Supporting Information

Extending the color retention of an electrochromic device by immobilizing color switching and ion-storage complementary layers

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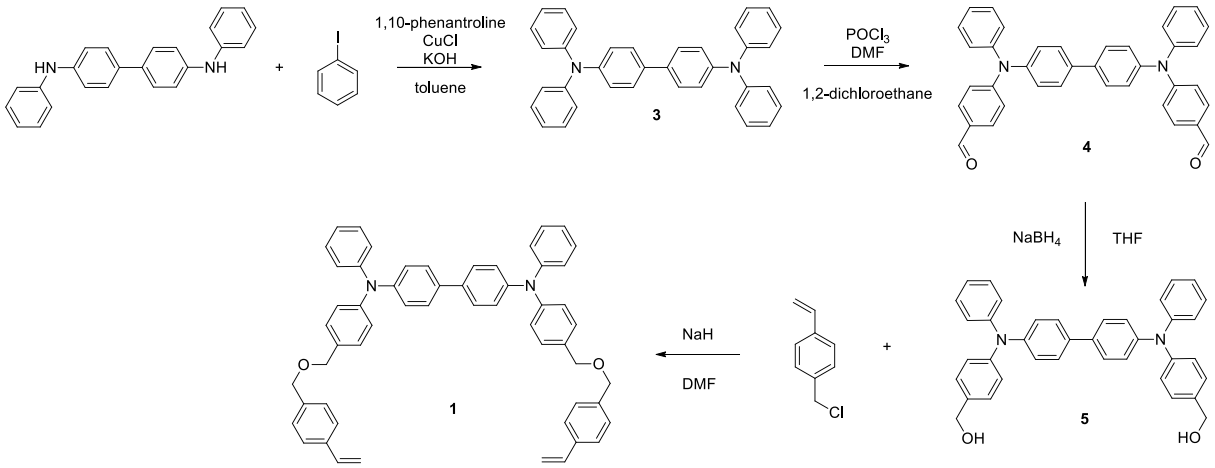

Figure S1. Synthetic scheme for the preparation of **1**.

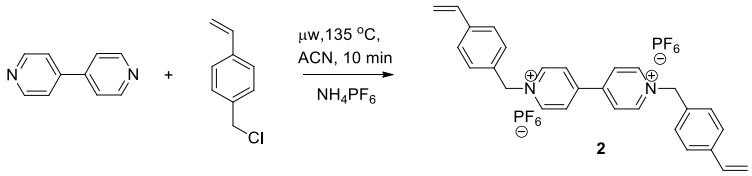

Figure S2. Synthetic scheme for the preparation of **2**.

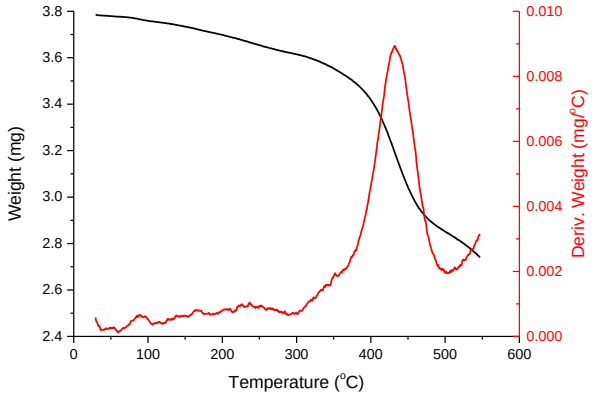

Figure S3. TGA analysis of **1**.

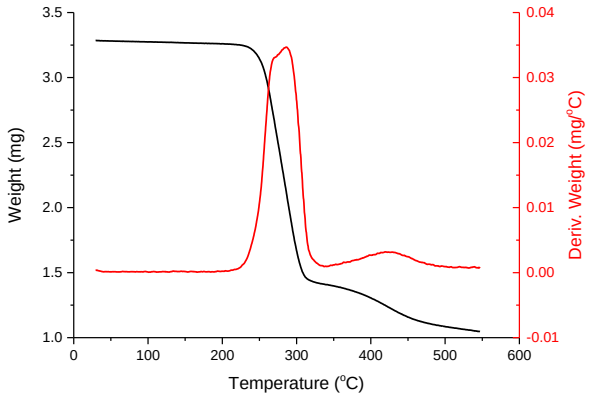

Figure S4. TGA analysis of **2**.

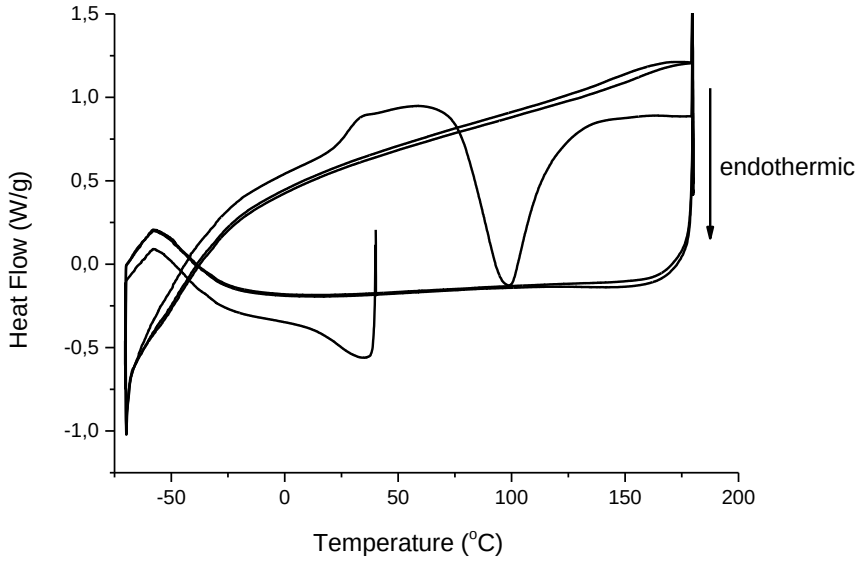

Figure S5. DSC analysis of **1**.

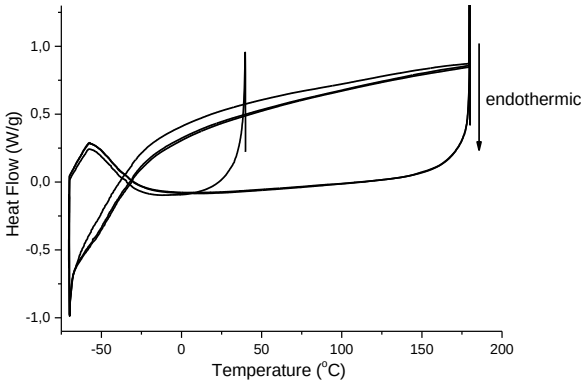

Figure S6. DSC analysis of **2**.

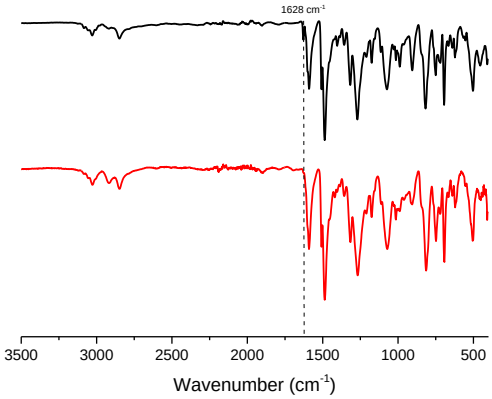

Figure S7. The FT-IR spectra of **1** before (black) and after polymerization (red).

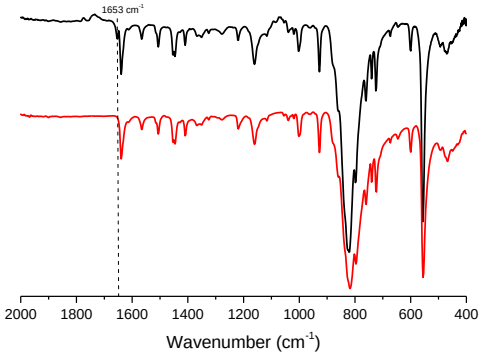

Figure S8. The FT-IR spectra of **2** before (black) and after polymerization (red).

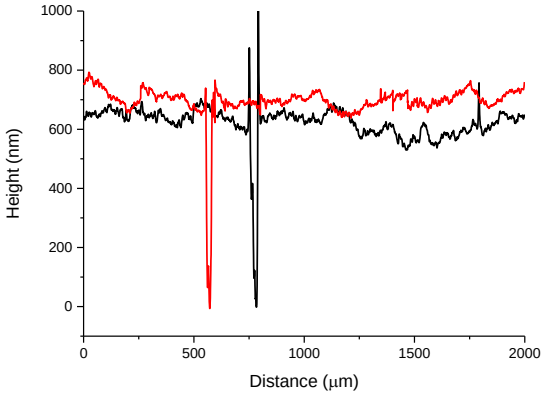

Figure S9. Profilometry traces of a spin coated thin film of **1** before (red) and after (black) polymerization.

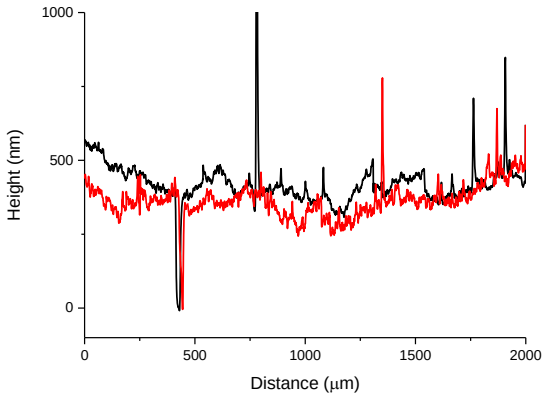

Figure S10. Profilometry traces of a spin coated thin film of **2** before (red) and after (black) polymerization.

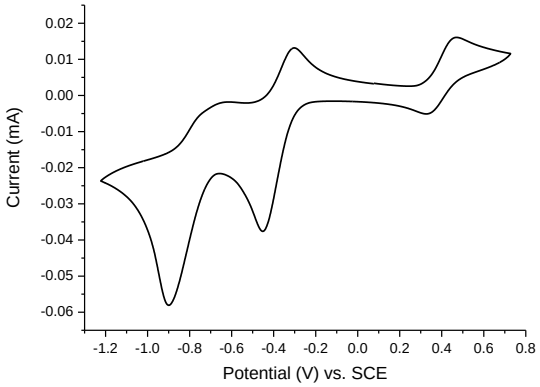

Figure S11. Complete cyclic voltammogram of **2** measured in anhydrous and deaerated dichloromethane with 0.1 M $TBAPF_6$ and calibrated against ferrocene (E^o = 0.46 V vs SCE) at 100 mV/sec.

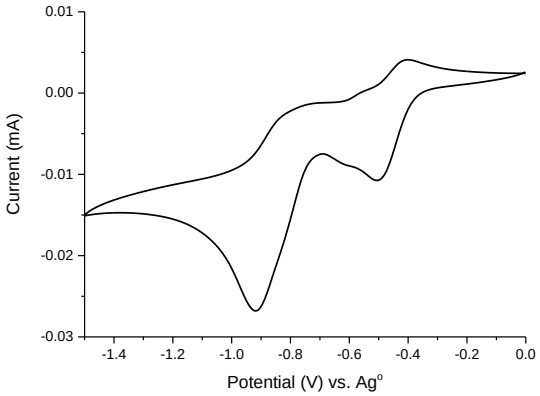

Figure S12. Cathodic cyclic voltammogram of **poly-2** measured in anhydrous and deaerated dichloromethane with 0.1 M $TBAPF_6$ at 100 mV/sec.

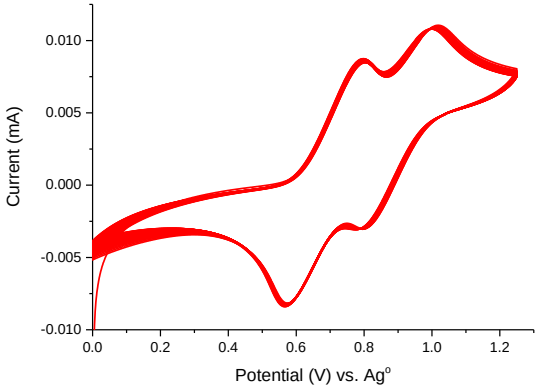

Figure S13. Anodic cyclic voltammograms (30 cycles) of **1** measured in anhydrous and deaerated dichloromethane with 0.1 M $TBAPF_6$ at 100 mV/sec.

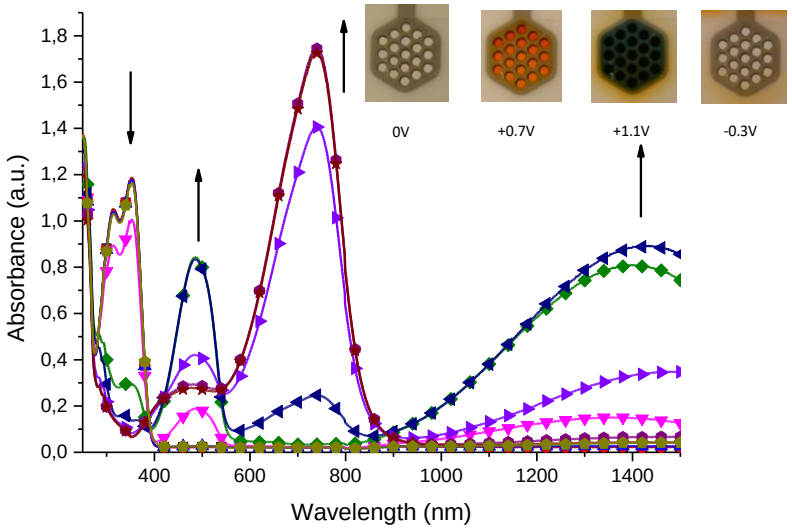

Figure S14. Spectroelectrochemistry of **1** measured in anhydrous and deaerated dichloromethane with $TBAPF_6$ as an electrolyte with applied potentials of 0 (■), 400 (●), 500 (▲), 600 (▼), 700 (♦), 800 (◀), 900 (▶), 1000 (●), 1100 (*) and -300 (●) mV held for 30 s per potential. Insert: photographs of original neutral, first oxidation (700 mV), second oxidation (1100 mV), and reduced (-300 mV) states of **1** with applied potential of 1 min.

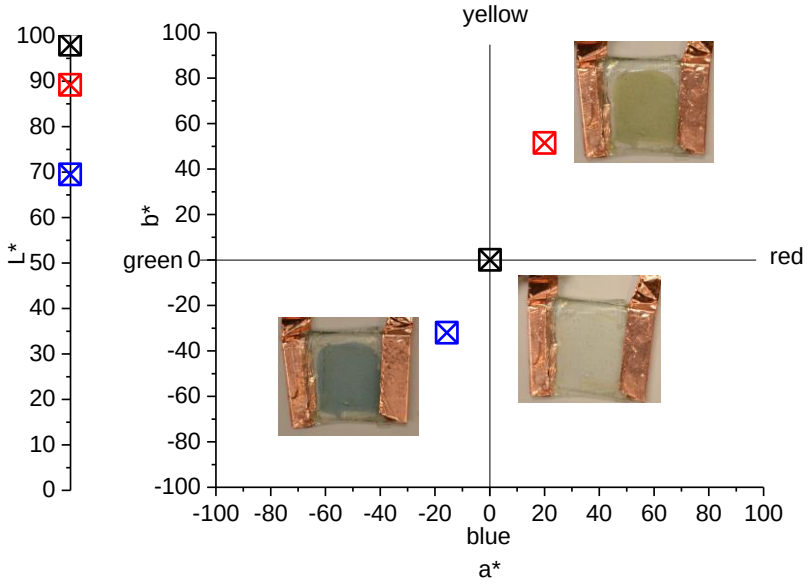

Figure S15. CIE $L^*a^*b^*$ color coordinates of a film of **poly-1** in its neutral (black), 1st oxidation (red) and 2nd oxidation (blue) states.

Table S1. CIE coordinates with A, B and C illuminants with the 2° standard observer angle of **poly-1**.[a]

State	CIE A			CIE B			CIE C		
	L^*	a^*	b^*	L^*	a^*	b^*	L^*	a^*	b^*
Neutral	98.0	0.1	0.07	98.0	0.1	0.05	98.0	0.1	0.05
1st oxidation	89.2	20.0	51.5	86.5	20.5	44.1	85.3	18.5	40.9
2nd oxidation	69.5	-15.7	-32.0	71.7	-12.3	-25.6	72.4	-11.2	-21.5

[a] Calculated for the spectral range 360-830 nm.

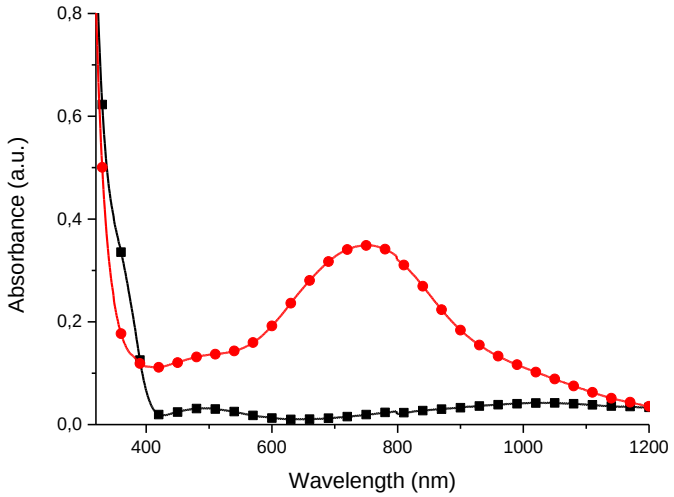

Figure S16. Absorbance spectra of the dual-layer electrochromic device consisting of **poly-1** and **poly-2** with the electrolytic gel in its neutral (■) and oxidized (●) states.

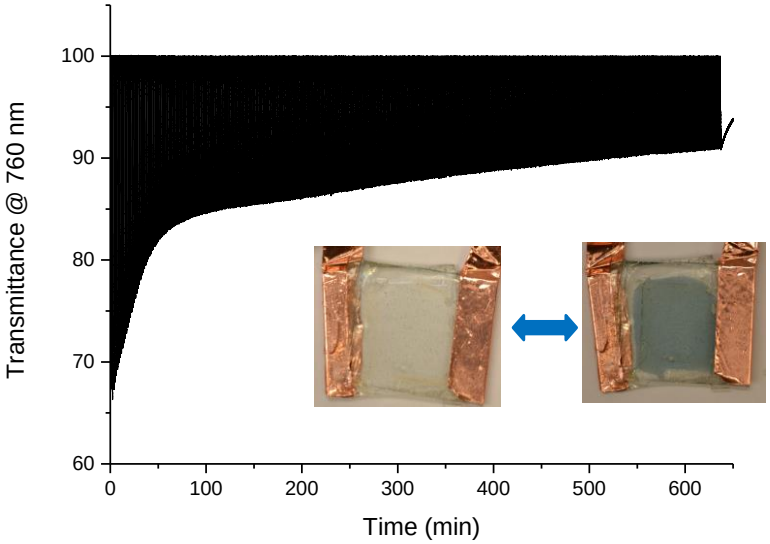

Figure S17. Change in transmittance percent of the double layer electrochromic device with **poly-1** and **poly-2** monitored at 760 nm as a function of switching potentials between +3 300 and -2 000 mV at 40 sec intervals. Baseline at 100% of transmittance was corrected to be consistent over time. Inserts: photographs of the double layer electrochromic device in the neutral (left) and oxidized states (right).

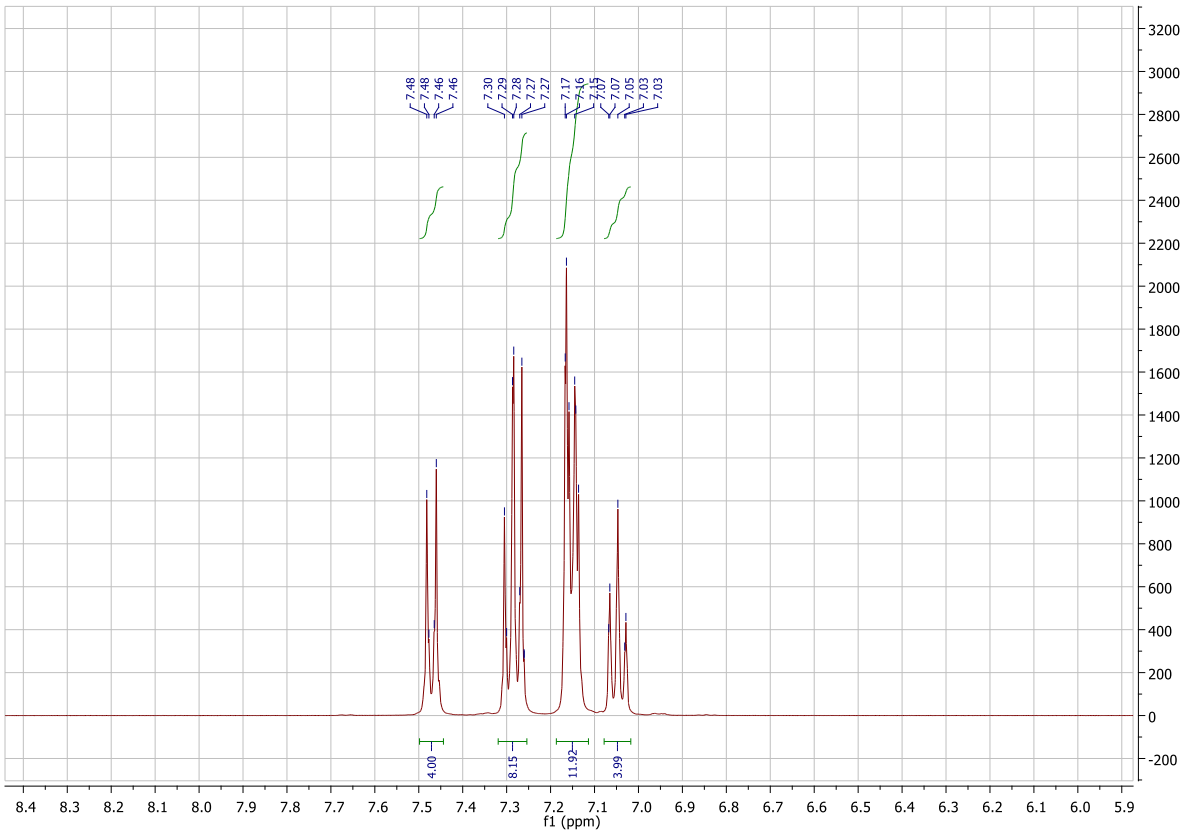

Figure S18. ^{1}H NMR spectrum of **3** in $CDCl_3$.

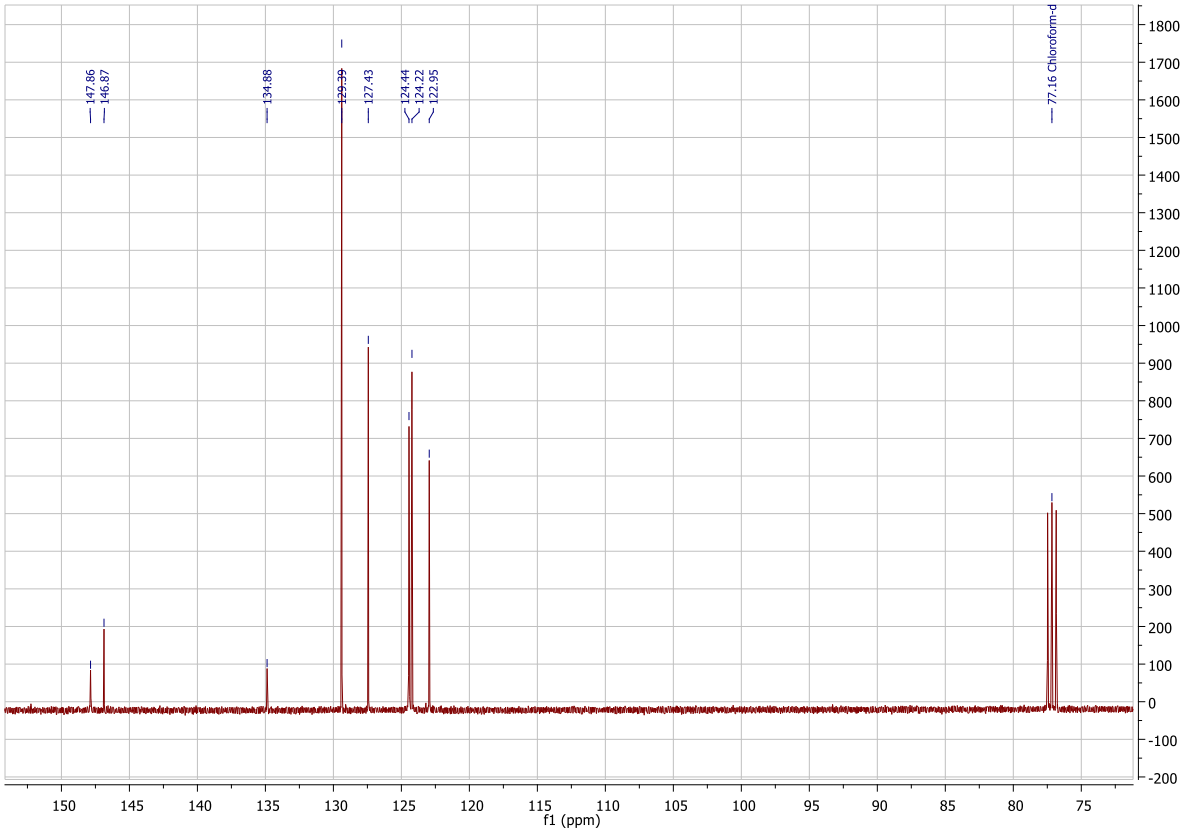

Figure S19. ^{13}C NMR spectrum of **3** in $CDCl_3$.

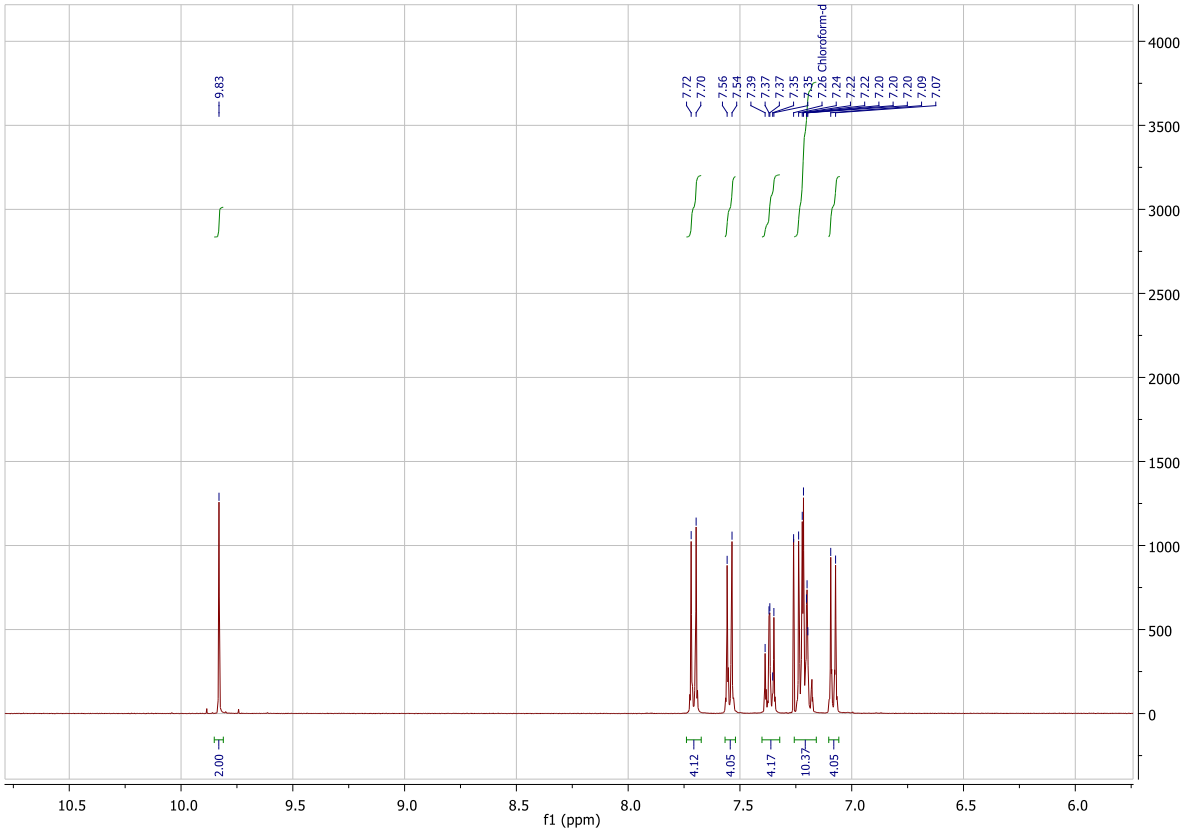

Figure S20. ^{1}H NMR spectrum of **4** in $CDCl_3$.

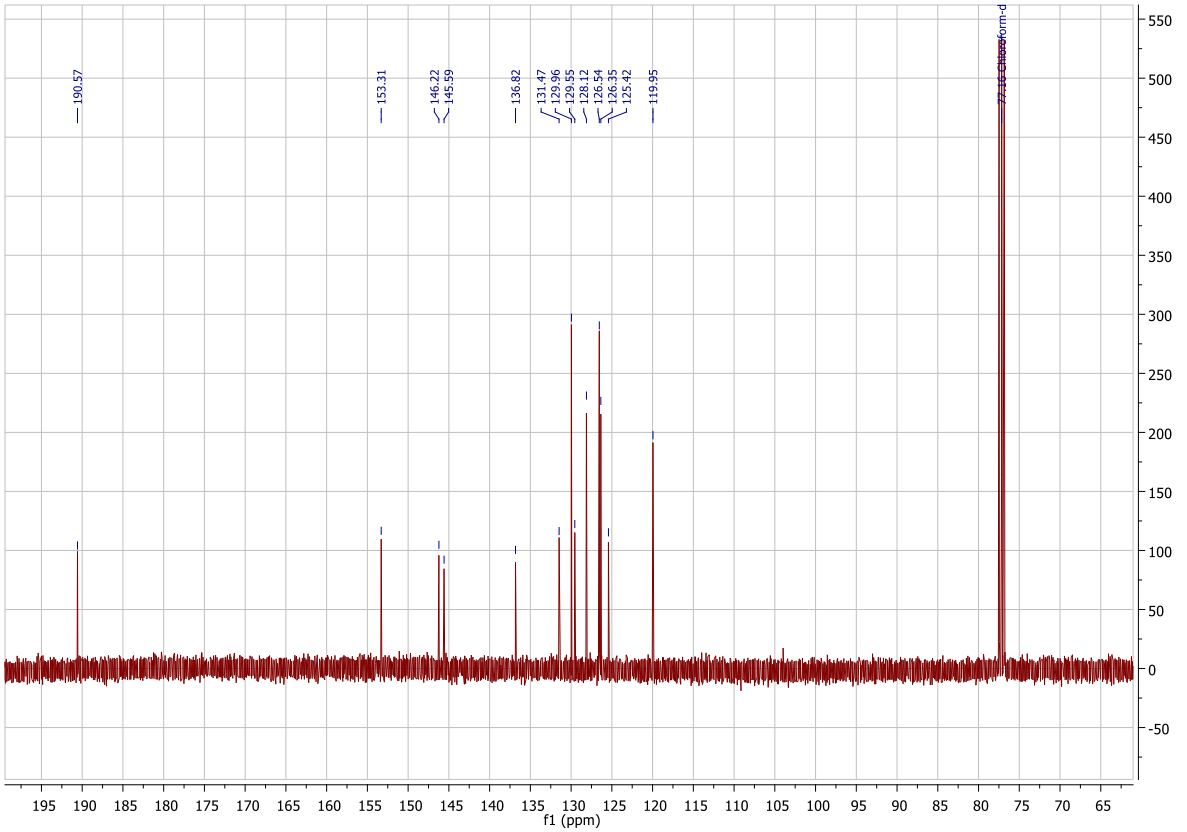

Figure S21. ^{13}C NMR spectrum of **4** in $CDCl_3$.

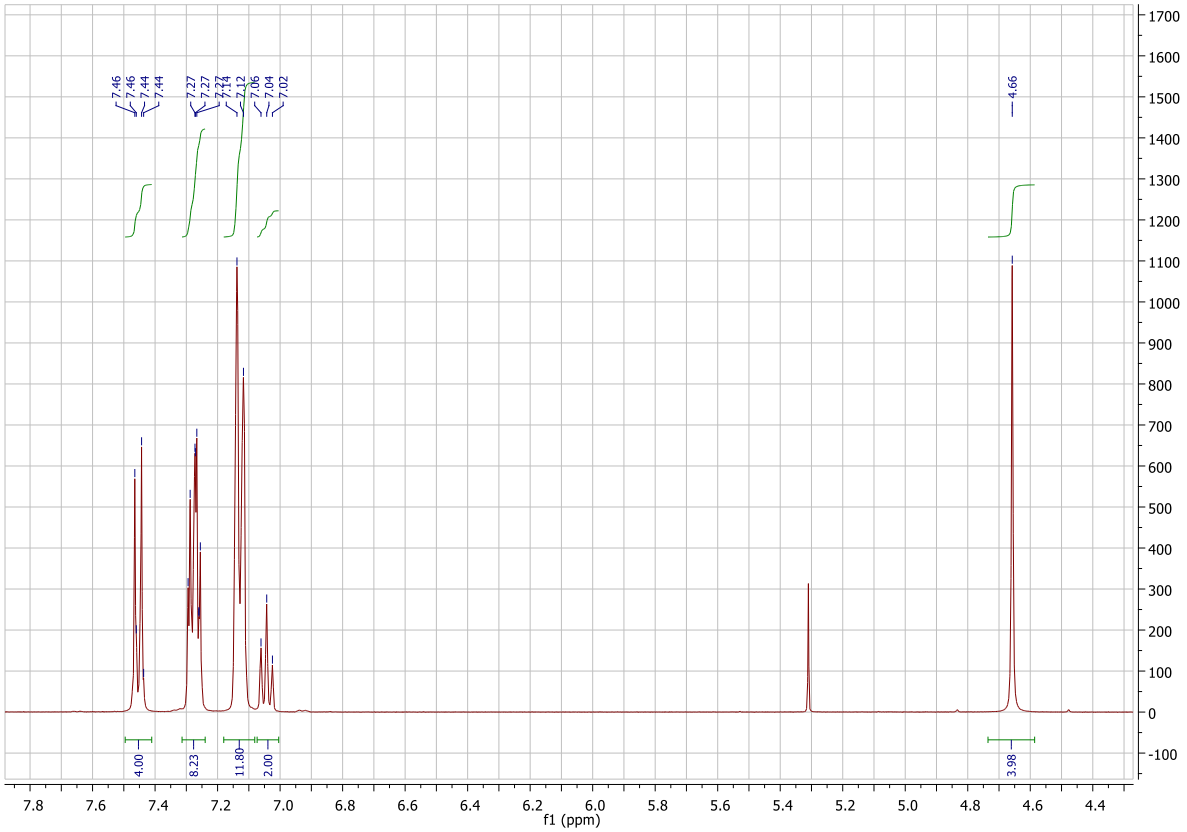

Figure S22. ^{1}H NMR spectrum of **5** in $CDCl_3$.

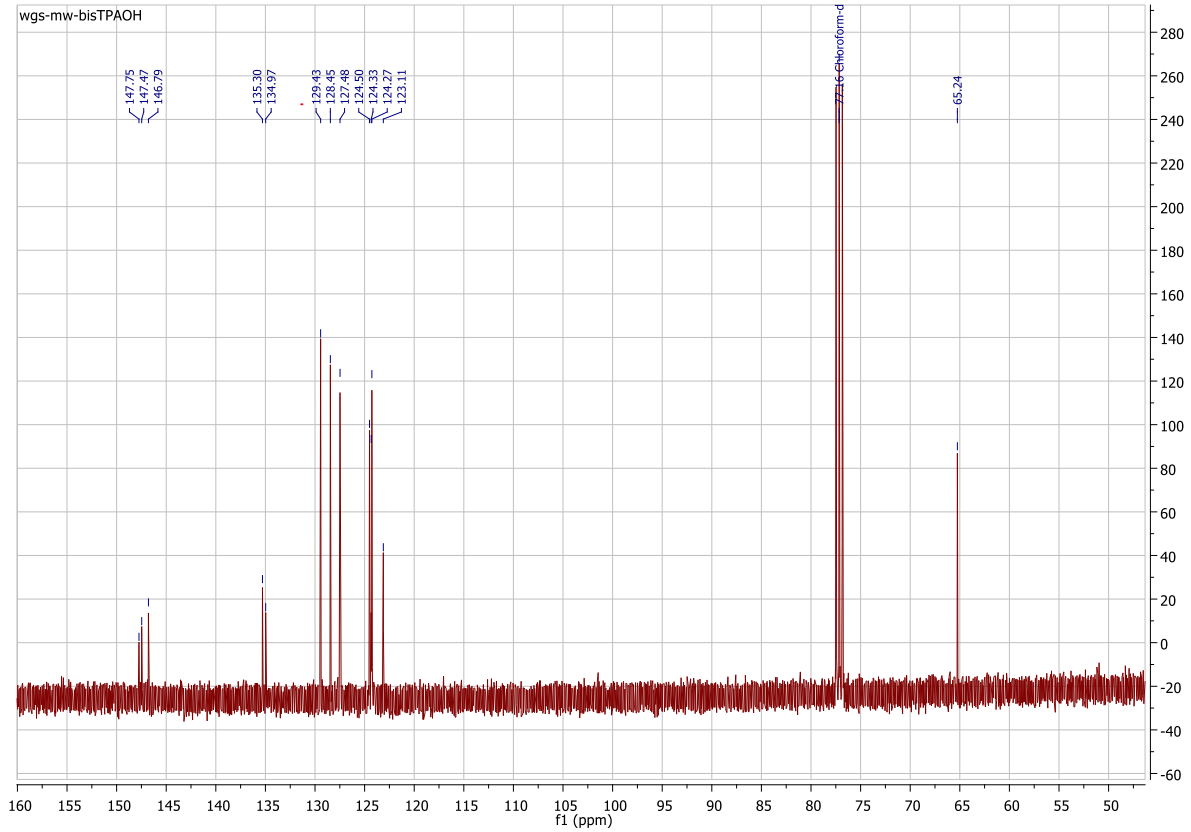

Figure S23. ^{13}C NMR spectrum of **5** in $CDCl_3$.

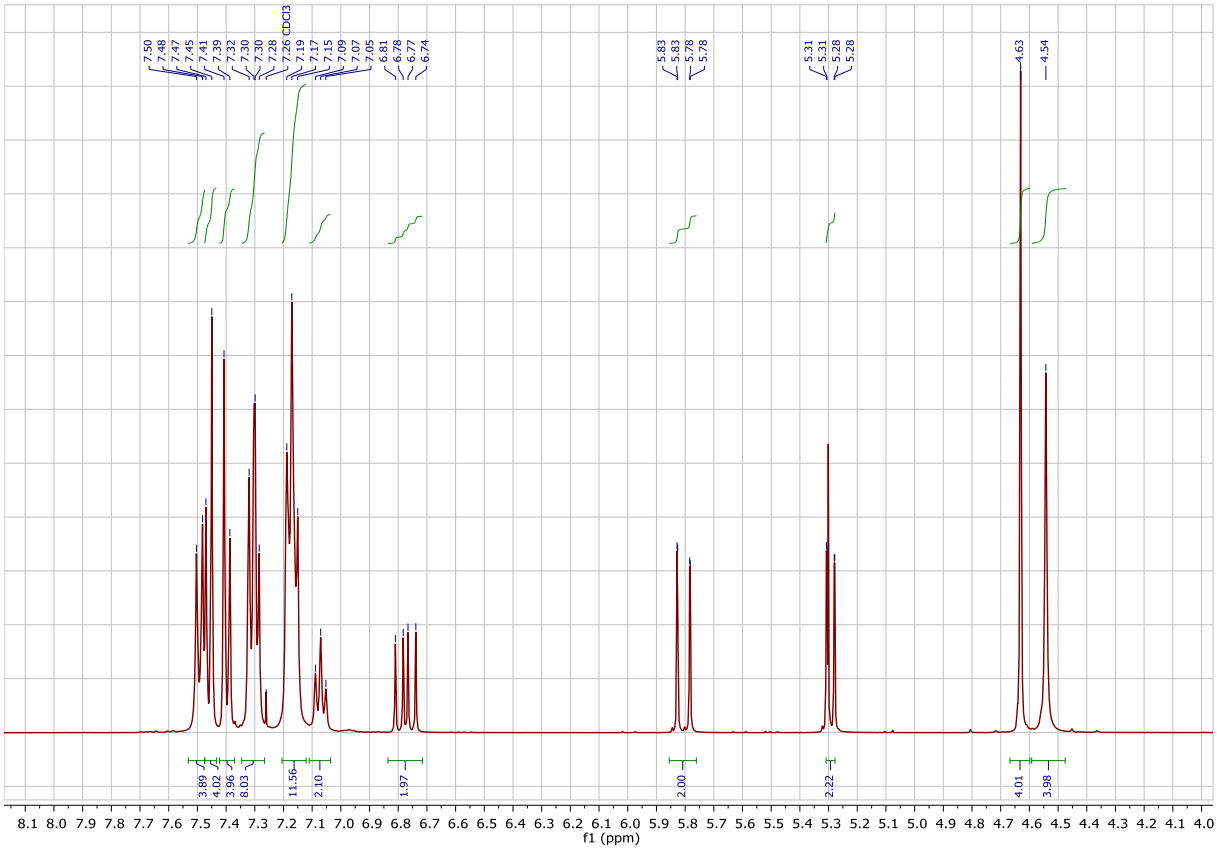

Figure S24. ^{1}H NMR spectrum of **1** in $CDCl_3$.

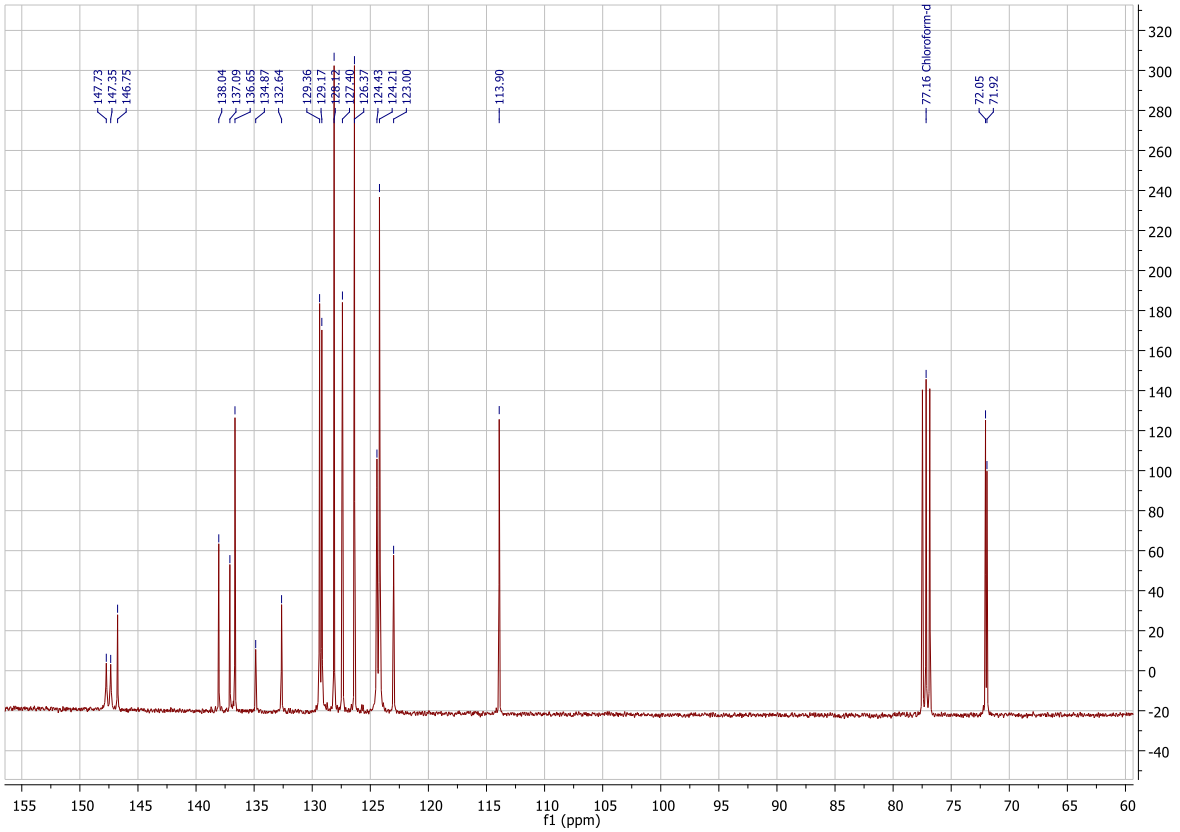

Figure S25. ^{13}C NMR spectrum of **1** in $CDCl_3$.

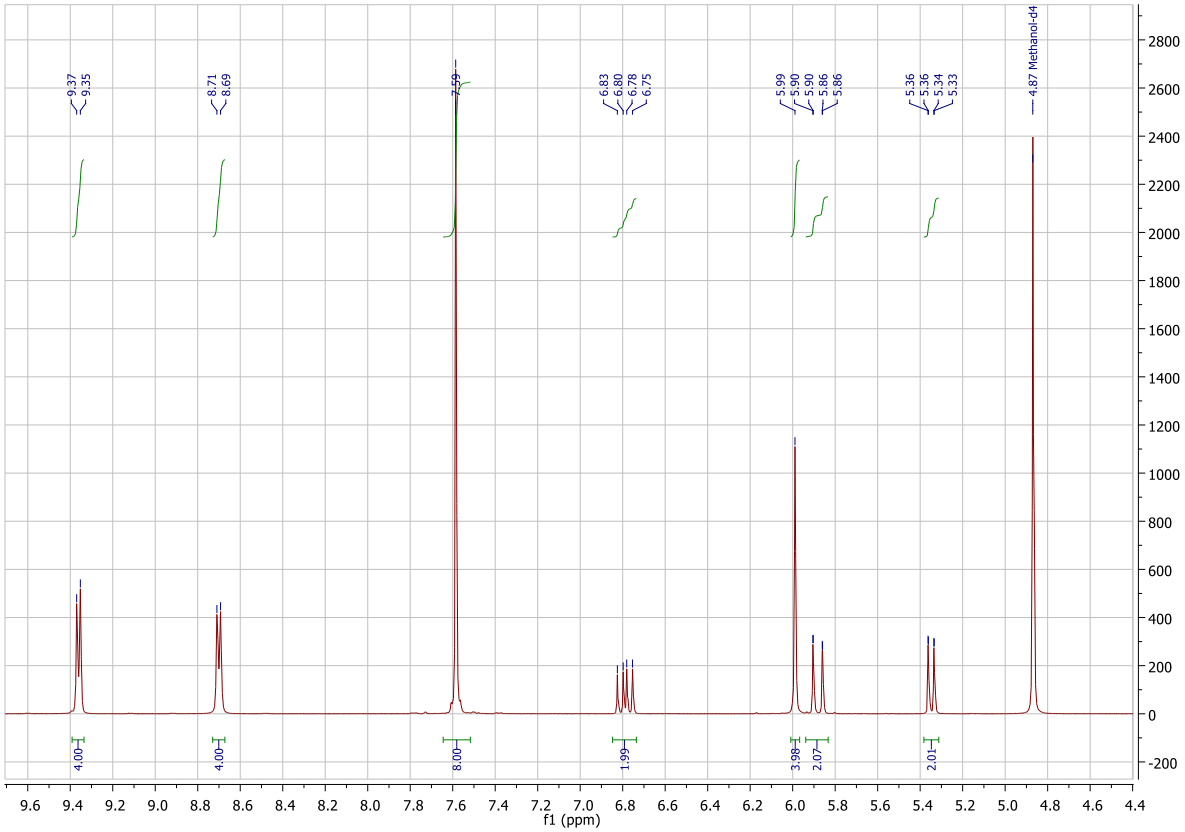

Figure S26. ^{1}H NMR spectrum of **2** in MeOD.

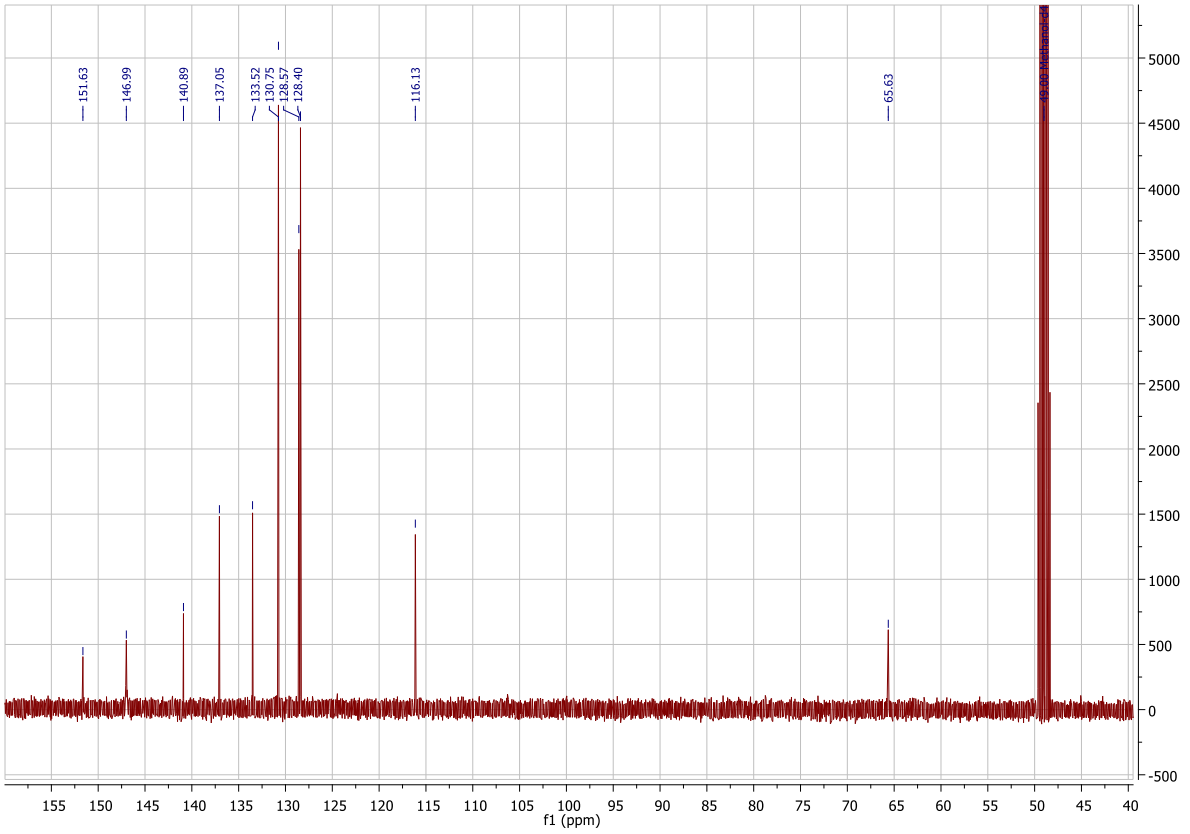

Figure S27. ^{13}C NMR spectrum of **2** in MeOD.