Supporting Information

Metal array fabrication through self-assembly of Pt-complex-bound amino acids

Katsuhiro Isozaki,[a,c,d] Kazuki Ogata,[a,b] Yusuke Haga,[d] Daisuke Sasano,[a,b] Tetsuya Ogawa,[e] Hiroki Kurata,[e] Masaharu Nakamura,[a,b] Takeshi Naota*[d] and Hikaru Takaya*[a,b,d,f]

[a]International Research Center for Elements Science, Institute for Chemical Research, Kyoto University, Uji, Kyoto 611-0011, Japan,
[b]Department of Energy and Hydrocarbon Chemistry, Graduate School of Engineering, Kyoto University, Uji, Kyoto 615-8510, Japan,
[c]Polymer Materials Unit, National Institute for Materials Science, Tsukuba, Ibaraki 305-0044, Japan,
[d]Department of Chemistry, Graduate School of Engineering Science, Osaka University, Machikaneyama, Toyonaka, Osaka 560-8531, Japan,
[e]Institute for Chemical Research, Kyoto University, Uji, Kyoto 611-0011, Japan,
[f]PRESTO, Japan Science and Technology Agency.

Contents

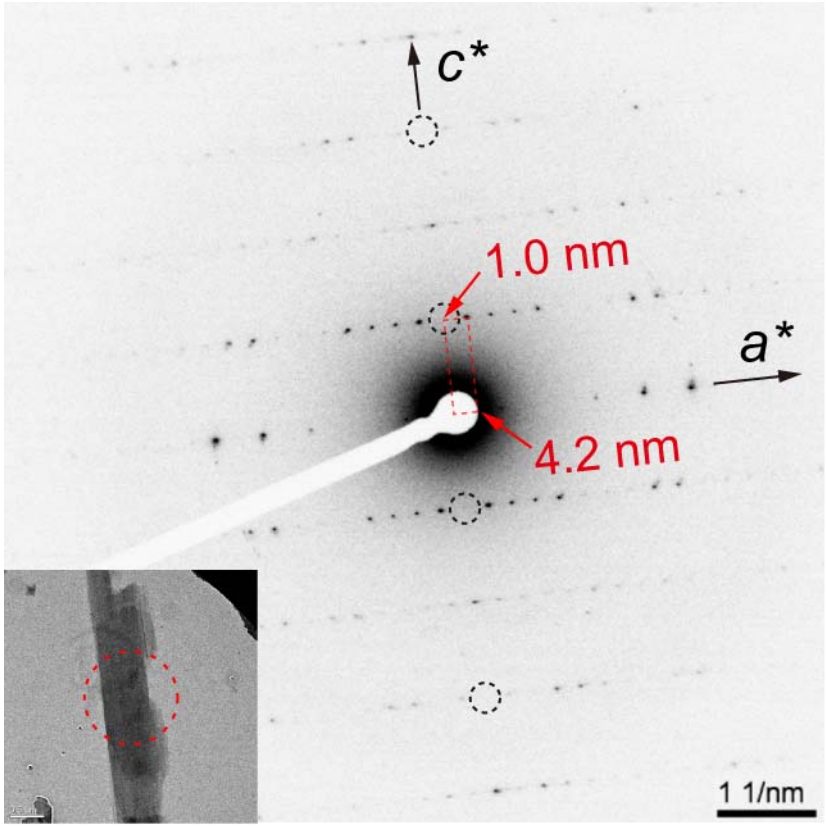
Experimental Section

General. Proton nuclear magnetic resonance (^{1}H NMR), carbon nuclear magnetic resonance (^{13}C NMR) spectra were recorded on Bruker Avance III 800 and UNITY-INOVA 500 NMR spectrometers: ^{1}H NMR spectra were recorded at 800 and 500 MHz, and ^{13}C NMR spectra were recorded at 201 and 125.7 Mz, and ^{31}P NMR spectra were recorded at 323.9 and 202.3 MHz, respectively. IR spectra were recorded on a JASCO FT/IR-460 Plus and a PerkinElmer Spectrum One FT-IR spectrometers. The high resolution mass spectrometry (HRMS) was measured on a JEOL JMS-700 using fast atom bombardment (FAB) method or on a Fourier transformation-ion cyclotron resonance-mass spectrometer, Bruker solariX (FT-ICR-MS) by using electron spray ionization (ESI) and laser desorption ionization (LDI) techniques. The system was equipped with 7 tesla superconductive magnet and has a quadrupole-hexapole in the front of ICR which were used for tandem MS measurement. Sonication for gelation test was performed on an AS ONE ultrasonic cleaner VS-50R. Optical rotation was measured on a JASCO DIP-370 digital polarimeter. Elemental analyses were carried out at the Microanalytical Laboratory of the Institute for Chemical Research, Kyoto University or performed on a Perkin Elmer 2400II CHN elemental analyzer. Scanning Electron Microscope (SEM) images are obtained using HITACHI–S4800. Transmission electron microscopy (TEM) images and electron diffractions were taken under liquid helium temperature by JEOL JEM-2100F(G5) with cryo-TEM which has liquid helium stage and is operated at 200 kV. Atomic force microscopy measurements were performed using Agilent Technologies 5500 Scanning Probe Microscope (N9410S). Single-crystal X-ray crystallographic analyses were performed on a Rigaku AFC 10 diffractometer with Saturn 72 CCD detector using graphite monochromated Mo-*K*α radiation (0.71071 Å). The small angle X-ray scattering (SAXS) and wide angle X-ray scattering (WAX) measurements were carried out by Si (111) monochromated synchrotron radiation (1.0 Å) at SPring-8 beam line BL40B2 (2011A1614, 2010B1744, 2009B1463, and 2008A1034) and BL19B2 (2007A1003, 2007A1078, and 2007B1613).

Material. Platinum salts $K_2[PtCl_4]$ was purchased from TANAKA Precious Metal and Fmoc-L-Glu(O^{t}Bu)-OH was purchased from Nova Biochem and used without further purification. 1-Ethyl-3-(3-dimethylaminopropyl)carbodiimide hydrochloride (EDCl: Peptide Institute. INC) were used as received.

Cryo-TEM experiments

TEM experiments were performed on a JEOL JEM-2100F(G5) cryo-TEM operated at an accelerating voltage 200 kV with liquid helium stage. To carry out the TEM observation, a drop of dilute solutions of gel were deposited on a carbon-coated Cu grid and dried for few hours before imaging. The grid was transferred into the cryo-TEM and observations were carried out at the liquid helium temperature (c.a. 4.2 K) which diminishes considerably the electron irradiation damage of gel fibril. Selected area electron diffraction patterns were obtained from 1 μm ϕ area in specimens with camera length of 50 cm. The lattice spacings determined from diffraction spots were calibrated by using Au (111) diffraction ring (0.235 nm) from gold nanoparticles as a reference.



***N*-Benzilidene-2-hydroxyethylamine.** Freshly distilled benzaldehyde (10.6 g, 0.100 mol) and 2-aminoethanol (6.11 g, 0.100 mol) were added to toluene (100 mL). The solution was refluxed over night under Dean-Stark apparatus. After cooling to room temperature, the solvent was removed under vacuum to give red-orange oil of *N*-benzilidene-2-hydroxyethylamine (11.9 g, >99%). IR (neat): 3364 (O-H), 1646 (C=N) cm^{-1}. ^1H NMR ($CDCl_3$, 500 MHz): δ 2.35 (br, 1H, -CH_2OH), 3.76 (td, J = 5.0, 1.5 Hz, 2H, -CH_2CH_2OH), 3.92 (t, J = 5.0 Hz, 2H, -NCH_2CH_2-), 7.40-7.44 (m, 3H, C_6H_5-), 7.70-7.74 (m, 2H, C_6H_5-), 8.36 (s, 1H, -NC*H*-). ^{13}C NMR ($CDCl_3$, 125 MHz): δ 62.6, 63.5, 128.4, 128.9, 131.1, 136.1, 163.4. CI-MS (*m/z*): 150.1 $[M+H]^+$.

Chloro[2-[(2-hydroxyethylimino-κ*N*)methyl]phenyl-κ*C*](triphenylphosphine)platinum [PtCl{$C_6H_4CH=N(CH_2)_2OH$}(PPh_3)] (2). The solution of $K_2[PtCl_4]$ (4.15 g, 10.0 mmol) in methanol (300 mL) was added **3** (2.98 g, 20.0 mmol), stirred for 24 h at 70 °C. After cooling to the room temperature the solution was filtered, added PPh_3 (2.62 g, 10.0 mmol) and stirred for 3 h. The mixture product was separated by silica gel chromatography to afford yellow solid of **2** (2.17 g, 34%). IR (KBr): 3457 (O-H), 1617 (C=N) cm^{-1}. ^1H NMR ($CDCl_3$, 500 MHz): δ 2.20 (t, J = 5.5 Hz, 1H, -CH_2OH), 4.06 (td, J = 5.5, 4.5 Hz, 2H, -CH_2CH_2OH), 4.25 (td, J = 5.0, 4.5 Hz, 2H, -NCH_2CH_2-), 6.52 (ddd, J_{H-H} = 7.5, 1.0 Hz, J_{P-H} = 2.5 Hz, J_{Pt-H} = 55 Hz, 1H, -PtC_6H_4-), 6.55 (ddd, J = 7.5, 7.5, 1.0 Hz, 1H, -PtC_6H_4-), 6.91 (ddd, J = 7.5, 7.5, 1.0 Hz, 1H, -PtC_6H_4-), 7.30 (dd, J = 7.5, 1.0 Hz, 1H, -PtC_6H_4-), 7.34-7.39 (m, 6H, -$P(C_6H_5)_3$), 7.41-7.45 (m, 3H, -$P(C_6H_5)_3$), 7.72-7.77 (m, 6H, -$P(C_6H_5)_3$), 8.35 (d, J_{P-H} = 9.0 Hz, J_{Pt-H} = 81 Hz, 1H, -C*H*N-). ^{13}C NMR ($CDCl_3$, 125.7 MHz): δ 60.4, 62.0, 123.0, 127.8, 127.9, 128.2, 129.8, 130.3, 130.8, 135.4, 135.5, 137.0, 146.3, 158.2, 179.3. ^{31}P NMR ($CDCl_3$, 202.3 MHz): δ 23.0 (s, J_{P-Pt} = 4203.6 Hz, Pt*P*Ph_3). Anal. Calcd for $C_{27}H_{25}ClNOPPt$: C, 50.59; H, 3.93; N, 2.19. Found: C, 50.83; H, 4.02; N, 1.98. FAB-MS (*m/z*): 641.1 $[M^+]$.

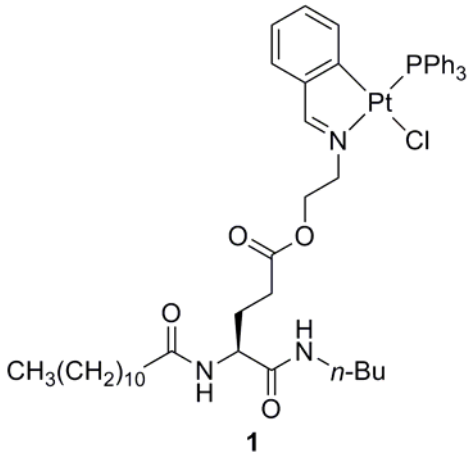
Fmoc-L-Glu(O-*t*-Bu)-NH-*n*-C_4H_9. Fmoc-L-Glu(O-*t*-Bu)-OH (4.26 g, 10.0 mmol) and EDCl (2.88 g, 15.0 mmol) were dissolved into CH_2Cl_2 (100 mL), *n*-$BuNH_2$ (1.09 mL) was added and stirred for 12 h at room temperature. The reaction mixture was washed with water (100 mL), aqueous HCl solution (1%, 100 mL × 2), brine (100 mL) and dried over $MgSO_4$. The solvent was removed under vacuum and the resulting mixture was chromatographed on SiO_2, where a major fraction was collected and evaporated to give white solid of Fmoc-L-Glu(O-*t*-Bu)-NH-*n*-C_4H_9 (4.11 g, 85%). ^1H NMR ($CDCl_3$, 500 MHz): δ 0.91 (t, J = 7.5 Hz, 3H, $CH_3(CH_2)_3$-), 1.33 (tt, J = 7.5, 7.5 Hz, 2H, $CH_3CH_2CH_2$-), 1.45 (s, 9H, -$OC(CH_3)_3$), 1.92 (dddd, J = 7.5, 7.5, 7.5, 7.5 Hz, 1H, -$CHCH_2CH_2$-), 2.06 (dddd, J = 7.5, 7.5, 7.5, 7.5 Hz, 1H, -$CHCH_2CH_2$-), 2.29 (ddd, J = 16.5, 7.5, 7.5 Hz, 1H, -$CHCH_2CH_2CO$-), 2.43 (ddd, J = 17.0, 7.5, 7.5 Hz, 1H, -$CHCH_2CH_2CO$-), 3.26 (td, J = 7.0, 6.0 Hz, 2H, -CH_2CH_2NH-), 4.17 (ddd, J = 7.5, 7.5, 6.5 Hz, 1H, -NHC*H*CO-), 4.20 (t, J = 7.0 Hz, 2H, $(C_6H_4)_2CHCH_2$-), 4.38 (d, J = 7.0 Hz, 2H, $(C_6H_4)_2CHCH_2CO$-), 5,76 (d, J = 7.0 Hz, 1H, FmocN*H*CH-), 6.29 (br, 1H, -CON*H*Bu), 7.31 (ddd, J = 7.5, 7.5, 1.5 Hz, 2H, $(C_6H_4)_2CHCH_2$-),

7.40 (dd, J = 7.5, 7.5 Hz, 2H, $(C_6H_4)_2CHCH_2$-), 7.59 (d, J = 7.5 Hz, 2H, $(C_6H_4)_2CHCH_2$-), 7.76 (d, J = 7.5 Hz, 2H, $(C_6H_4)_2CHCH_2$-). ^{13}C NMR ($CDCl_3$, 125.7 MHz): δ 13.7, 20.0, 28.1, 31.5, 31.7, 39.3, 47.1, 54.3, 67.0, 81.1, 120.0, 125.1, 127.1, 127.7, 141.3, 143.7, 156.3, 171.0, 173.0. FAB-MS (HR) *m/z* calcd for $C_{28}H_{37}N_2O_5$ $[M+H]^+$ 481.2702, found 481.2702.

***n*-$C_{11}H_{23}$-L-Glu(O-*t*-Bu)-NH-*n*-C_4H_9.** Fmoc-L-Glu(O-*t*-Bu)-NH-*n*-C_4H_9 (1.44 g, 3.00 mmol) was dissolved into acetonitrile (150 mL), piperidine (3.15 mL) was added and stirred for 30 min at room temperature. The reaction mixture was then washed with hexane (150 mL × 5), concentrated under vacuum to afford yellow solid. The residue, lauric acid (0.601 g, 3.00 mmol) and EDCl (0.863 g, 4.50 mmol) were added to CH_2Cl_2 (30 mL) and stirred for 12 h at room temperature. The resulting mixture was chromatographed on SiO_2, where a major fraction was collected and evaporated to give white solid of *n*-$C_{11}H_{23}$-L-Glu(O-*t*-Bu)-NH-*n*-C_4H_9 (1.02 g, 92%). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 0.88 (t, J = 7.5 Hz, 3H, $CH_3(CH_2)_{10}$-), 0.92 (t, J = 7.5 Hz, 3H, $CH_3(CH_2)_3$-), 1.25 (br, 10H, $CH_3(CH_2)_{10}$-), 1.28 (br, 6H, $CH_3(CH_2)_{10}$-), 1.29-1.38 (m, 2H, $CH_3CH_2CH_2$-), 1.41-1.53 (m, 11H, -OC(CH_3)$_3$, $CH_3CH_2CH_2CH_2$-), 1.61 (tt, J = 7.0, 7.0 Hz, 2H, $CH_3(CH_2)_{10}$-), 1.92 (dddd, J = 7.5, 7.5, 7.5, 7.5 Hz, 1H, -CH$CH_2$$CH_2$-), 2.03 (dddd, J = 7.5, 7.5, 7.5, 7.5 Hz, 1H, -CH$CH_2$$CH_2$-), 2.19 (t, J = 7.5 Hz, 2H, $CH_3(CH_2)_9CH_2$CO-), 2.26 (ddd, J = 17.0, 7.5, 7.5 Hz, 1H, -CHCH$_2$CH_2CO-), 2.45 (ddd, J = 17.0, 7.5, 7.5 Hz, 1H, -CHCH$_2$CH_2CO-), 3.24 (td, J = 7.0, 6.0 Hz, 2H, -CH$_2$CH_2NH-), 4.39 (ddd, J = 9.5, 7.5, 7.5 Hz, 1H, -NHC*H*CO-), 6.48 (d, J = 7.5 Hz, 1H, -CON*H*Bu), 6.51 (br, 1H, -CH$_2$N*H*COCH-). ^{13}C NMR ($CDCl_3$, 125.7 MHz): δ 13.7, 14.1, 20.0, 22.7, 25.6, 27.8, 28.1, 29.2, 29.3, 29.4, 29.5, 31.5, 31.8, 31.9, 36.6, 39.2, 52.5, 81.0, 171.1, 173.1, 173.4. ESI-MS (m/z): 983.8 $[2M+Na]^+$.

***n*-$C_{11}H_{23}$-L-Glu-NH-*n*-C_4H_9.** *n*-$C_{11}H_{23}$-L-Glu(O-*t*-Bu)-NH-*n*-C_4H_9 (6.53 g, 14.8 mmol) was dissolved into CH_2Cl_2 (100 mL) and trifluoroacetic acid (100 mL) was added, stirred for 30 min at room temperature. The reaction mixture was washed with water (200 mL × 3) to afford white gammy product. The obtained jelly was dried under vacuum at 45 ºC to afford white solid of *n*-$C_{11}H_{23}$-L-Glu-NH-*n*-C_4H_9 (3.42 g, 60%). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 0.88 (t, J = 7.5 Hz, 3H, $CH_3(CH_2)_{10}$-), 0.91 (t, J = 7.5 Hz, 3H, -CH_2CH_3), 1.20-1.32 (m, 16H, $CH_3(CH_2)_{10}$-), 1.35 (qt, J = 7.5, 7.5 Hz, 2H, -$CH_2CH_2CH_3$), 1.49 (tt, J = 7.5, 7.5 Hz, 2H, -NHCH$_2$C$H_2$$CH_2$$CH_3$), 1.61 (tt, J = 7.5, 6.5 Hz, 2H, $CH_3(CH_2)_{10}$-), 1.87-1.97 (m, 1H, -CH$CH_2$$CH_2$CO-), 1.99-2.11 (m, 1H, -CH$CH_2$$CH_2$CO-), 2.23 (t, J = 7.5 Hz, -COC$H_2$$(CH_2)_9CH_3$), 2.36 (ddd, J = 16.5, 7.5, 4.5 Hz, 1H, -CHCH$_2$CH_2CO-), 2.50 (ddd, J = 16.0, 8.5, 4.5 Hz, 1H, -CHCH$_2$CH_2CO-), 3.20 (tdd, J = 15.0, 7.5, 7.5 Hz, 2H, -NHC$H_2$$CH_2$-), 4.65 (ddd, J = 6.0, 6.0, 6.0 Hz, 1H, -NHC*H*CO-), 6.67 (d, J = 8.5 Hz, 1H, -CON*H*CH-), 7.11 (br, 1H, -CHN*H*CH$_2$-). ^{13}C NMR ($CDCl_3$, 125.7 MHz): δ 13.7, 14.1, 19.6, 22.7, 25.6, 28.4, 29.1, 29.2, 29.3, 29.4, 29.5, 30.2, 31.3, 31.9, 36.6, 39.3, 51.9, 171.2, 174.2, 175.4. FAB-MS (HR) *m/z* calcd for $C_{21}H_{41}N_2O_4$ $[M+H]^+$ 385.3066, found 385.3066.

***n*-$C_{11}H_{23}$-L-Glu(O[Pt]$_{n=2}$)-NH-*n*-C_4H_9 {[Pt]$_{n=2}$ = (-CH_2CH_2N=CHC_6H_4)$PtPPh_3Cl$} 1.** Platinum complex **2** (0.608 g, 1.10 mmol), *n*-$C_{11}H_{23}$-L-Glu-NH-*n*-C_4H_9 (0.385 g, 1.00 mmol), EDCl (0.288 g, 1.50 mmol), and DMAP (11.2 mg, 0.100 mmol) were dissolved into CH_2Cl_2 (10.0 mL) and stirred for 12 h at room temperature. The mixture solution washed with water (10.0 mL × 2), Brine (50 mL), and dried over Na_2SO_4. The solution was filtered and subjected to SiO_2 column chromatograph, where a major fraction was collected and evaporated to give yellow solid of **1** (0.722 g, 77%). ^{1}H NMR ($CDCl_3$, 800.1 MHz): δ 0.87 (t, *J* = 7.3 Hz, 3H, C*H*$_3$(CH$_2$)$_{10}$-), 0.91 (t, *J* = 7.3 Hz, 3H, C*H*$_3$(CH$_2$)$_3$-), 1.20-1.36 (m, 18H, CH$_3$(C*H*$_2$)$_{10}$-), 1.45 (tt, *J* = 7.5, 7.5 Hz, 2H, CH$_3$C*H*$_2$CH$_2$CH$_2$-), 1.62 (q, *J* = 7.5 Hz, 2H, CH$_3$(C*H*$_2$)$_{10}$-), 1.88 (td, *J* = 14.0, 6.8 Hz, 1H, -CHC*H*$_2$CH$_2$-), 2.06-2.11 (m, 1H, -CHC*H*$_2$CH$_2$-), 2.20 (td, *J* = 7.5, 5.5 Hz, 2H, CH$_3$CH$_2$C*H*$_2$-), 2.37 (ddd, *J* = 17.0, 6.6, 6.6 Hz, 1H, -CHCH$_2$C*H*$_2$CO-), 2.51-2.60 (m, 1H, -CHCH$_2$C*H*$_2$CO-), 3.20 (td, *J* = 6.8, 6.8 Hz, 2H, -CH$_2$C*H*$_2$NH-), 4.26-4.31 (m, 1H, -NC*H*$_2$CH$_2$-), 4.42 (ddd, *J* = 7.8, 7.8, 5.2 Hz, 1H, -NHC*H*CO-), 4.42-4.47 (m, 1H, -NC*H*$_2$CH$_2$-), 4.51-4.54 (m, 1H, -OC*H*$_2$CH$_2$-), 4.64-4.68 (m, 1H, -OC*H*$_2$CH$_2$-), 6.43 (t, *J* = 5.8 Hz, -CON*H*Bu), 6.47 (d, *J* = 7.5 Hz, 1H, LaurCON*H*CH-), 6.52 (dd, $J_{H\text{-}H}$ = 7.5, 1.5 Hz, $J_{Pt\text{-}H}$ = 43.0 Hz, 1H, -PtC$_6$*H*$_4$-), 6.56 (ddd, *J* = 7.8, 7.8, 2.3 Hz, 1H, -PtC$_6$*H*$_4$-), 6.90 (ddd, *J* = 7.3, 7.3, 1.0 Hz, 1H, -PtC$_6$*H*$_4$-), 7.34-7.39 (m, 7H, -PtC$_6$*H*$_4$-, -P(C$_6$*H*$_5$)$_3$), 7.41-7.45 (m, 3H, -P(C$_6$*H*$_5$)$_3$), 7.72-7.76 (m, 6H, -P(C$_6$*H*$_5$)$_3$), 8.46 (d, $J_{P\text{-}H}$ = 9.0 Hz, $J_{Pt\text{-}H}$ = 87.5 Hz, 1H, -C*H*N-). ^{13}C NMR ($CDCl_3$, 201.2 MHz): δ 13.7, 14.1, 20.0, 22.6, 25.6, 28.6, 29.27, 29.28, 29.3, 29.5, 29.56, 29.58, 30.5, 31.4, 31.9, 36.6, 39.3, 52.0, 56.9, 63.7, 122.9, 127.86, 127.91, 128.5, 129.9, 130.2, 130.8, 131.7, 135.37, 135.42, 137.03, 137.00, 145.4, 145.5, 146.4, 171.0, 173.3, 173.4, 180.0. ^{31}P NMR ($CDCl_3$, 323.9 MHz): δ 23.0 (s, $J_{P\text{-}Pt}$ = 4220.4 Hz, Pt*P*Ph$_3$). FAB-MS (HR) *m/z* calcd for $C_{48}H_{63}N_3O_4PPt$ $(M\text{-}Cl)^+$ 971.4204, found 971.4208. $[\alpha]_D^{24}$ +35.2 (*c* 0.24, $CHCl_3$).



1

Gelation test.

A mixture of Pt-bound glutamic acid **1** and solvents were charged with a glass tube (8 mm ϕ × 50 mm, wall thickness: 1 mm). The test tube was capped and heated until the complex was completely dissolved into the solvent. The resulting solution was cooled at room temperature overnight, or sonicated for 3 min using sonoreactor (0.45 W cm^{-2}, 40 kHz). The states of the phase were confirmed if these criteria were met: (1) by visual observation; (2) when inverted, sample did not flow perceptibly.

Table S1. Gelation property of **1** in organic solvents.[a,b]

solvent	**1**
benzene	S
toluene	G(18.9)[c]
diethyl ether	G(14.2)[c]
t-butyl methyl ether	G(20.0)[c]
acetonitrile	P
ethanol	S
ethyl acetate	S
acetone	S
chloroform	S

[a]The results of a 5.00 x 10^{-2} M solution in organic solvents at room temperature. [b]S, solution; P, precipitate. [c]Minimum gelation concentration (MGC, mM) under sonicated (0.45 W/cm^2, 40.0 kHz, 3 min) condition.

SAXS and WAX analyses

The toluene gel of **1** (2.0×10^{-2} M) was charged in a 2 mm i.d. quartz capillary for SAXS and a 0.3 mm i.d. Lindemann glass capillary for WAX. SAXS and WAX measurements were performed at BL40B2 beam line ($\lambda = 1$ Å) and BL19B2 beam line of SPring-8 ($\lambda = 1$ Å) under ambient temperature.

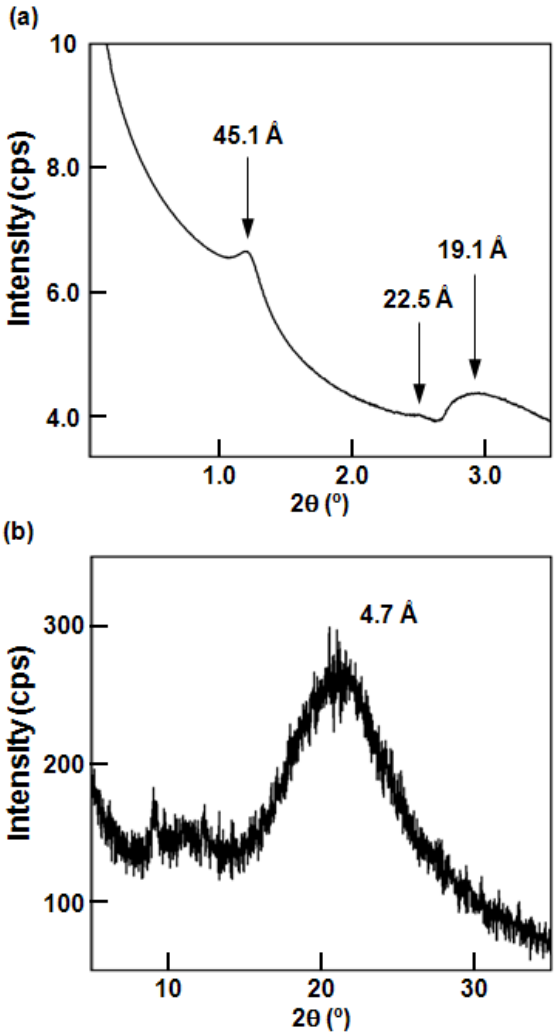


Figure S1. (a) SAXS and (b) WAX patterns of **1** gel prepared from toluene solution (2.0×10^{-2} M).

AFM measurements

The toluene gel of **1** (2.0×10^{-2} M) was dispersed in hexane (0.1 mg/mL) with the aid of sonication and then spin-coated onto silicon wafer surfaces. The morphology of gel fibril was measured with tapping mode using silicon cantilevers PPP-NCL-10 (NANOSENSORS).

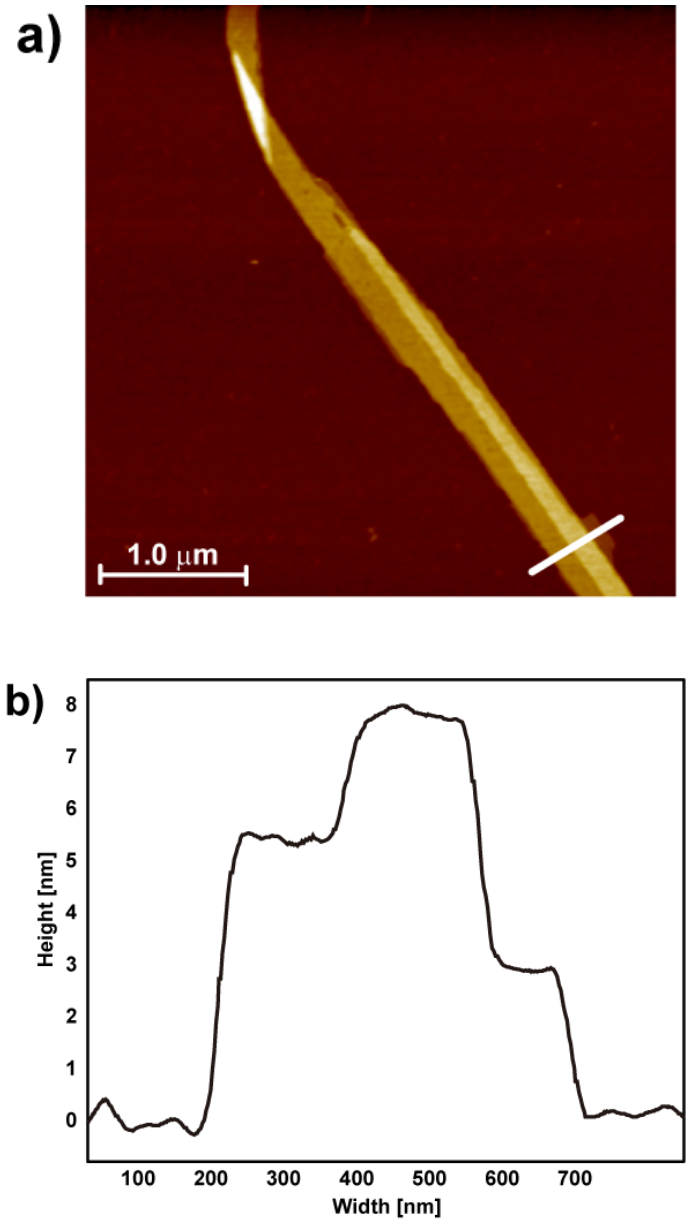


Figure S2. (a) AFM image of **1** xerogel prepared from toluene solution (2.0×10^{-2} M). (b) Cross section image along the white line.

High precision isotope ratio analysis by FT-ICR-MS with LDI ionization

The high precision isotope ratios of **1** were measured by FT-ICR-MS with LDI positive ionization mode. The toluene gel of **1** was directly deposited on stainless steel target. The obtained isotope patterns of $[M\text{-}Cl]^+$, $[2M\text{-}Cl]^+$, $[3M\text{-}Cl]^+$, $[4M\text{-}Cl]^+$ of **1** were evaluated by rating congruency between experimental (upper) and theoretical (bttom) isotope intensities and mass as shown in Figure S3-S6. All the monoisotopic (M_m) masses were confirmed with an absolute mass error less than 5 ppm.

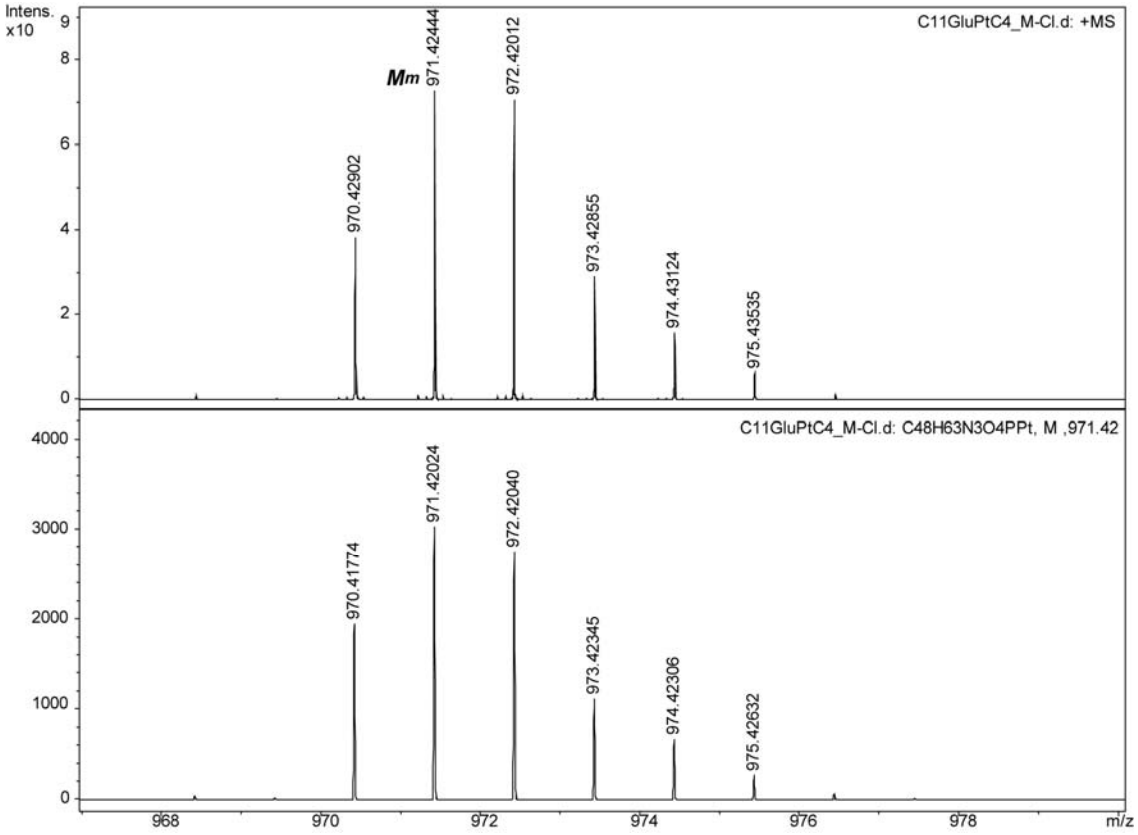


Figure S3. The isotope ratio of **1** for $[M\text{-}Cl]^+$. Upper; experiment, bottom; simulation.

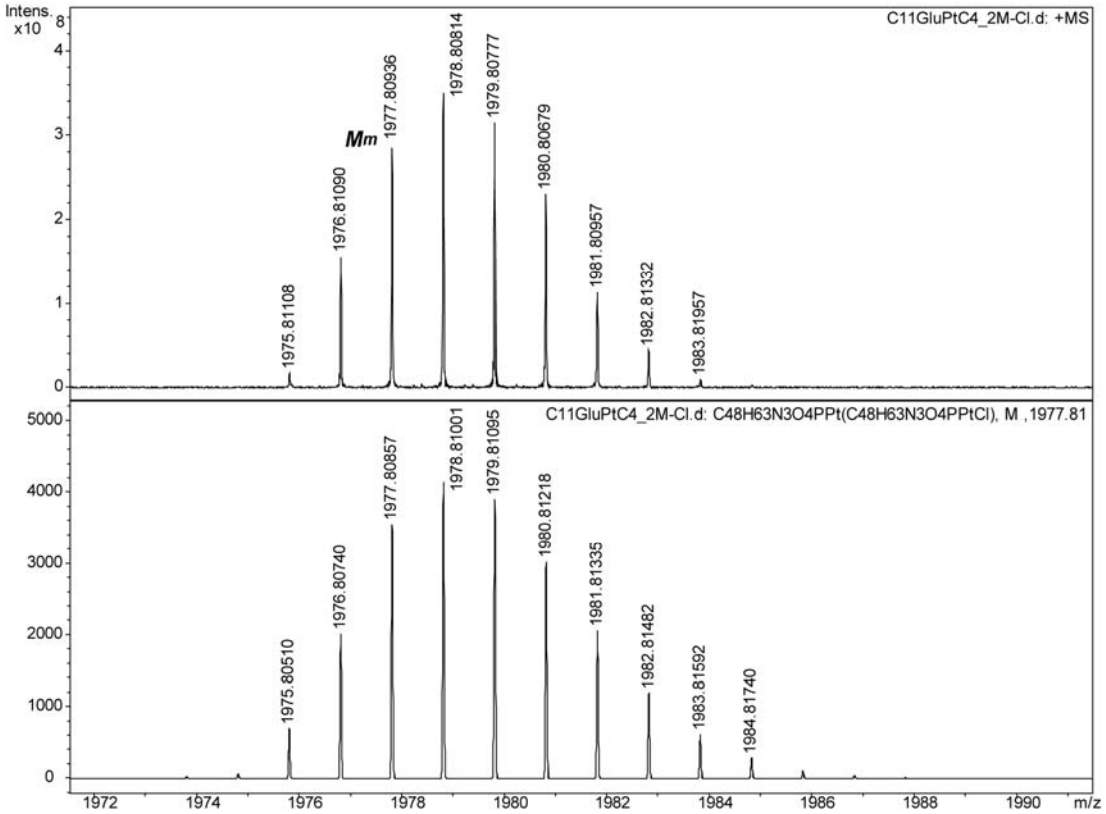


Figure S4. The isotope ratio of **1** for $[2M\text{-}Cl]^+$. Upper; experiment, bottom; simulation.

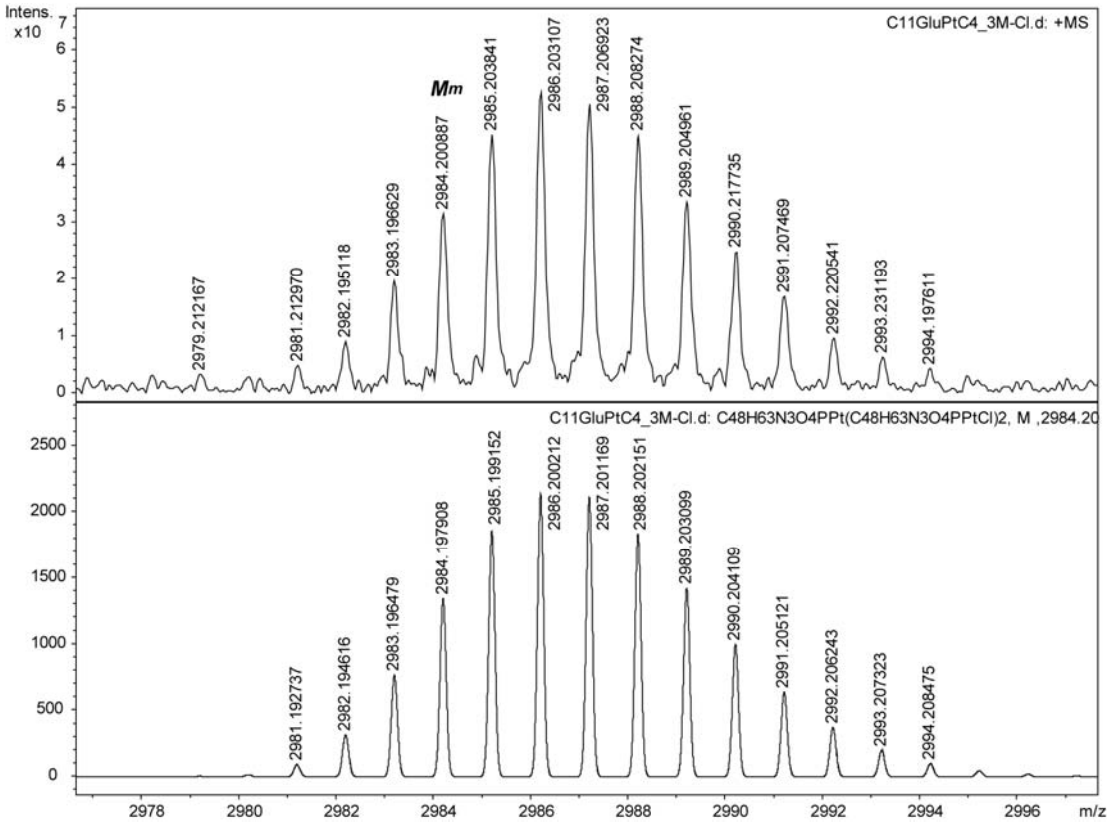


Figure S5. The isotope ratio of **1** for $[3M\text{-}Cl]^+$. Upper; experiment, bottom; simulation.

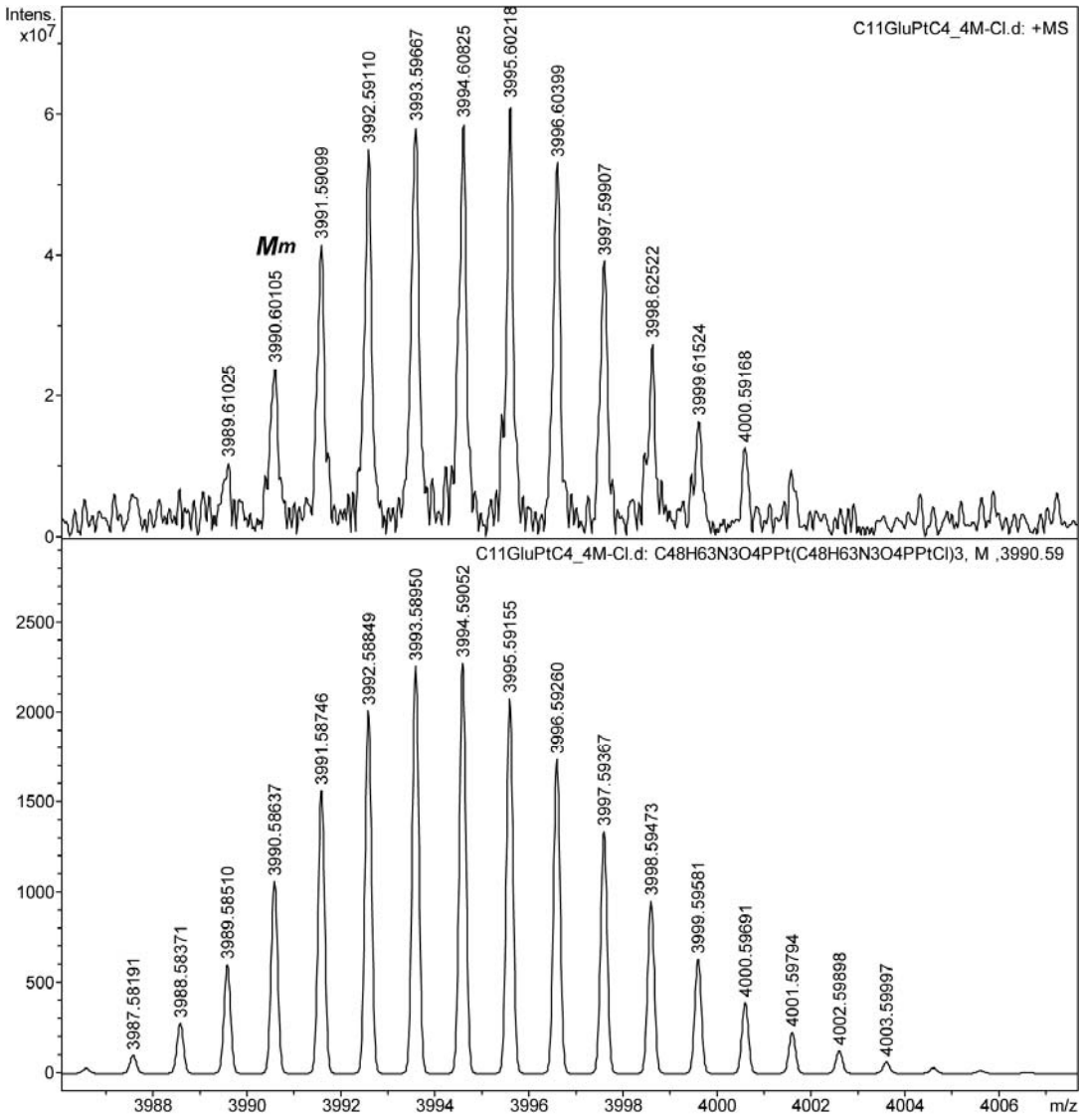


Figure S6. The isotope ratio of **1** for $[4M\text{-}Cl]^+$. Upper; experiment, bottom; simulation.

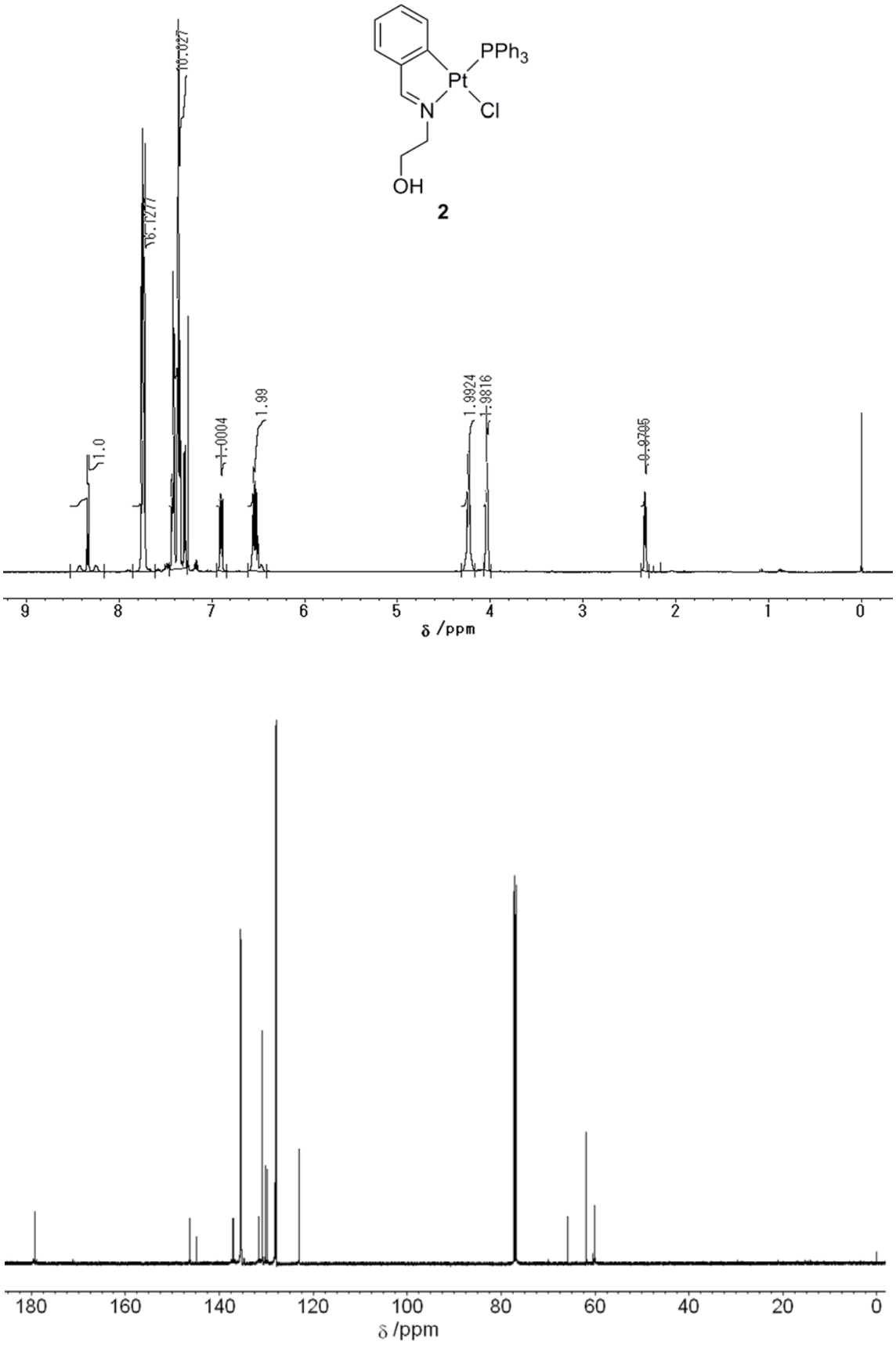


Figure S7. ^{1}H, ^{13}C and ^{31}P ($CDCl_3$) NMR spectra of **2**.

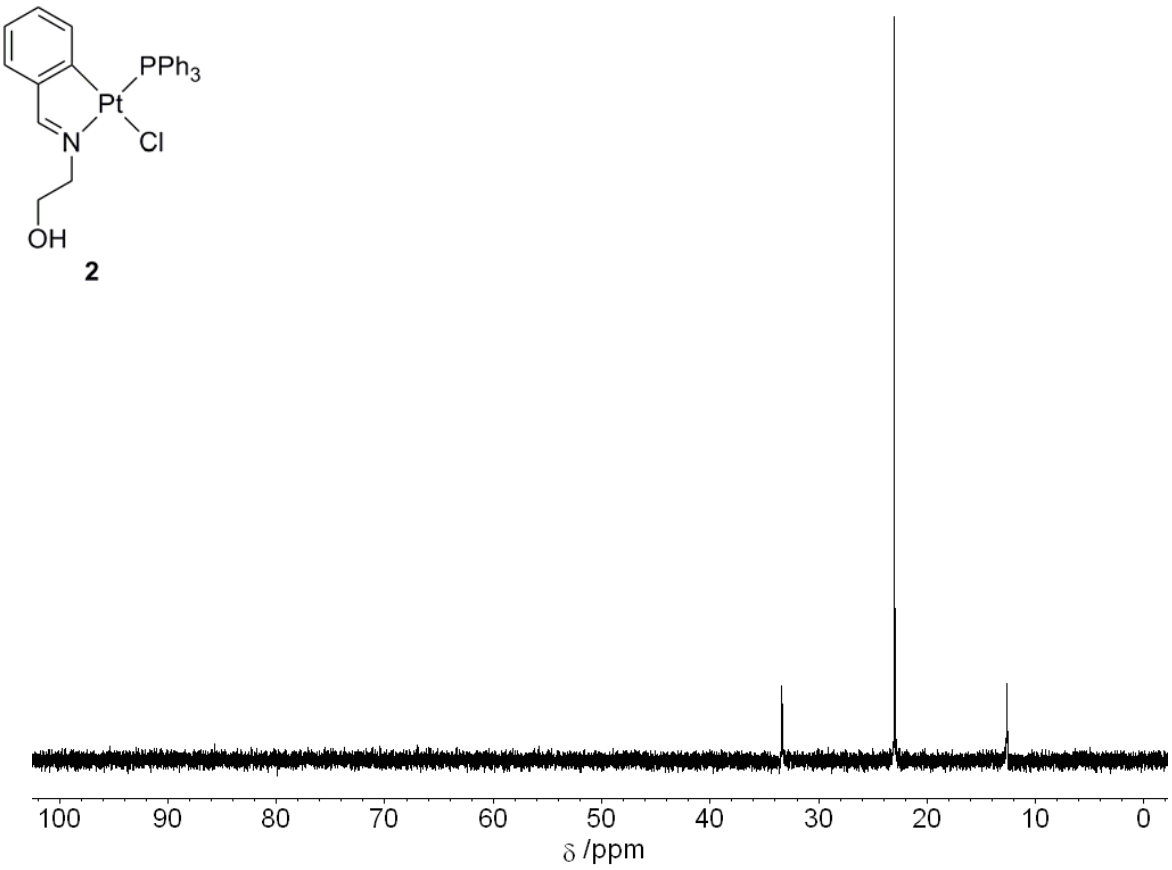


Figure S7. ^{1}H, ^{13}C and ^{31}P NMR ($CDCl_3$) spectra of **2** (continued).

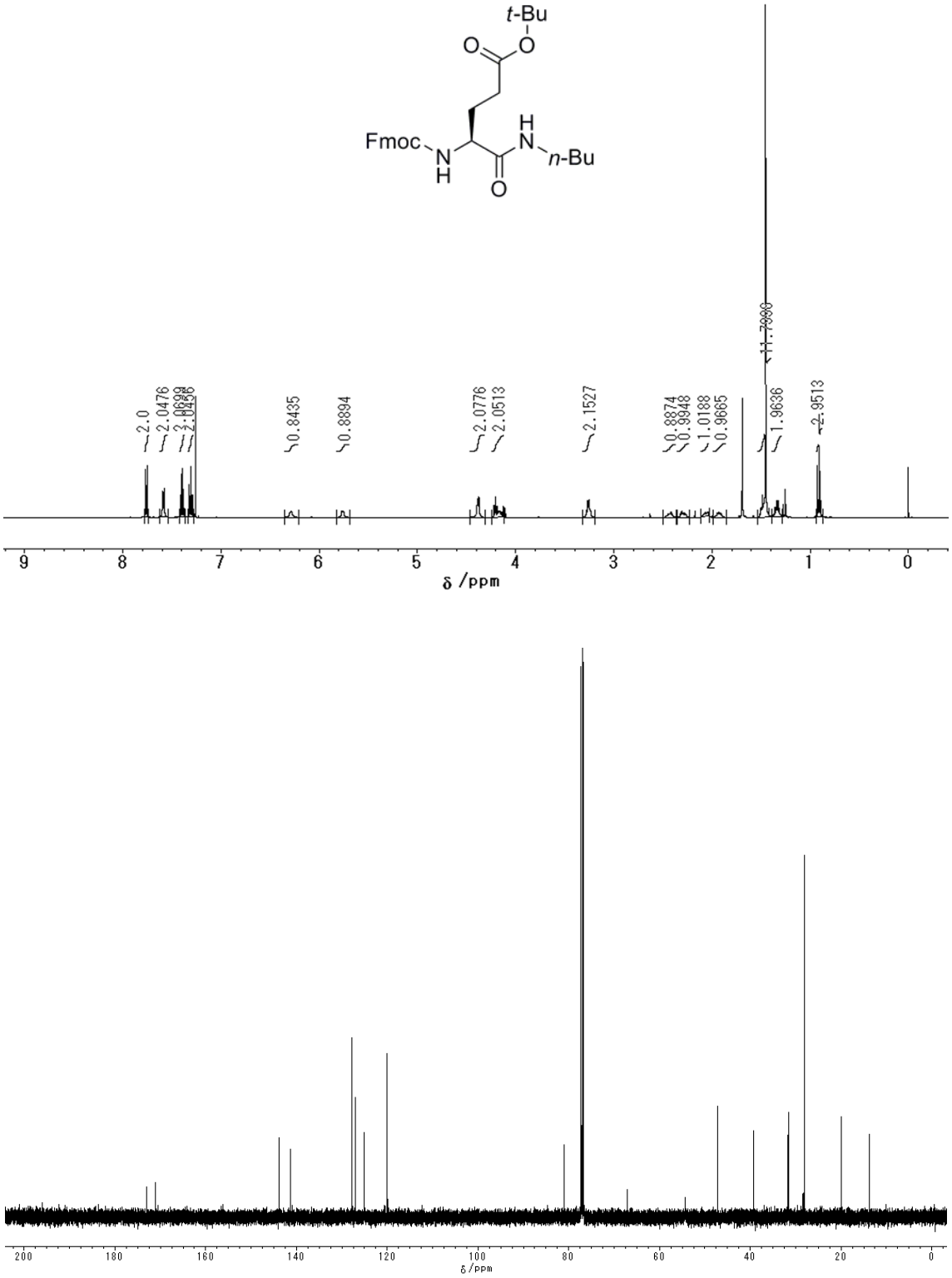


Figure S8. ^{1}H and ^{13}C NMR ($CDCl_3$) spectra of Fmoc-L-Glu(O-*t*-Bu)-NH-*n*-C_4H_9.

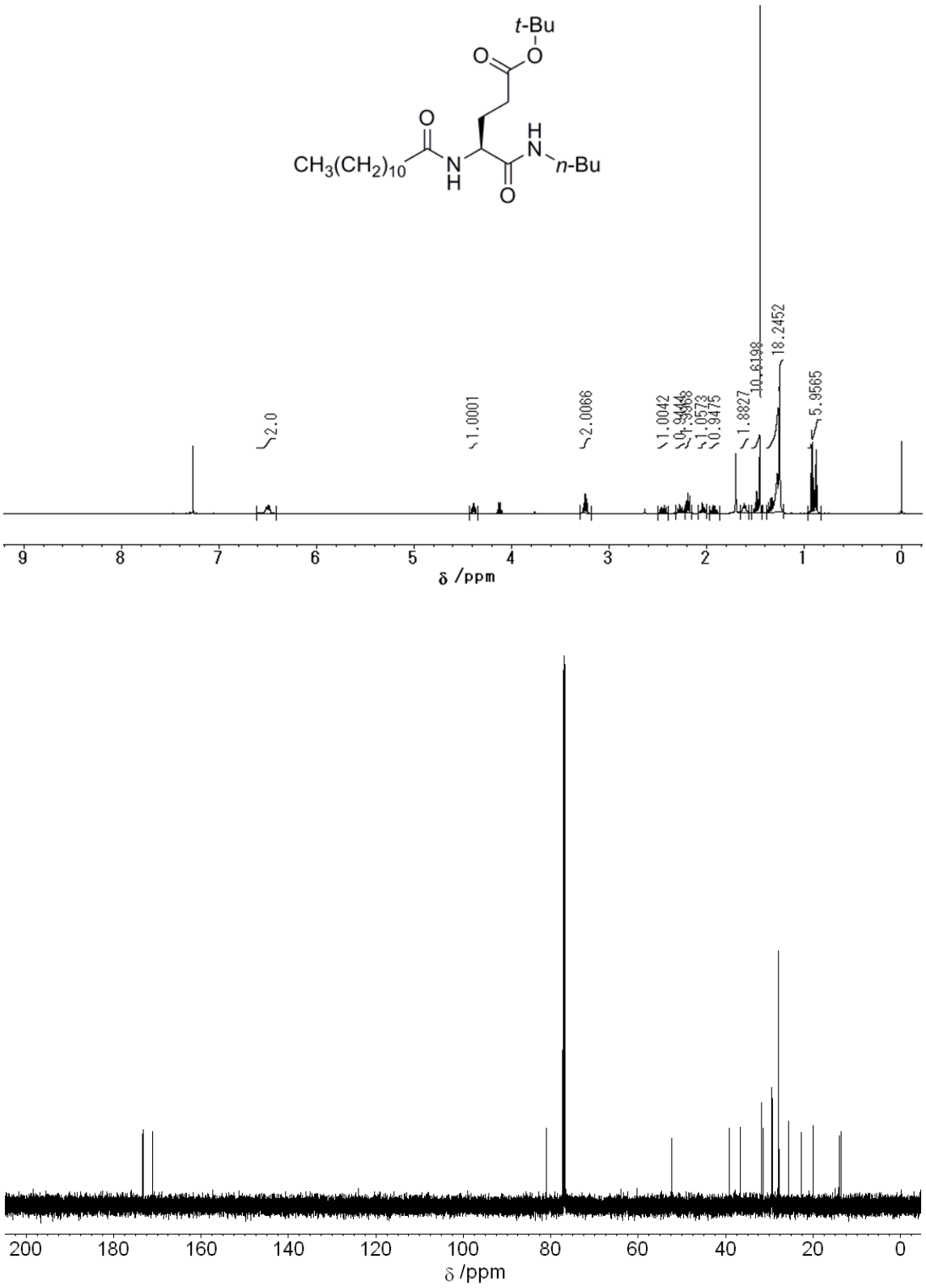


Figure S9. ^{1}H and ^{13}C NMR ($CDCl_3$) spectra of $C_{11}H_{23}$-L-Glu(O-*t*-Bu)-NH-*n*-C_4H_9.

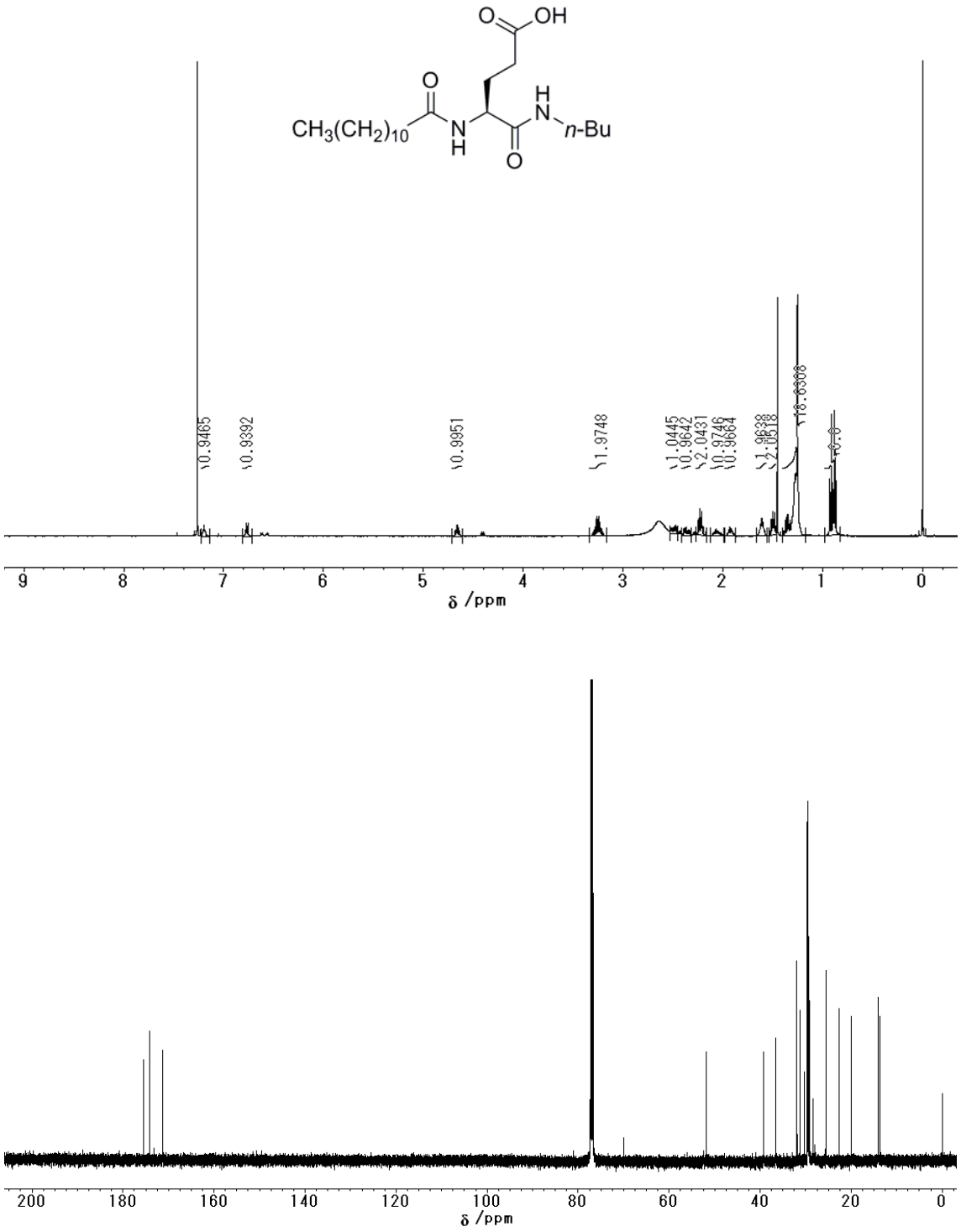


Figure S10. ^{1}H and ^{13}C NMR ($CDCl_3$) spectra of $C_{11}H_{23}$-L-Glu-NH-*n*-C_4H_9.

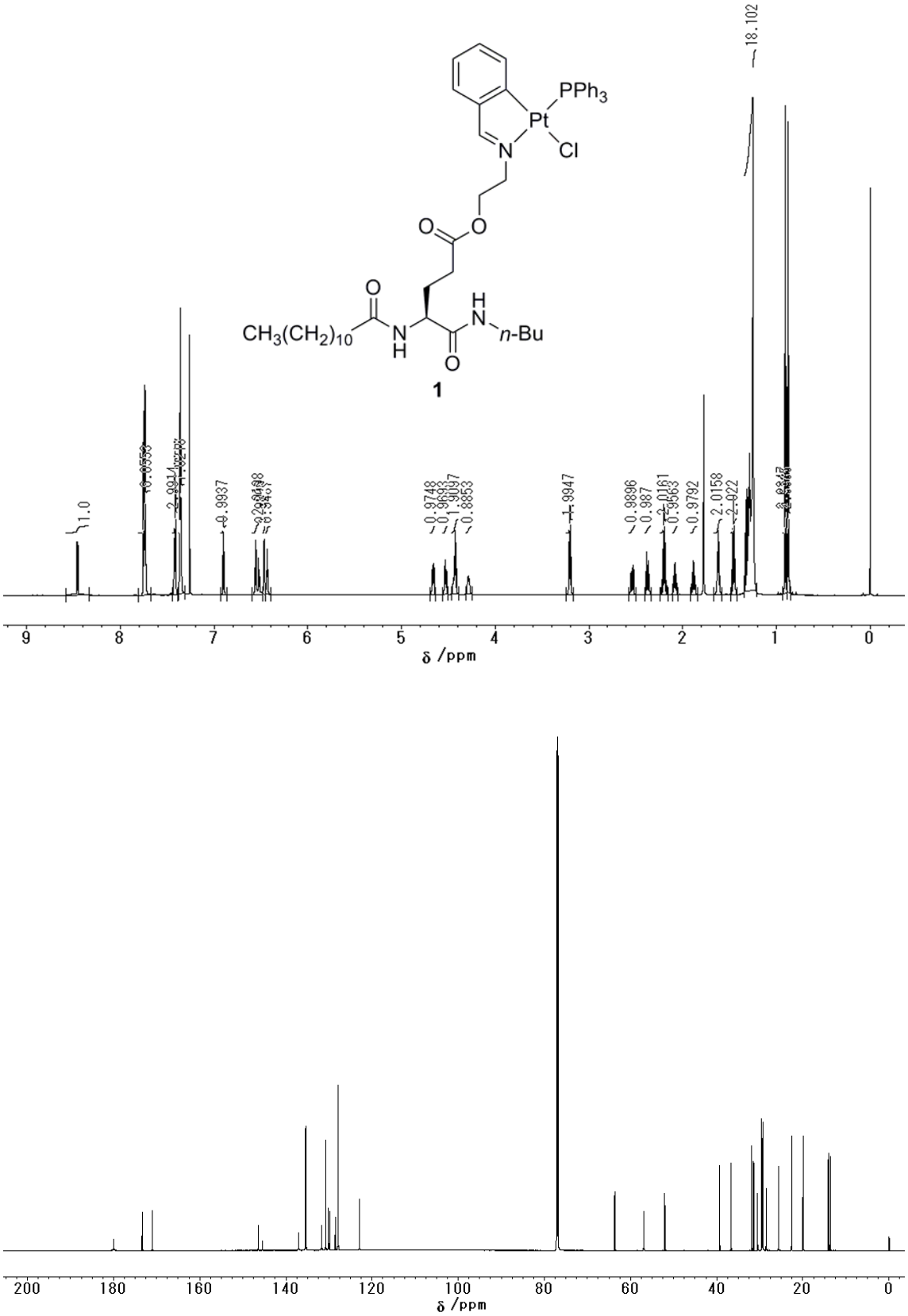


Figure S11. ^{1}H, ^{13}C and ^{31}P NMR ($CDCl_3$) spectra of **1**.

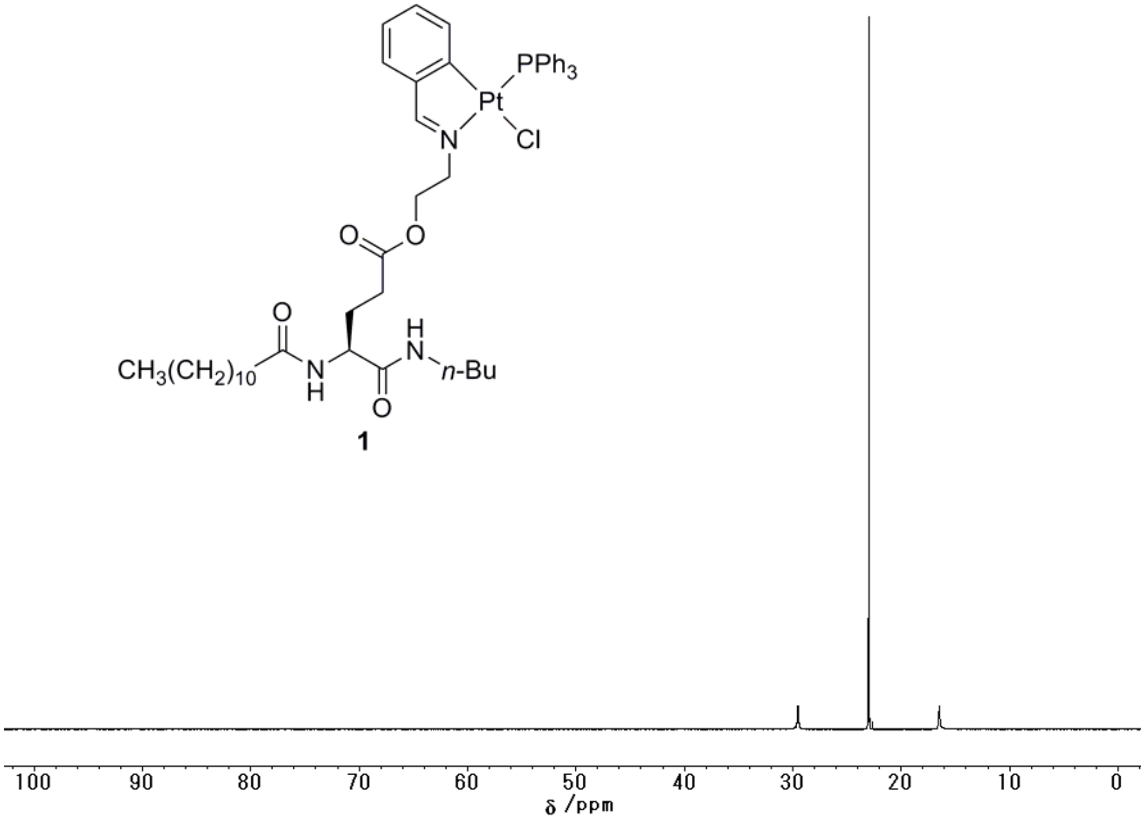


Figure S11. ^{1}H, ^{13}C and ^{31}P NMR ($CDCl_3$) spectra of **1** (continued).

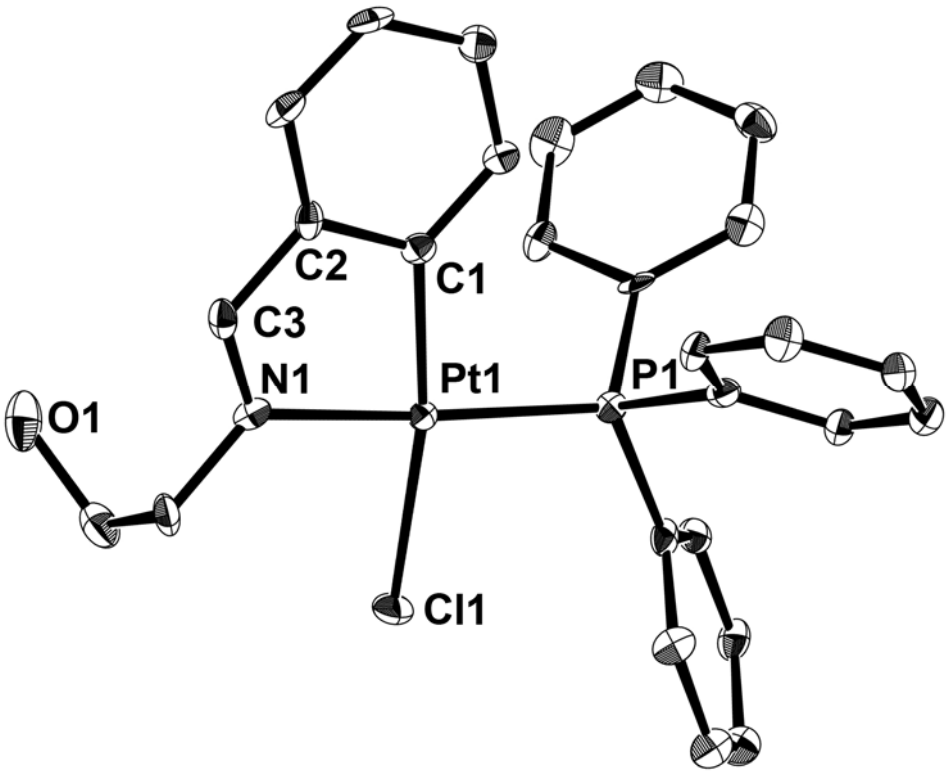


Figure S12. ORTEP drawing of **2**. Thermal ellipsoids are drawn at 50% probability level. H atoms are omitted for clatity.

Table S2. Crystallographic data for **2** obtained from ethyl acetate.

Molecular Formula	$C_{27}H_{25}NOClPPt$
Formula Weight	641.02
Crystal Dimensions	0.10 × 0.10 × 0.10
Crystal Color, Habit	yellow, block
Crystal System	monoclinic
Lattice Type	*C*-centered
Space Group	*Cc* (#9)
a (Å)	13.5149(4)
b (Å)	14.1091(4)
c (Å)	27.8446(7)
β (º)	101.3565(8)
Cell Volume ($Å^3$)	5205.5(3)
Z Value	10
F (000)	3120.0
D_{calc} (g/cm^{-3})	2.045
Temperature	−160 ºC
Radiation (Å)	graphite monochromated Mo *Kα* (*λ* = 0.71075 Å)
μ(Mo *Kα*) (cm^{-1})	69.40
$2\theta_{max}$ (º)	54.8
Toral Number of Reflections	42191
Number of Variables	578
Reflection / Parameter Ratio	70.92
Final *R* and R_w	0.091; 0.155
Goodness of Fit	1.71
Max Shift / Error	0.009
Method of phase determination	Direct Methods (SIR92)

Table S3. Atomic coordinates and B_{eq} for **2**.

atom	x	y	z	B_{eq}
Pt(1)	0.5918(7)	-0.14694(1)	-0.0596(3)	0.956(3)
Pt(2)	0.3066(7)	0.29419(1)	-0.2562(3)	0.997(3)
Cl(1)	0.7583(7)	-0.19674(9)	-0.0639(3)	1.68(3)
Cl(2)	0.1422(7)	0.34251(9)	-0.2488(3)	1.53(3)
P(1)	0.6465(7)	-0.01678(9)	-0.0165(3)	0.94(2)
P(2)	0.2516(7)	0.16468(9)	-0.3007(3)	1.04(2)
O(1)	0.5371(7)	-0.3310(3)	-0.1971(3)	2.81(10)
O(2)	0.3739(7)	0.4694(3)	-0.1194(3)	2.89(10)
N(1)	0.5316(7)	-0.2681(3)	-0.0957(3)	1.22(8)
N(2)	0.3709(7)	0.4165(3)	-0.2200(4)	1.27(8)
C(1)	0.4424(8)	-0.1143(4)	-0.0664(4)	1.11(8)
C(2)	0.3730(7)	-0.1938(3)	-0.0914(3)	0.36(7)
C(3)	0.2762(8)	-0.1842(4)	-0.1016(4)	1.39(9)
C(4)	0.2278(7)	-0.1030(4)	-0.0881(4)	1.66(10)
C(5)	0.2883(7)	-0.0280(4)	-0.0644(4)	1.20(9)
C(6)	0.3961(7)	-0.0390(4)	-0.0537(4)	1.13(9)
C(7)	0.4349(7)	-0.2697(4)	-0.1060(4)	1.23(9)
C(8)	0.5840(7)	-0.3517(4)	-0.1101(4)	1.6(1)
C(9)	0.6231(8)	-0.3368(4)	-0.1581(4)	1.9(1)
C(10)	0.5995(7)	0.0908(3)	-0.0490(4)	0.98(8)
C(11)	0.5732(8)	0.0891(4)	-0.1003(4)	1.29(9)
C(12)	0.5330(8)	0.1652(4)	-0.1253(4)	1.6(1)
C(13)	0.5099(8)	0.2488(4)	-0.1016(4)	2.1(1)
C(14)	0.5354(8)	0.2547(4)	-0.0523(4)	1.74(10)

Table S3. Atomic coordinates and B_{eq} for **2** (continued).

atom	x	y	z	B_{eq}
C(15)	0.5814(8)	0.1750(4)	-0.0255(4)	1.57(10)
C(16)	0.7836(7)	-0.0021(4)	-0.0023(4)	1.23(9)
C(17)	0.8314(7)	0.0730(4)	-0.0216(4)	1.42(9)
C(18)	0.9369(7)	0.0805(4)	-0.0096(4)	1.35(9)
C(19)	0.9924(7)	0.0116(4)	0.0225(4)	1.51(10)
C(20)	0.9446(8)	-0.0606(4)	0.0424(4)	1.9(1)
C(21)	0.8397(7)	-0.0658(4)	0.0292(4)	1.40(9)
C(22)	0.6154(8)	-0.0090(3)	0.0448(4)	1.19(8)
C(23)	0.6741(7)	0.0505(3)	0.0807(4)	1.13(9)
C(24)	0.6523(7)	0.0591(4)	0.1262(4)	1.58(10)
C(25)	0.5699(8)	0.0113(3)	0.1385(4)	1.66(10)
C(26)	0.5152(7)	-0.0476(4)	0.1047(4)	1.61(10)
C(27)	0.5363(7)	-0.0595(3)	0.0556(4)	1.32(9)
C(28)	0.4530(8)	0.2667(4)	-0.2528(4)	1.11(9)
C(29)	0.5115(8)	0.3351(5)	-0.2277(4)	2.4(1)
C(30)	0.6262(8)	0.3327(4)	-0.2191(4)	1.62(10)
C(31)	0.6651(8)	0.2508(4)	-0.2345(4)	2.2(1)
C(32)	0.6082(8)	0.1836(4)	-0.2604(4)	2.1(1)
C(33)	0.5078(8)	0.1872(4)	-0.2699(4)	1.9(1)
C(34)	0.4699(7)	0.4171(4)	-0.2110(4)	1.41(9)
C(35)	0.3161(8)	0.4976(4)	-0.2052(4)	2.0(1)
C(36)	0.2873(8)	0.4812(4)	-0.1563(4)	2.6(1)
C(37)	0.2748(8)	0.1740(4)	-0.3629(4)	1.17(9)
C(38)	0.3374(7)	0.2459(3)	-0.3754(4)	1.17(9)

Table S3. Atomic coordinates and B_{eq} for **2** (continued).

atom	x	y	z	B_{eq}
C(39)	0.3551(8)	0.2555(4)	-0.4224(4)	1.40(9)
C(40)	0.3034(8)	0.1929(4)	-0.4587(4)	1.9(1)
C(41)	0.2509(7)	0.1234(4)	-0.4471(4)	1.18(9)
C(42)	0.2329(7)	0.1155(4)	-0.4016(4)	0.99(8)
C(43)	0.1178(7)	0.1361(3)	-0.3125(4)	1.19(8)
C(44)	0.0443(7)	0.2013(3)	-0.3366(4)	1.38(9)
C(45)	-0.0538(8)	0.1808(4)	-0.3446(4)	1.99(10)
C(46)	-0.0890(7)	0.0895(4)	-0.3357(4)	1.69(10)
C(47)	-0.0172(8)	0.0204(4)	-0.3153(4)	1.79(10)
C(48)	0.0858(7)	0.0424(4)	-0.3030(4)	1.33(9)
C(49)	0.3128(7)	0.0569(3)	-0.2714(4)	1.03(8)
C(50)	0.3404(8)	-0.0199(4)	-0.2982(4)	1.49(9)
C(51)	0.3858(8)	-0.0978(4)	-0.2721(4)	1.54(9)
C(52)	0.4000(7)	-0.1005(4)	-0.2215(4)	1.73(9)
C(53)	0.3718(8)	-0.0276(4)	-0.1957(4)	1.51(9)
C(54)	0.3266(8)	0.0549(4)	-0.2212(4)	1.40(9)

Table S4. Anisotropic displacement parameters for **2**.

atom	U_{11}	U_{22}	U_{33}	U_{12}	U_{13}	U_{23}
Pt(1)	0.01132(8)	0.01221(8)	0.01263(8)	-0.00007(7)	0.00195(7)	-0.00002(7)
Pt(2)	0.01328(8)	0.01238(9)	0.01204(8)	0.00063(7)	0.00201(7)	0.00010(7)
Cl(1)	0.0119(6)	0.0223(7)	0.0299(7)	0.0036(5)	0.0051(6)	-0.0052(5)
Cl(2)	0.0154(6)	0.0240(7)	0.0188(6)	0.0033(5)	0.0030(5)	-0.0021(5)
P(1)	0.0119(5)	0.0118(6)	0.0117(6)	-0.0015(5)	0.0012(5)	-0.0001(5)
P(2)	0.0108(6)	0.0158(6)	0.0119(6)	0.0010(5)	0.0001(5)	-0.0001(5)
O(1)	0.046(3)	0.044(3)	0.019(2)	-0.014(2)	0.013(2)	-0.012(2)
O(2)	0.037(2)	0.052(3)	0.023(2)	-0.014(2)	0.013(2)	-0.018(2)
N(1)	0.017(2)	0.020(2)	0.010(2)	-0.005(2)	0.005(2)	0.000(2)
N(2)	0.022(2)	0.006(2)	0.018(2)	0.006(2)	0.001(2)	0.003(2)
C(1)	0.012(2)	0.015(2)	0.012(2)	0.000(2)	-0.005(2)	0.004(2)
C(2)	0.007(2)	0.016(2)	-0.010(2)	0.015(2)	-0.001(2)	0.001(1)
C(3)	0.020(2)	0.017(2)	0.014(2)	-0.006(2)	0.001(2)	0.009(2)
C(4)	0.004(2)	0.040(3)	0.017(2)	-0.003(2)	-0.005(2)	-0.003(2)
C(5)	0.008(2)	0.021(3)	0.020(2)	0.002(2)	0.010(2)	0.004(2)
C(6)	0.000(2)	0.025(3)	0.017(2)	-0.001(2)	-0.001(2)	-0.010(2)
C(7)	0.022(2)	0.017(2)	0.005(2)	0.006(2)	-0.003(2)	-0.007(2)
C(8)	0.025(3)	0.013(2)	0.022(3)	0.005(2)	0.006(2)	-0.008(2)
C(9)	0.020(3)	0.022(3)	0.033(3)	-0.006(2)	0.012(2)	-0.014(2)
C(10)	0.004(2)	0.019(2)	0.014(2)	-0.006(2)	0.001(2)	0.001(2)
C(11)	0.015(2)	0.017(2)	0.017(2)	-0.001(2)	0.004(2)	-0.007(2)
C(12)	0.023(3)	0.030(3)	0.010(2)	-0.006(2)	0.005(2)	0.005(2)
C(13)	0.016(3)	0.030(3)	0.029(2)	-0.002(2)	-0.006(2)	0.009(2)
C(14)	0.019(3)	0.018(2)	0.033(2)	-0.002(2)	0.014(2)	-0.001(2)

Table S4. Anisotropic displacement parameters for **2** (continued).

atom	U_{11}	U_{22}	U_{33}	U_{12}	U_{13}	U_{23}
C(15)	0.020(3)	0.018(2)	0.024(3)	-0.004(2)	0.010(2)	0.004(2)
C(16)	0.018(2)	0.012(2)	0.017(2)	-0.007(2)	0.004(2)	-0.004(2)
C(17)	0.019(2)	0.016(2)	0.015(2)	0.003(2)	-0.007(2)	-0.004(2)
C(18)	0.016(2)	0.023(3)	0.013(2)	-0.012(2)	0.007(2)	-0.007(2)
C(19)	0.011(2)	0.030(3)	0.016(2)	-0.014(2)	0.002(2)	0.000(2)
C(20)	0.014(2)	0.028(3)	0.028(3)	0.001(2)	0.001(2)	0.007(2)
C(21)	0.008(2)	0.024(3)	0.021(2)	-0.012(2)	0.000(2)	0.003(2)
C(22)	0.017(2)	0.006(2)	0.021(2)	0.000(2)	0.002(2)	0.001(2)
C(23)	0.017(2)	0.007(2)	0.019(2)	-0.008(2)	0.003(2)	0.005(2)
C(24)	0.017(2)	0.020(3)	0.023(2)	0.002(2)	0.001(2)	-0.017(2)
C(25)	0.054(3)	0.003(2)	0.004(2)	0.000(2)	0.000(2)	0.003(2)
C(26)	0.024(3)	0.023(3)	0.015(2)	0.001(2)	0.004(2)	0.003(2)
C(27)	0.016(2)	0.014(2)	0.018(2)	-0.003(2)	-0.001(2)	0.004(2)
C(28)	0.018(2)	0.020(2)	0.007(2)	0.002(2)	0.008(2)	0.006(2)
C(29)	0.017(2)	0.038(3)	0.032(3)	-0.028(2)	-0.005(2)	-0.008(3)
C(30)	0.015(2)	0.029(3)	0.015(3)	-0.001(2)	-0.005(2)	0.001(2)
C(31)	0.023(3)	0.034(3)	0.022(3)	0.002(2)	-0.010(2)	0.002(2)
C(32)	0.027(2)	0.017(3)	0.032(3)	0.011(2)	0.001(2)	0.001(2)
C(33)	0.023(2)	0.012(2)	0.036(3)	0.002(2)	0.002(2)	0.000(2)
C(34)	0.014(2)	0.020(3)	0.020(3)	-0.014(2)	0.004(2)	0.002(2)
C(35)	0.034(3)	0.007(2)	0.033(3)	0.001(2)	0.006(2)	-0.004(2)
C(36)	0.039(3)	0.029(3)	0.029(3)	-0.007(3)	0.002(2)	-0.020(3)
C(37)	0.014(2)	0.020(2)	0.012(2)	0.005(2)	0.006(2)	0.004(2)
C(38)	0.013(2)	0.008(2)	0.021(2)	0.003(2)	-0.001(2)	0.003(2)

Table S4. Anisotropic displacement parameters for **2** (continued).

atom	U_{11}	U_{22}	U_{33}	U_{12}	U_{13}	U_{23}
C(39)	0.012(2)	0.022(3)	0.022(2)	0.003(2)	0.011(2)	0.009(2)
C(40)	0.030(3)	0.031(3)	0.007(2)	0.003(2)	-0.009(2)	-0.003(2)
C(41)	0.006(2)	0.032(3)	0.008(2)	0.002(2)	0.006(2)	-0.006(2)
C(42)	0.006(2)	0.020(2)	0.009(2)	0.001(2)	-0.004(2)	-0.003(2)
C(43)	0.016(2)	0.015(2)	0.014(2)	0.000(2)	0.003(2)	0.001(2)
C(44)	0.015(2)	0.010(2)	0.031(3)	0.000(2)	0.012(2)	-0.002(2)
C(45)	0.016(2)	0.028(3)	0.027(3)	0.001(2)	-0.006(2)	-0.009(2)
C(46)	0.008(2)	0.039(3)	0.017(2)	-0.009(2)	0.002(2)	0.005(2)
C(47)	0.026(2)	0.028(3)	0.014(2)	-0.015(2)	0.003(2)	0.001(2)
C(48)	0.022(2)	0.018(2)	0.013(2)	-0.004(2)	0.006(2)	-0.001(2)
C(49)	0.012(2)	0.010(2)	0.017(2)	-0.001(2)	0.002(2)	0.002(2)
C(50)	0.024(3)	0.019(2)	0.014(2)	-0.001(2)	0.003(2)	0.001(2)
C(51)	0.014(2)	0.018(2)	0.026(2)	0.003(2)	0.003(2)	-0.006(2)
C(52)	0.007(2)	0.016(2)	0.038(2)	0.011(2)	-0.008(2)	0.012(2)
C(53)	0.014(2)	0.023(3)	0.016(2)	-0.002(2)	-0.006(2)	0.009(2)
C(54)	0.016(2)	0.021(3)	0.014(2)	0.002(2)	-0.001(2)	0.003(2)

Table S5. Bond lengths (Å) for **2**.

atom	atom	distance	atom	atom	distance
Pt(1)	Cl(1)	2.383(2)	Pt(1)	P(1)	2.238(2)
Pt(1)	N(1)	2.067(5)	Pt(1)	C(1)	2.044(6)
Pt(2)	Cl(2)	2.371(2)	Pt(2)	P(2)	2.250(2)
Pt(2)	N(2)	2.099(5)	Pt(2)	C(28)	2.000(6)
P(1)	C(10)	1.817(6)	P(1)	C(16)	1.829(6)
P(1)	C(22)	1.841(6)	P(2)	C(37)	1.822(6)
P(2)	C(43)	1.818(7)	P(2)	C(49)	1.844(6)
O(1)	C(9)	1.429(9)	O(2)	C(36)	1.407(10)
N(1)	C(7)	1.282(8)	N(1)	C(8)	1.472(8)
N(2)	C(34)	1.311(8)	N(2)	C(35)	1.465(8)
C(1)	C(2)	1.537(8)	C(1)	C(6)	1.317(9)
C(2)	C(3)	1.290(9)	C(2)	C(7)	1.466(8)
C(3)	C(4)	1.41(1)	C(4)	C(5)	1.418(9)
C(5)	C(6)	1.436(8)	C(8)	C(9)	1.545(10)
C(10)	C(11)	1.400(9)	C(10)	C(15)	1.402(9)
C(11)	C(12)	1.337(10)	C(12)	C(13)	1.42(1)
C(13)	C(14)	1.35(1)	C(14)	C(15)	1.423(10)
C(16)	C(17)	1.402(9)	C(16)	C(21)	1.375(9)
C(17)	C(18)	1.403(8)	C(18)	C(19)	1.431(9)
C(19)	C(20)	1.379(9)	C(20)	C(21)	1.395(8)
C(22)	C(23)	1.421(9)	C(22)	C(27)	1.367(8)
C(23)	C(24)	1.362(9)	C(24)	C(25)	1.400(10)
C(25)	C(26)	1.361(9)	C(26)	C(27)	1.458(9)
C(28)	C(29)	1.351(10)	C(28)	C(33)	1.474(9)

Table S5. Bond lengths (Å) for **2** (continued).

atom	atom	distance	atom	atom	distance
C(29)	C(30)	1.522(10)	C(29)	C(34)	1.41(1)
C(30)	C(31)	1.37(1)	C(31)	C(32)	1.34(1)
C(32)	C(33)	1.331(10)	C(35)	C(36)	1.51(1)
C(37)	C(38)	1.409(9)	C(37)	C(42)	1.388(9)
C(38)	C(39)	1.382(9)	C(39)	C(40)	1.419(9)
C(40)	C(41)	1.289(10)	C(41)	C(42)	1.341(8)
C(43)	C(44)	1.422(9)	C(43)	C(48)	1.433(8)
C(44)	C(45)	1.333(9)	C(45)	C(46)	1.41(1)
C(46)	C(47)	1.414(10)	C(47)	C(48)	1.401(9)
C(49)	C(50)	1.407(9)	C(49)	C(54)	1.375(9)
C(50)	C(51)	1.393(9)	C(51)	C(52)	1.384(10)
C(52)	C(53)	1.352(10)	C(53)	C(54)	1.435(9)

Table S6. Bond angles (°) for **2**.

atom	atom	atom	angle	atom	atom	atom	angle
Cl(1)	Pt(1)	P(1)	93.08(6)	Cl(1)	Pt(1)	N(1)	90.9(2)
Cl(1)	Pt(1)	C(1)	170.9(2)	P(1)	Pt(1)	N(1)	175.0(2)
P(1)	Pt(1)	C(1)	94.7(2)	N(1)	Pt(1)	C(1)	81.6(2)
Cl(2)	Pt(2)	P(2)	93.91(6)	Cl(2)	Pt(2)	N(2)	91.6(2)
Cl(2)	Pt(2)	C(28)	170.6(2)	P(2)	Pt(2)	N(2)	173.1(2)
P(2)	Pt(2)	C(28)	94.9(2)	N(2)	Pt(2)	C(28)	79.9(2)
Pt(1)	P(1)	C(10)	111.9(2)	Pt(1)	P(1)	C(16)	115.0(2)
Pt(1)	P(1)	C(22)	115.7(2)	C(10)	P(1)	C(16)	104.6(3)
C(10)	P(1)	C(22)	106.9(3)	C(16)	P(1)	C(22)	101.5(3)
Pt(2)	P(2)	C(37)	111.4(2)	Pt(2)	P(2)	C(43)	119.3(2)
Pt(2)	P(2)	C(49)	110.8(2)	C(37)	P(2)	C(43)	101.2(3)
C(37)	P(2)	C(49)	109.5(3)	C(43)	P(2)	C(49)	103.9(3)
Pt(1)	N(1)	C(7)	114.2(4)	Pt(1)	N(1)	C(8)	129.2(4)
C(7)	N(1)	C(8)	116.6(5)	Pt(2)	N(2)	C(34)	114.1(4)
Pt(2)	N(2)	C(35)	126.4(4)	C(34)	N(2)	C(35)	119.6(6)
Pt(1)	C(1)	C(2)	112.4(4)	Pt(1)	C(1)	C(6)	132.1(5)
C(2)	C(1)	C(6)	115.5(5)	C(1)	C(2)	C(3)	121.7(5)
C(1)	C(2)	C(7)	109.2(5)	C(3)	C(2)	C(7)	128.6(6)
C(2)	C(3)	C(4)	122.1(6)	C(3)	C(4)	C(5)	118.5(6)
C(4)	C(5)	C(6)	119.0(6)	C(1)	C(6)	C(5)	123.2(6)
N(1)	C(7)	C(2)	122.5(6)	N(1)	C(8)	C(9)	113.1(6)
O(1)	C(9)	C(8)	107.5(5)	P(1)	C(10)	C(11)	119.1(5)
P(1)	C(10)	C(15)	123.4(5)	C(11)	C(10)	C(15)	117.3(6)
C(10)	C(11)	C(12)	120.9(6)	C(11)	C(12)	C(13)	122.0(6)

Table S6. Bond angles(°) for **2** (continued).

atom	atom	atom	angle	atom	atom	atom	angle
C(12)	C(13)	C(14)	119.3(6)	C(13)	C(14)	C(15)	118.9(6)
C(10)	C(15)	C(14)	121.5(6)	P(1)	C(16)	C(17)	121.8(5)
P(1)	C(16)	C(21)	118.1(5)	C(17)	C(16)	C(21)	120.0(5)
C(16)	C(17)	C(18)	119.3(6)	C(17)	C(18)	C(19)	118.8(5)
C(18)	C(19)	C(20)	121.6(5)	C(19)	C(20)	C(21)	117.7(6)
C(16)	C(21)	C(20)	122.6(6)	P(1)	C(22)	C(23)	119.3(4)
P(1)	C(22)	C(27)	120.3(5)	C(23)	C(22)	C(27)	120.4(6)
C(22)	C(23)	C(24)	121.0(6)	C(23)	C(24)	C(25)	120.7(6)
C(24)	C(25)	C(26)	118.4(6)	C(25)	C(26)	C(27)	122.6(6)
C(22)	C(27)	C(26)	116.9(6)	Pt(2)	C(28)	C(29)	111.0(5)
Pt(2)	C(28)	C(33)	133.4(5)	C(29)	C(28)	C(33)	115.5(6)
C(28)	C(29)	C(30)	122.7(7)	C(28)	C(29)	C(34)	121.9(7)
C(30)	C(29)	C(34)	115.3(6)	C(29)	C(30)	C(31)	114.2(7)
C(30)	C(31)	C(32)	123.4(7)	C(31)	C(32)	C(33)	122.3(7)
C(28)	C(33)	C(32)	121.5(6)	N(2)	C(34)	C(29)	113.0(6)
N(2)	C(35)	C(36)	111.7(6)	O(2)	C(36)	C(35)	110.6(7)
P(2)	C(37)	C(38)	120.8(5)	P(2)	C(37)	C(42)	125.1(5)
C(38)	C(37)	C(42)	114.1(5)	C(37)	C(38)	C(39)	122.1(6)
C(38)	C(39)	C(40)	117.4(6)	C(39)	C(40)	C(41)	120.9(6)
C(40)	C(41)	C(42)	120.8(6)	C(37)	C(42)	C(41)	124.2(6)
P(2)	C(43)	C(44)	121.3(5)	P(2)	C(43)	C(48)	119.8(5)
C(44)	C(43)	C(48)	118.4(6)	C(43)	C(44)	C(45)	121.3(6)
C(44)	C(45)	C(46)	121.8(7)	C(45)	C(46)	C(47)	118.1(6)
C(46)	C(47)	C(48)	121.1(6)	C(43)	C(48)	C(47)	118.7(6)

Table S6. Bond angles(°) for **2** (continued).

atom	atom	atom	angle	atom	atom	atom	angle
P(2)	C(49)	C(50)	122.9(5)	P(2)	C(49)	C(54)	115.2(5)
C(50)	C(49)	C(54)	121.9(6)	C(49)	C(50)	C(51)	117.8(6)
C(50)	C(51)	C(52)	120.8(6)	C(51)	C(52)	C(53)	121.6(6)
C(52)	C(53)	C(54)	119.4(6)	C(49)	C(54)	C(53)	118.6(6)