SUPPORTING INFORMATION

Synthesis of Bis(oxazoline)-based Rare-earth Metal Complexes and Their Catalytic Performance in the Polymerization of Isoprene and Polar *ortho*-Methoxystyrene

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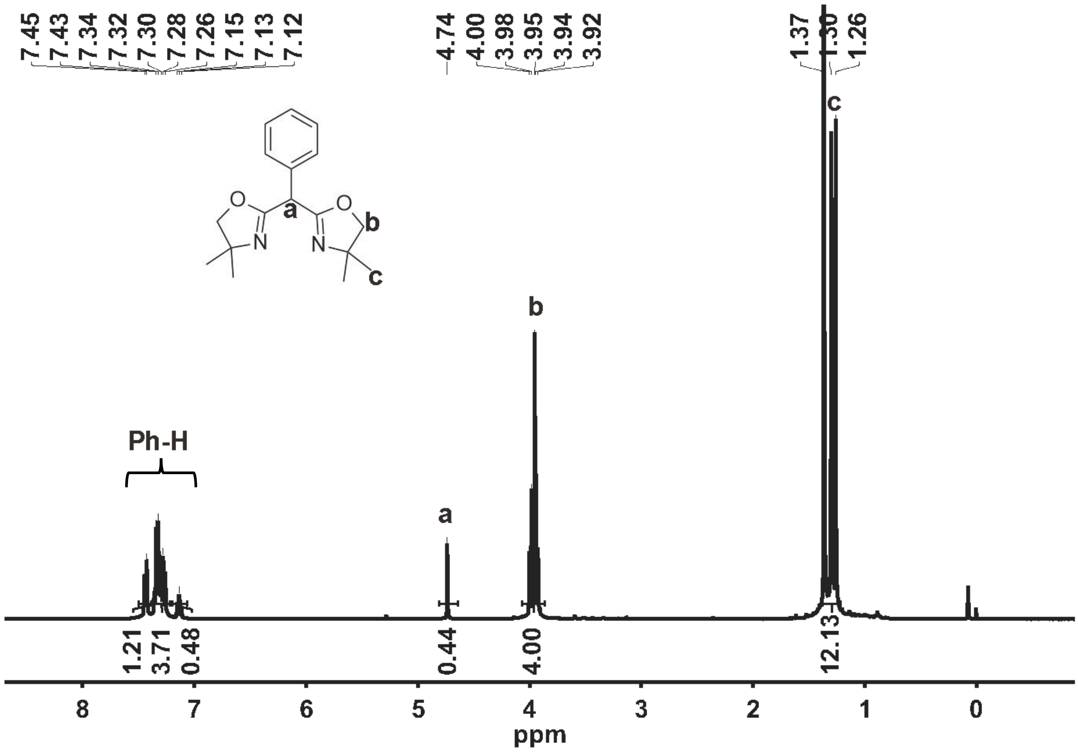

Figure S1 ^{1}H NMR spectrum of **L1-H** (400 MHz, $CDCl_3$, 25 °C)

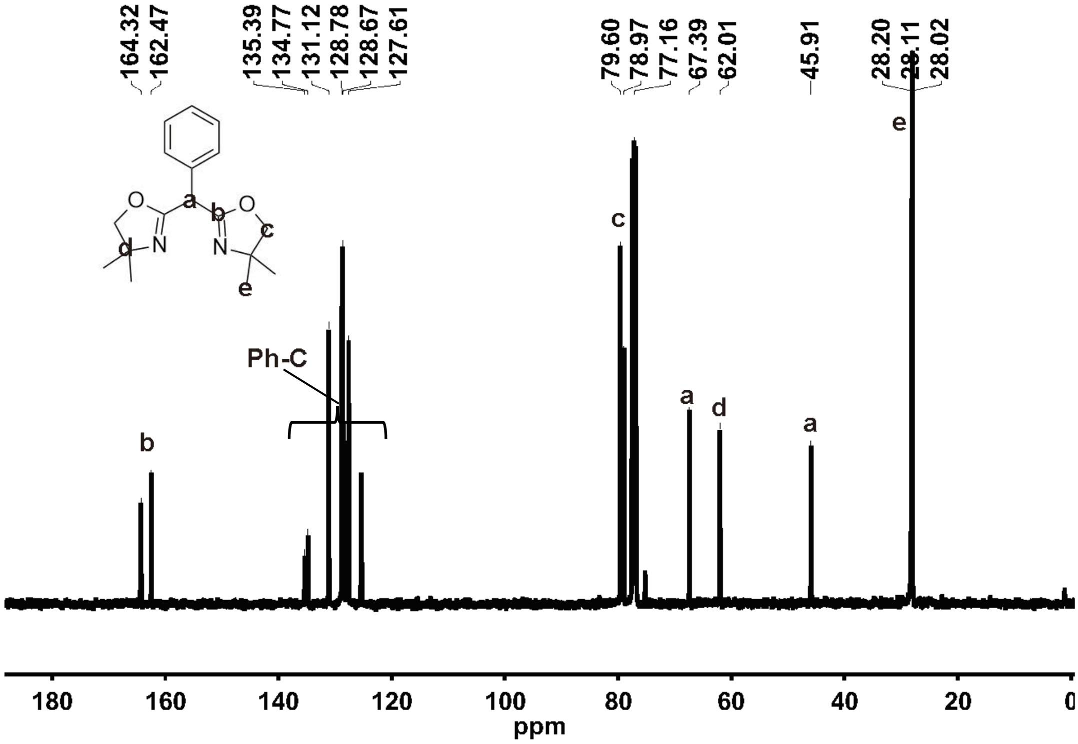

Figure S2 ^{13}C NMR spectrum of **L1-H** (100 MHz, $CDCl_3$, 25 °C)

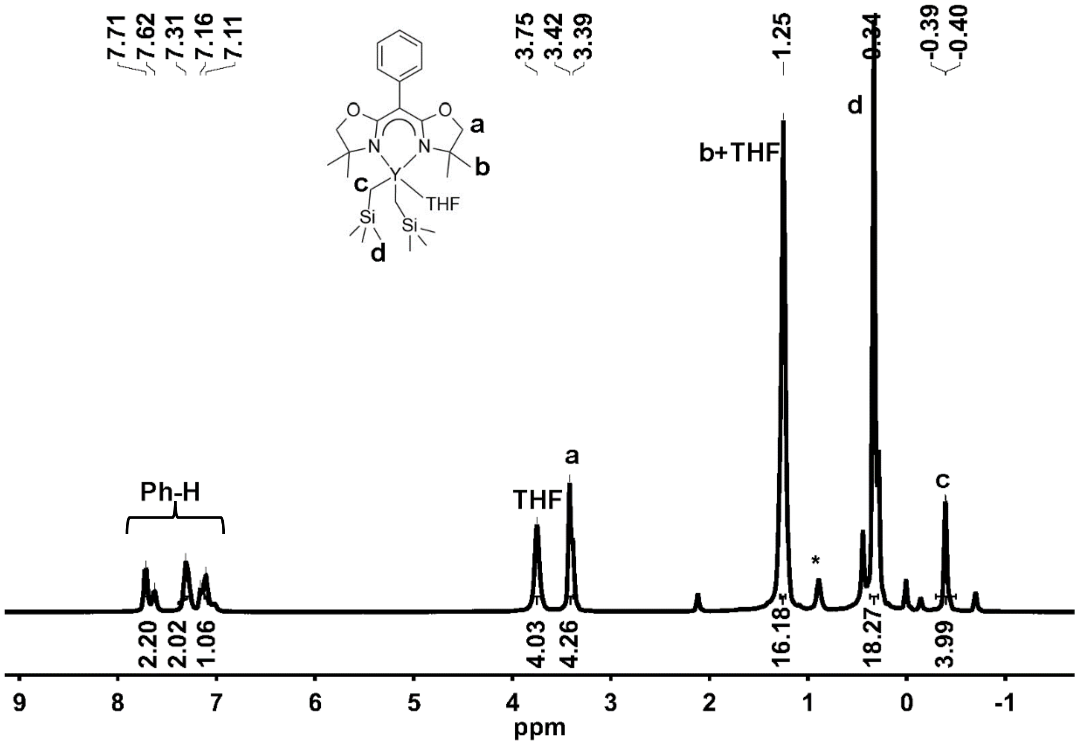

Figure S3 ^{1}H NMR spectrum of **1-Y** (400 MHz, C_6D_6, 25 °C; * *n*-hexane)

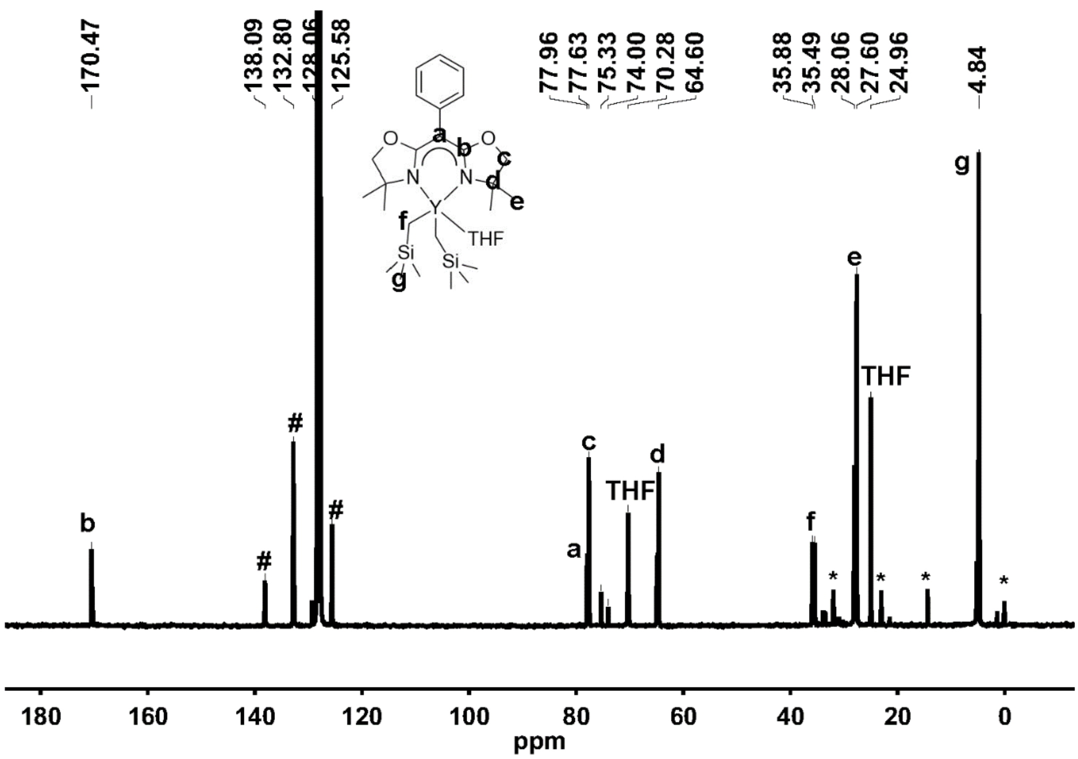

Figure S4 ^{13}C NMR spectrum of **1-Y** (100 MHz, C_6D_6, 25 °C; **n*-hexane; # Ph-C)

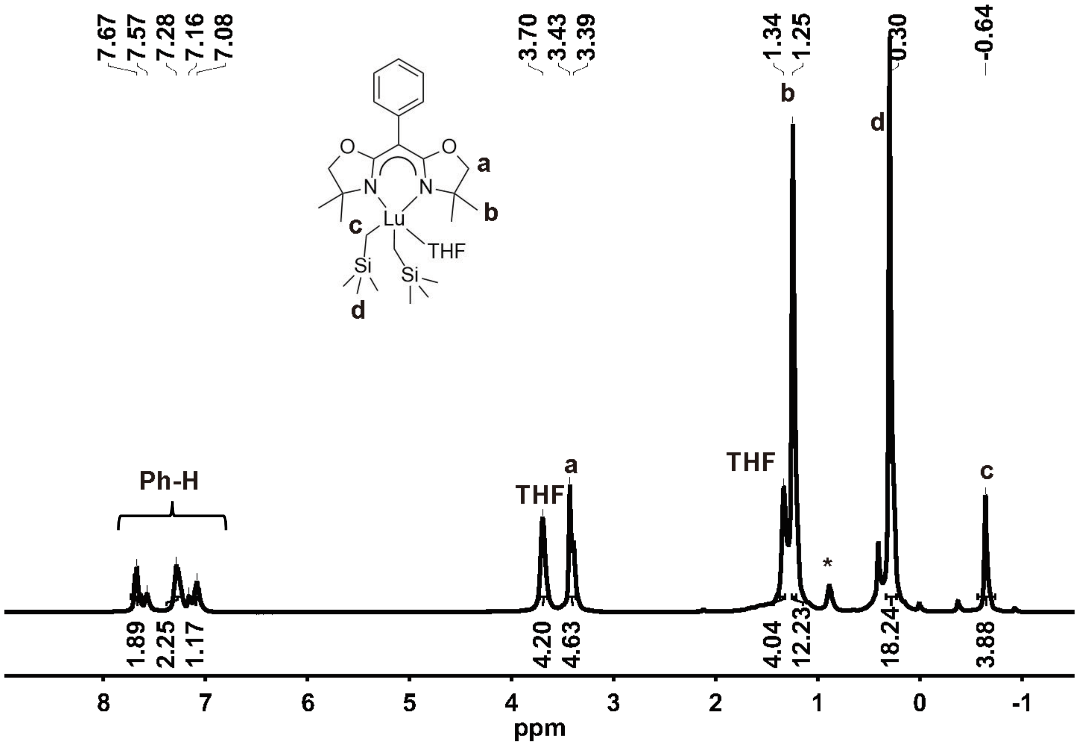

Figure S5 ^{1}H NMR spectrum of **1-Lu** (400 MHz, C_6D_6, 25 °C; * *n*-hexane)

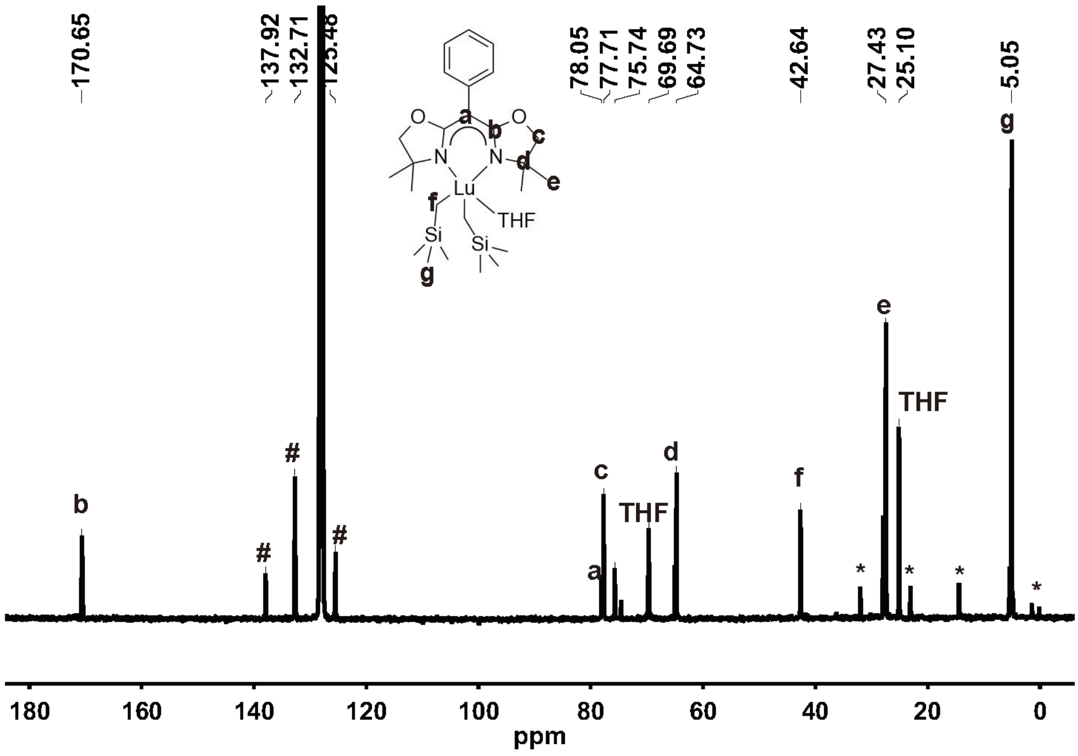

Figure S6 ^{13}C NMR spectrum of **1-Lu** (100 MHz, C_6D_6, 25 °C; **n*-hexane; # Ph-C)

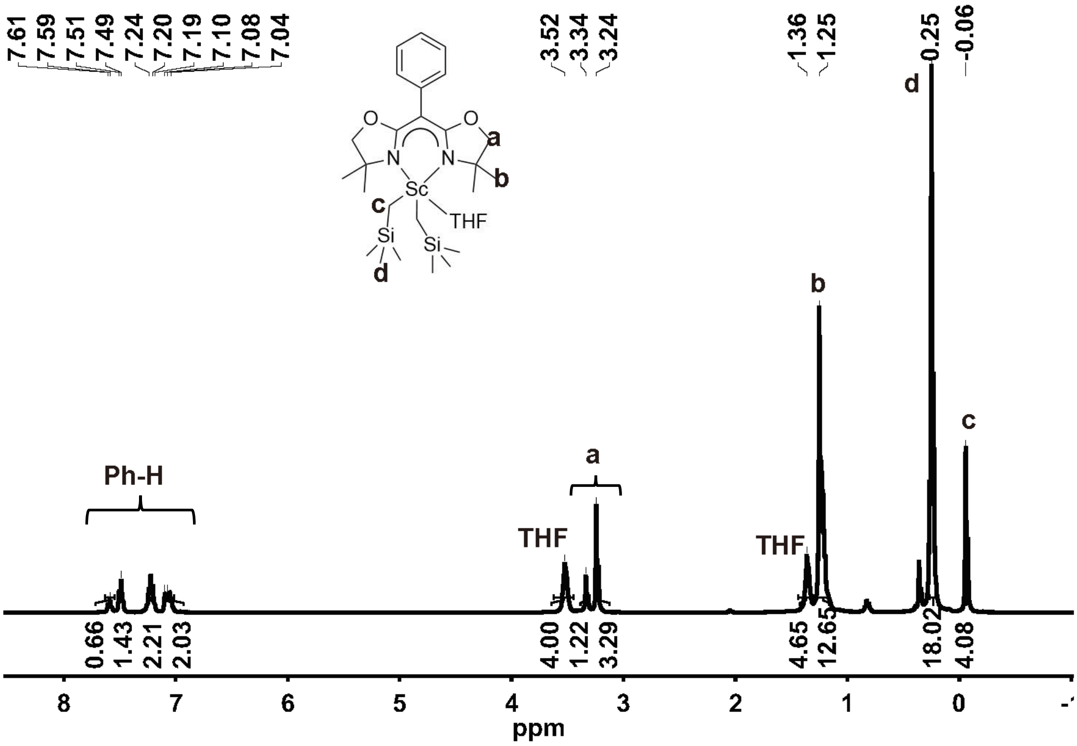

Figure S7 ^{1}H NMR spectrum of **1-Sc** (400 MHz, C_6D_6, 25 °C)

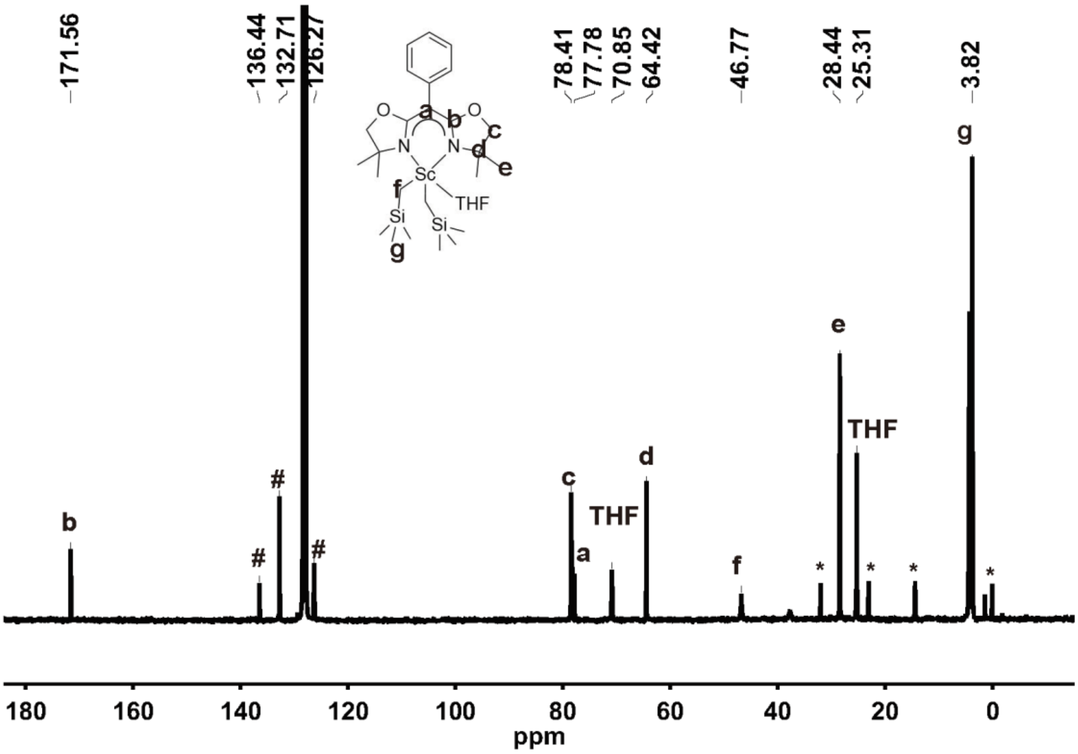

Figure S8 ^{13}C NMR spectrum of **1-Sc** (100 MHz, C_6D_6, 25 °C; **n*-hexane; # Ph-C)

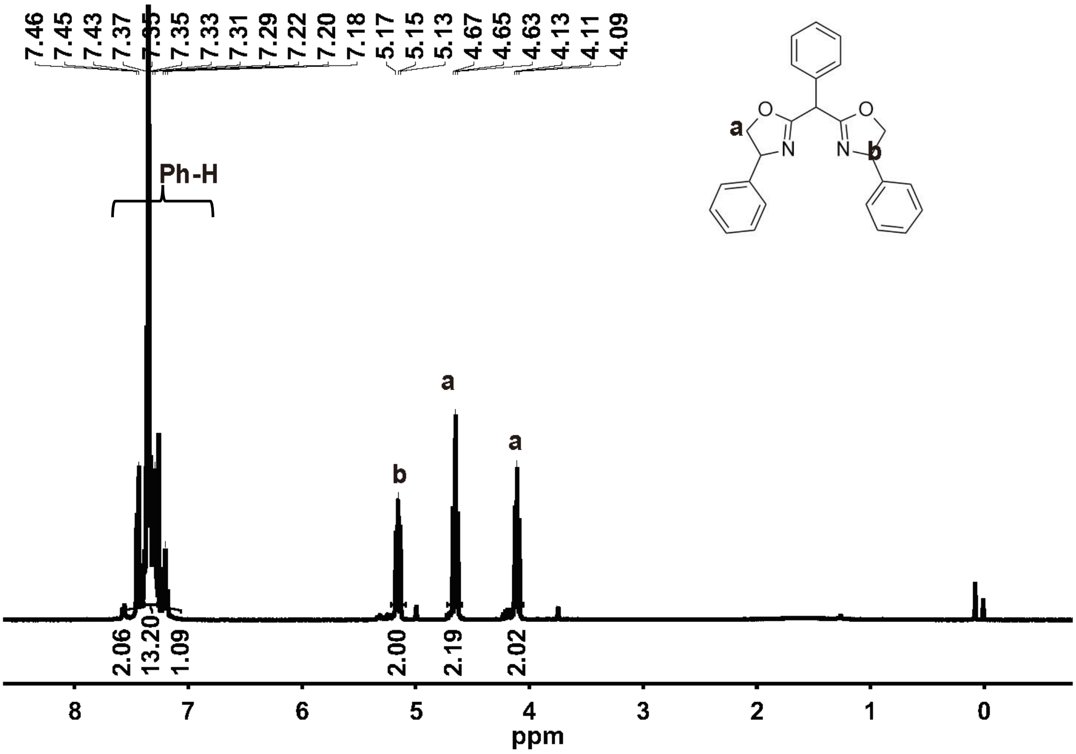

Figure S9 ^{1}H NMR spectrum of **L2-H** (400 MHz, $CDCl_3$, 25 °C)

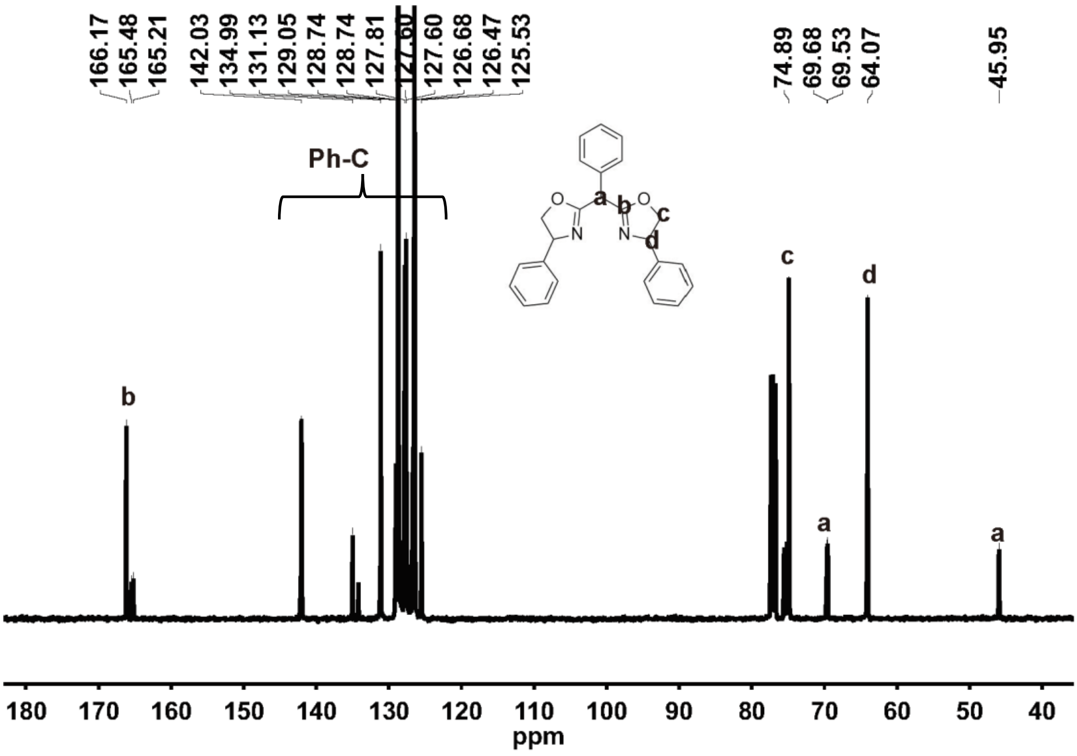

Figure S10 ^{13}C NMR spectrum of **L2-H** (100 MHz, $CDCl_3$, 25 °C)

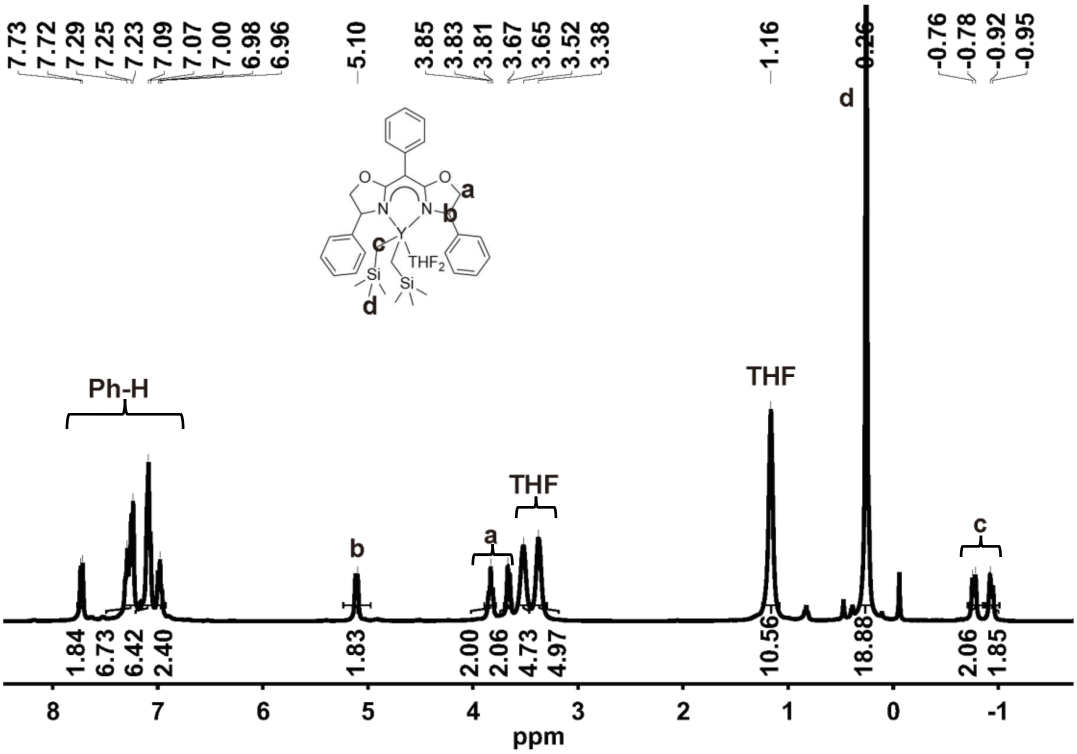

Figure S11 ^{1}H NMR spectrum of **2-Y** (400 MHz, C_6D_6, 25 °C)

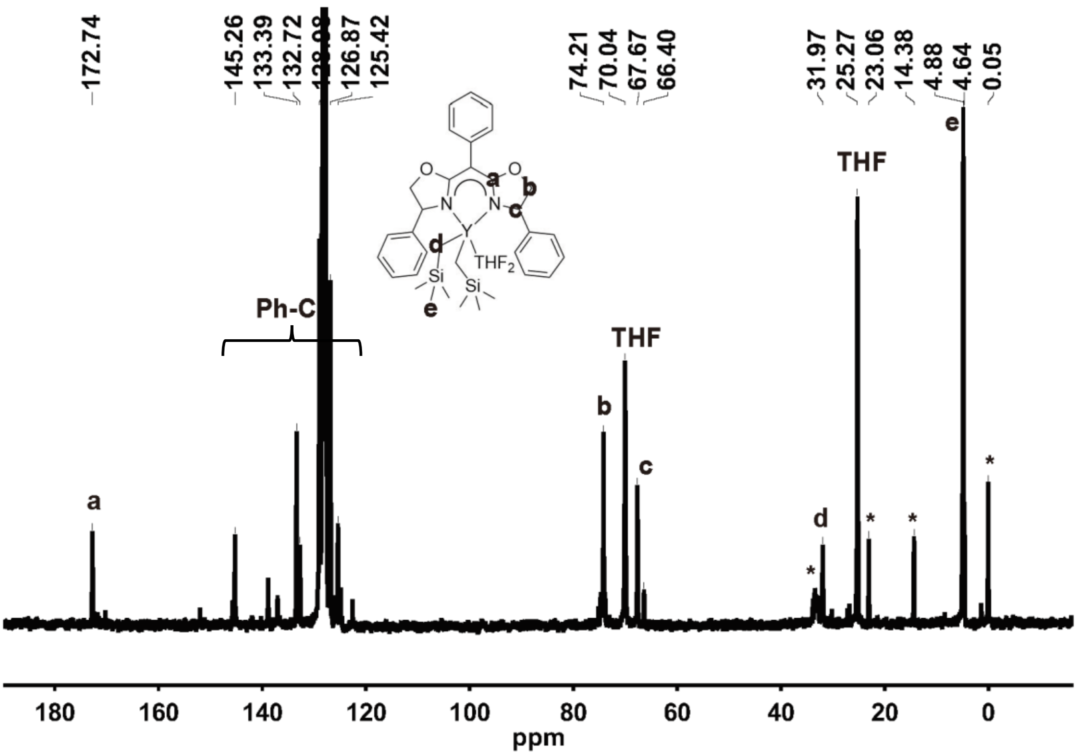

Figure S12 ^{13}C NMR spectrum of **2-Y** (100 MHz, C_6D_6, 25 °C; * *n*-hexane)

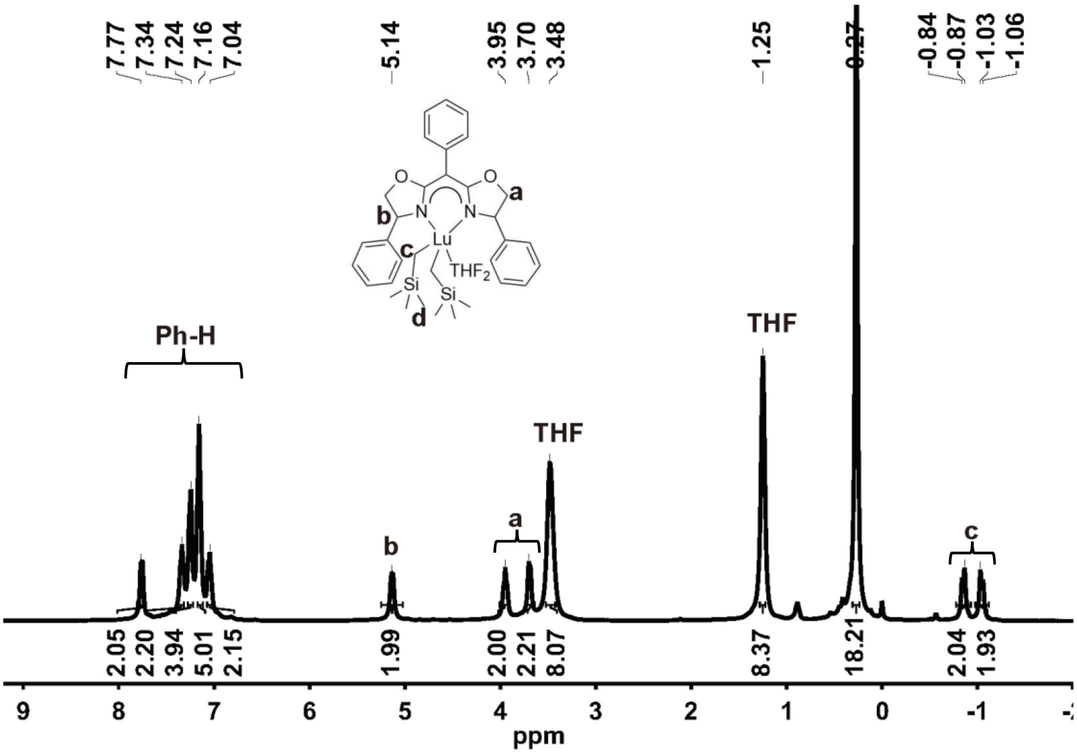

Figure S13 ^{1}H NMR spectrum of **2-Lu** (400 MHz, C_6D_6, 25 °C)

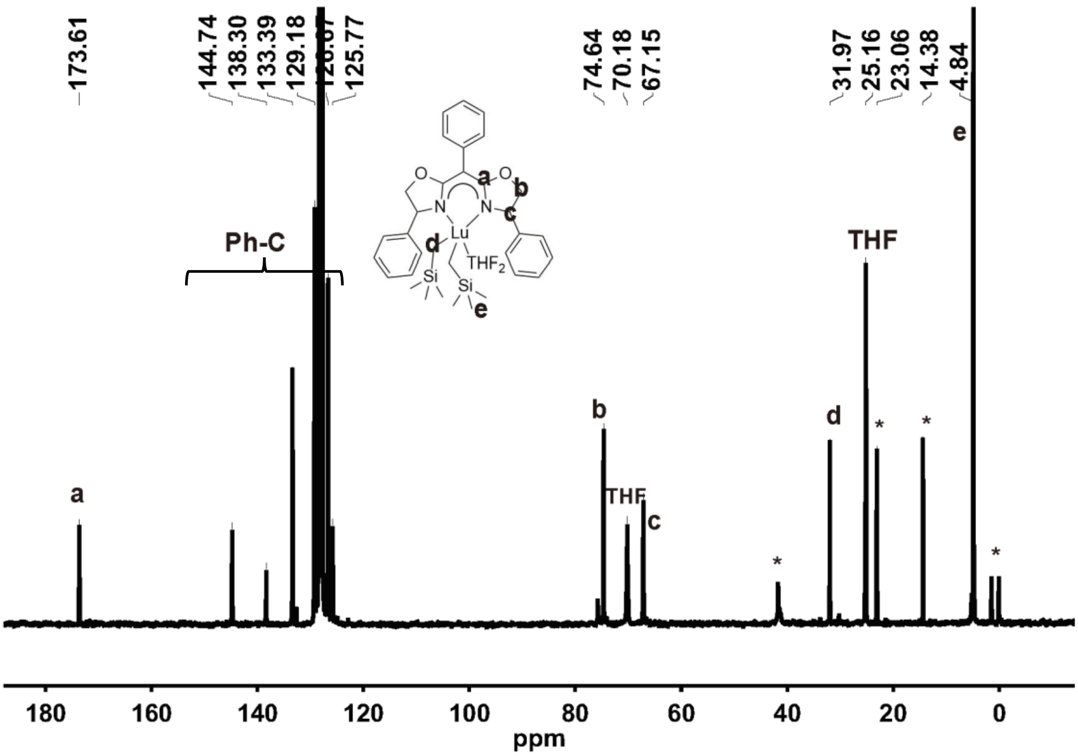

Figure S14 ^{13}C NMR spectrum of **2-Lu** (100 MHz, C_6D_6, 25 °C; * *n*-hexane)

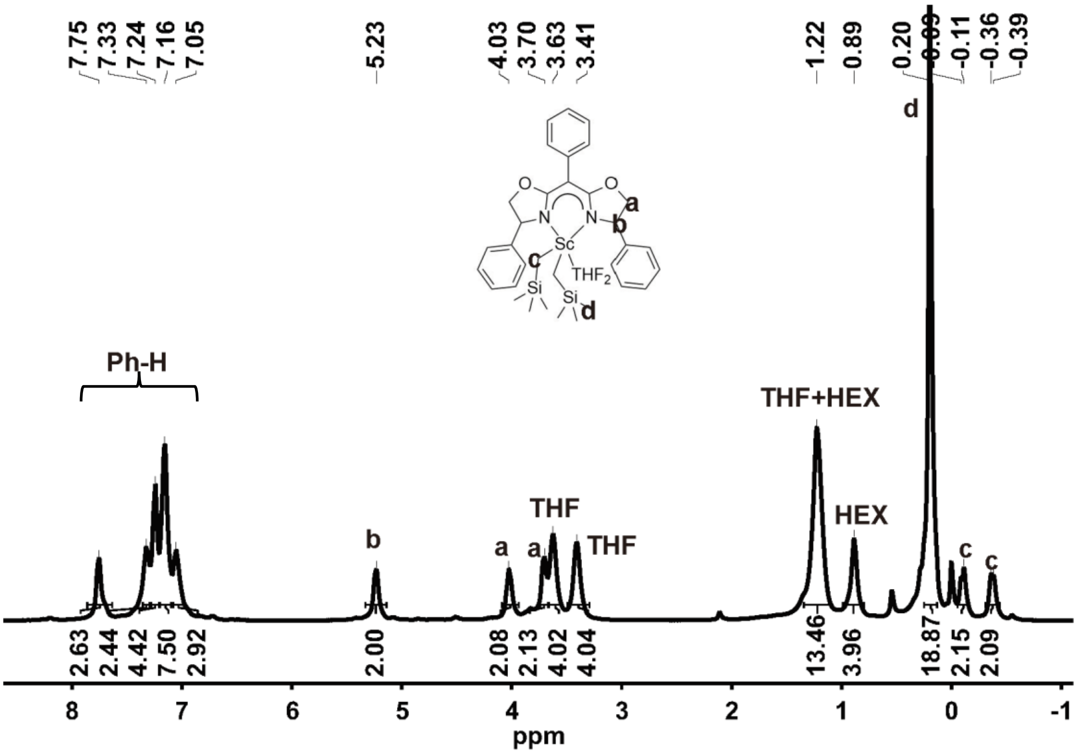

Figure S15 ^{1}H NMR spectrum of **2-Sc** (400 MHz, C_6D_6, 25 °C)

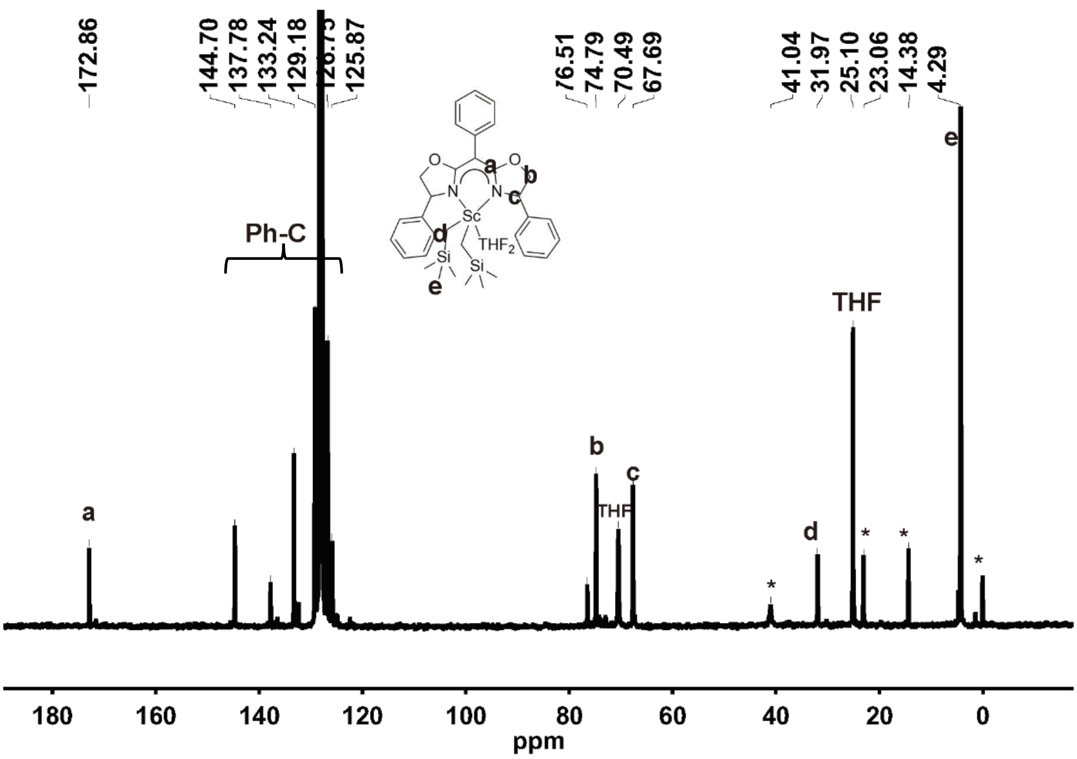

Figure S16 ^{13}C NMR spectrum of **2-Sc** (100 MHz, C_6D_6, 25 °C; * *n*-hexane)

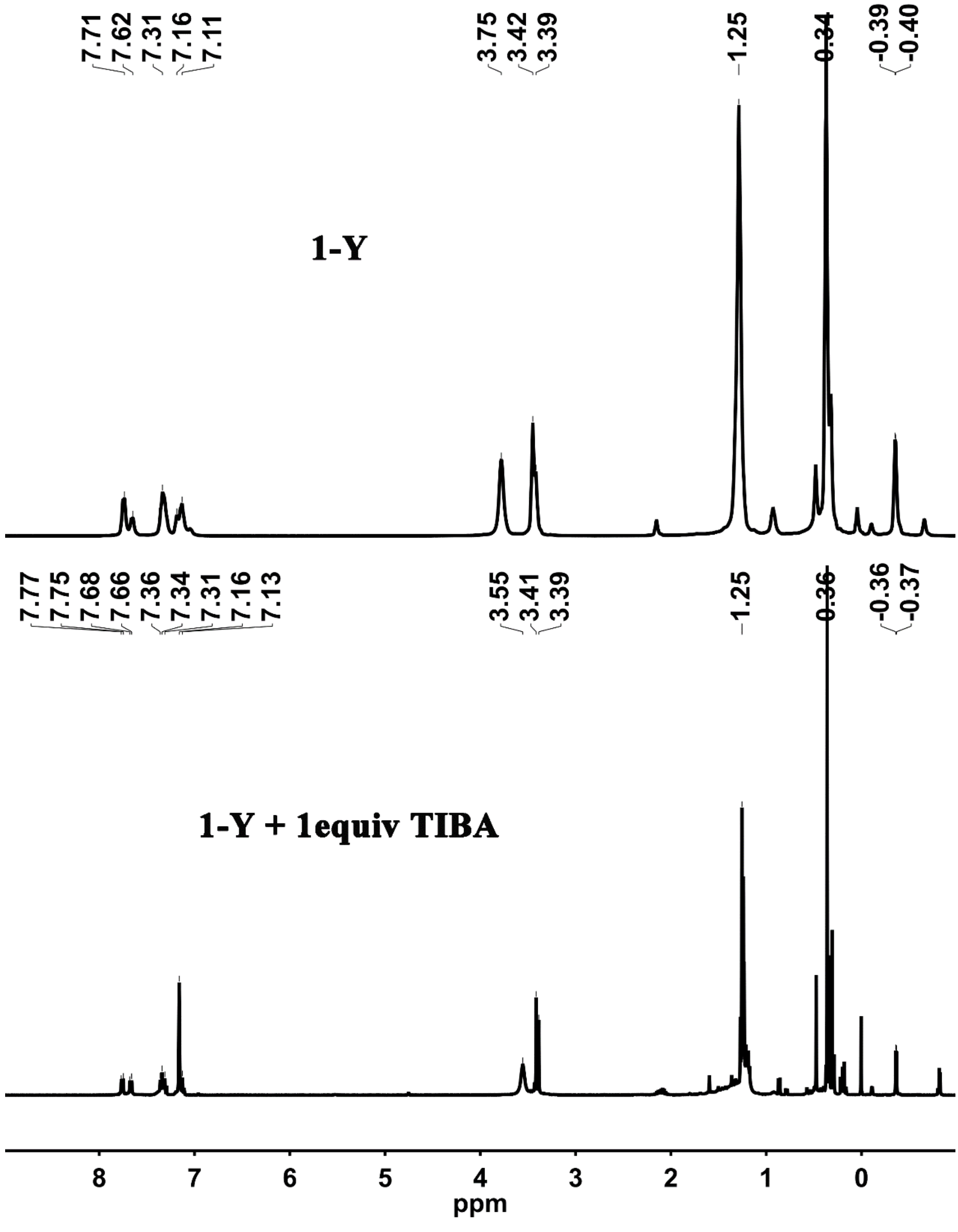

Figure S17 ^{1}H NMR spectrum of **1-Y** and **1-Y** + 1 equiv TIBA (400 MHz, C_6D_6, 25 °C)

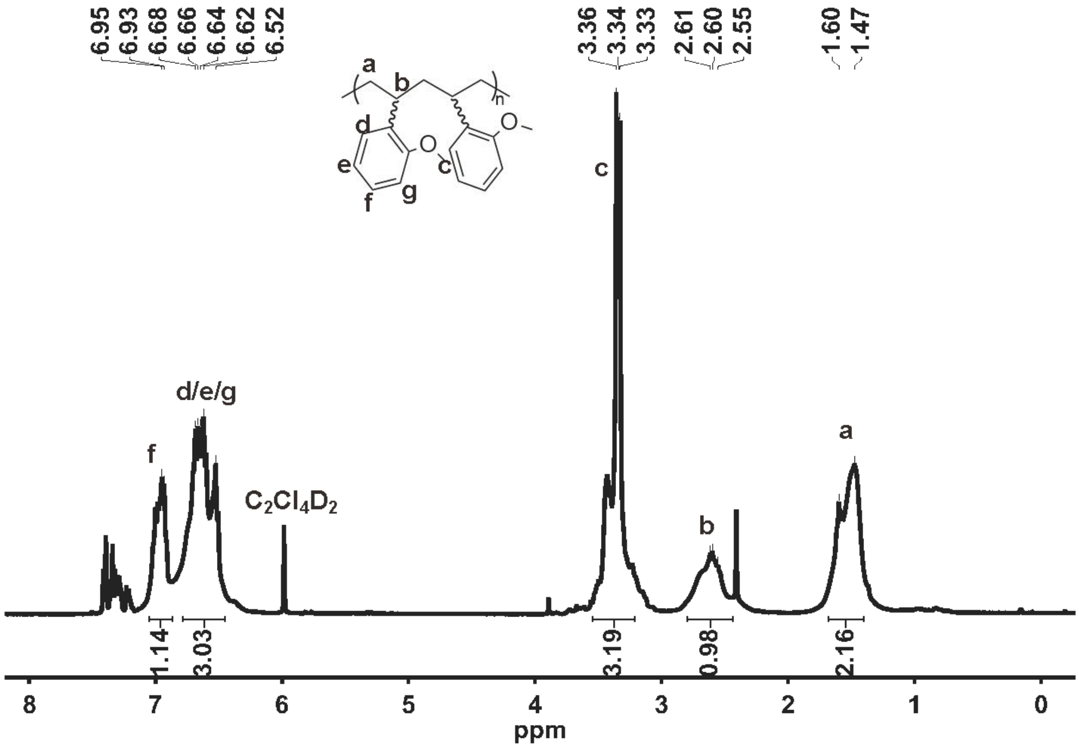

Figure S18 ^{1}H NMR spectrum of atactic P(*o*MOS) catalyzed by **1-Y**/[Ph$_3$C][B(C$_6$F$_5$)$_4$] /TIBA (400 MHz, $C_2Cl_4D_2$, 120 °C, Entry 3 in Table 2)

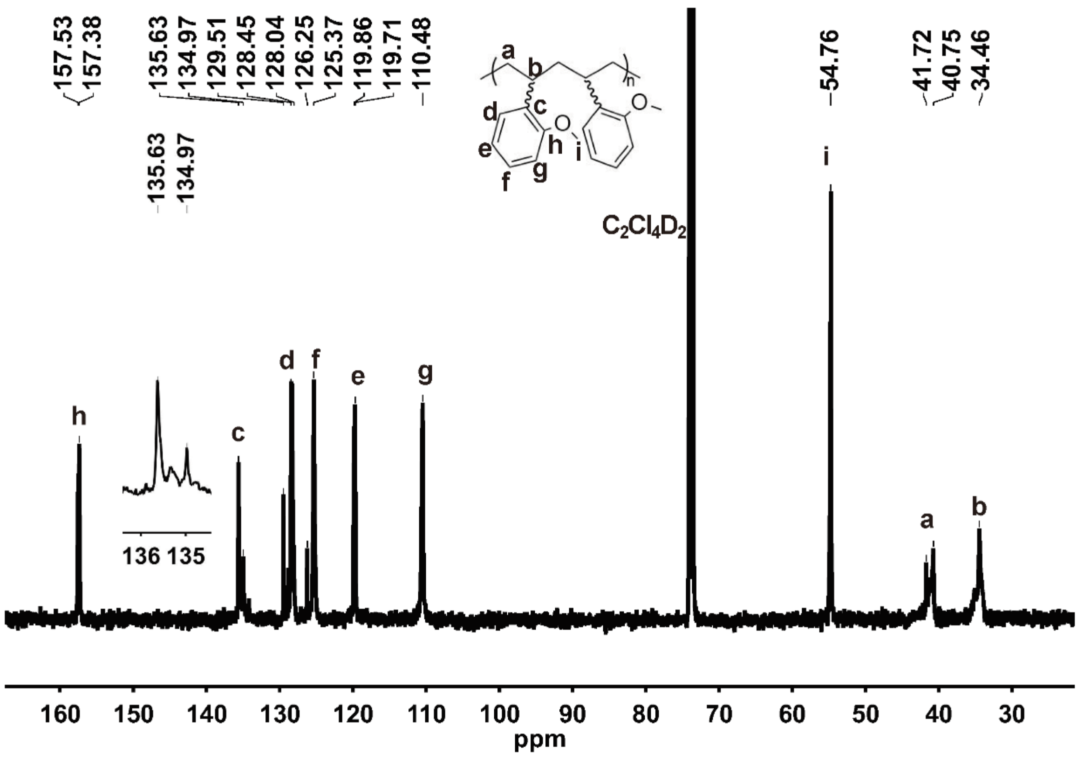

Figure S19 ^{13}C NMR spectrum of atactic P(*o*MOS) catalyzed by **1-Y**/ [Ph$_3$C][B(C$_6$F$_5$)$_4$]/TIBA (100 MHz, $C_2Cl_4D_2$, 120 °C, Entry 3 in Table 2)

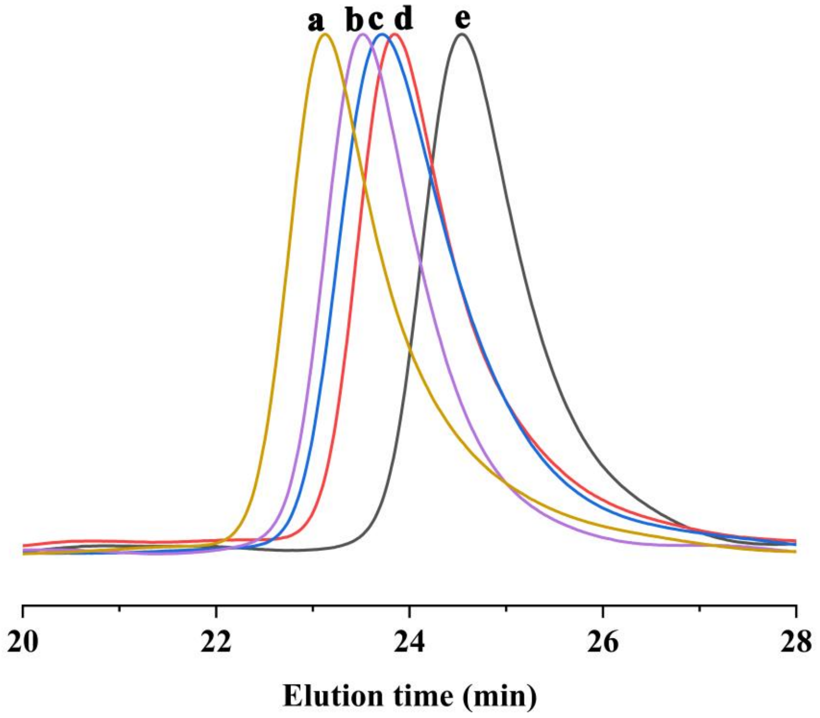

Figure S20 GPC curves of different polymerization time catalyzed by **1-Y**. time: 3min (a), 2.5min (b), 2min (c), 1.5min (d), and 1min (e)

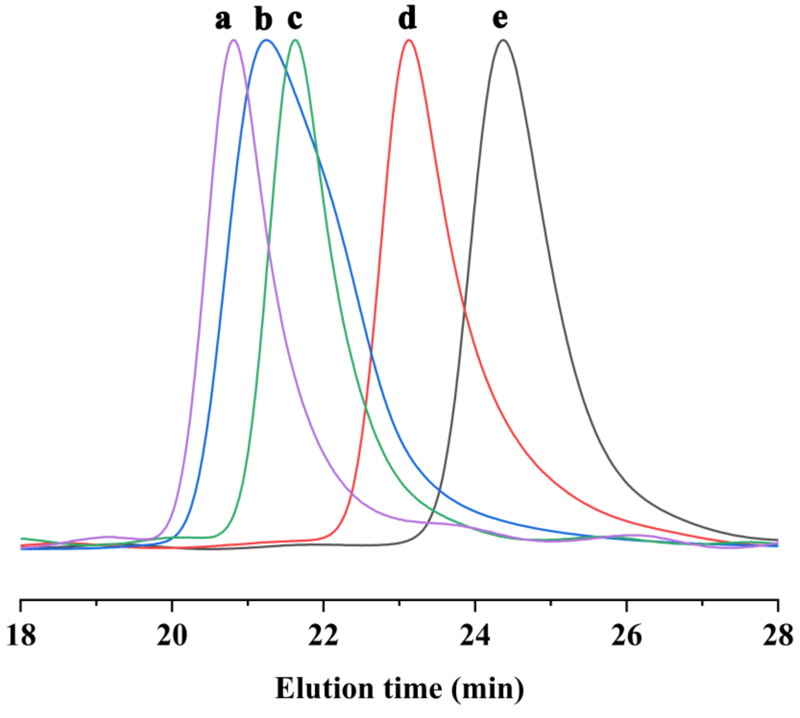

Figure S21 GPC curves of different monomer feeds catalyzed by **1-Y**. [IP]/[**1-Y**]: 1500 (a), 1000 (b), 750 (c), 500 (d), and 300 (e)

Table S1 Summary of the crystallographic data for **1-Y**, **1-Lu** and **2-Sc**

	1-Y	**1-Lu**	**2-Sc**
Empirical formula	$C_{29}H_{51}N_2O_3Si_2Y$	$C_{29}H_{51}LuN_2O_3Si_2Y$	$C_{41}H_{55}N_2O_2ScSi_2$
Formula weight	620.80	707.87	741.01
Temperature/K	150.00	150.00	150.00
Crystal system	triclinic	triclinic	orthorhombic
Space group	$P\overline{1}$ (2)	$P\overline{1}$ (2)	$P2_12_12_1$ (19)
a/Å	10.3675(12)	10.3467(4)	10.8048(16)
b/Å	11.7613(12)	11.7319(4)	12.4139(17)
c/Å	14.9863(10)	14.9386(5)	30.850(6)
α/°	92.529(3)	92.6780(10)	90
β/°	100.532(3)	100.7490(10)	90
γ/°	112.138(2)	112.1510(10)	90
Volume/$Å^3$	1651.3(3)	1636.33(10)	4137.9(11)
Z	2	2	4
D_c/Mg m^{-3}	1.249	1.437	1.189
μ/mm^{-1}	1.868	3.119	0.276
F(000)	660	726	1584
Crystal size/mm^3	0.23×0.19×0.18	0.3×0.1×0.1	0.1×0.08×0.05
2θ range for data collection/°	4.34 to 55.06	4.40 to 55.01	3.99 to 55.04
Index ranges	−13 ≤ h ≤ 13 −15 ≤ k ≤ 15 −19 ≤ l ≤ 18	−13 ≤ h ≤ 13 −15 ≤ k ≤ 15 −19 ≤ l ≤ 19	−14 ≤ h ≤ 14 −16 ≤ k ≤ 15 −37 ≤ l ≤ 40
Reflections collected	55689	47958	46196
Independent reflections	7598 Rint = 0.0988	7444 R(int) = 0.0483	9493 R(int) = 0.1436
Completeness to θ/°	25.242(99.9 %)	25.242(98.5 %)	25.242(100.0 %)
Data/Restraints/Parameters	7598/0/344	7444/0/344	9493/0/457
Goodness-of-fit on F^2	1.033	0.963	1.025
Final R indexes [I≥2σ(I)]	R1 = 0.0319 wR2 = 0.0725	R1 = 0.0176 wR2 = 0.0521	R1 = 0.0612 wR2 = 0.1308
Final R indexes [all data]	R1 = 0.0454 wR2 = 0.0768	R1 = 0.0181 wR2 = 0.0524	R1 = 0.1082 wR2 = 0.1532
Largest peak/hole/e$Å^{-3}$	0.53/-0.41	0.86/-0.82	0.49/-0.29

$R_1 = \Sigma||F_o| - |F_c||/\Sigma|F_o|$; $wR_2 = [\Sigma w(F_o^2-F_c^2)^2/\Sigma w(Fo^2)^2]^{1/2}$