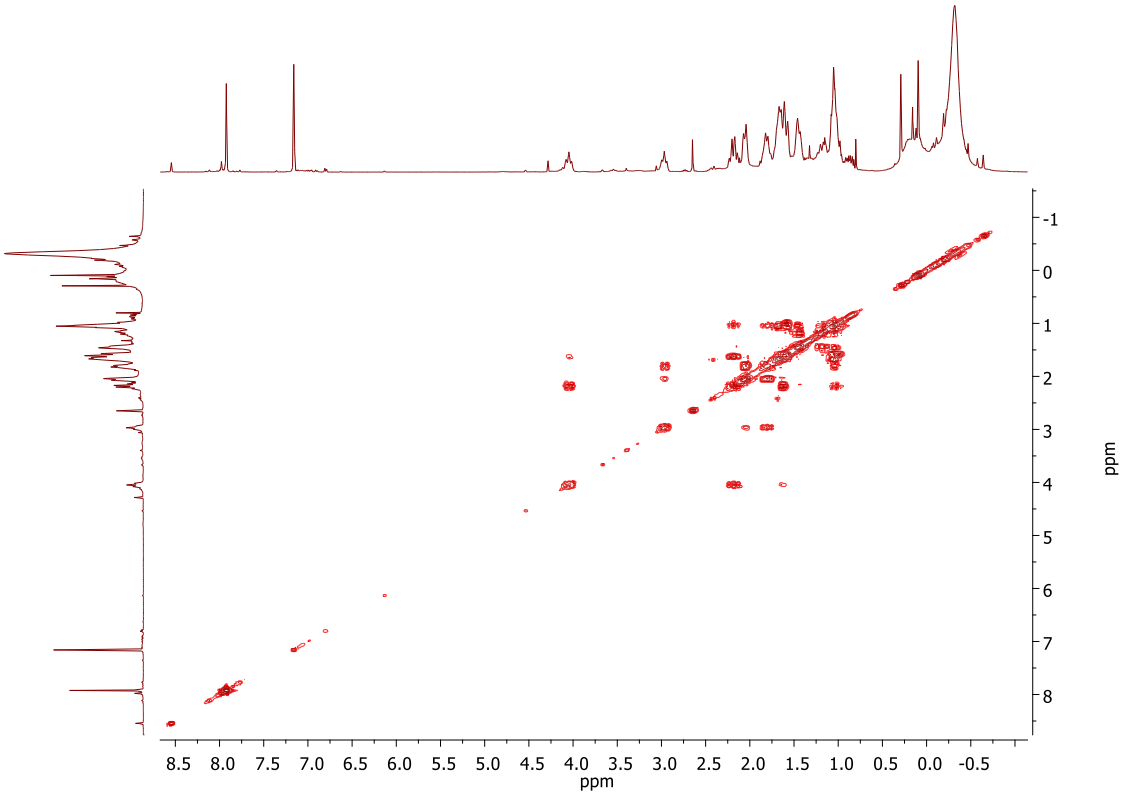


Figure S10. ^{1}H–^{1}H COSY NMR spectrum for alkyl aluminum adduct **2** in C_6D_6.

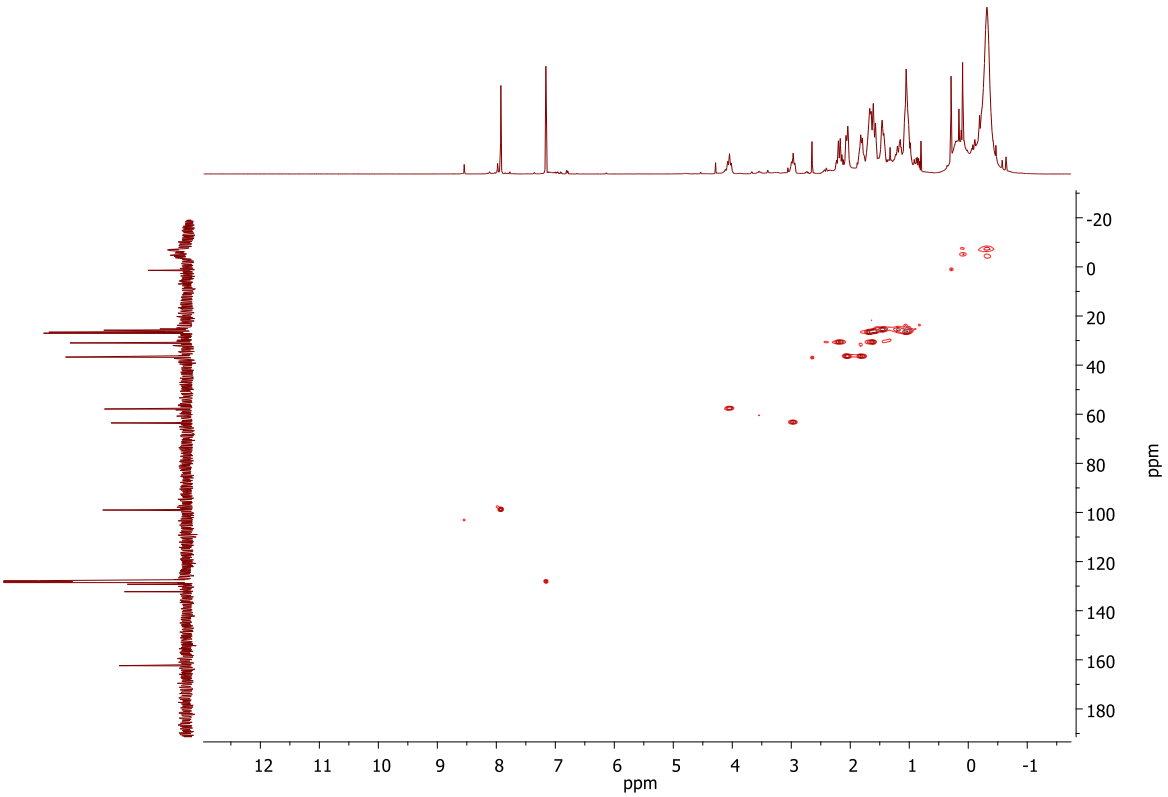


Figure S11. $^{13}C\{^{1}H\}$–HMQC NMR spectrum for alkyl aluminum adduct **2** in C_6D_6.

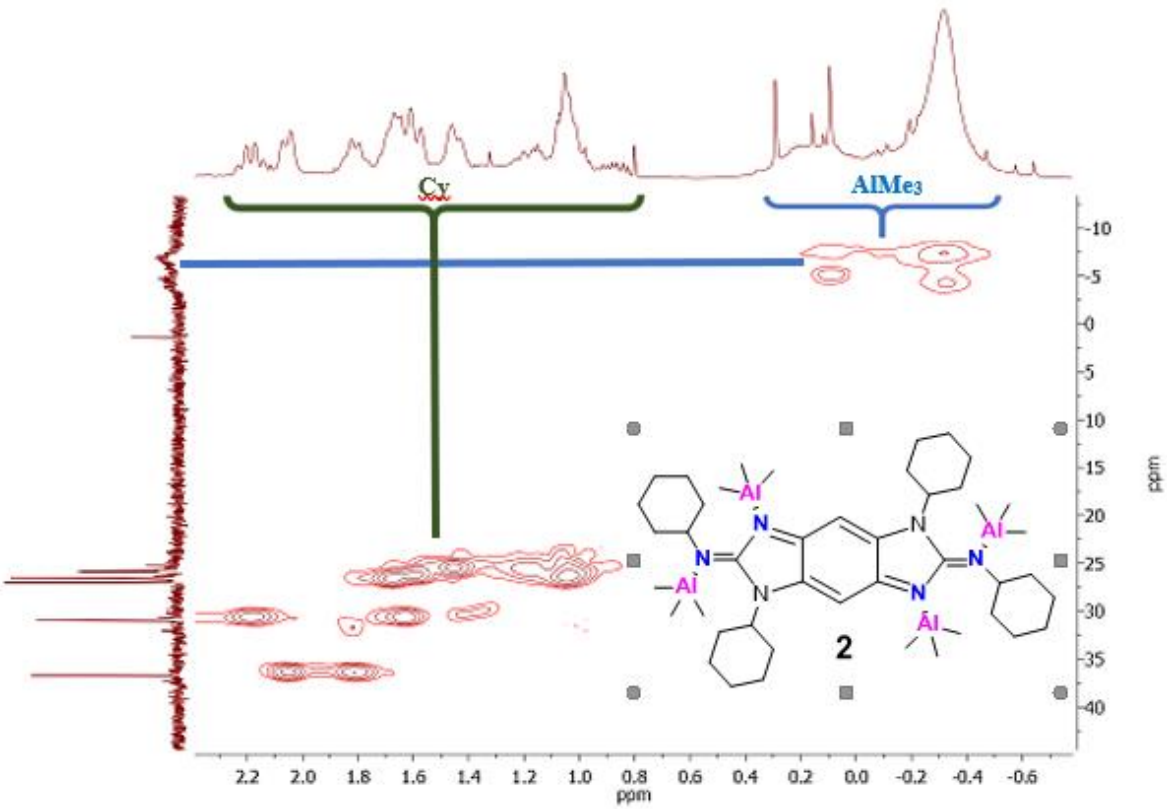


Figure S12. $^{13}C\{^{1}H\}$–HMQC NMR spectrum for alkyl aluminum adduct **2** in C_6D_6 (range (–0.8)–2.4 ppm in ^{1}H-NMR and (–12.0)–45.0 ppm in ^{13}C-NMR).

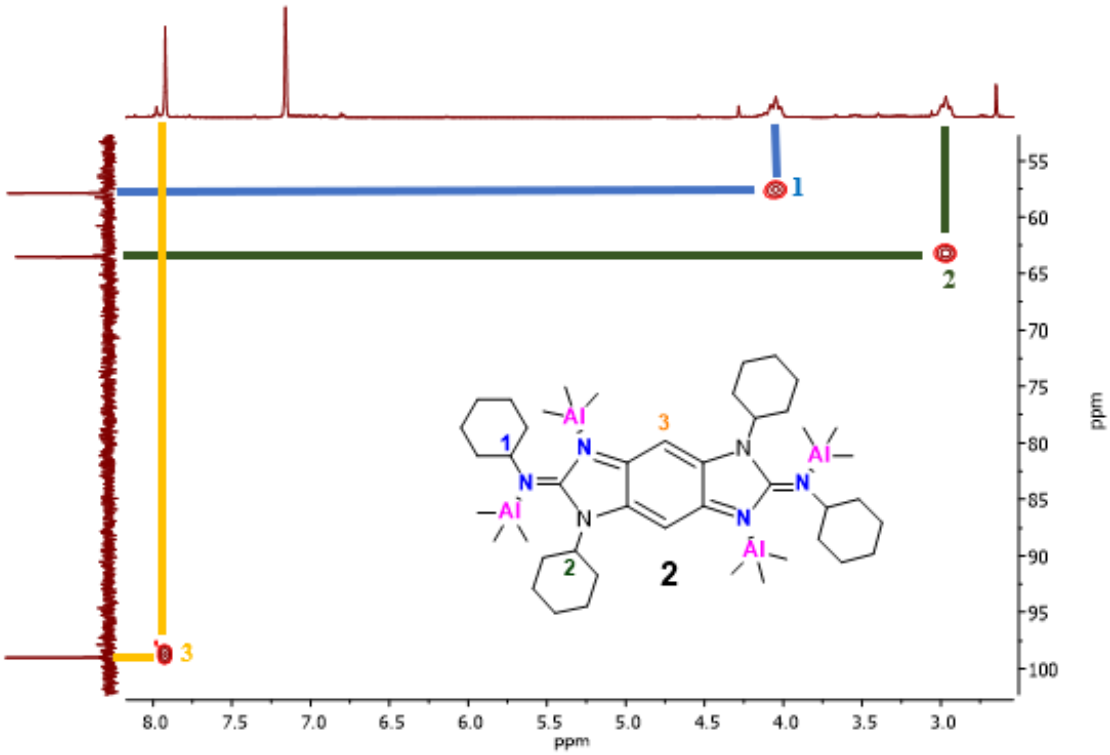


Figure S13. $^{13}C\{^{1}H\}$–HMQC NMR spectrum for alkyl aluminum adduct **2** in C_6D_6 (range 2.5–8.2 ppm in ^{1}H-NMR and 53.0–103.0 ppm in ^{13}C-NMR).

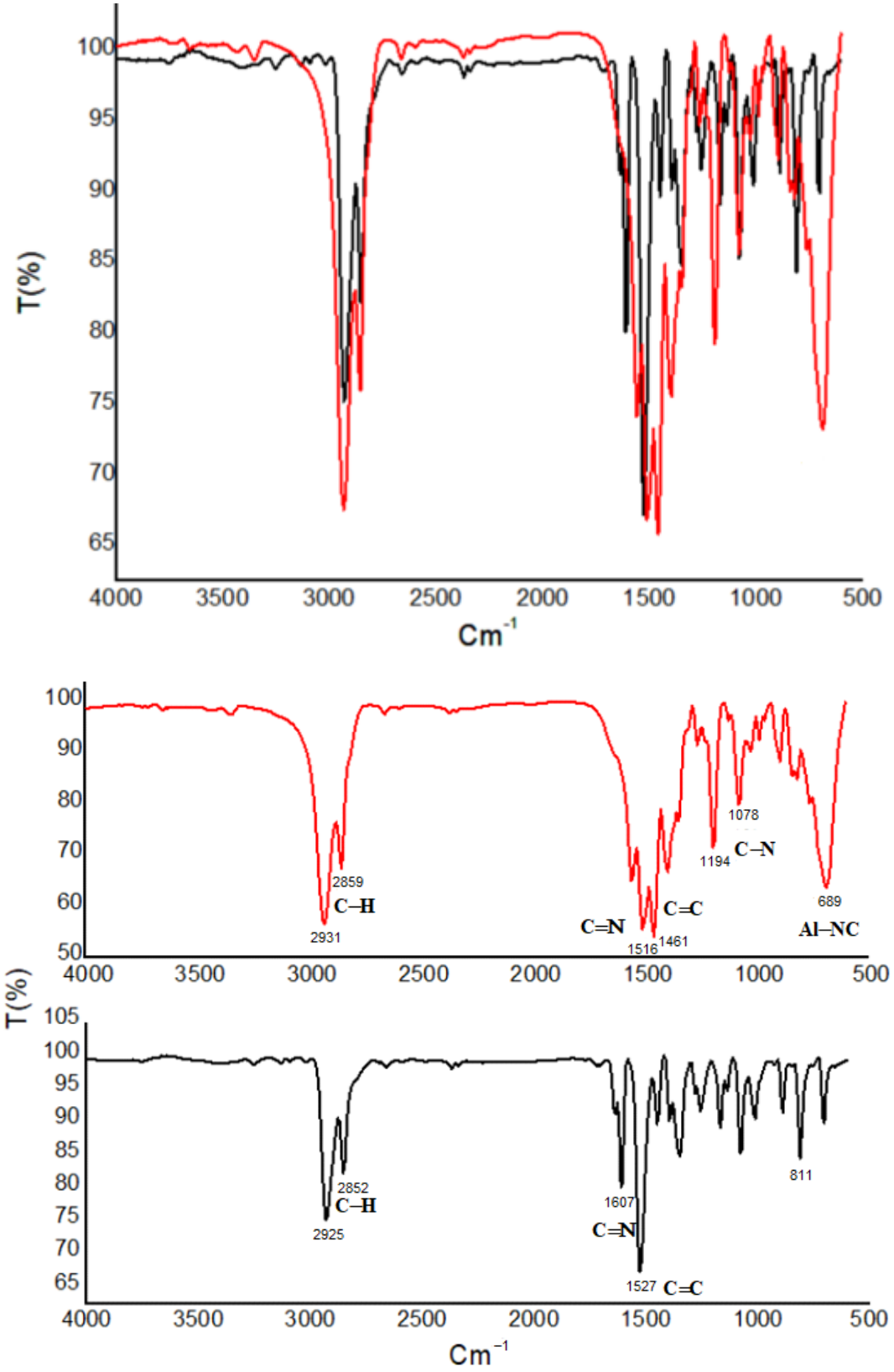


Figure S14. FT-IR spectrum for alkyl aluminum adduct **2** (red) versus benzodiimidazole-diylidenes ligand **L**$_2$ (black).

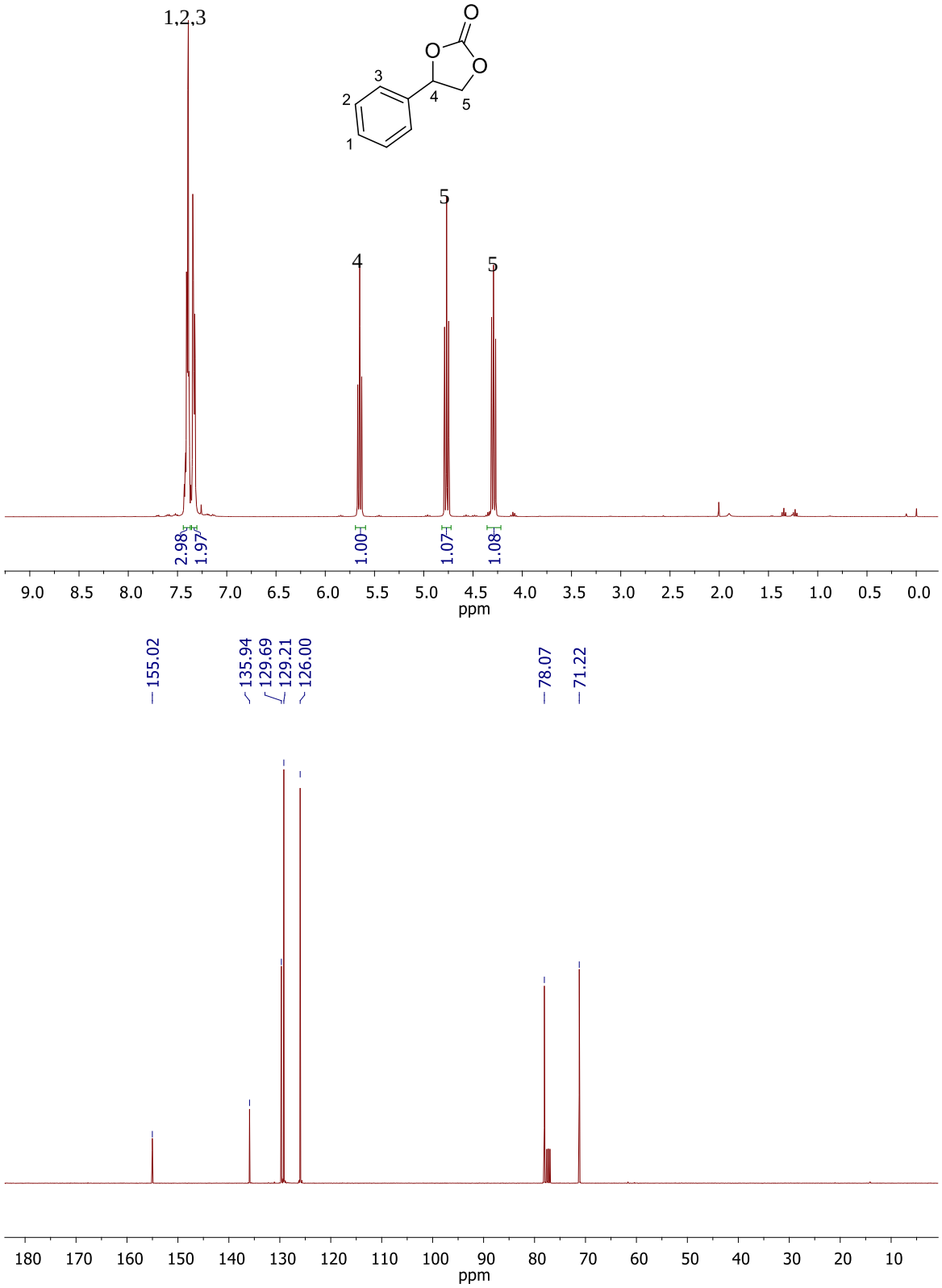


Figure S15. NMR spectra for styrene carbonate **3a** in $CDCl_3$.

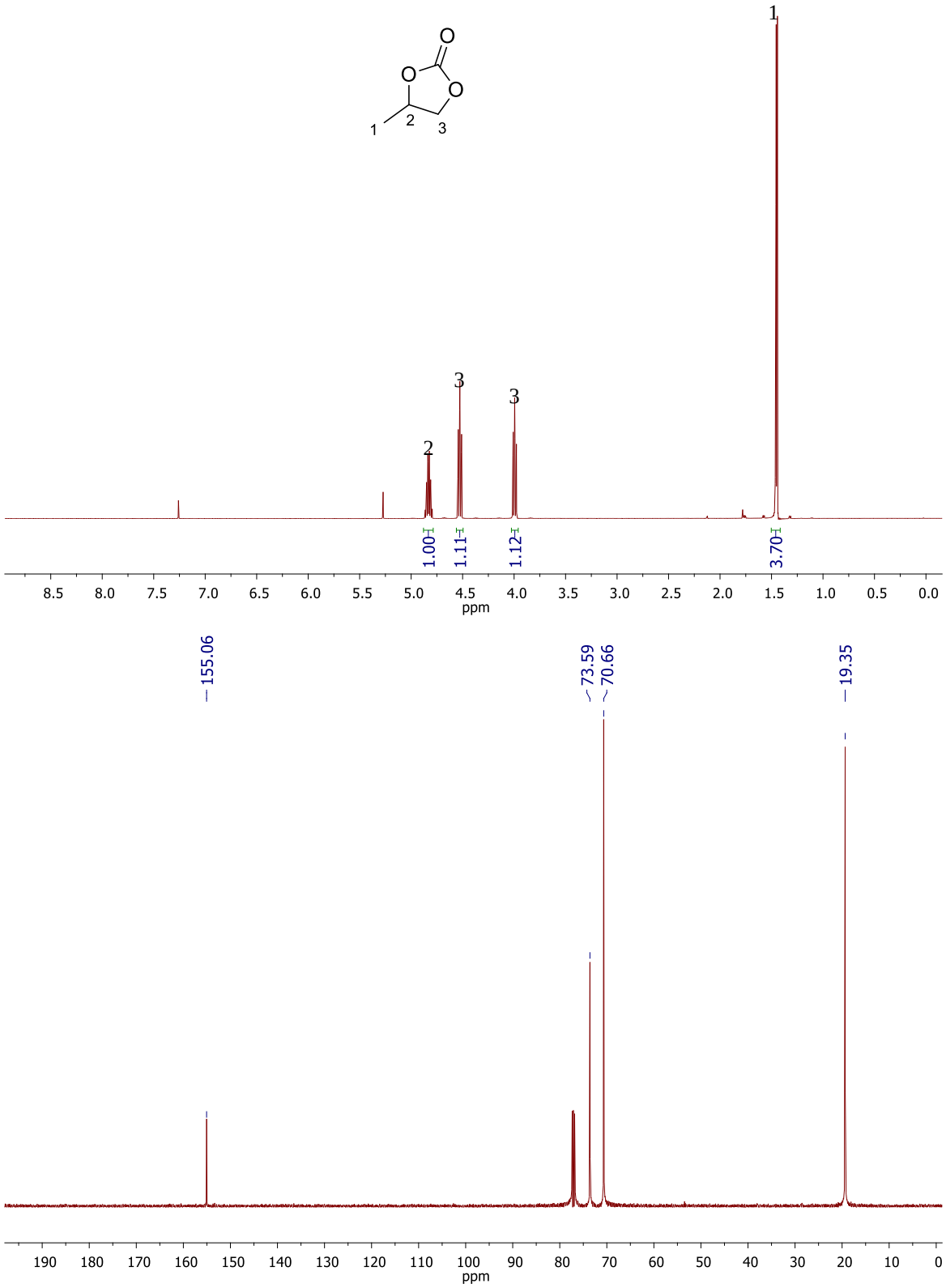


Figure S16. NMR spectra for propylene carbonate **3b** in $CDCl_3$.

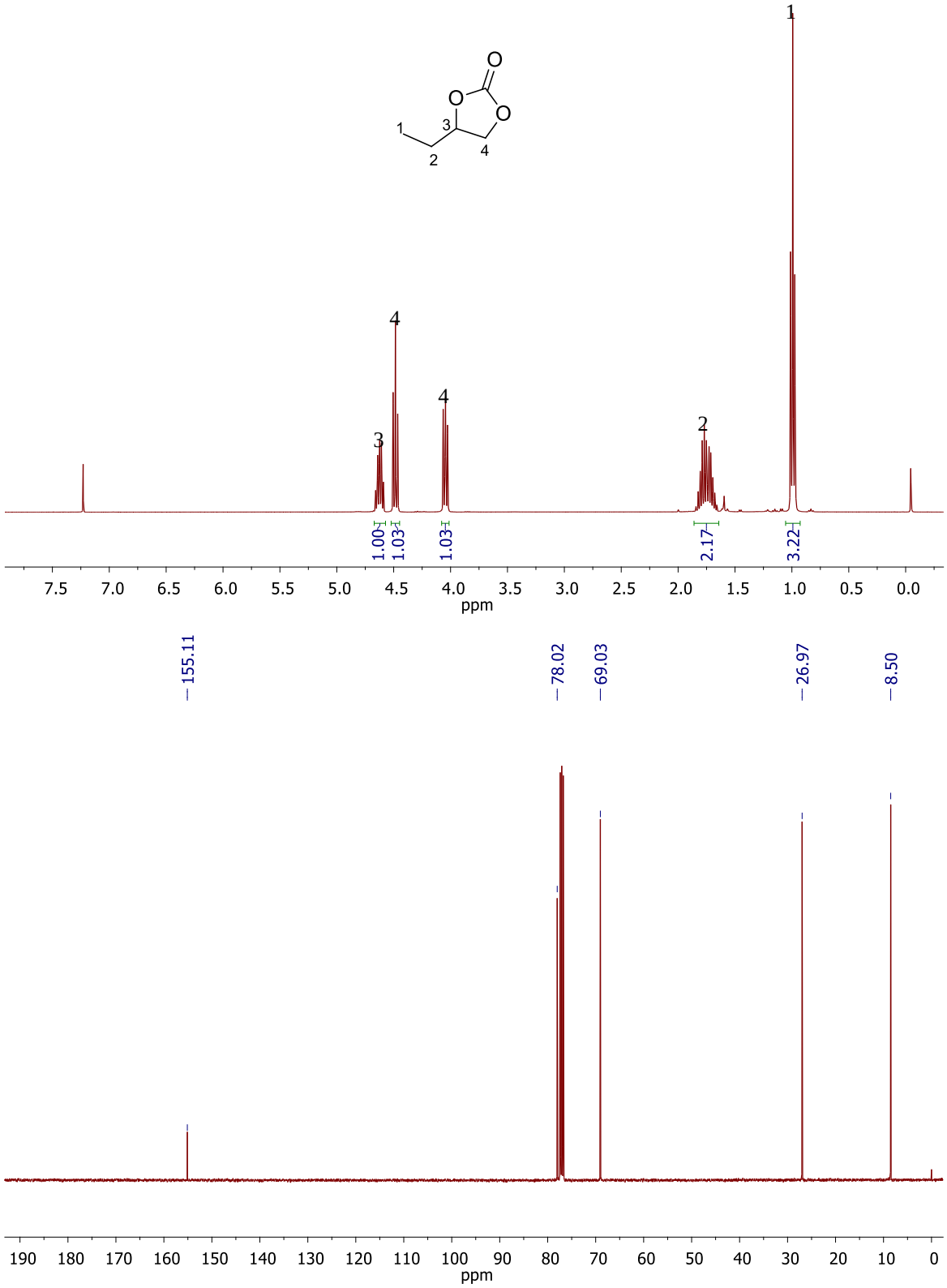


Figure S17. NMR spectra for 1,2-butylene carbonate **3c** in $CDCl_3$.

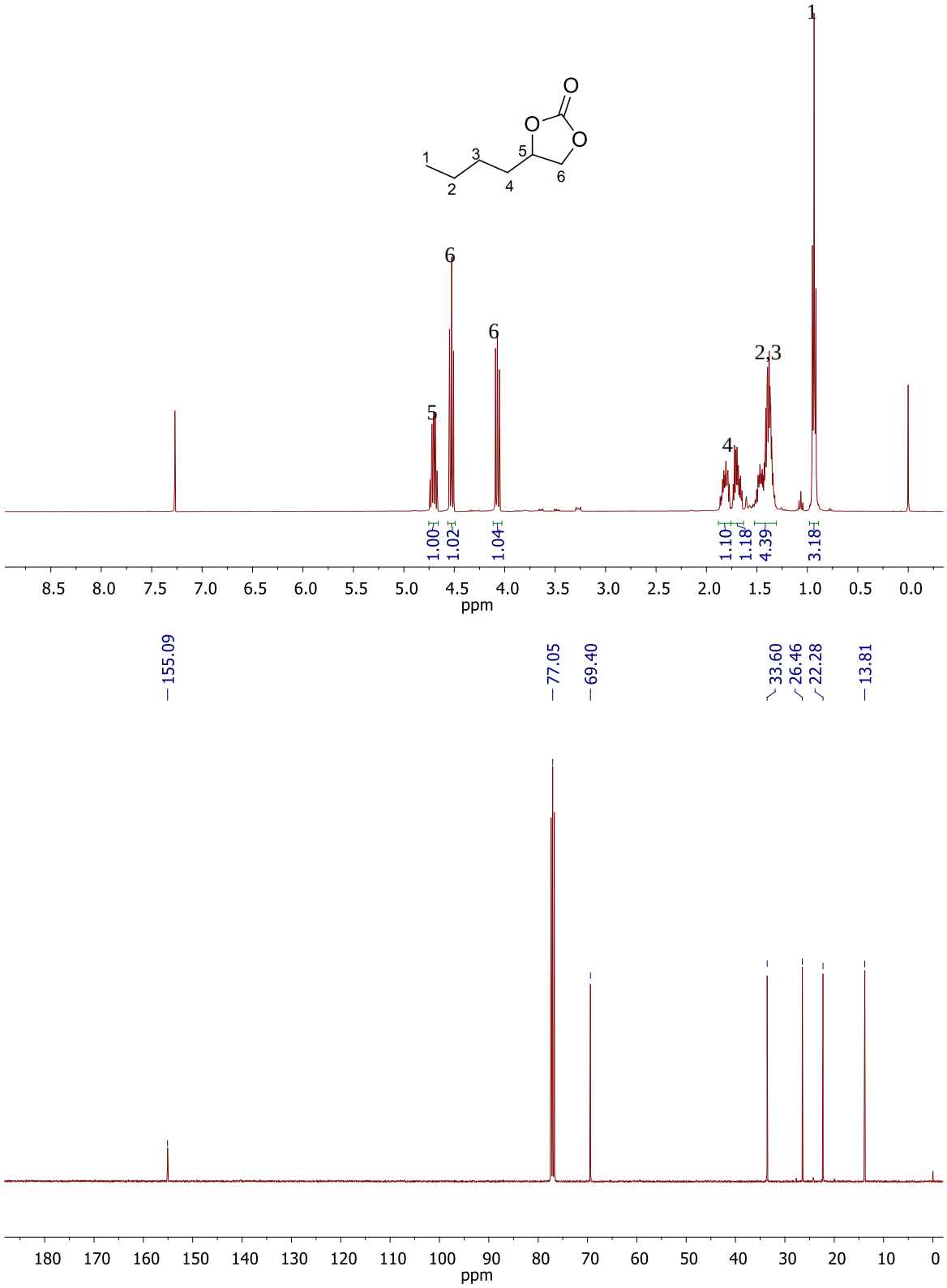


Figure S18. NMR spectra for 1,2-hexylene carbonate **3d** in $CDCl_3$.

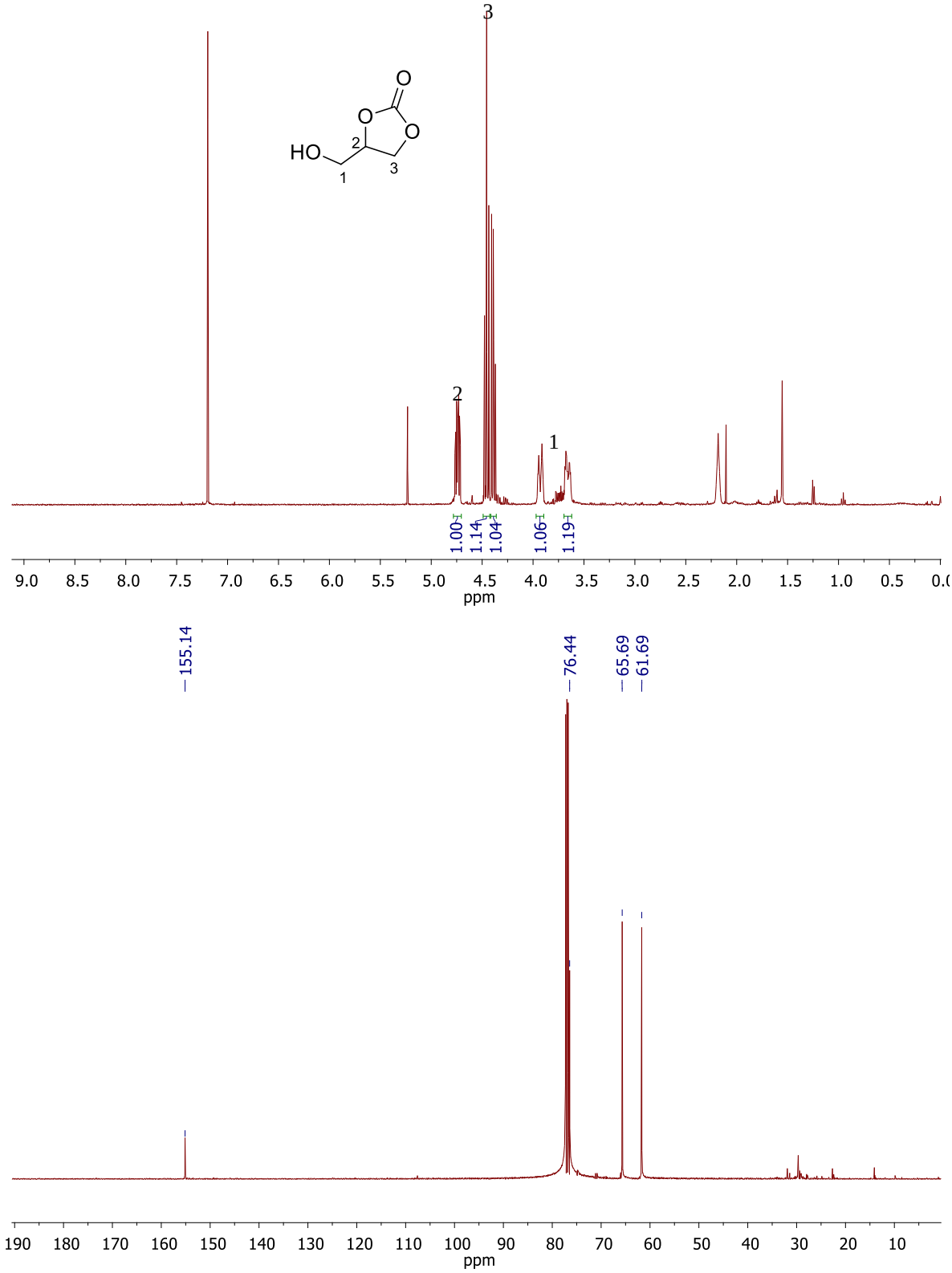


Figure S19. NMR spectra for glycerol carbonate **3e** in [D_6]DMSO.

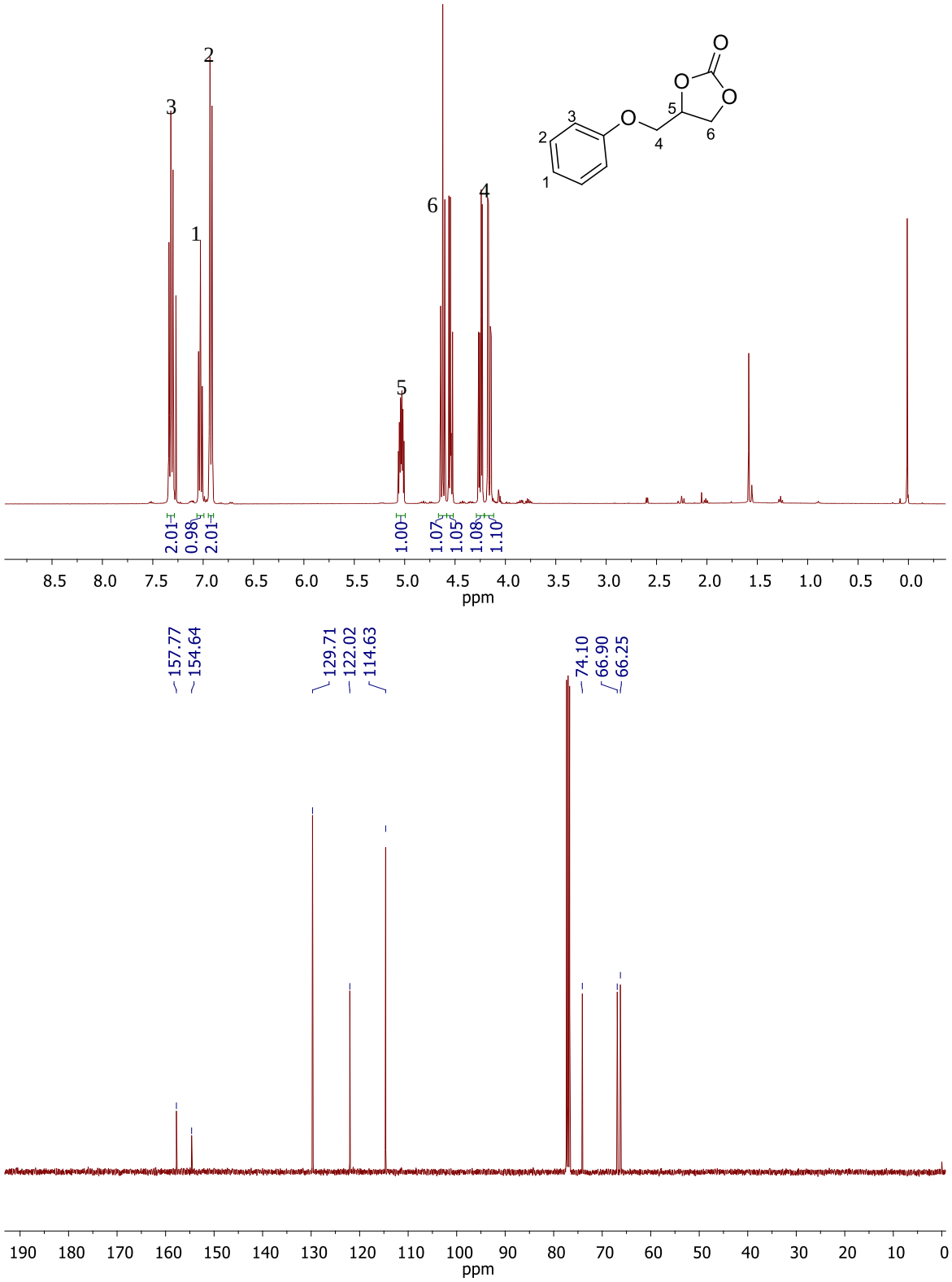


Figure S20. NMR spectra for 3-phenoxyproplylene carbonate **3f** in $CDCl_3$.

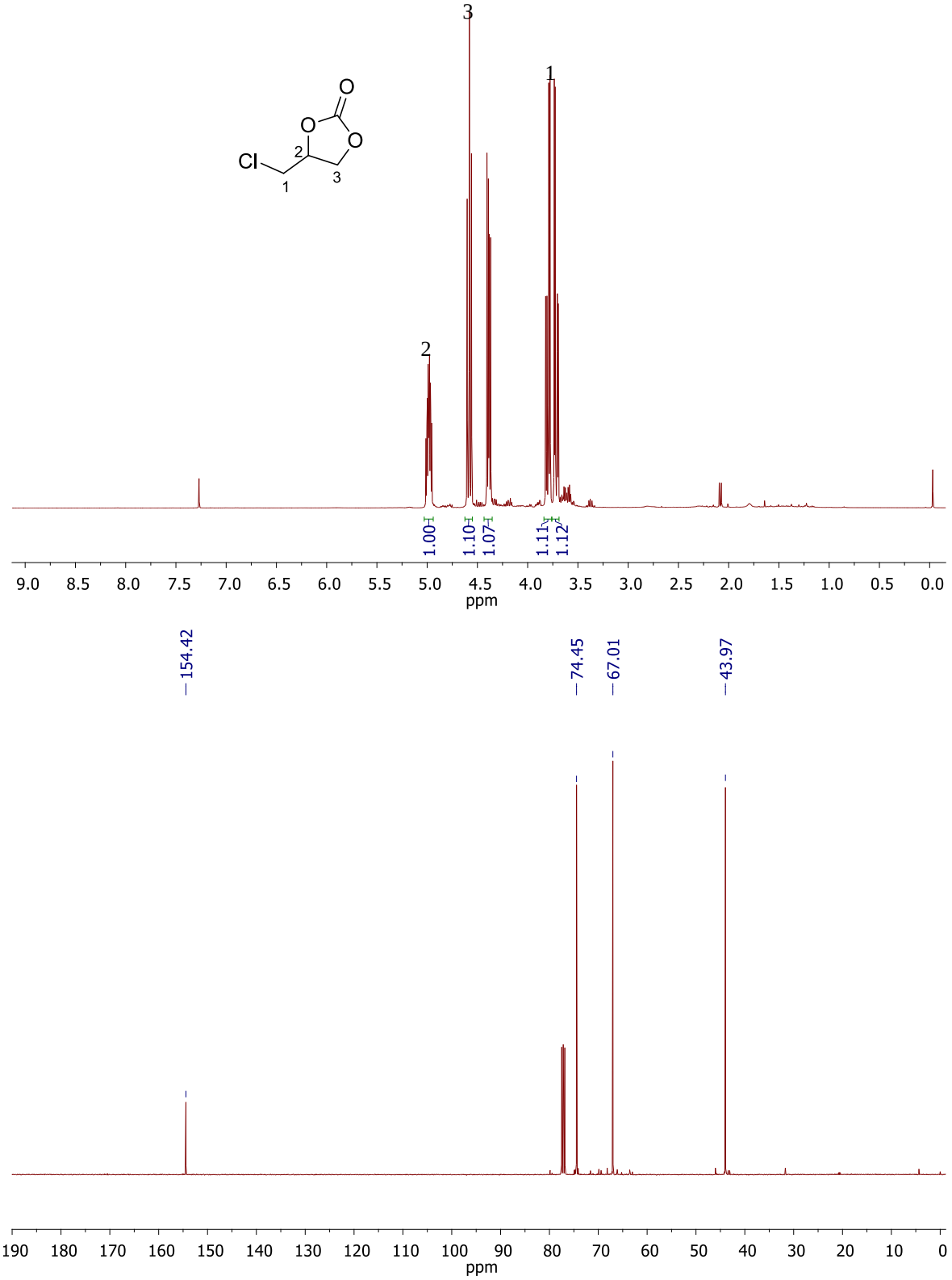


Figure S21. NMR spectra for 3-chloropropylene carbonate **3g** in $CDCl_3$.

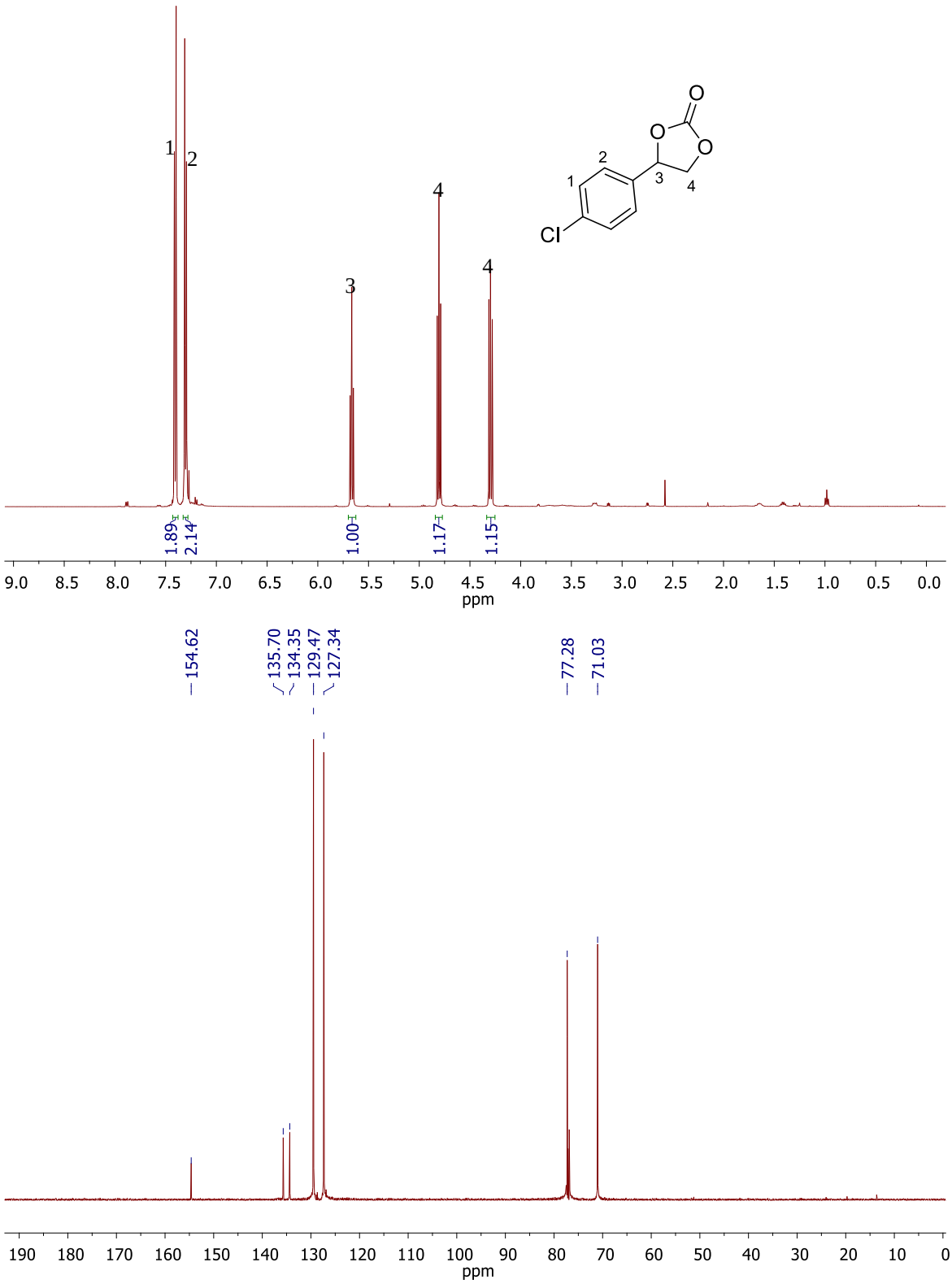


Figure S22. NMR spectra for 4-chlorostyrene carbonate **3h** in $CDCl_3$.

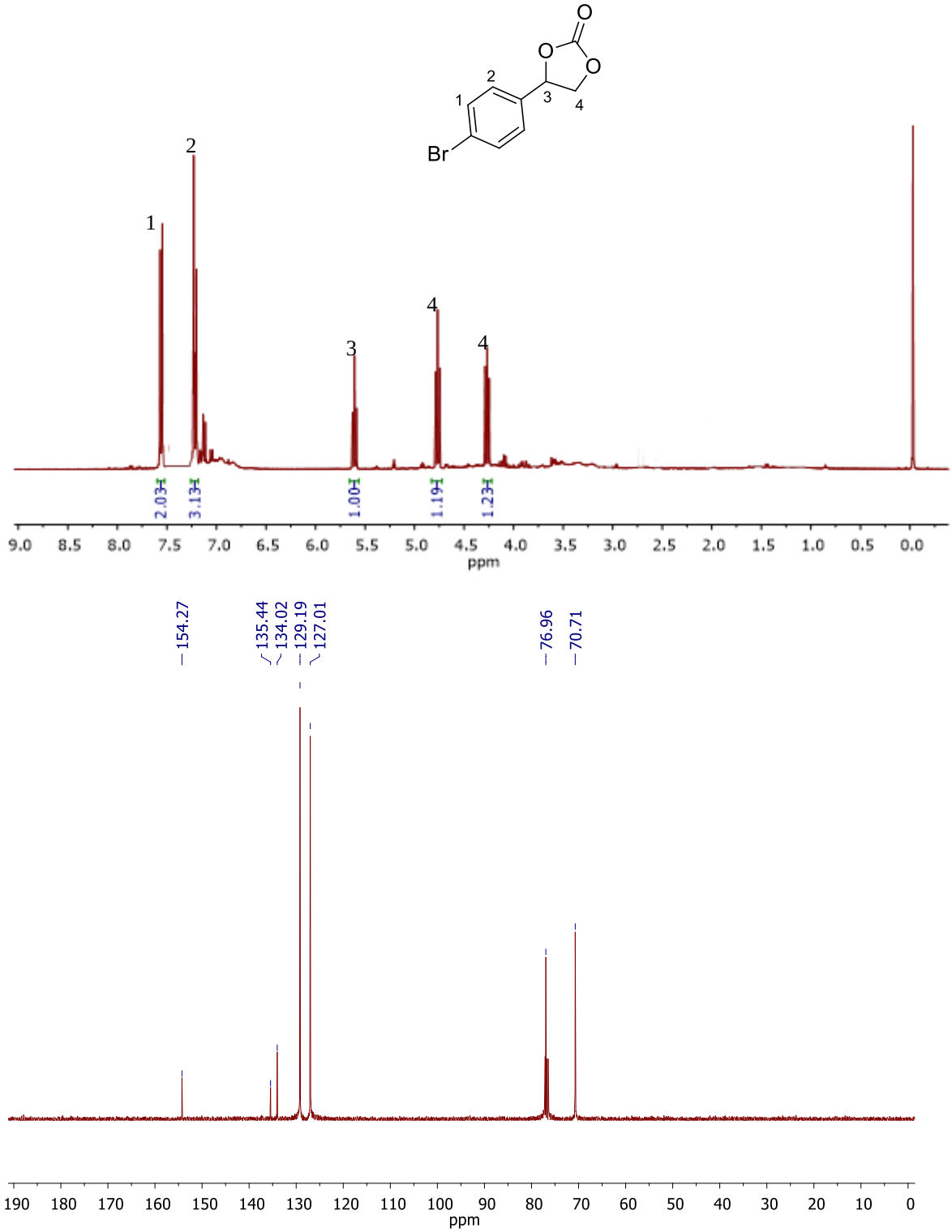
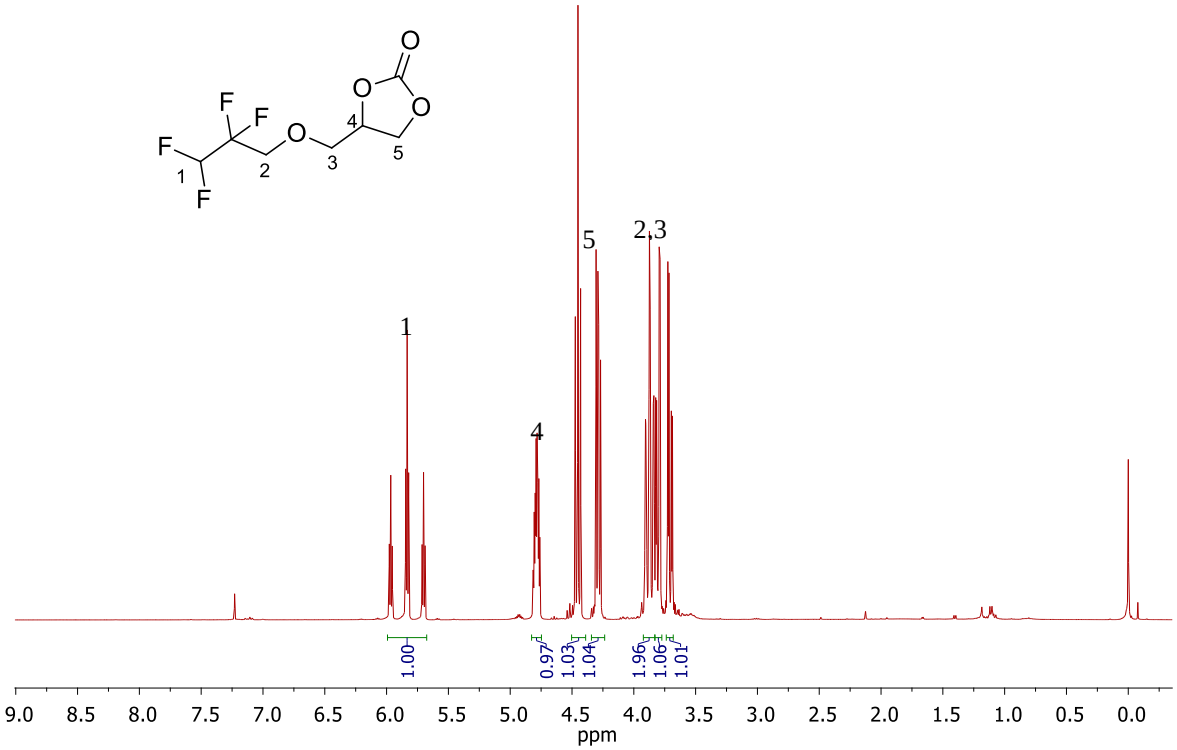
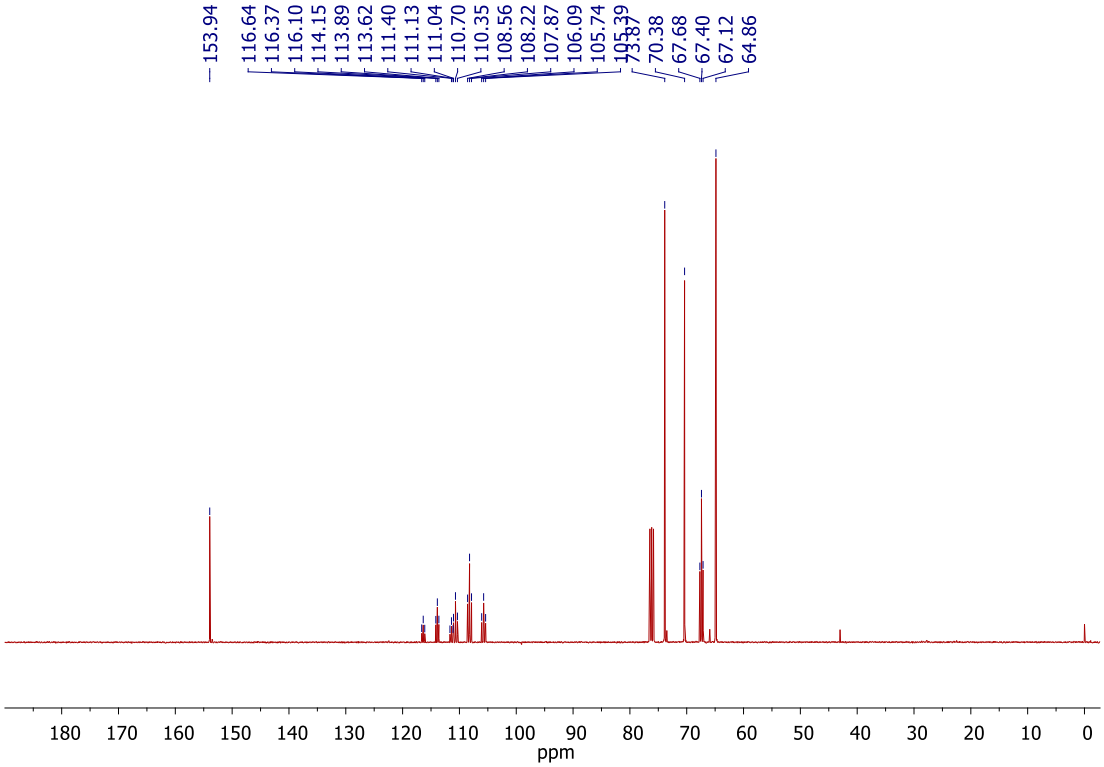


Figure S23. NMR spectra for 4-bromostyrene carbonate **3i** in $CDCl_3$.

F
F
F
F
O
O
O
O
1
2
3
4
5


1
4
5
2,3
1.00
0.97
1.03
1.04
1.96
1.06
1.01
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
ppm


153.94
116.64
116.37
116.10
114.15
113.89
113.62
111.40
111.13
111.04
110.70
110.35
108.56
108.22
107.87
106.09
105.74
105.39
73.87
70.38
67.68
67.40
67.12
64.86
180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
ppm

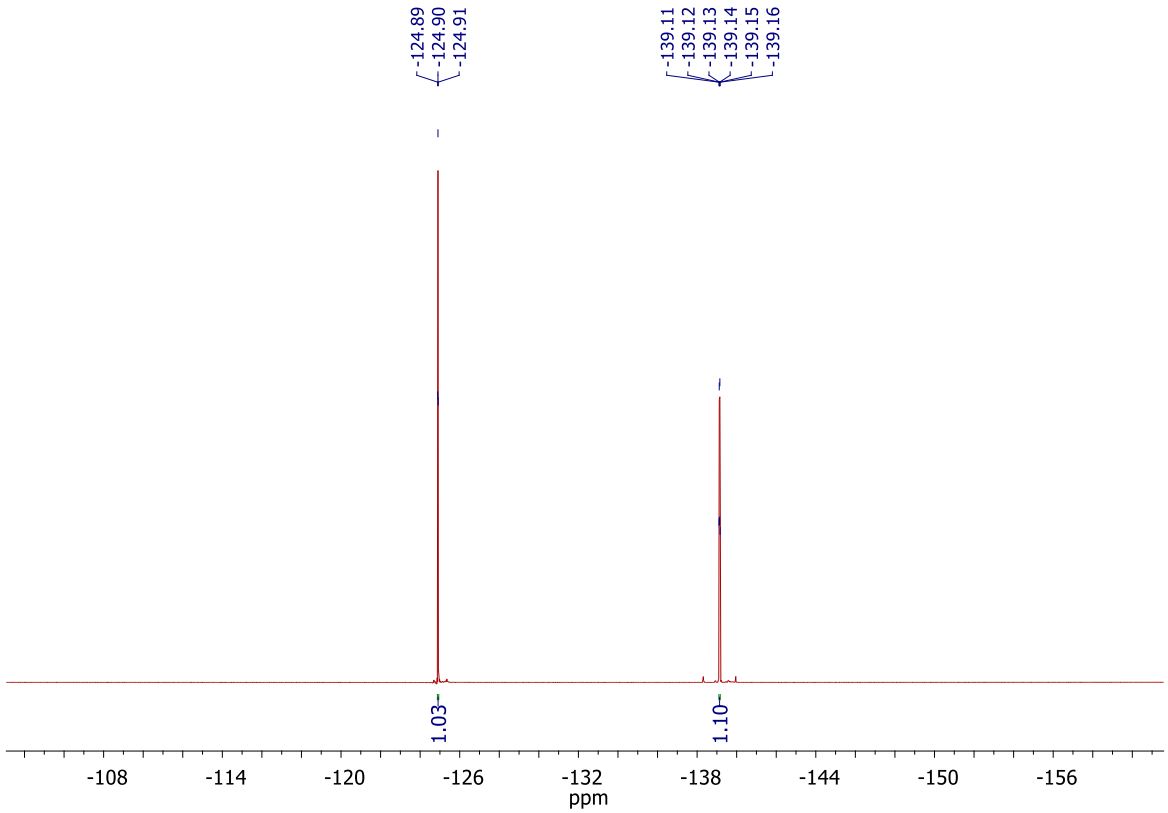
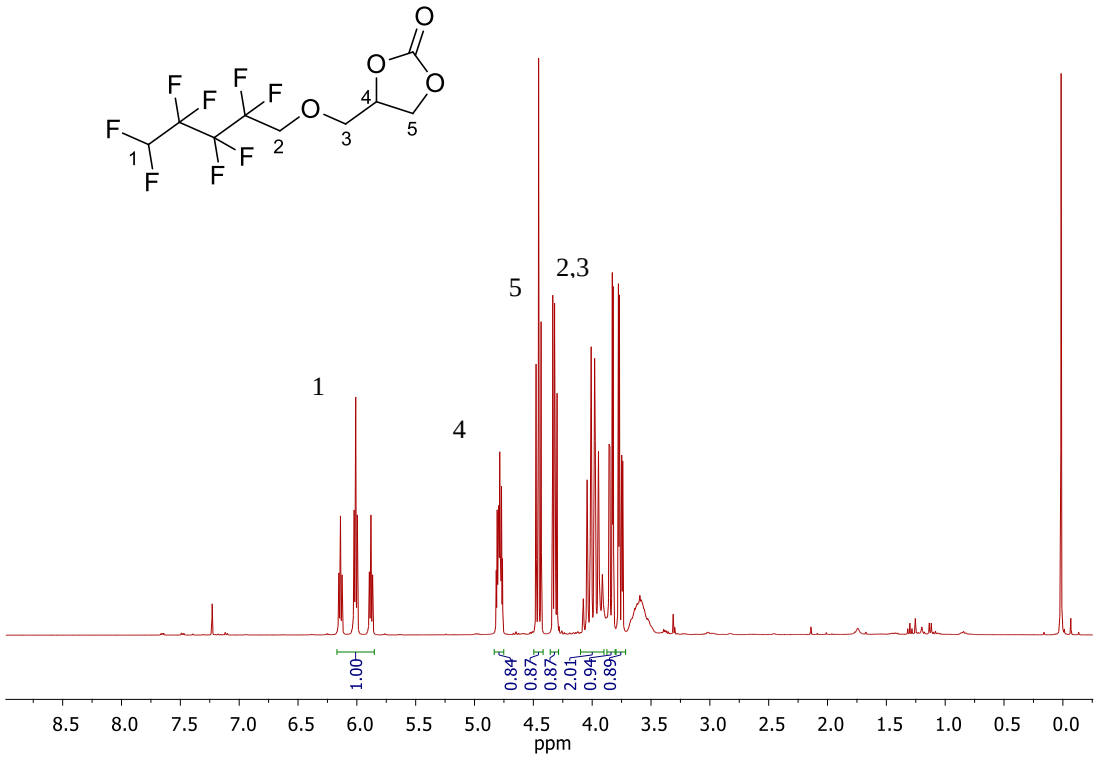
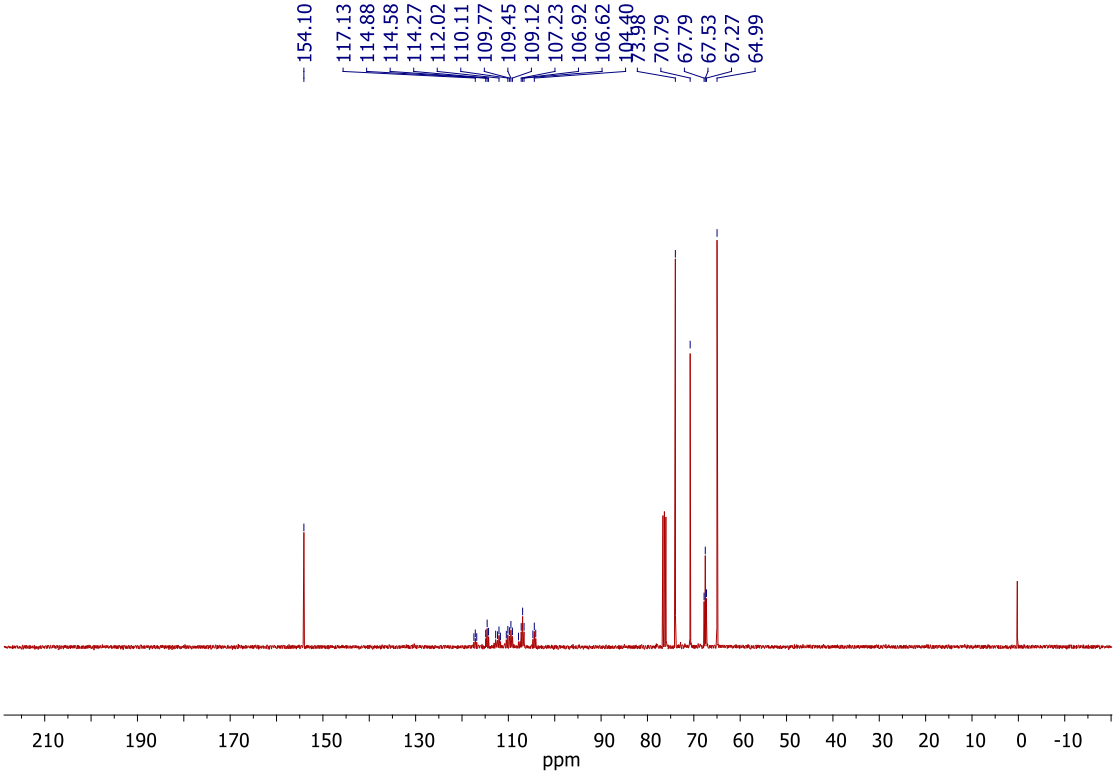


Figure 24. NMR spectra for 4-((2,2,3,3-tetrafluoropropoxy)methyl)-1,3-dioxolan-2-one **3j** in $CDCl_3$.


1
4
5
2,3
1.00
0.84
0.87
0.87
2.01
0.94
0.89
8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
ppm


154.10
117.13
114.88
114.58
114.27
112.02
110.11
109.77
109.45
109.12
107.23
106.92
106.62
104.40
73.98
70.79
67.79
67.53
67.27
64.99
210 190 170 150 130 110 90 80 70 60 50 40 30 20 10 0 -10
ppm

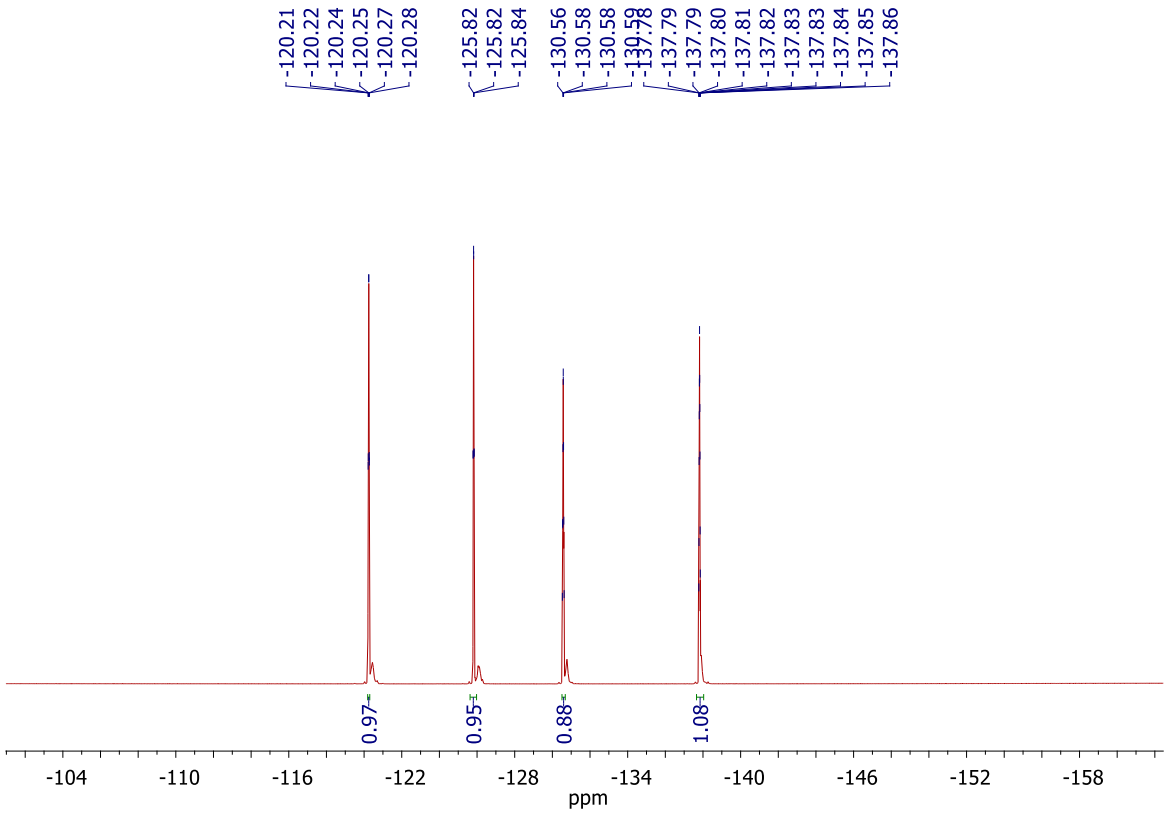


Figure 25. NMR spectra for 4-(((2,2,3,3,4,4,5,5-Octafluoropentyl)oxy)methyl)-1,3-dioxolan-2-one **3h** in $CDCl_3$.

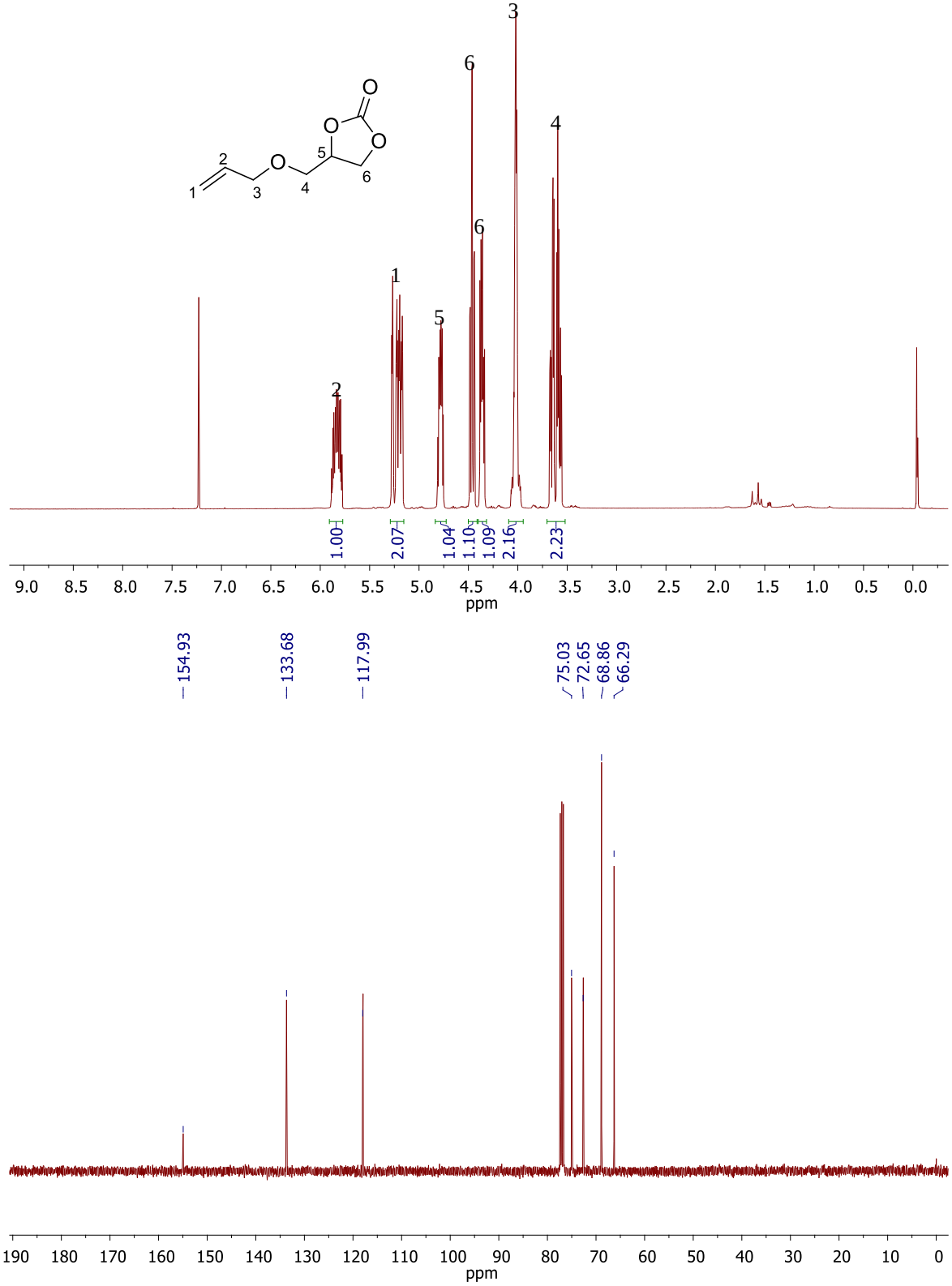


Figure S26. NMR spectra for 4-((allyloxy)methyl)-1,3-dioxolan-2-one **3l** in $CDCl_3$.

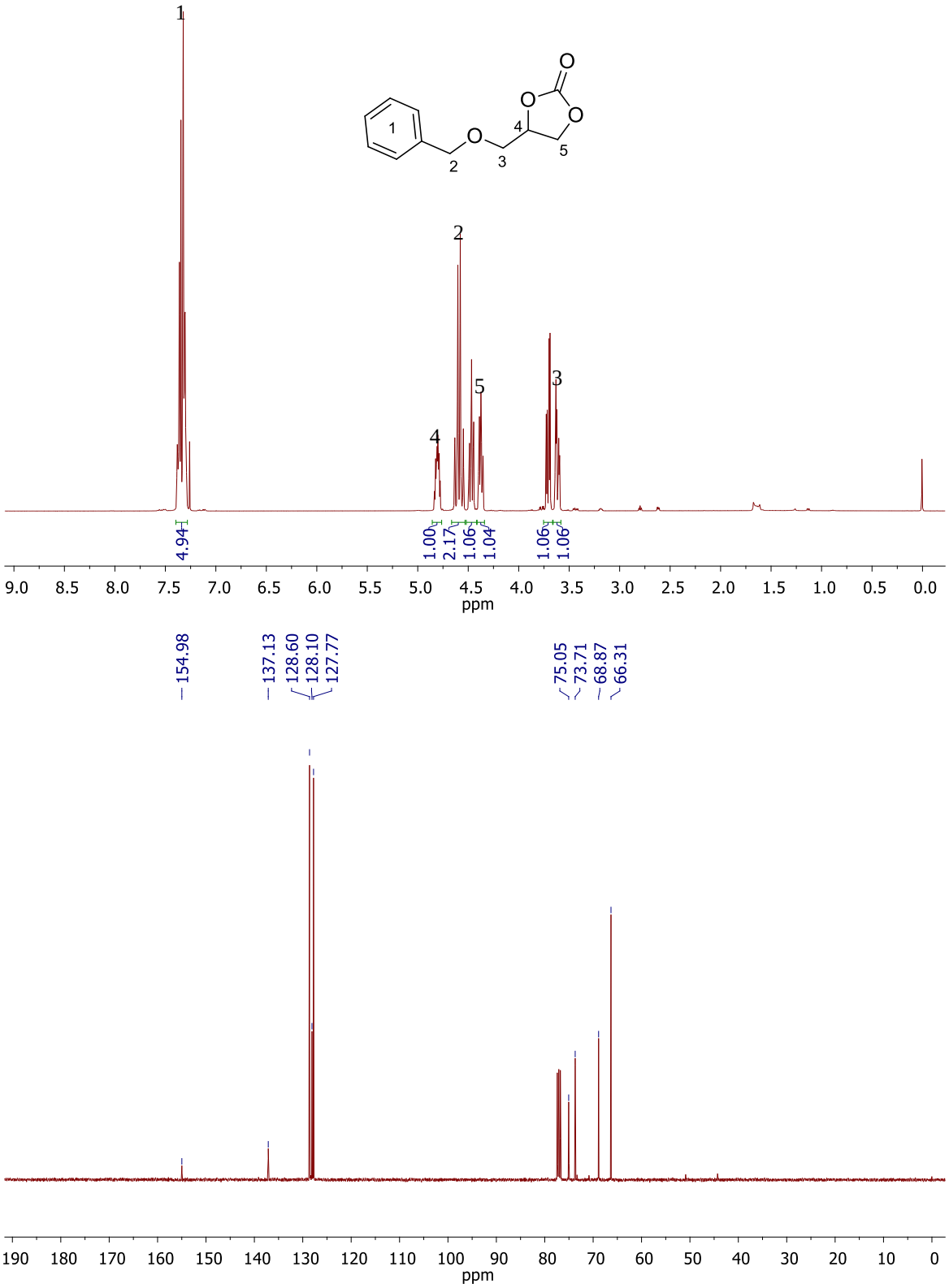


Figure S27. NMR spectra for 4-((benzyloxy)methyl)-1,3-dioxolan-2-one **3m** in $CDCl_3$.

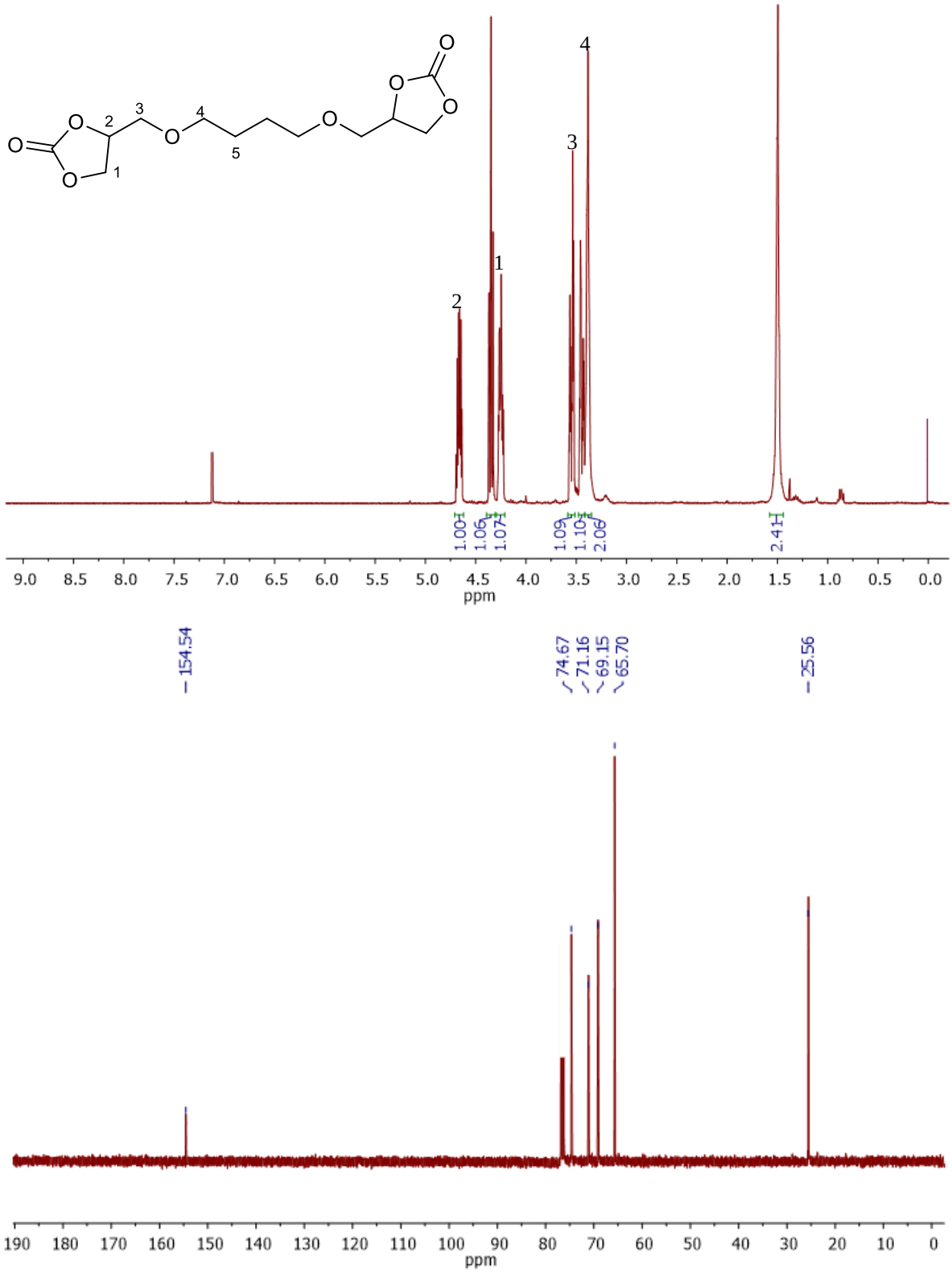


Figure S28. NMR spectra for 4,4'-((butane-1,4-diylbis(oxy))bis(methylene))bis(1,3-dioxolan-2-one) **3n** in $CDCl_3$.

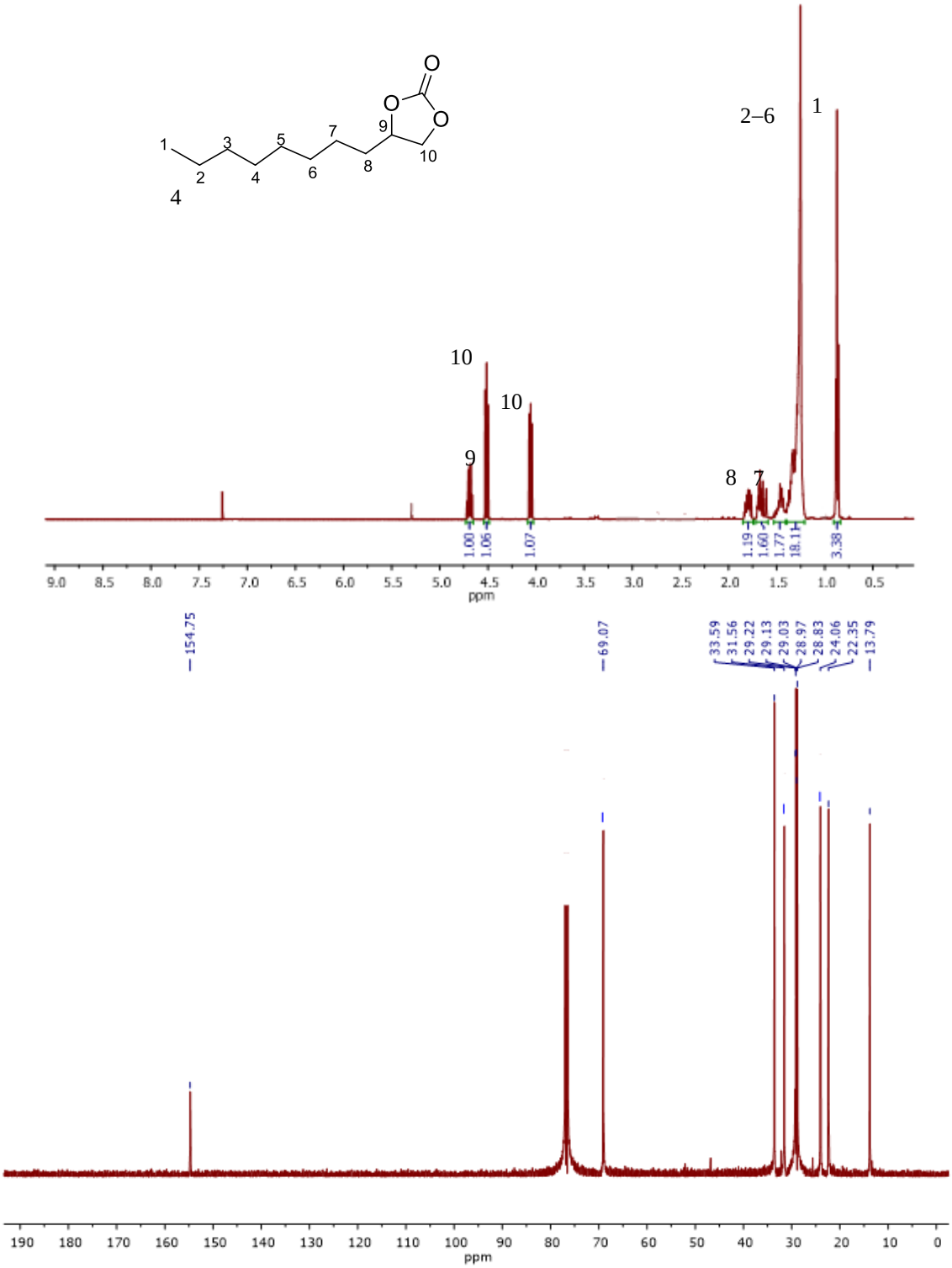


Figure S29. NMR spectra 1,2-Decylene carbonate **3o** in $CDCl_3$.