Supporting Information

Palladium-Catalyzed Direct Preparation of Highly Branched Ethylene Oligomers and MA Functionalized Derivatives Using Dibenzhydryl Pyrazine-Imine Ligands

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1. Experimental sections

1.1 General Considerations

All chemicals were commercially sourced, except those whose synthesis is described. All experiments were carried out under a dry nitrogen atmosphere using standard Schlenk techniques or in a glove-box. Deuterated solvents used for NMR were dried and distilled prior to use. ^{1}H, ^{13}C and 2D NMR spectra were recorded by an AVANCE NEO 400M or 500M spectrometer at ambient temperature unless otherwise stated. The chemical shifts of the ^{1}H and ^{13}C NMR spectra were referenced to the residual solvent; coupling constants are in Hz. Molecular weight of the (MF)HBEOs was determined by ^{1}H and ^{13}C NMR spectra. Elemental analysis was performed by the Analytical Center of Anhui Normal University. The ligands **L1-L4** were prepared using methods reported by our research group and are all known compounds[1].

2. Spectra Data

2.1 ^{1}H, ^{13}C and 2D NMR of the Synthetic Compounds

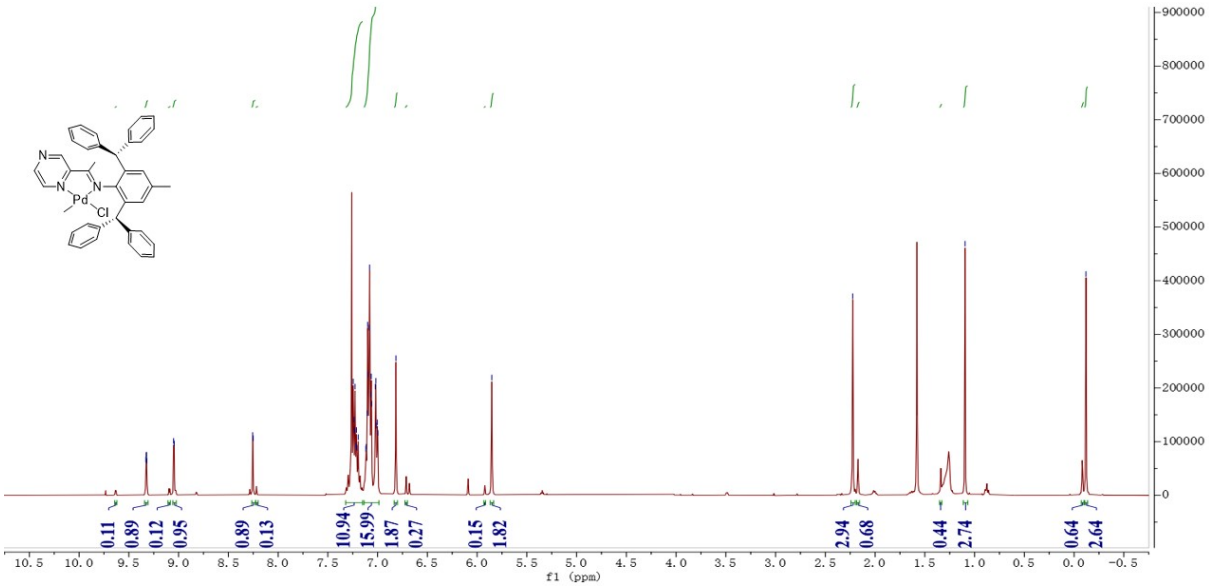

Figure S1. ^{1}H NMR spectrum of **Pd1** in $CDCl_3$ (400 MHz, 20 ℃).

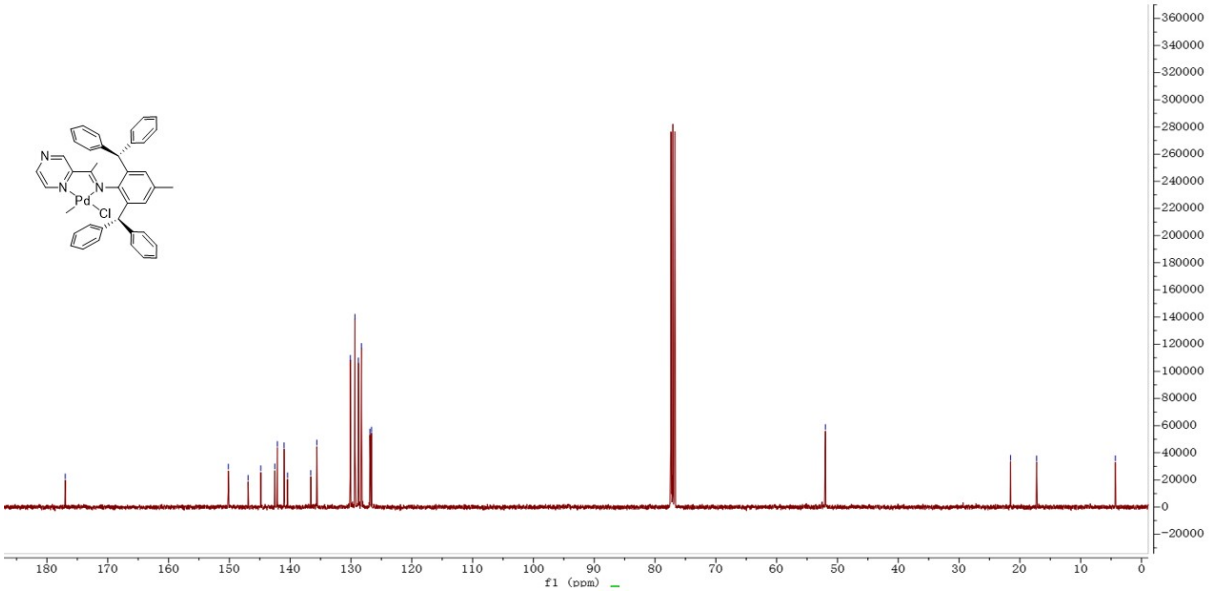

Figure S2. ^{13}C NMR spectrum of **Pd1** in $CDCl_3$ (400 MHz, 20 ℃).

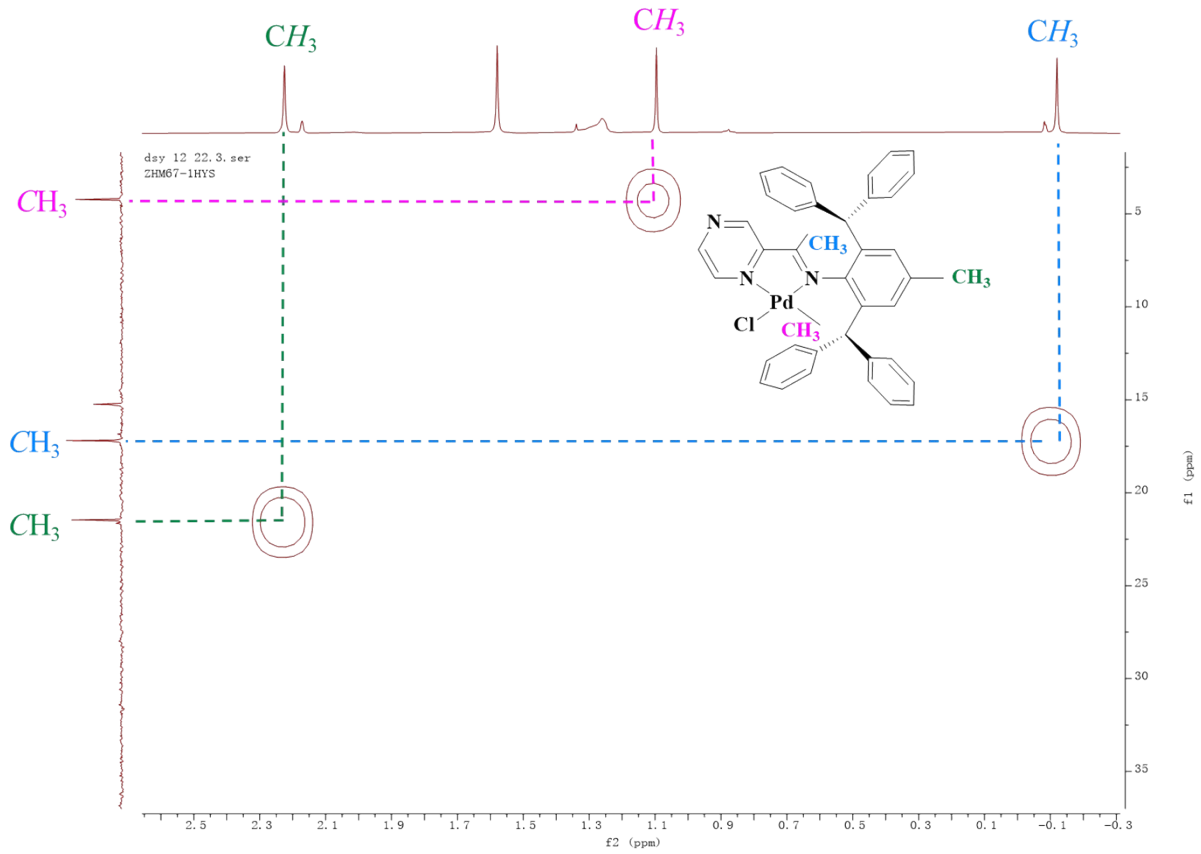

Figure S3. ^{1}H-^{13}C HSQC NMR spectrum of **Pd1** in $CDCl_3$ (500 MHz, 20 °C).

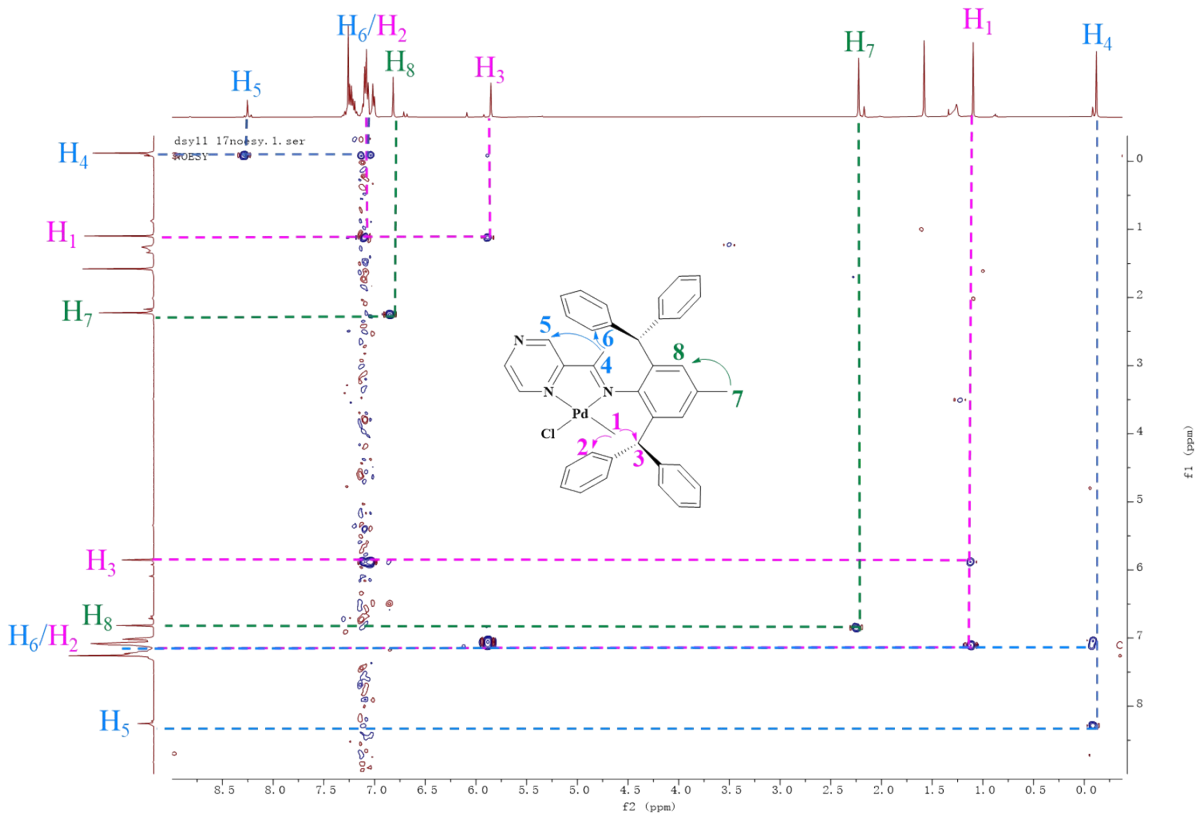

Figure S4. ^{1}H-^{1}H NOESY NMR spectrum of **Pd1** in $CDCl_3$ (500 MHz, 20 °C).

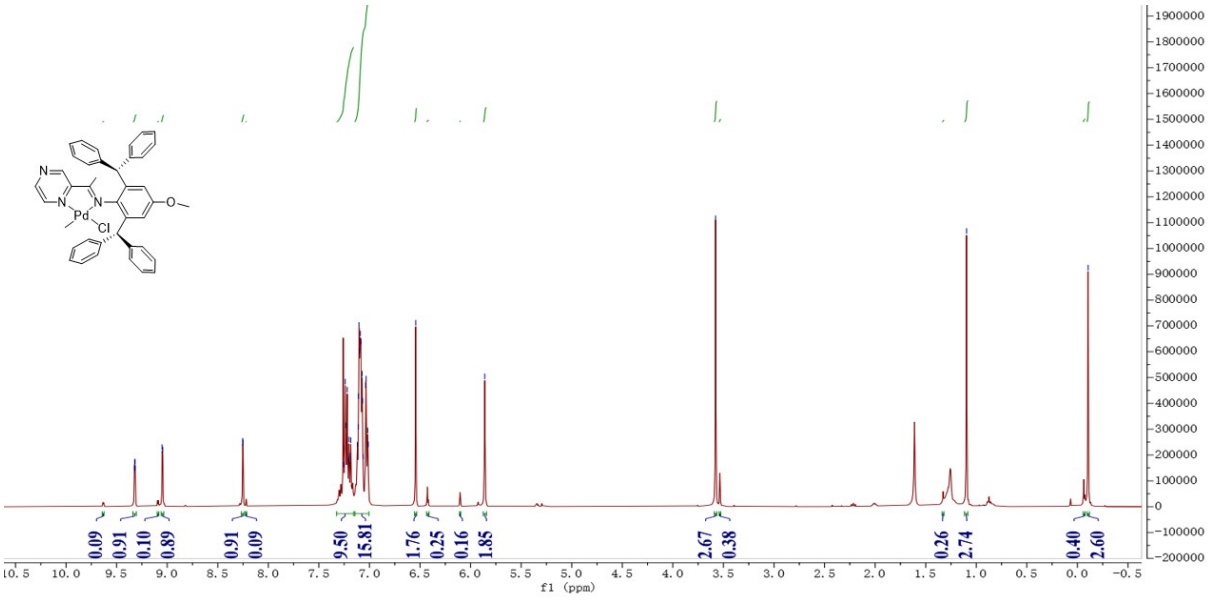

Figure S5. ^{1}H NMR spectrum of **Pd2** in $CDCl_3$ (400 MHz, 20 ℃).

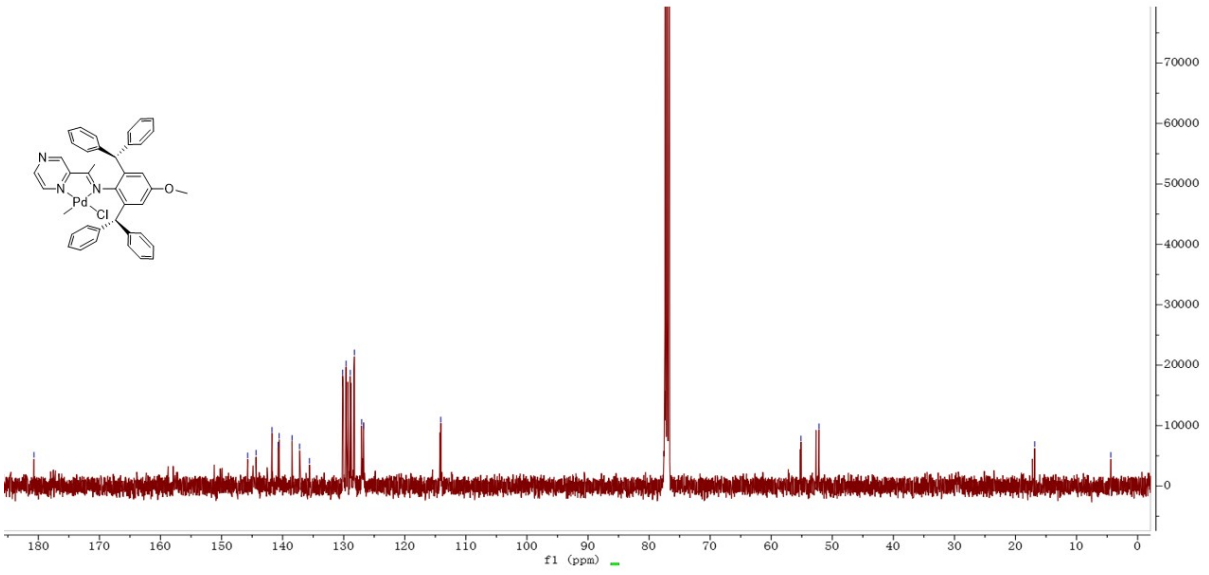

Figure S6. ^{13}C NMR spectrum of **Pd2** in $CDCl_3$ (400 MHz, 20 ℃).

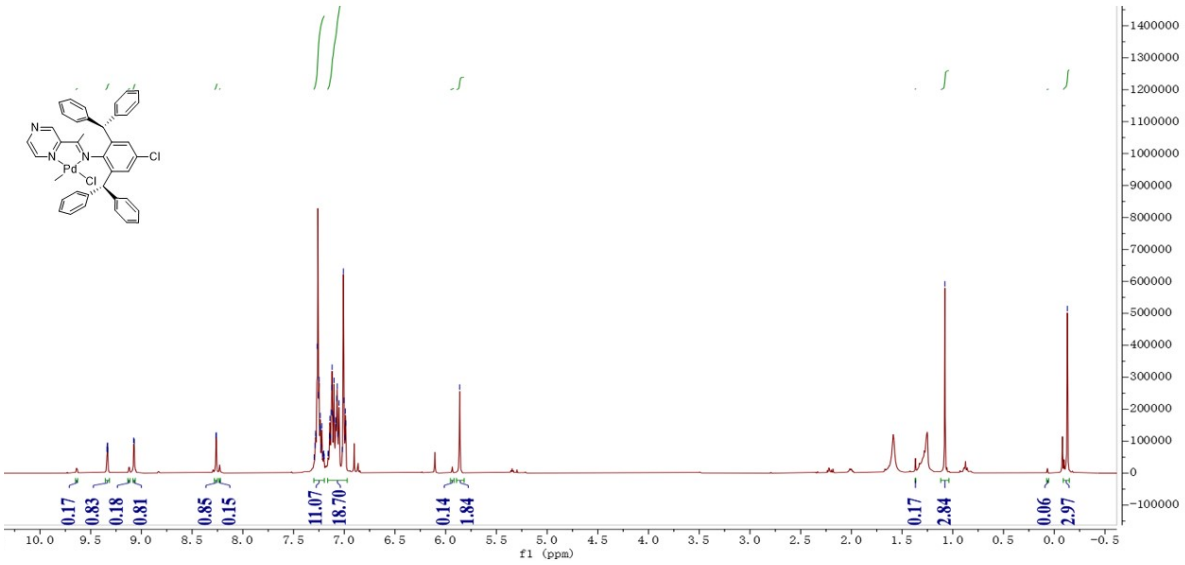

Figure S7. ^{1}H NMR spectrum of **Pd3** in $CDCl_3$ (400 MHz, 20 ℃).

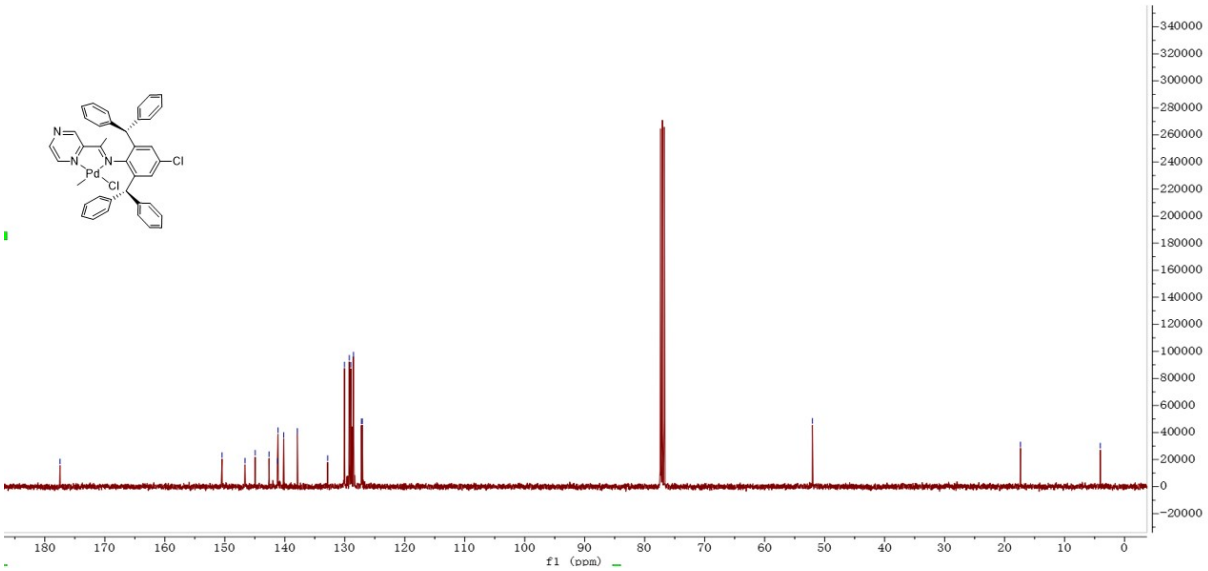

Figure S8. ^{13}C NMR spectrum of **Pd3** in $CDCl_3$ (400 MHz, 20 ℃).

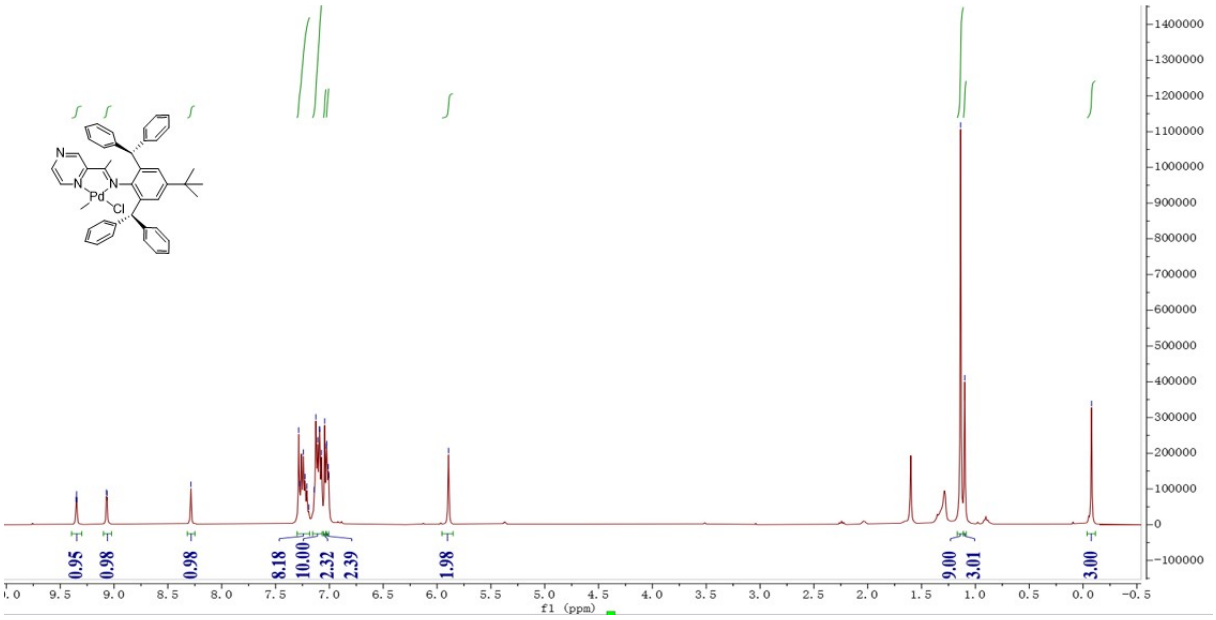

Figure S9. ^{1}H NMR spectrum of **Pd4** in $CDCl_3$ (400 MHz, 20 ℃).

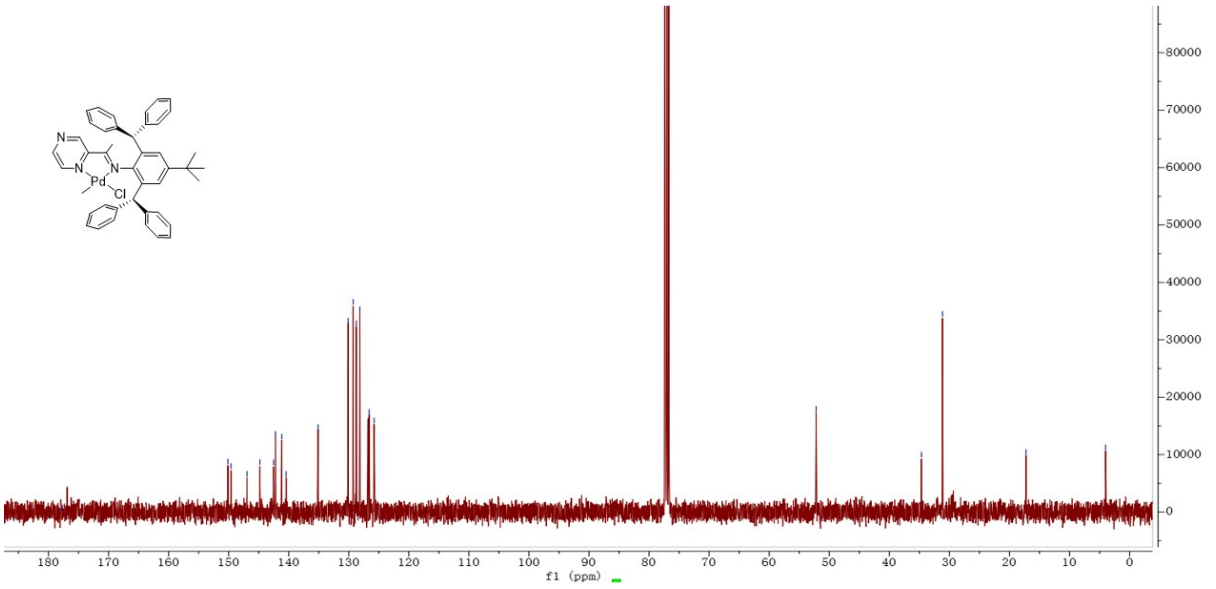

Figure S10. ^{13}C NMR spectrum of **Pd4** in $CDCl_3$ (400 MHz, 20 ℃).

2.2 ^{1}H NMR of Representative HBEOs and MFHBEOs.

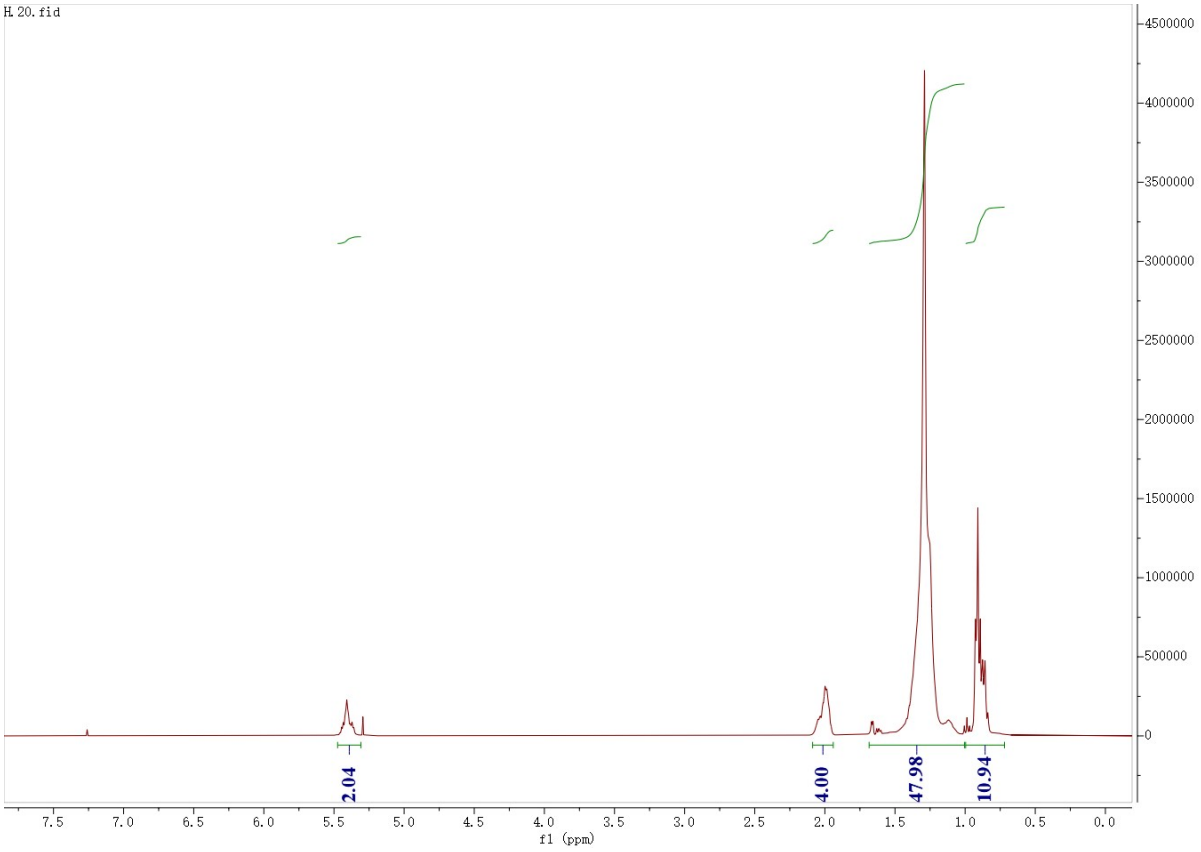

Figure S11. ^{1}H NMR spectrum of the HBEO from entry 1, table 1 ($CDCl_3$, 20 °C).

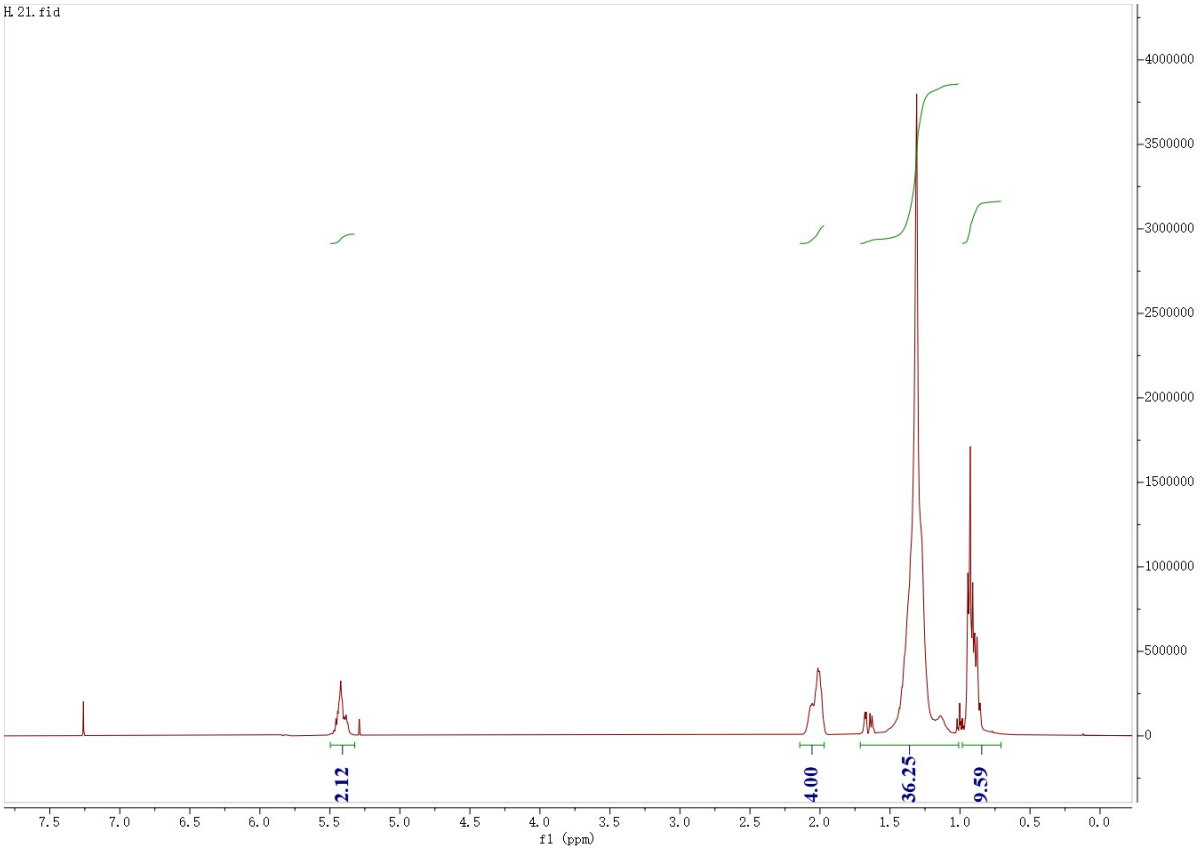

Figure S12. ^{1}H NMR spectrum of the HBEO from entry 2, table 1 ($CDCl_3$, 20 °C).

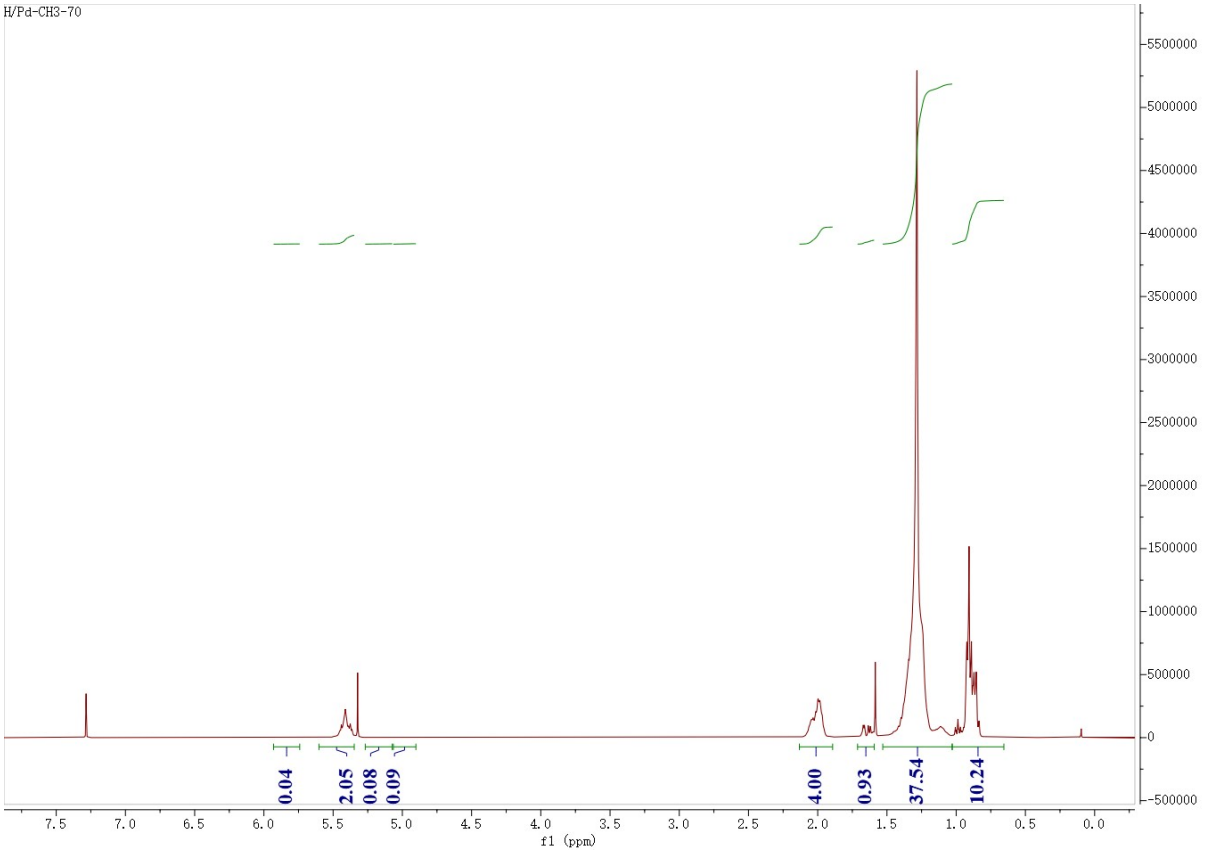

Figure S13. ^{1}H NMR spectrum of the HBEO from entry 3, table 1 ($CDCl_3$, 20 °C).

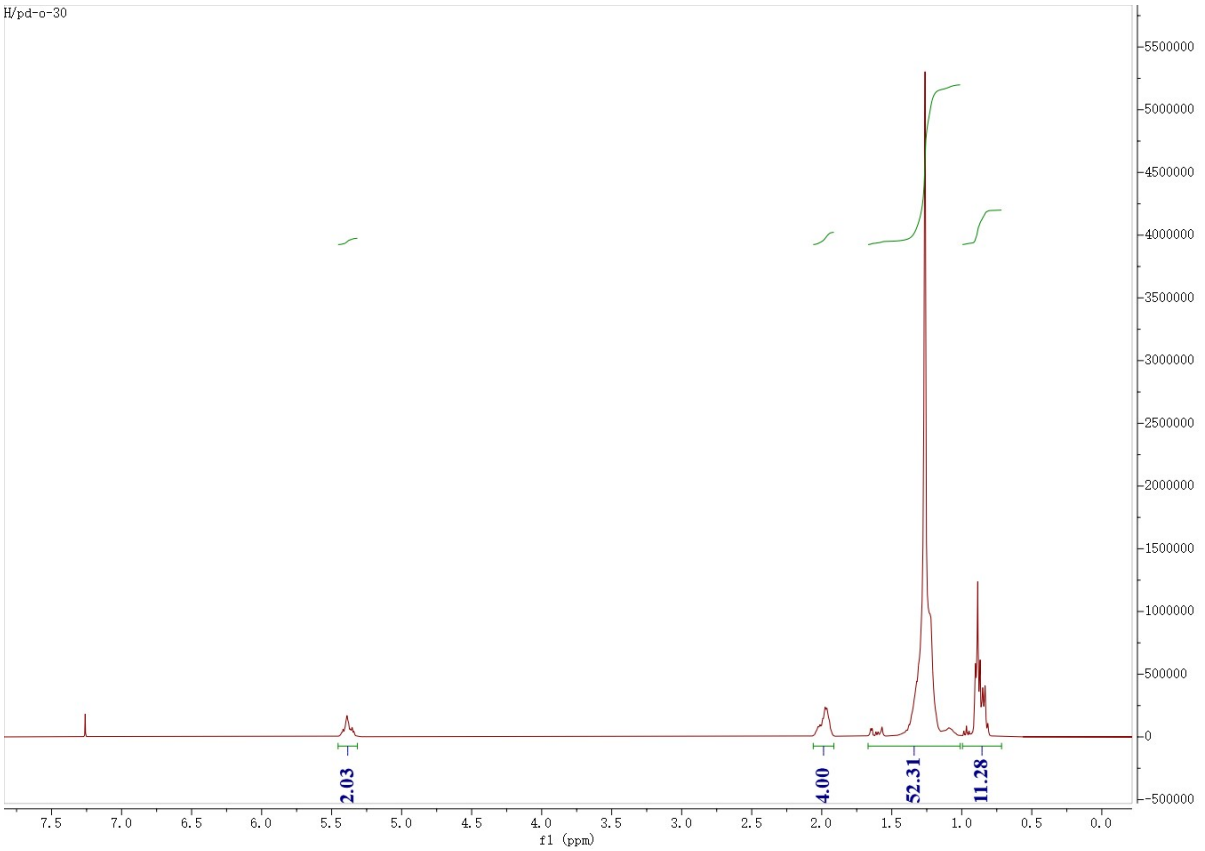

Figure S14. ^{1}H NMR spectrum of the HBEO from entry 4, table 1 ($CDCl_3$, 20 °C).

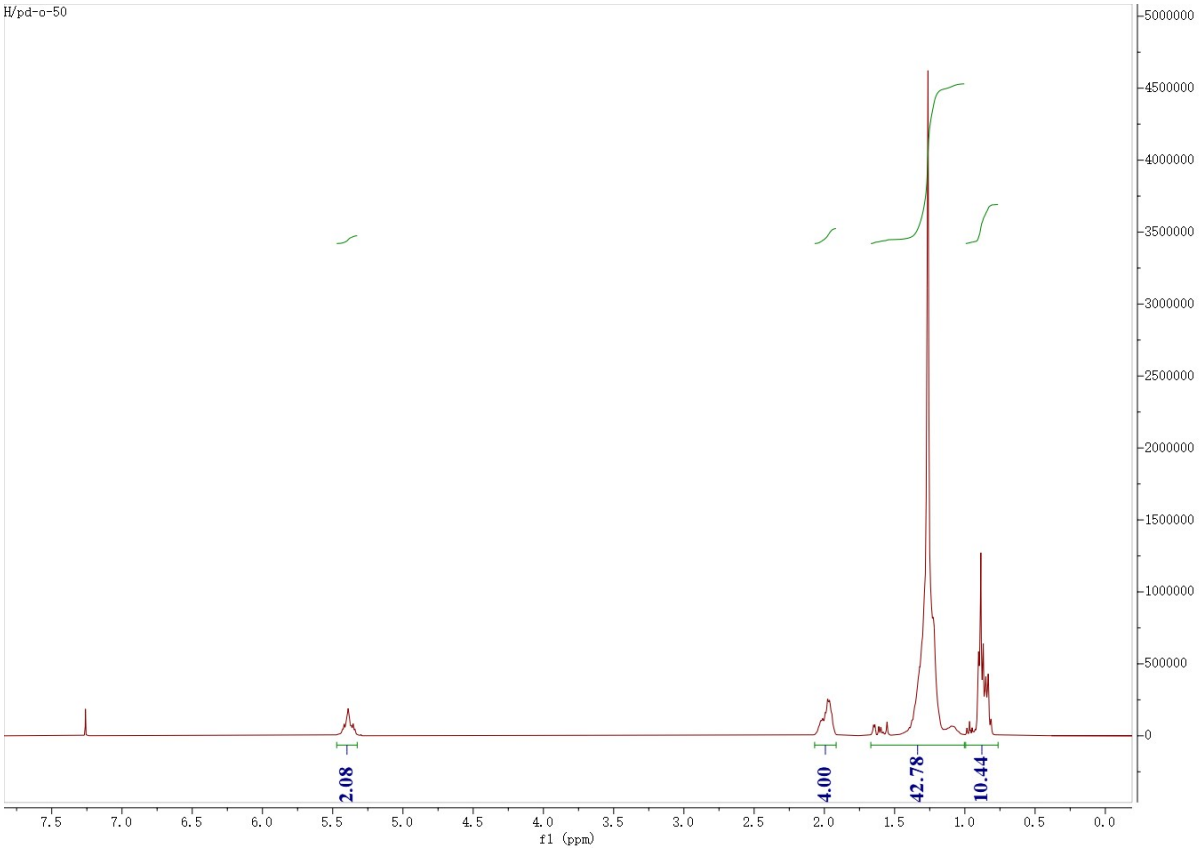

Figure S15. ^{1}H NMR spectrum of the HBEO from entry 5, table 1 ($CDCl_3$, 20 °C).

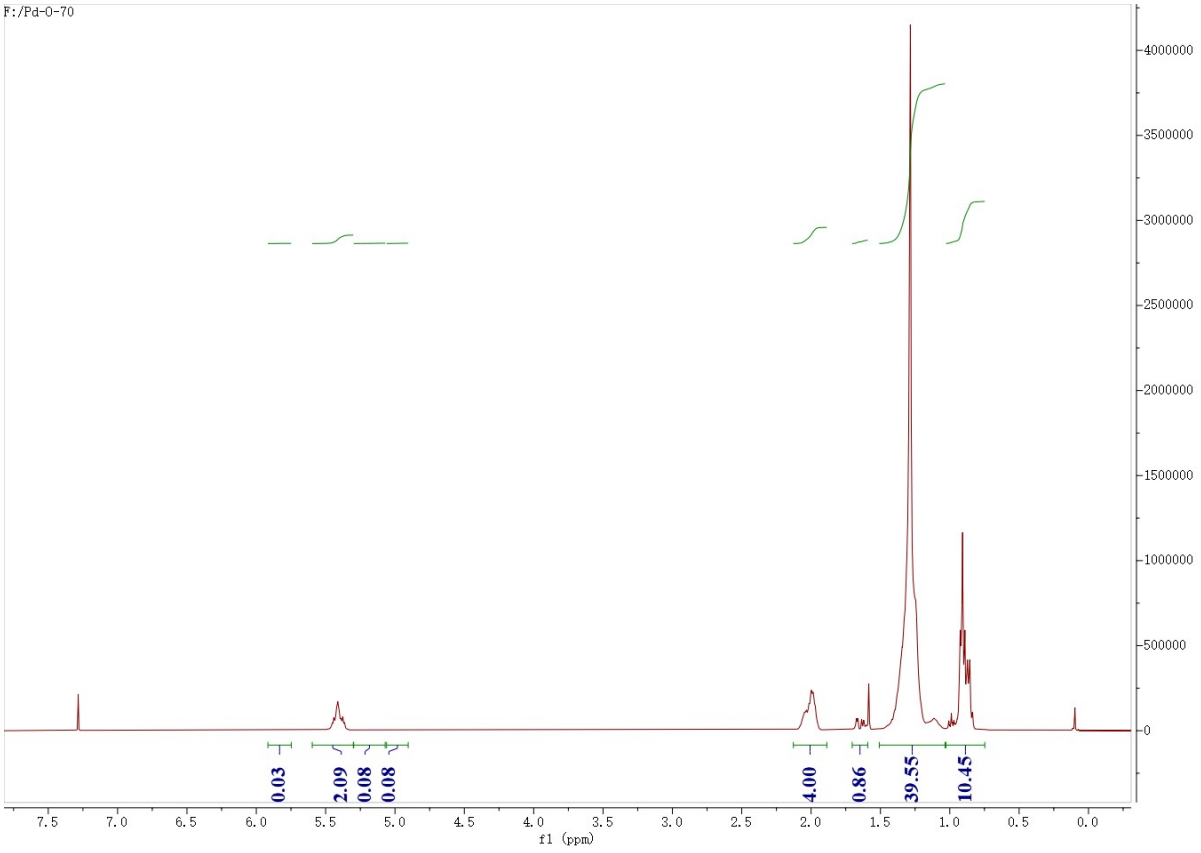

Figure S16. ^{1}H NMR spectrum of the HBEO from entry 6, table 1 ($CDCl_3$, 20 °C).

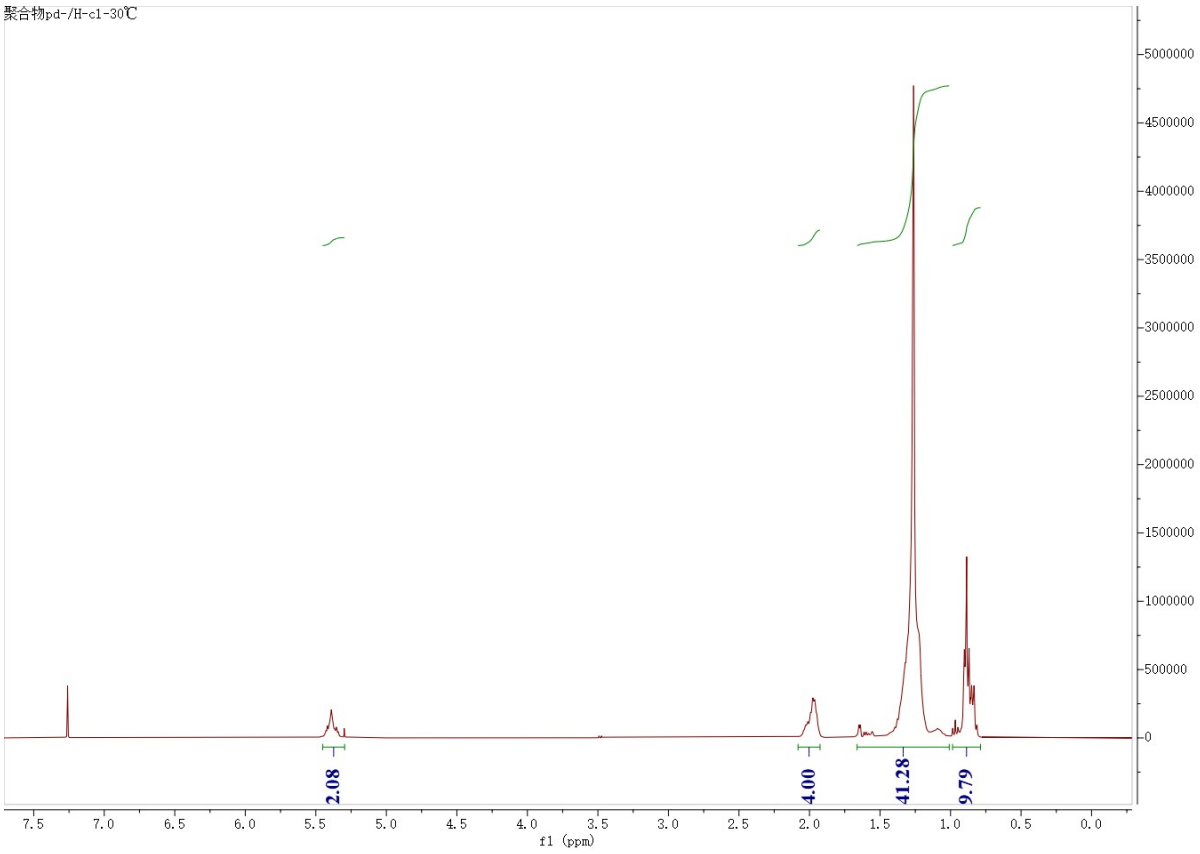

Figure S17. ^{1}H NMR spectrum of the HBEO from entry 7, table 1 ($CDCl_3$, 20 °C).

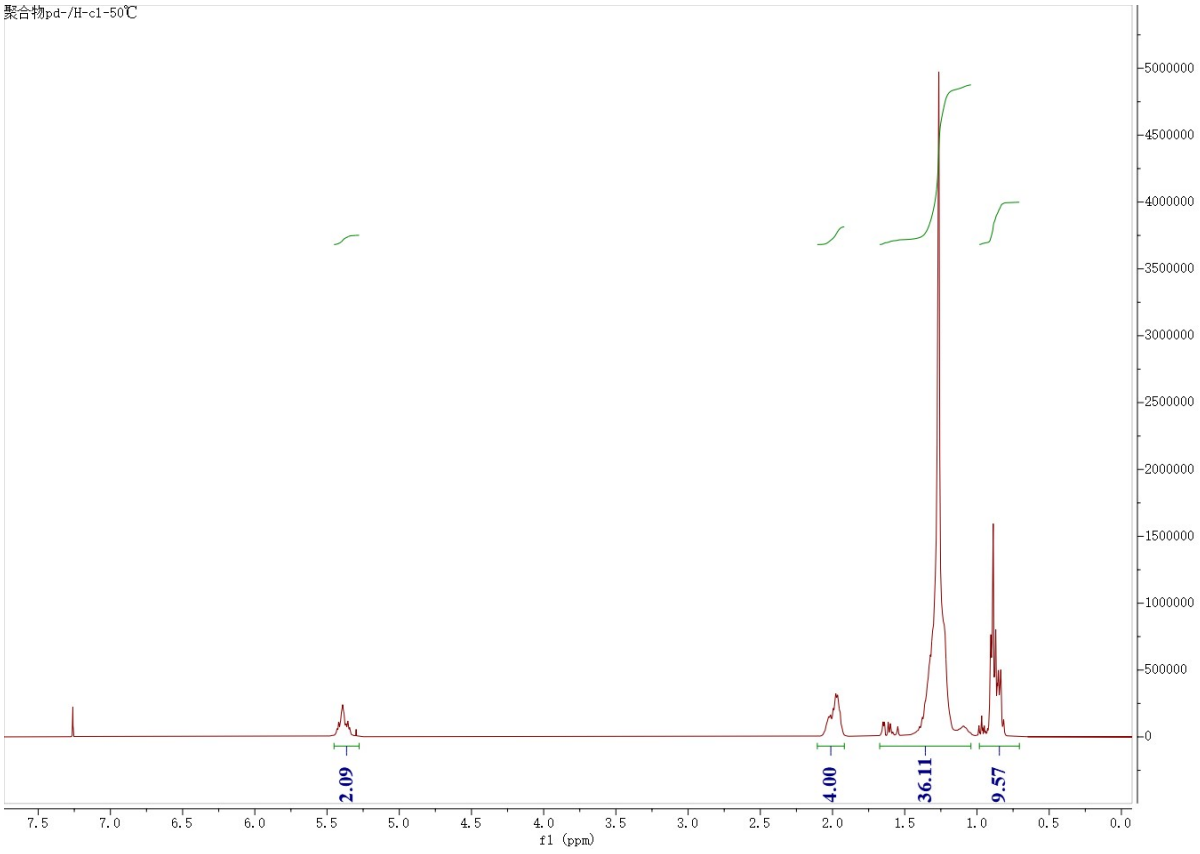

Figure S18. ^{1}H NMR spectrum of the HBEO from entry 8, table 1 ($CDCl_3$, 20 °C).

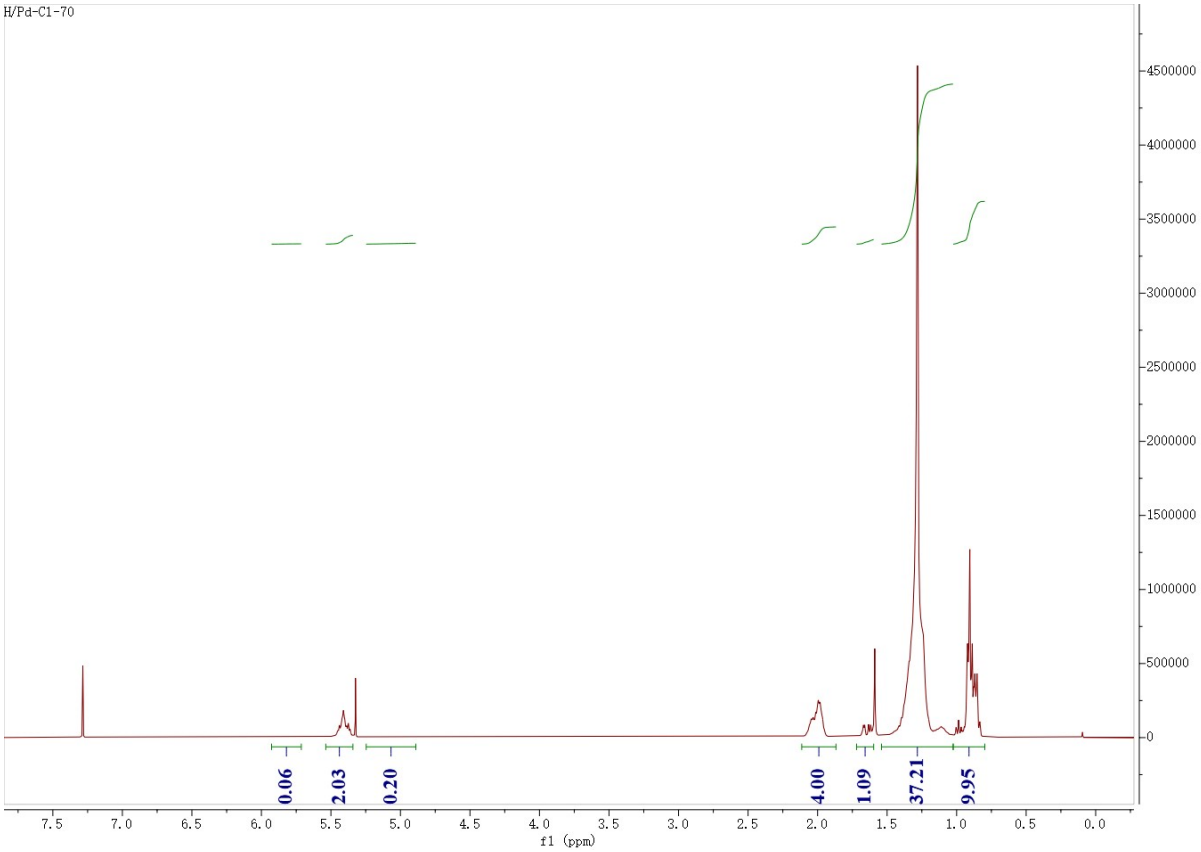

Figure S19. ^{1}H NMR spectrum of the HBEO from entry 9, table 1 ($CDCl_3$, 20 °C).

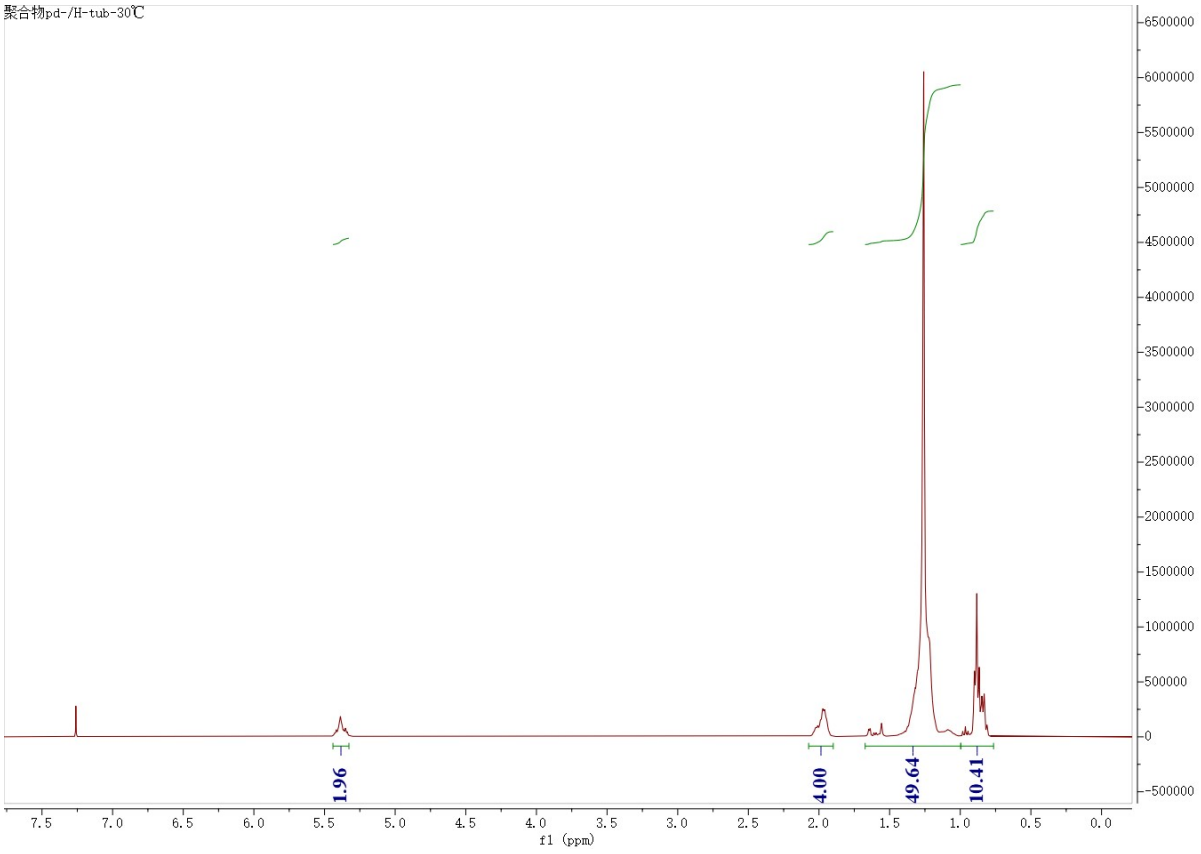

Figure S20. ^{1}H NMR spectrum of the HBEO from entry 10, table 1 ($CDCl_3$, 20 °C).

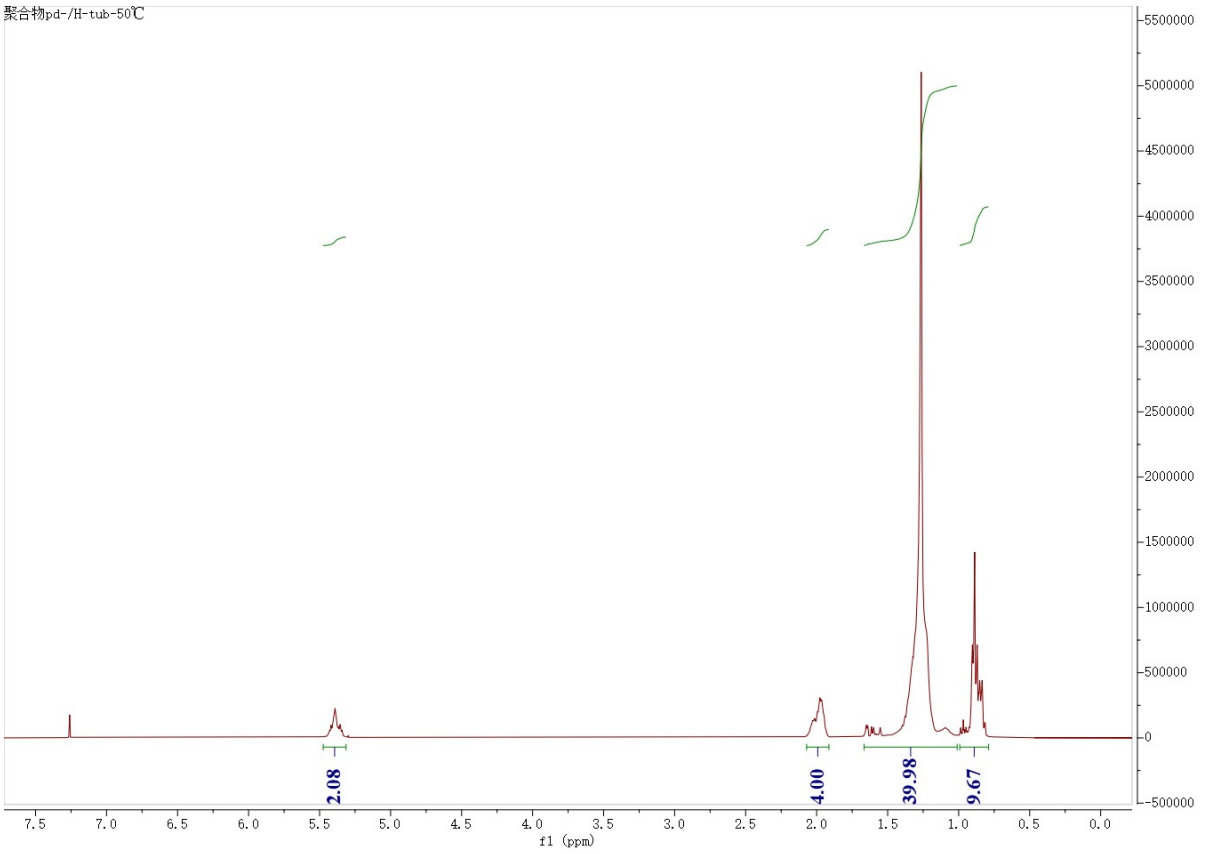

Figure S21. ^{1}H NMR spectrum of the HBEO from entry 11, table 1 ($CDCl_3$, 20 ℃).

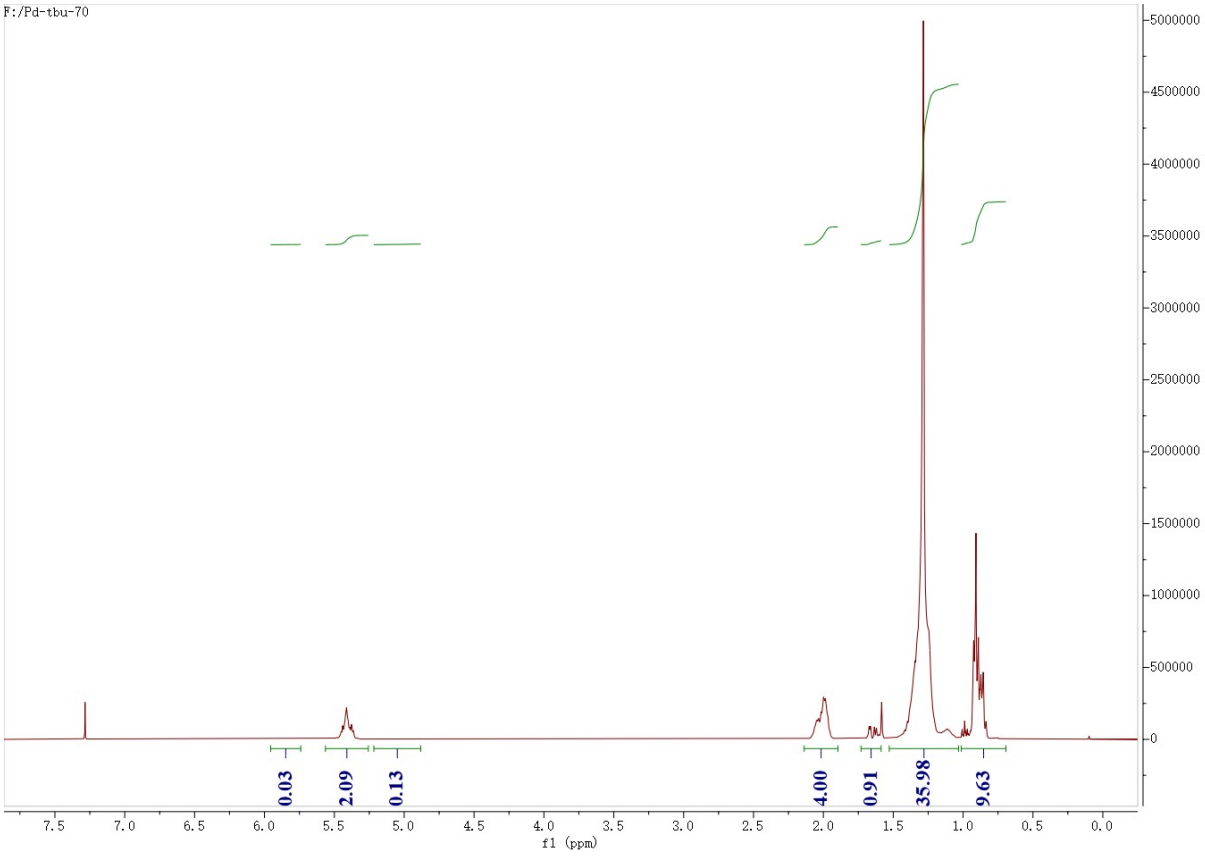

Figure S22. ^{1}H NMR spectrum of the HBEO from entry 12, table 1 ($CDCl_3$, 20 ℃).

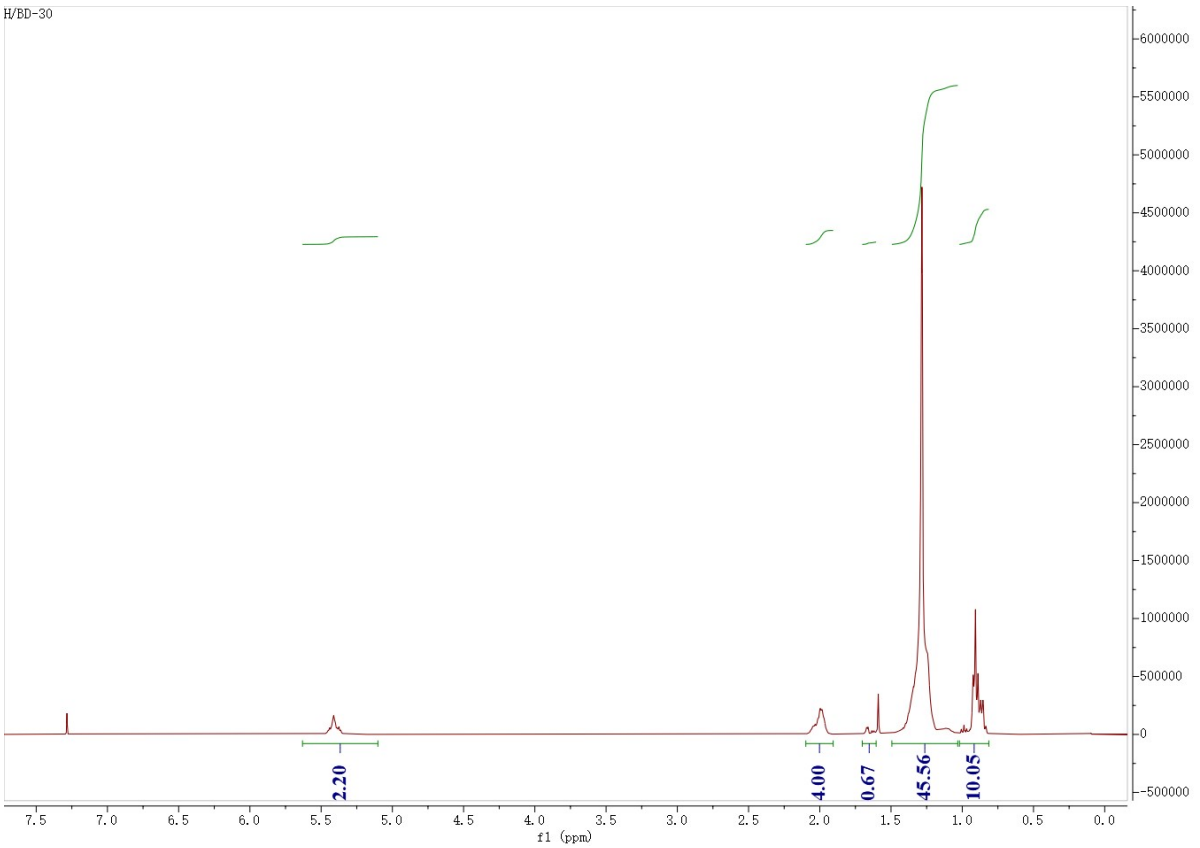

Figure S23. ^{1}H NMR spectrum of the HBEO from entry 13, table 1 ($CDCl_3$, 20 ℃).

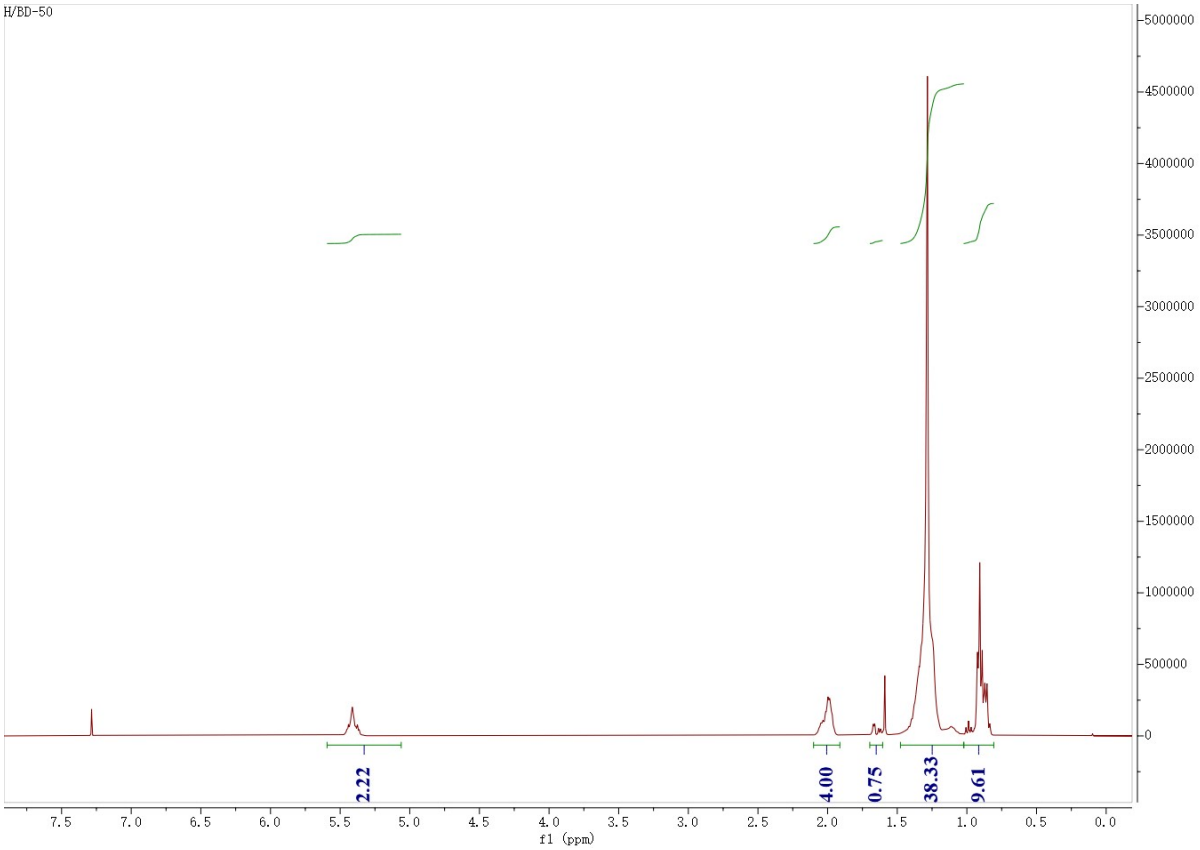

Figure S24. ^{1}H NMR spectrum of the HBEO from entry 14, table 1 ($CDCl_3$, 20 ℃).

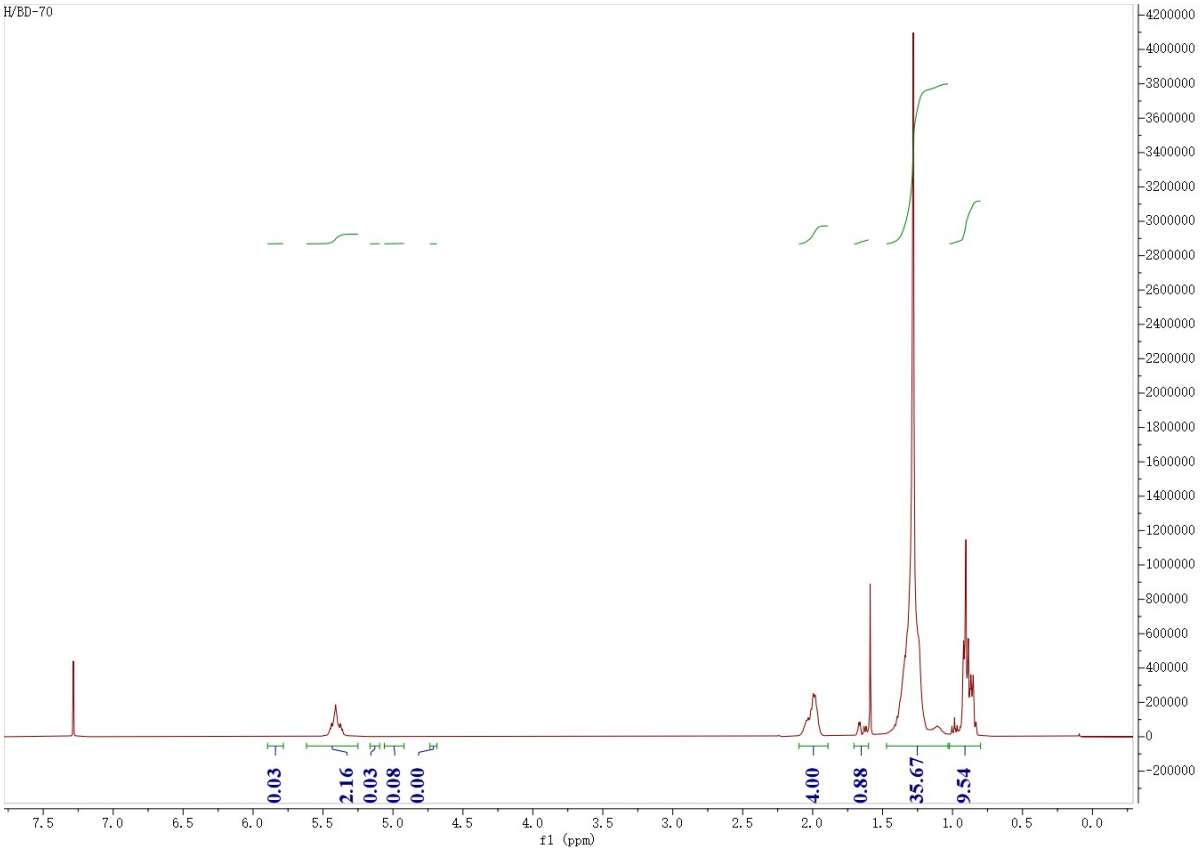

Figure S25. ^{1}H NMR spectrum of the HBEO from entry 15, table 1 ($CDCl_3$, 20 ℃).

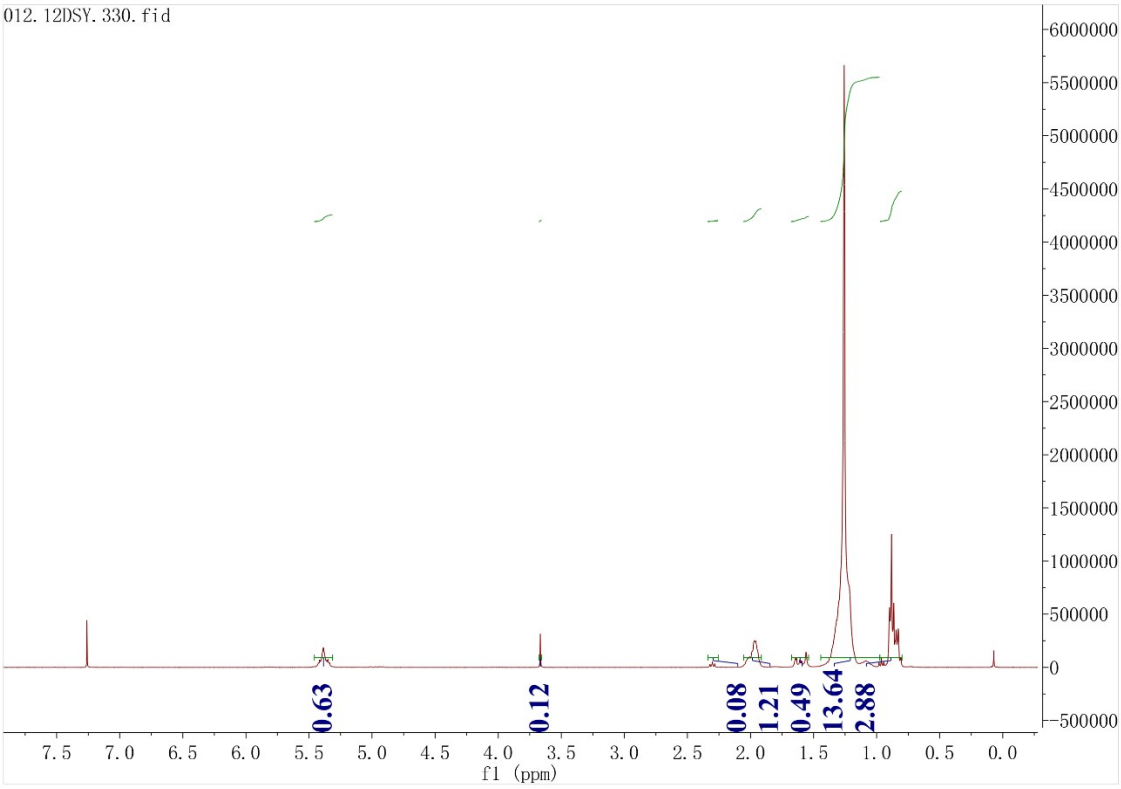

Figure S26. ^{1}H NMR spectrum of the polymer from entry 1, table 2 ($CDCl_3$, 20 ℃).

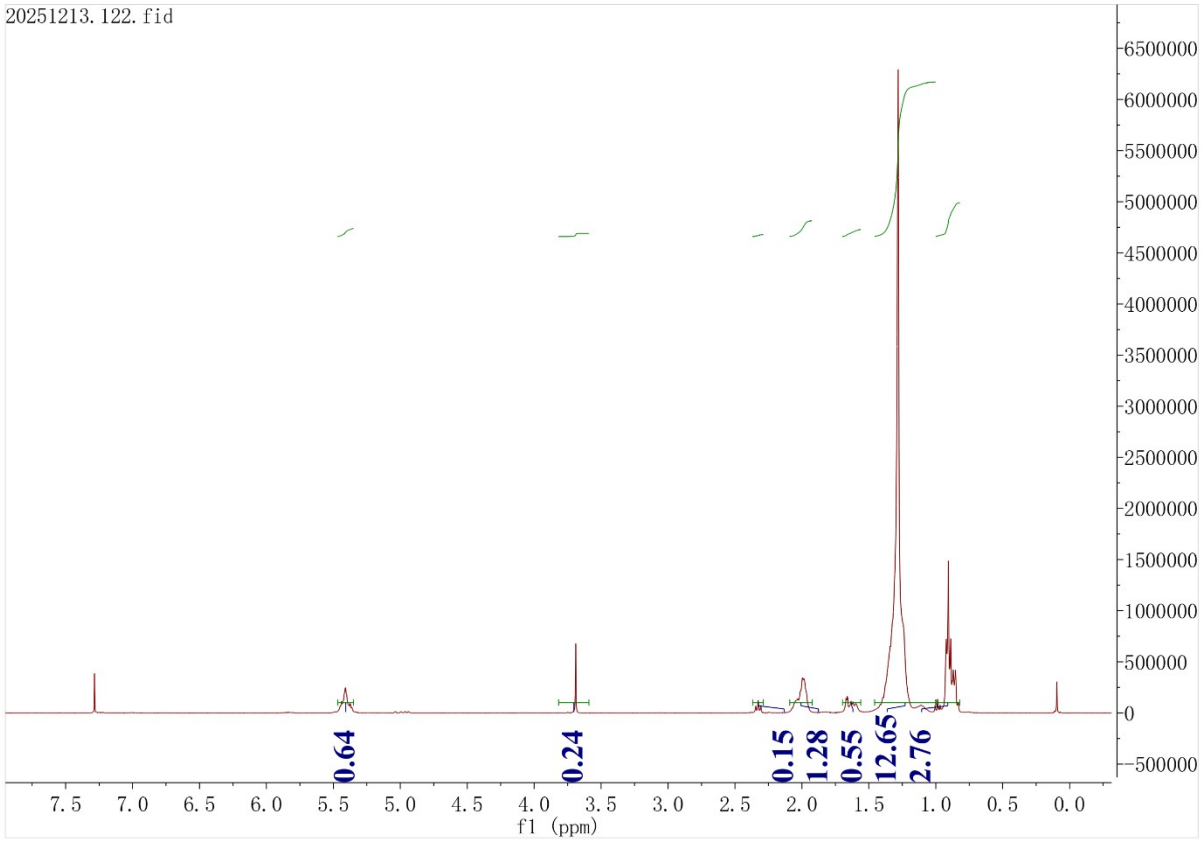

Figure S27. ^{1}H NMR spectrum of the polymer from entry 2, table 2 ($CDCl_3$, 20 ℃).

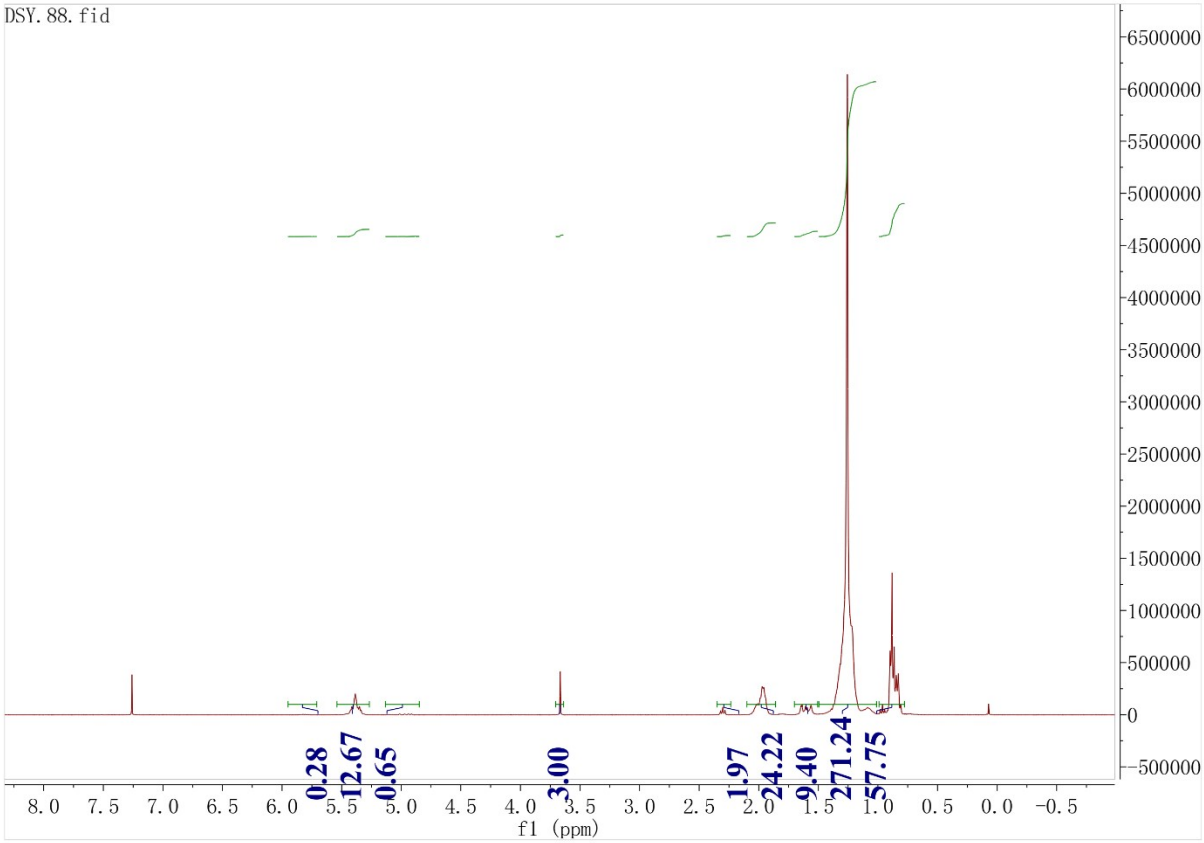

Figure S28. ^{1}H NMR spectrum of the polymer from entry 3, table 2 ($CDCl_3$, 20 ℃).

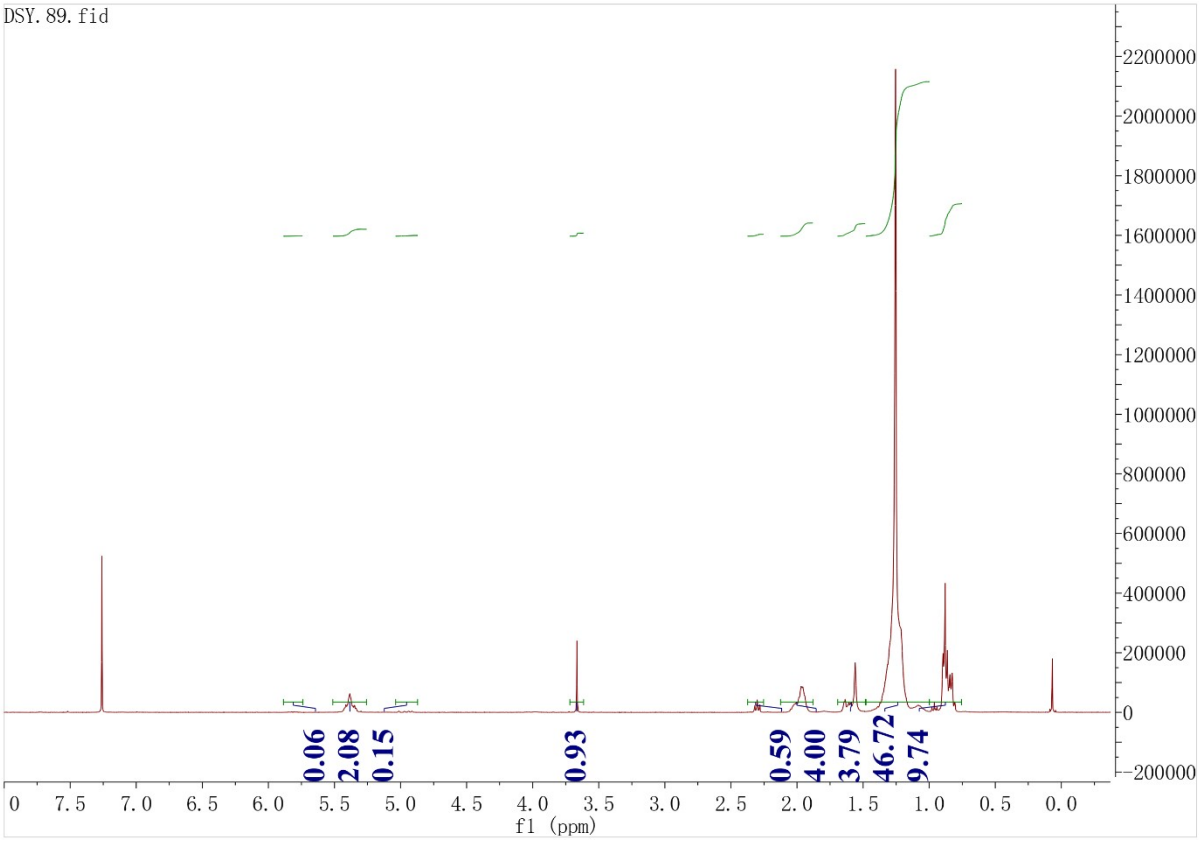

Figure S29. ^{1}H NMR spectrum of the polymer from entry 4, table 2 ($CDCl_3$, 20 ℃).

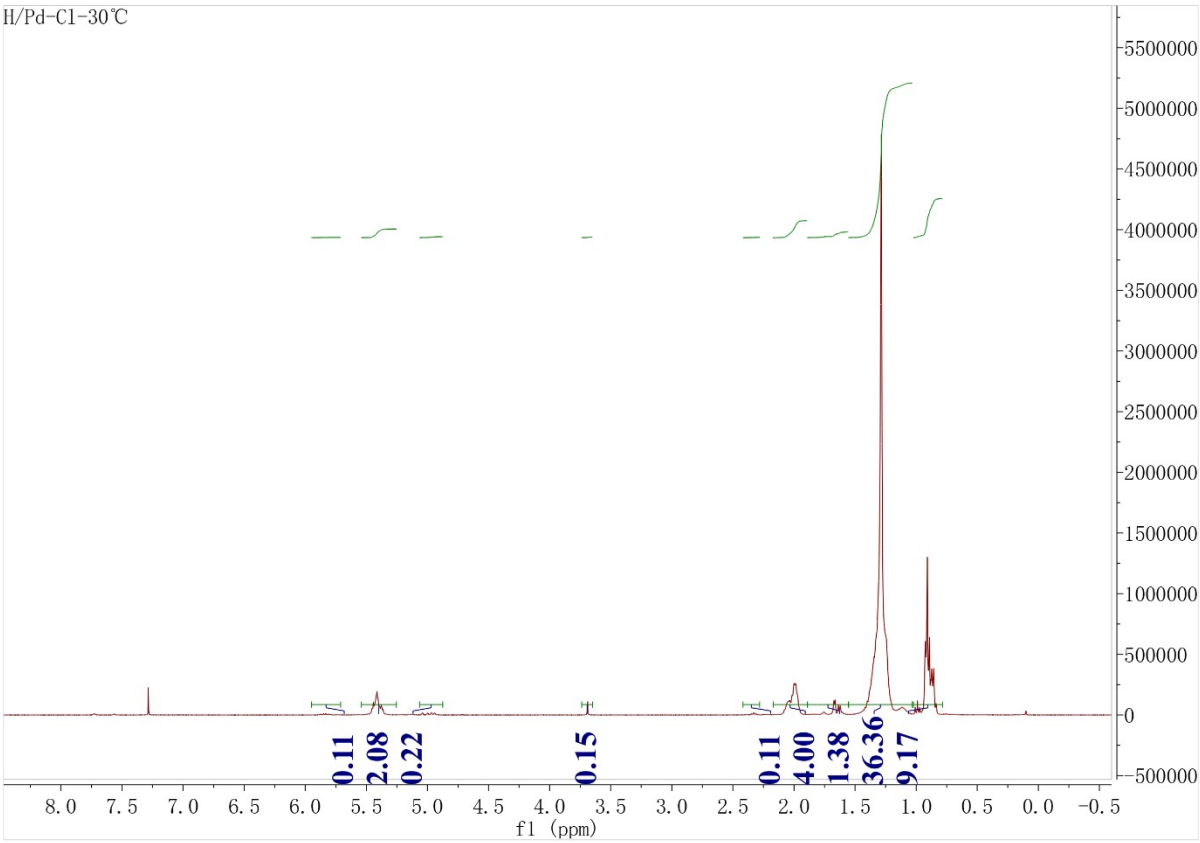

Figure S30. ^{1}H NMR spectrum of the polymer from entry 5, table 2 ($CDCl_3$, 20 ℃).

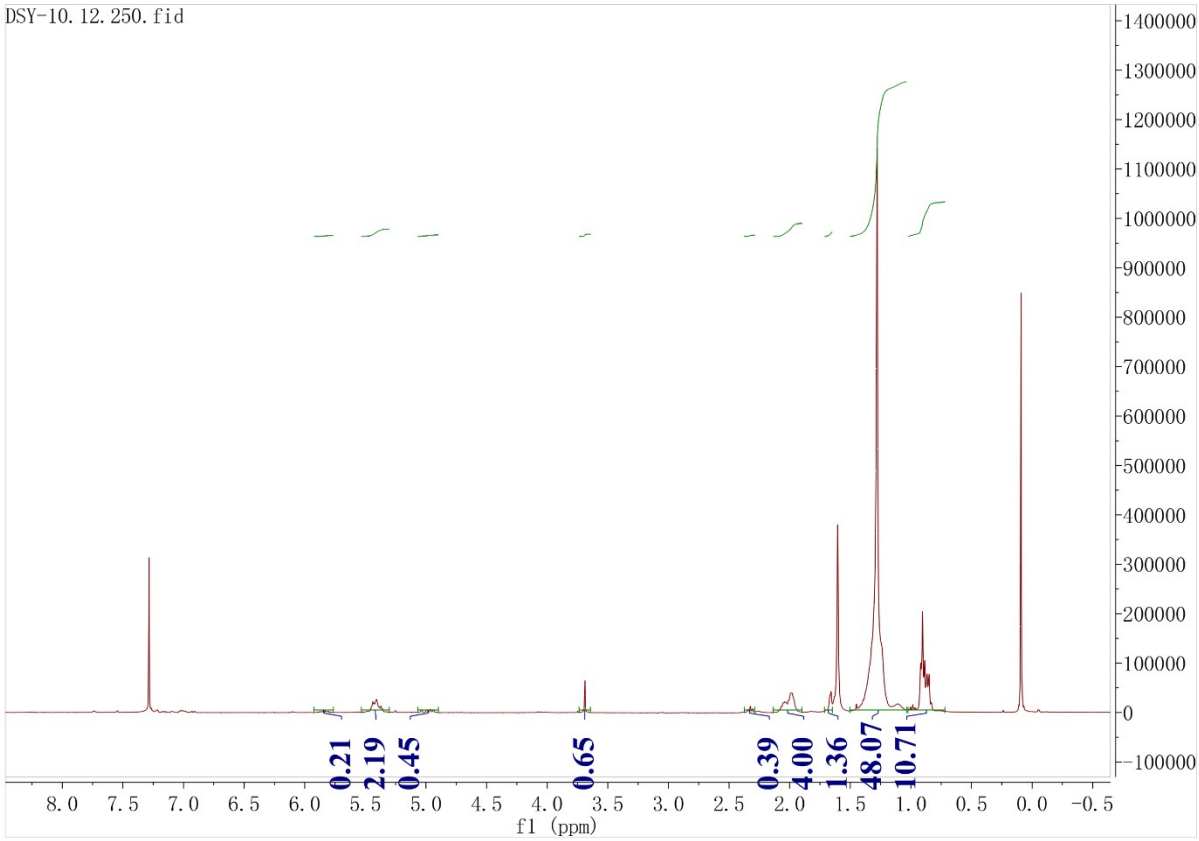

Figure S31. ^{1}H NMR spectrum of the polymer from entry 6, table 2 ($CDCl_3$, 20 ℃).

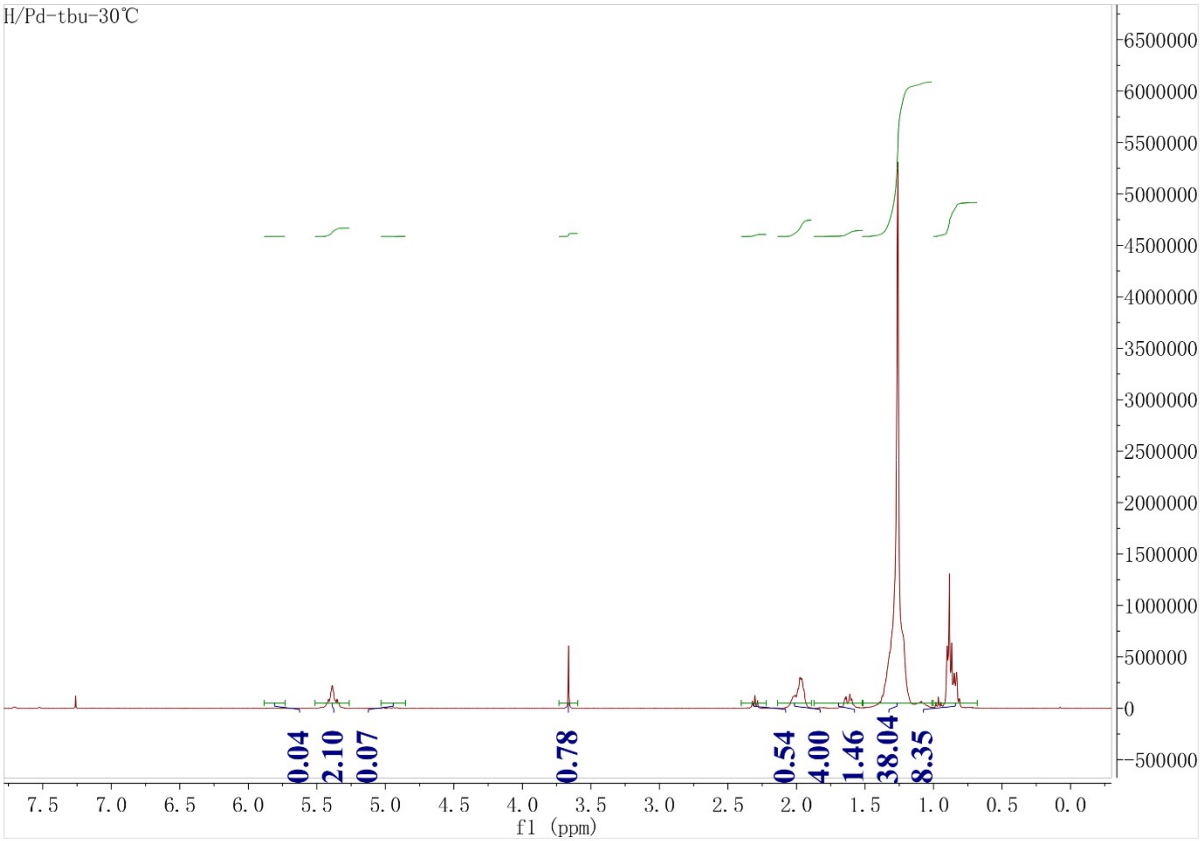

Figure S32. ^{1}H NMR spectrum of the polymer from entry 7, table 2 ($CDCl_3$, 20 ℃).

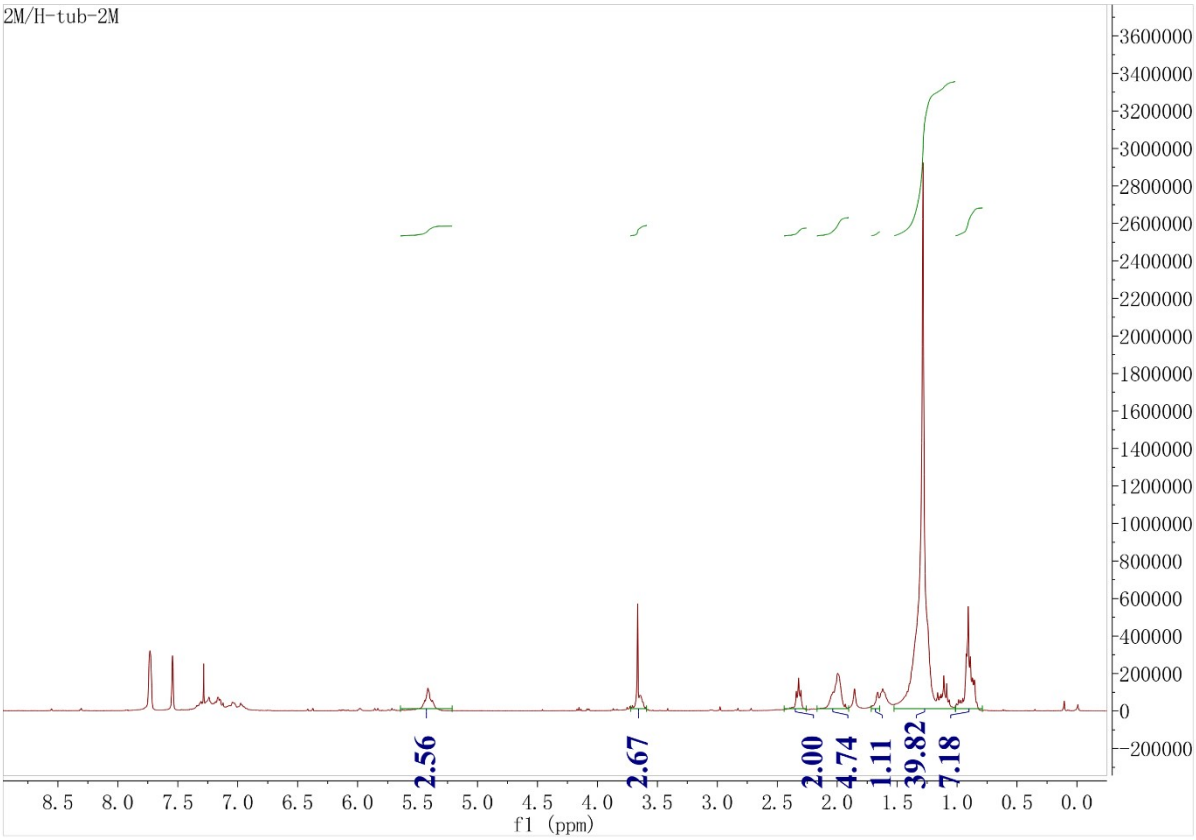

Figure S33. ^{1}H NMR spectrum of the polymer from entry 8, table 2 ($CDCl_3$, 20 ℃).

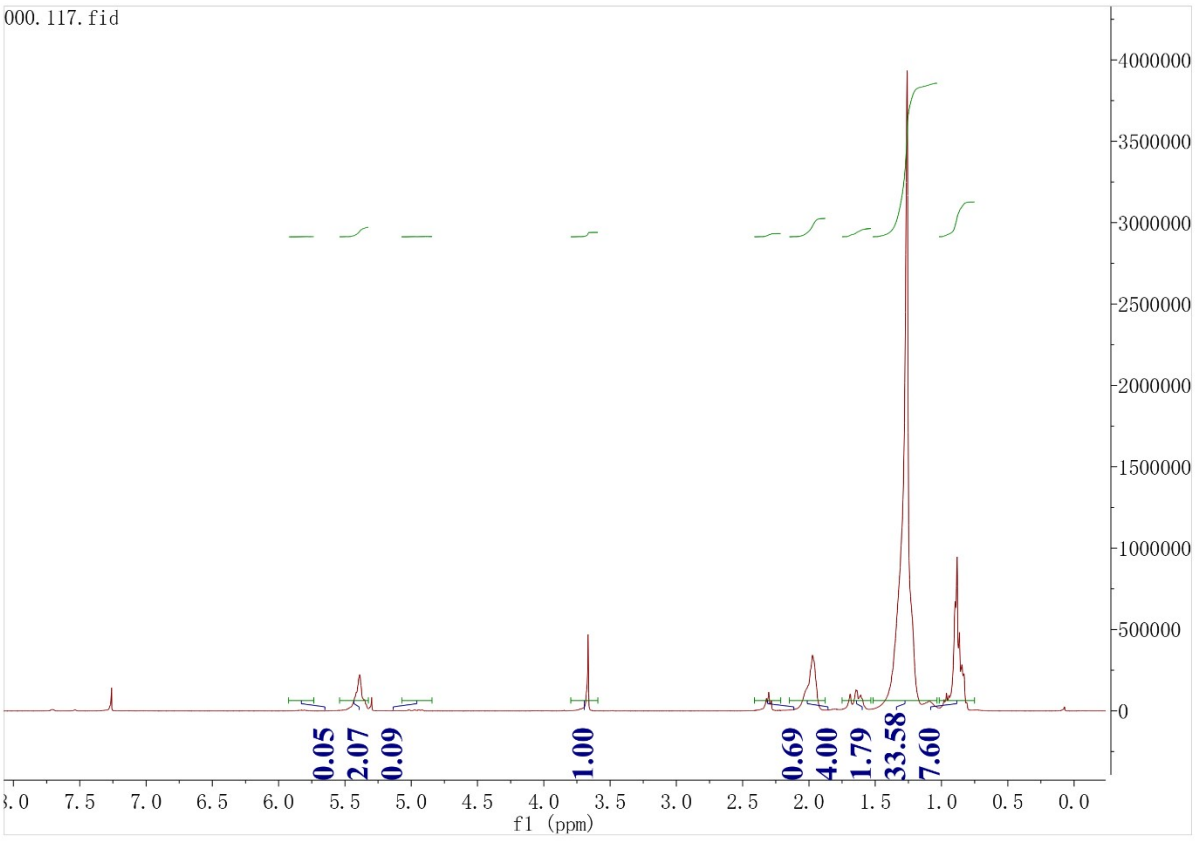

Figure S34. ^{1}H NMR spectrum of the polymer from entry 9, table 2 ($CDCl_3$, 20 ℃).

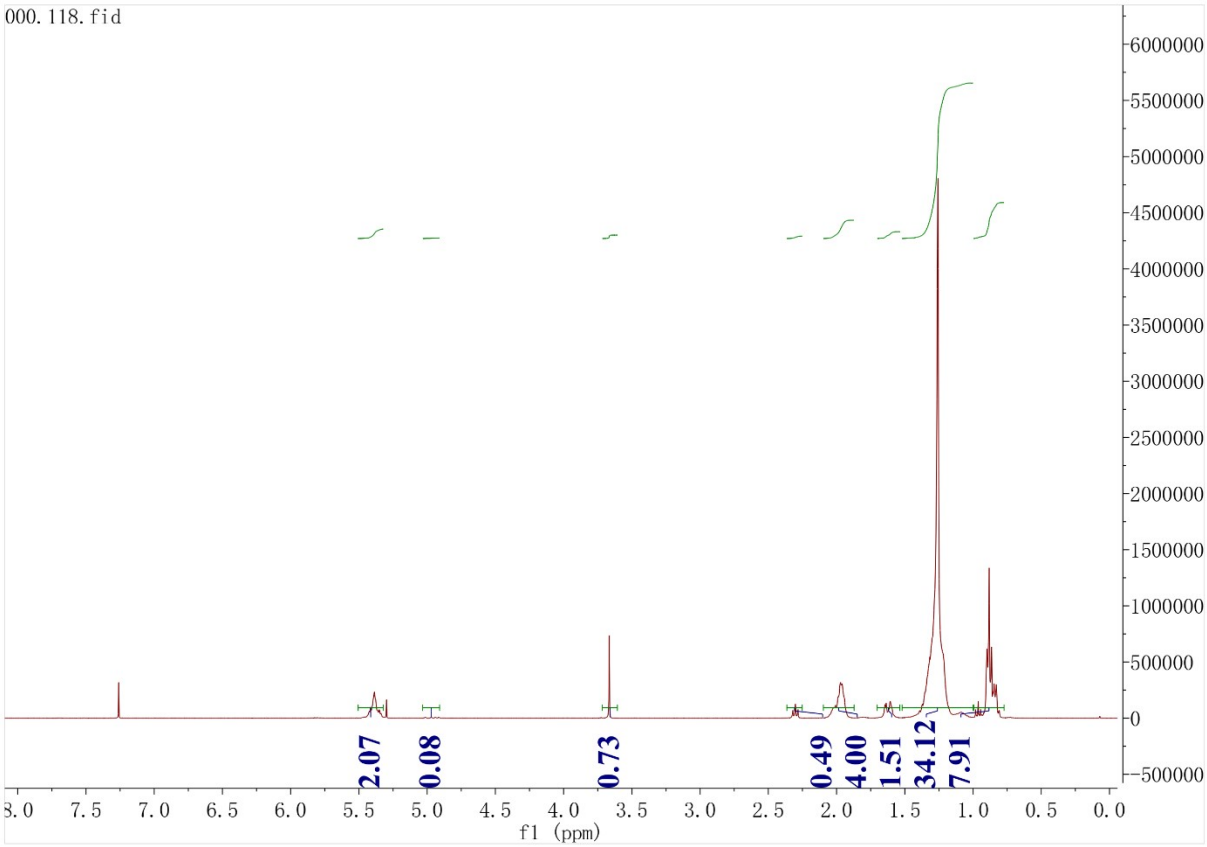

Figure S35. ^{1}H NMR spectrum of the polymer from entry 10, table 2 ($CDCl_3$, 20 ℃).

2.3 Rheological Properties of the Representative HBEO.

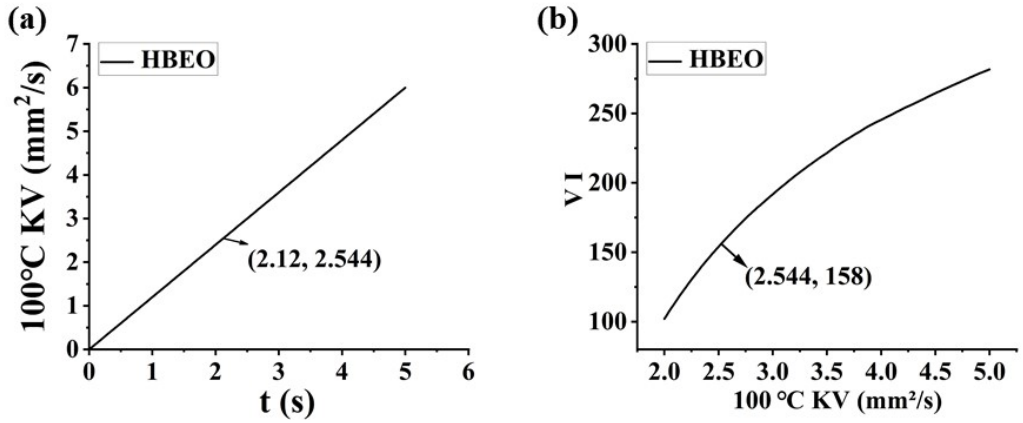

Figure S36. Rheological properties of the representative HBEO prepared by **Pd2** at 30 °C: kinematic viscosity (100 °C) and viscosity index.