**Supporting Information**

# (*S*)- or (*R*)-α-(phenyl)ethylamine-derived NH-type ligands: Design, synthesis and applications for chemical resolution of α-amino acids

**Ryosuke Takeda,[a] Akie Kawamura,[a] Aki Kawashima,[a] Hiroki Moriwaki,[a] Tatsunori Sato,[a] José Luis Aceña*[b] and Vadim A. Soloshonok*[b,c]**

[a] *Hamari Chemicals Ltd. 1-4-29 Kunijima, Higashi-Yodogawa-ku, Osaka, Japan 533-0024*
[b] *Department of Organic Chemistry I, Faculty of Chemistry, University of the Basque Country UPV/EHU, Paseo Manuel Lardizábal 3, 20018 San Sebastián, Spain. Fax: +34 943-015270; Tel: +34 943-015177; E-mail: joseluis.acena@ehu.es, vadym.soloshonok@ehu.es*
[c] *IKERBASQUE, Basque Foundation for Science, Alameda Urquijo 36-5, Plaza Bizkaia, 48011 Bilbao, Spain*

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**X-Ray data of compound 14a**

| Physical and crystallographic data | | Refinement conditions | |
|---|---|---|---|
| Formula | $C_{34}$ $H_{34}$ Cl $N_3$ Ni $O_4$ | Difractometer | Agilent SuperNova Cu |
| $M_r$ (g·mol$^{-1}$) | 642.8 | Detector | CCD (Atlas) |
| Crystal system | Tetragonal | Temperature (K) | 100(1)° |
| Space group | $P4_1/n$ | λ (CuKα) (Å) | 1.54184 |
| a (Å) | 9.76204(4) | Monochromator | Óptica multicapa |
| b (Å) | 9.76204(4) | Collimator (mm) | 0.2 |
| c (Å) | 31.9566(2) | Scan mode | Rotation ω |
| α (°) | 90 | Scan width (°) | 1.0 |
| β (°) | 90 | Time (s) (Total, h) | 2;8 (4) |
| γ (°) | 90 | Interval θ (°) | 4.53-71.44 |
| V (Å$^3$) | 3045.357(19) | (hkl) minimum | (–11 –12 –39) |
| Z | 4 (Z'=1) | (hkl) maximun | (12 11 27) |
| F (000) | 1344 | Reflections collected | 24338 |
| μ (CuKα) (mm$^{-1}$) | 2.077 | Independent reflections ($R_{int.}$) | 5213(0.024) |
| $D_x$ (g·cm$^{-3}$) | 1.402 (1) | Observed reflections [I>2σ(I)] | 5195 |
| Morphology | Cubic prism | Absorption correction | Gaussian |
| Color | red | Solution | OLEX2 |
| Crystal size (mm) | 0.21x0.25x0.30 | Refinement | SHELXL97 |
|  | | Parameters | 391 |
| | | Restraints | 1 |
| | | Δ/σ maximum | 0.002 |
| | | Δ/σ average | 0.000 |
| | | Δρ maximum (eÅ$^{-3}$) | 0.138 |
| | | Δρ minimum (eÅ$^{-3}$) | -0.147 |
| **Friedel coverage** | **76%** | S (GOF) | 1.115 |
| **Flack *x*** | **0.006(12)** | Secondary extinction coefficient[b] | 0 |
| **Hooft *y*** | **0.000(3)** | R(F) (I>2$\sigma_I$, all data) | 0.0262, 0.0263 |
| **P2(wrong)** | **<10$^{-99}$** | $R_w(F^2)$[a] (I>2$\sigma_I$ ,all data) | 0.0698, 0.0699 |

[a] Weighting: $1/[\sigma^2(F_o^2)+(0.0390P)^2]$ where $P = [Max(F_0^2,0)+2F_c^2]/3$.

[b] Secondary extinction expression SHELXL: $F_c^* = kF_c[1+0.001F_c^2\lambda^3/sen(2\theta)]^{-1/4}$

**Molecular and crystalline structure of 14a**

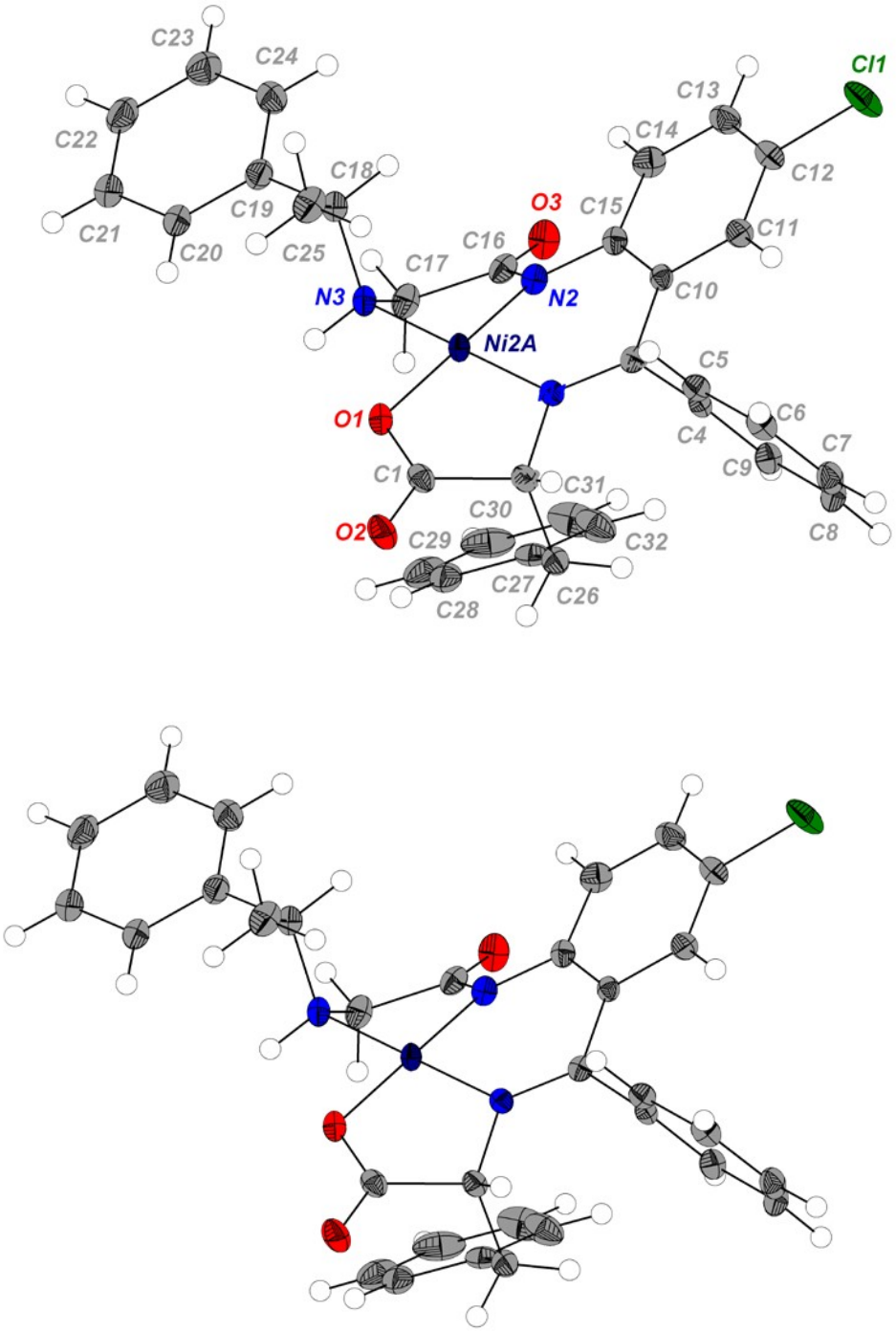



**Figure S1.** ORTEP diagram of **14a**. Ellipsoids displayed at 50% probability.

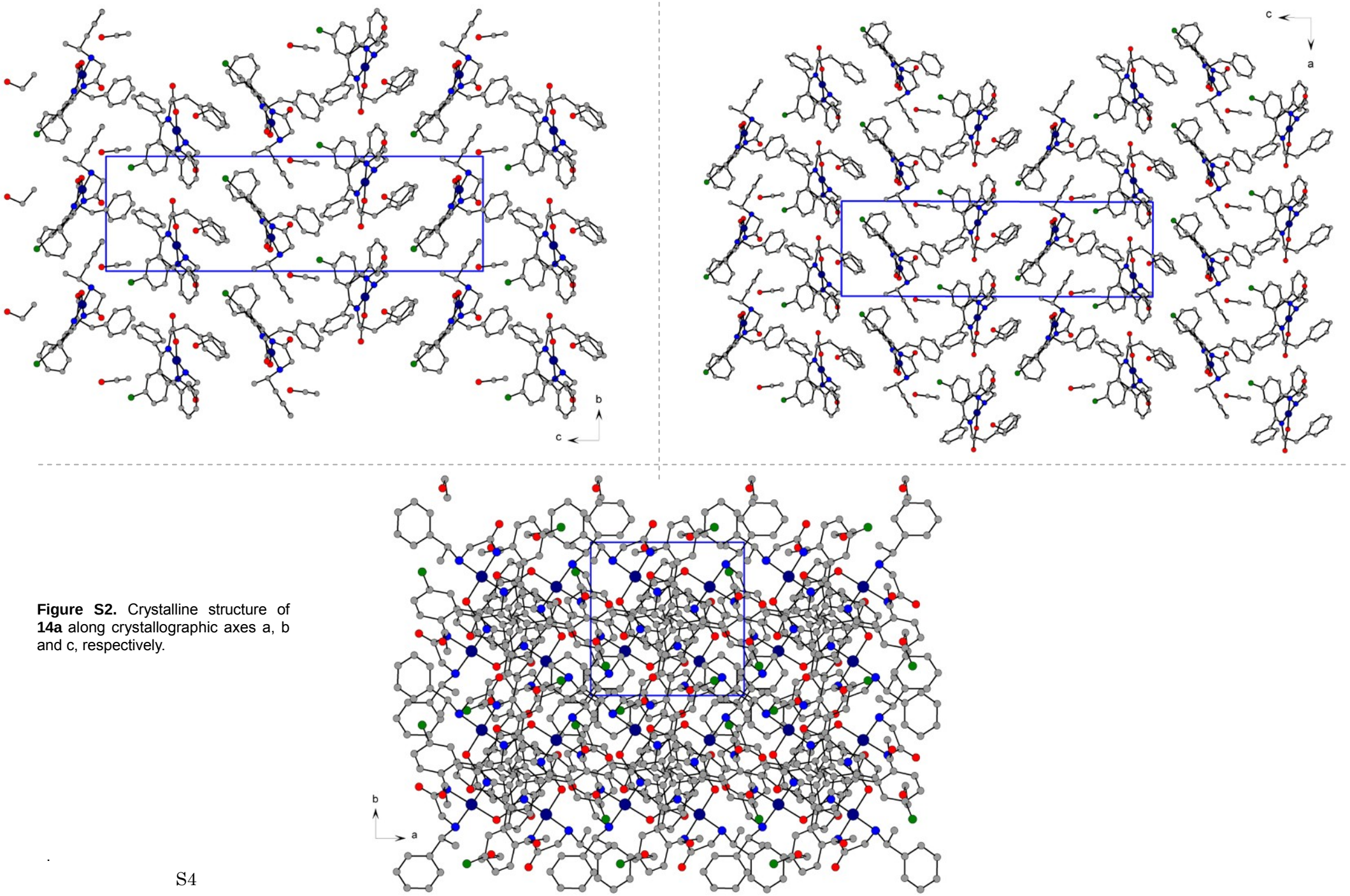



**Figure S2.** Crystalline structure of **14a** along crystallographic axes a, b and c, respectively.

**Table S1**. Bond lenghts (Å) of **14a**

| ATOMS | LENGHTS (Å) |
|---|---|
| Ni2A-O1 | 1.8692(14) |
| Ni2A-N1 | 1.8466(16) |
| Ni2A-N2 | 1.8404(17) |
| Ni2A-N3 | 1.9201(18) |
| Cl1-C12 | 1.737(2) |
| O1-C1 | 1.303(2) |
| O2-C1 | 1.213(2) |
| O3-C16 | 1.220(3) |
| N1-C3 | 1.302(3) |
| N1-C2 | 1.475(3) |
| N2-C16 | 1.374(3) |
| N2-C15 | 1.391(3) |
| N3-C18 | 1.510(3) |
| N3-C17 | 1.479(3) |
| C1-C2 | 1.531(3) |
| C2-C26 | 1.544(3) |
| C3-C10 | 1.466(3) |
| C3-C4 | 1.501(3) |
| C4-C9 | 1.388(3) |
| C4-C5 | 1.397(3) |
| C5-C6 | 1.388(3) |
| C6-C7 | 1.384(3) |
| C7-C8 | 1.384(3) |
| C8-C9 | 1.399(3) |
| C10-C15 | 1.423(3) |
| C10-C11 | 1.409(3) |
| C11-C12 | 1.376(3) |
| C12-C13 | 1.388(3) |
| C13-C14 | 1.378(3) |
| C14-C15 | 1.403(3) |
| C16-C17 | 1.518(3) |
| C18-C25 | 1.522(3) |
| C18-C19 | 1.517(3) |
| C19-C24 | 1.395(3) |
| C19-C20 | 1.390(3) |
| C20-C21 | 1.400(3) |
| C21-C22 | 1.388(4) |
| C22-C23 | 1.387(3) |
| C23-C24 | 1.385(3) |
| C26-C27 | 1.517(3) |
| C27-C32 | 1.384(4) |
| C27-C28 | 1.397(3) |
| C28-C29 | 1.391(3) |
| C29-C30 | 1.370(4) |
| C30-C31 | 1.377(4) |
| C31-C32 | 1.395(4) |
| ***solvent*** | |
| O1D-C1D | 1.418(3) |
| C1D-C2D | 1.541(6) |

**Table S2**. Bond angles (°) of **14a**

| ATOMS | ANGLES (°) |
|---|---|
| Ni2A-N1-C2 | 110.80(12) |
| Ni2A-N1-C3 | 127.44(14) |
| Ni2A-N2-C15 | 123.89(14) |
| Ni2A-N2-C16 | 113.53(14) |
| Ni2A-N3-C17 | 103.32(12) |
| Ni2A-N3-C18 | 113.49(13) |
| Ni2A-O1-C1 | 114.58(12) |
| O1-C1-C2 | 114.88(16) |
| O1-C1-O2 | 124.76(18) |
| O1-Ni2A-N1 | 86.89(7) |
| O1-Ni2A-N2 | 177.54(8) |
| O1-Ni2A-N3 | 94.05(7) |
| O2-C1-C2 | 120.31(18) |
| O3-C16-C17 | 121.24(19) |
| O3-C16-N2 | 127.86(19) |
| N1-C2-C1 | 107.29(15) |
| N1-C2-C26 | 111.51(16) |
| N1-C3-C10 | 121.58(17) |
| N1-C3-C4 | 120.77(17) |
| N1-Ni2A-N2 | 94.53(7) |
| N1-Ni2A-N3 | 178.61(8) |
| N2-C15-C10 | 120.39(17) |
| N2-C15-C14 | 120.86(18) |
| N2-C16-C17 | 110.89(17) |
| N2-Ni2A-N3 | 84.50(7) |
| N3-C17-C16 | 108.50(17) |
| N3-C18-C19 | 110.82(17) |
| N3-C18-C25 | 109.38(16) |
| Cl1-C12-C11 | 119.44(16) |
| Cl1-C12-C13 | 119.40(15) |
| C1-C2-C26 | 109.31(17) |
| C2-C26-C27 | 114.10(16) |
| C2-N1-C3 | 121.72(16) |
| C3-C10-C11 | 117.45(17) |
| C3-C10-C15 | 123.53(17) |
| C3-C4-C5 | 119.68(18) |
| C3-C4-C9 | 120.29(19) |
| C4-C3-C10 | 117.65(17) |
| C4-C5-C6 | 119.74(19) |
| C4-C9-C8 | 119.9(2) |
| C5-C4-C9 | 119.97(18) |
| C5-C6-C7 | 120.1(2) |
| C6-C7-C8 | 120.56(19) |
| C7-C8-C9 | 119.65(19) |
| C10-C11-C12 | 120.25(19) |
| C10-C15-C14 | 118.63(19) |
| C11-C10-C15 | 119.02(18) |
| C11-C12-C13 | 121.15(19) |
| C12-C13-C14 | 119.52(18) |
| C13-C14-C15 | 121.42(19) |
| C15-N2-C16 | 122.58(17) |
| C17-N3-C18 | 110.43(16) |
| C18-C19-C20 | 120.90(17) |
| C18-C19-C24 | 119.92(18) |
| C19-C18-C25 | 113.19(16) |
| C19-C20-C21 | 120.1(2) |
| C19-C24-C23 | 120.58(19) |
| C20-C19-C24 | 119.18(19) |
| C20-C21-C22 | 120.2(2) |
| C21-C22-C23 | 119.7(2) |
| C22-C23-C24 | 120.3(2) |
| C26-C27-C28 | 120.63(18) |
| C26-C27-C32 | 121.3(2) |
| C27-C28-C29 | 120.6(2) |
| C27-C32-C31 | 120.8(3) |
| C28-C27-C32 | 118.1(2) |
| C28-C29-C30 | 120.6(2) |
| C29-C30-C31 | 119.5(3) |
| C30-C31-C32 | 120.3(3) |
| ***solvent*** | |
| O1D-C1D-C2D | 106.3(3) |

**Table S3**. Torsion angles (°) of **14a**

| ATOMS | ANGLES (°) | | |
|---|---|---|---|
| N1-Ni2A-O1-C1 | -11.42(15) | C10-C3-C4-C9 | -79.7(2) |
| N3-Ni2A-O1-C1 | 167.56(15) | N1-C3-C10-C11 | 163.56(19) |
| O1-Ni2A-N1-C2 | 20.73(13) | N1-C3-C10-C15 | -16.7(3) |
| N2-Ni2A-N1-C2 | -157.26(14) | C9-C4-C5-C6 | 1.2(3) |
| O1-Ni2A-N1-C3 | -161.51(17) | C3-C4-C9-C8 | 176.94(18) |
| N2-Ni2A-N1-C3 | 20.50(18) | C3-C4-C5-C6 | -176.20(18) |
| N1-Ni2A-N2-C15 | -31.42(17) | C5-C4-C9-C8 | -0.4(3) |
| N3-Ni2A-N2-C15 | 149.57(17) | C4-C5-C6-C7 | -0.6(3) |
| N1-Ni2A-N2-C16 | 149.34(15) | C5-C6-C7-C8 | -0.8(3) |
| N3-Ni2A-N2-C16 | -29.67(15) | C6-C7-C8-C9 | 1.5(3) |
| O1-Ni2A-N3-C17 | -138.91(13) | C7-C8-C9-C4 | -0.9(3) |
| N2-Ni2A-N3-C17 | 39.10(13) | C11-C10-C15-C14 | 0.5(3) |
| O1-Ni2A-N3-C18 | 101.48(13) | C3-C10-C11-C12 | -179.81(19) |
| N2-Ni2A-N3-C18 | -80.51(14) | C15-C10-C11-C12 | 0.5(3) |
| Ni2A-O1-C1-O2 | -178.42(18) | C3-C10-C15-N2 | 4.7(3) |
| Ni2A-O1-C1-C2 | -1 | C3-C10-C15-C14 | -179.26(19) |
| C3-N1-C2-C26 | -82.9(2) | C11-C10-C15-N2 | -175.55(19) |
| Ni2A-N1-C2-C1 | -24.69(19) | C10-C11-C12-Cl1 | 177.33(16) |
| C3-N1-C2-C1 | 157.41(18) | C10-C11-C12-C13 | -1.3(3) |
| Ni2A-N1-C3-C4 | 178.55(14) | Cl1-C12-C13-C14 | -177.50(16) |
| C2-N1-C3-C10 | 176.72(18) | C11-C12-C13-C14 | 1.1(3) |
| C2-N1-C3-C4 | -3 | C12-C13-C14-C15 | -0.1(3) |
| Ni2A-N1-C2-C26 | 94.98(16) | C13-C14-C15-N2 | 175.4(2) |
| Ni2A-N1-C3-C10 | -0 | C13-C14-C15-C10 | -0.6(3) |
| Ni2A-N2-C16-O3 | -167.53(18) | N2-C16-C17-N3 | 21.3(2) |
| C15-N2-C16-O3 | 13.2(3) | O3-C16-C17-N3 | -159.98(19) |
| C16-N2-C15-C14 | 26.7(3) | N3-C18-C19-C20 | 60.1(3) |
| C16-N2-C15-C10 | -157.43(19) | N3-C18-C19-C24 | -119.1(2) |
| Ni2A-N2-C15-C10 | 23.4(3) | C25-C18-C19-C20 | -63.2(3) |
| Ni2A-N2-C16-C17 | 11.1(2) | C25-C18-C19-C24 | 117.7(2) |
| Ni2A-N2-C15-C14 | -152.52(17) | C18-C19-C20-C21 | -178.5(2) |
| C15-N2-C16-C17 | -168.18(18) | C24-C19-C20-C21 | 0.6(3) |
| Ni2A-N3-C18-C19 | -179.25(12) | C18-C19-C24-C23 | 178.5(2) |
| C17-N3-C18-C25 | -169.24(16) | C20-C19-C24-C23 | -0.7(4) |
| C18-N3-C17-C16 | 80.43(19) | C19-C20-C21-C22 | 0.2(4) |
| Ni2A-N3-C17-C16 | -41.26(17) | C20-C21-C22-C23 | -1.0(4) |
| Ni2A-N3-C18-C25 | -53.77(18) | C21-C22-C23-C24 | 1.0(4) |
| C17-N3-C18-C19 | 65.3(2) | C22-C23-C24-C19 | -0.2(4) |
| O1-C1-C2-C26 | -104.3(2) | C2-C26-C27-C28 | -82.1(2) |
| O2-C1-C2-N1 | -165.71(19) | C2-C26-C27-C32 | 97.3(2) |
| O2-C1-C2-C26 | 73.2(3) | C26-C27-C28-C29 | -179.8(2) |
| O1-C1-C2-N1 | 16.7(3) | C32-C27-C28-C29 | 0.7(3) |
| C1-C2-C26-C27 | 69.8(2) | C26-C27-C32-C31 | -179.6(2) |
| N1-C2-C26-C27 | -48.7(2) | C28-C27-C32-C31 | -0.1(4) |
| C4-C3-C10-C11 | -15.8(3) | C27-C28-C29-C30 | -1.1(4) |
| C4-C3-C10-C15 | 163.90(19) | C28-C29-C30-C31 | 0.8(4) |
| N1-C3-C4-C5 | -81.7(3) | C29-C30-C31-C32 | -0.2(4) |
| N1-C3-C4-C9 | 100.9(2) | C30-C31-C32-C27 | -0.2(4) |
| C10-C3-C4-C5 | 97.7(2) | | |

**Table S4**. Possible hydrogen bonds (Å,°)

| ***D—H···A*** | ***D—H*** | ***H···A*** | ***D···A*** | ***D—H···A*** |
|---|---|---|---|---|
| O1D-H1D···O1$^{i}$ | 0.8400 | 2.0600 | 2.790(2) | 144.00 |
| N3-H3···O1D$^{ii}$ | 0.9300 | 2.1100 | 3.000(3) | 161.00 |
| C6-H6···O3$^{iii}$ | 0.9500 | 2.4800 | 3.196(3) | 132.00 |
| C14-H14···O3 | 0.9500 | 2.3100 | 2.851(3) | 116.00 |
| C17-H17A···Cl1$^{iv}$ | 0.9900 | 2.6300 | 3.432(2) | 138.00 |
| C24-H24···O2$^{v}$ | 0.9500 | 2.3800 | 3.283(3) | 159.00 |

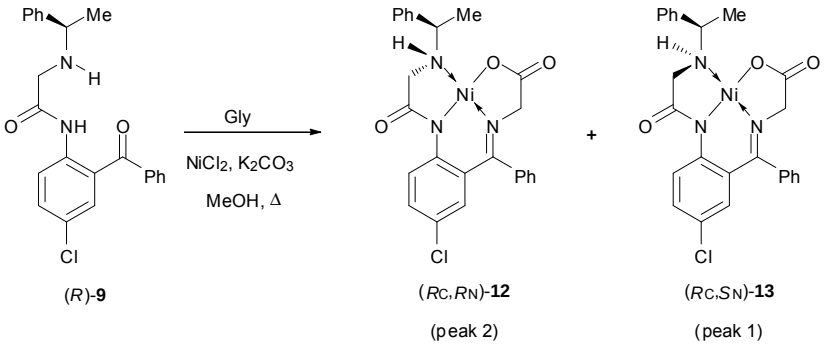
Symmetry options: (i)= 2-y,x,1/4+z z; (ii) =- y,2-x,-1/4+z; (iii)= -1-y,-1+x,1/4+z.. (iv)=1+y,2-x,-1/4+z z; (v) =-1+x,y,z

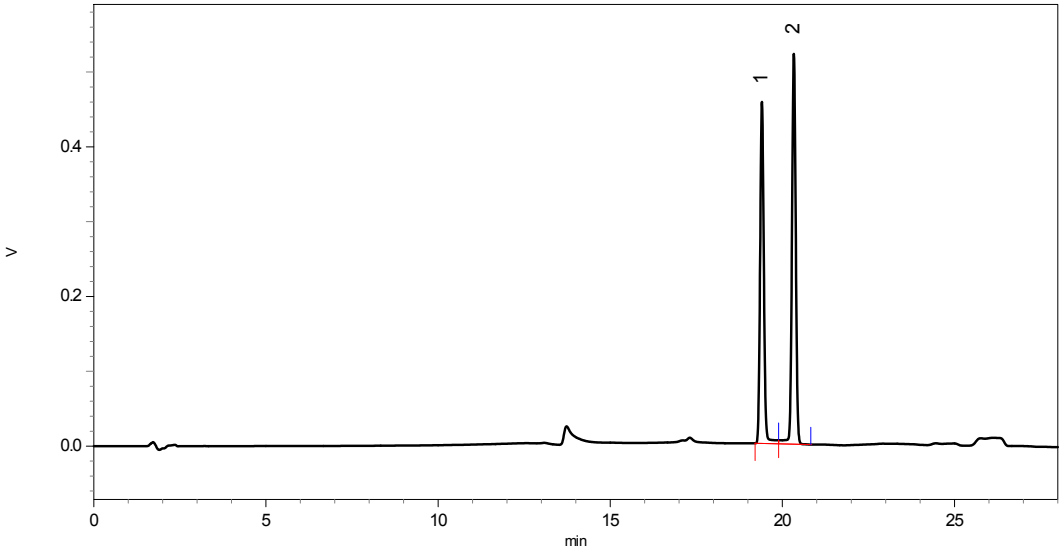
**HPLC analysis data**

**General conditions for HPLC analysis of Ni(II) complexes 12-15:**

| | |
|---|---|
| Insturument: | SHIMADZU LC-2010CHT chromatography system and a CLASS-VP™ analysis data system (SHIMADZU CORPORATION, Kyoto, Japan). |
| Column: | Inertsil™ ODS-3 (3μm, 150*4.6 mm i.d.) |
| Eluent: | A = 10mM ammonium formate 0.1% formic acid buffer<br>B = acetonitrile |
| Flow rate: | 1.0 mL/min |
| Temp: | 30 ºC |
| Detector: | UV 254 nm |

**Reaction of (*R*)-9 with glycine**



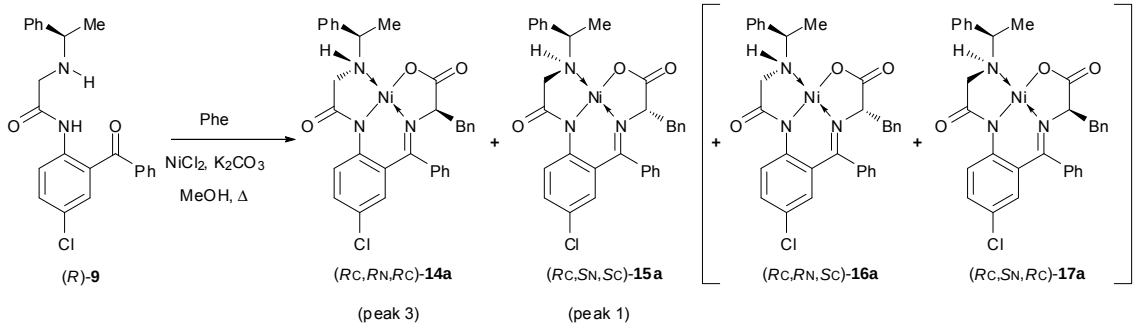



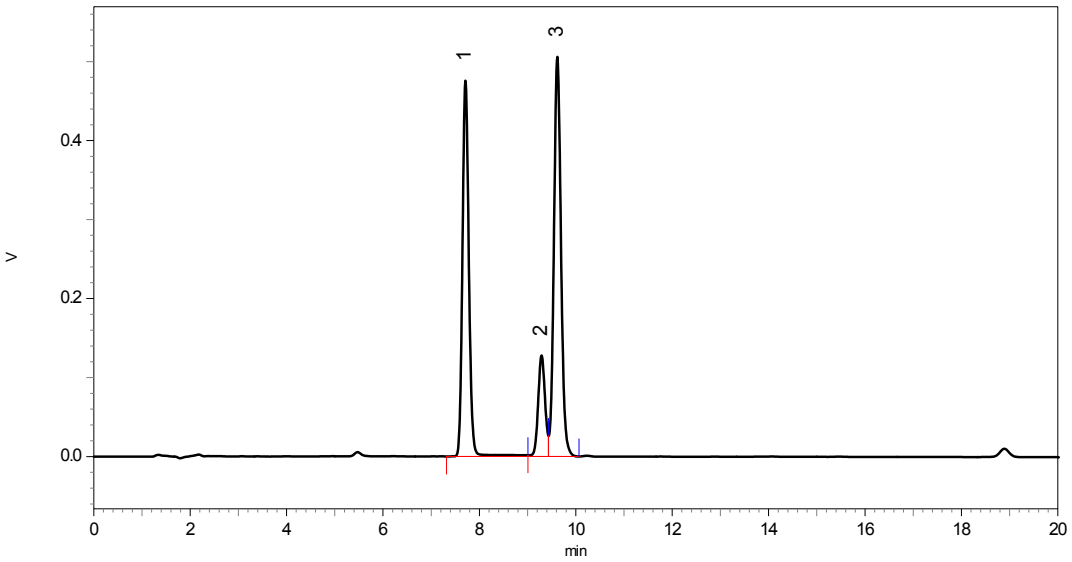

Detector A - 1 (254nm)

| Peak Number | Retention Time | Area | Area% |
|---|---|---|---|
| 1 | 19.402 | 3456701 | 46.22 |
| 2 | 20.330 | 4022287 | 53.78 |
| Total | | 7478988 | 100.00 |

Gradient A: B = 80:20 to 20:80 (0 to 25 min)

**Reaction of (*R*)-9 with phenylalanine**



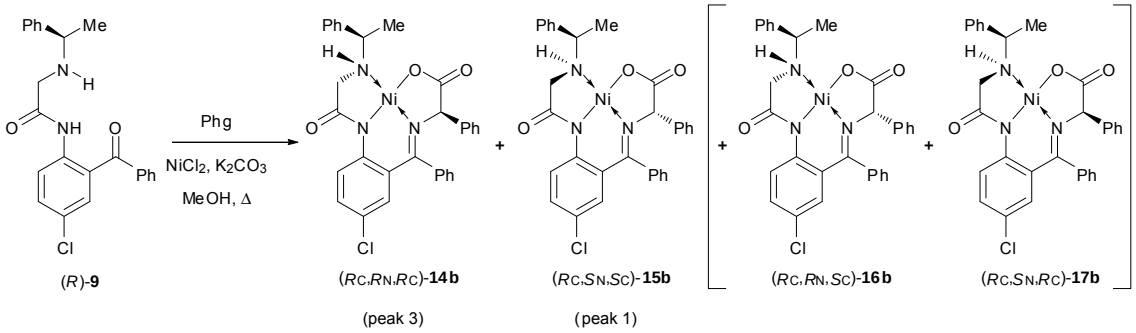

Detector A - 1 (254nm)

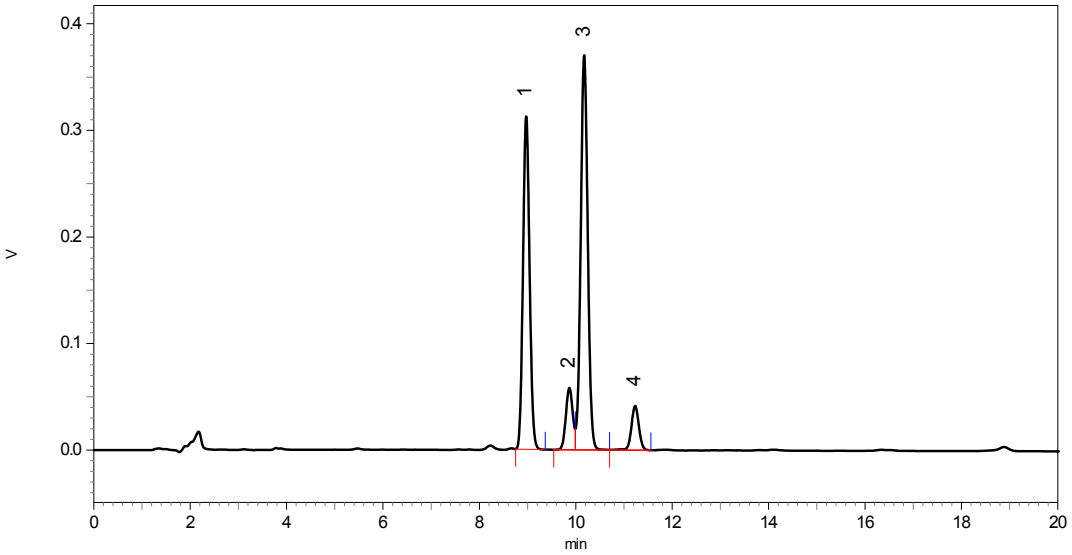
| Peak Number | Retention Time | Area | Area% |
|---|---|---|---|
| 1 | 7.707 | 4414629 | 40.70 |
| 2 | 9.286 | 1273188 | 11.74 |
| 3 | 9.613 | 5160205 | 47.57 |

| | | | |
|---|---|---|---|
| Total | | 10848022 | 100.00 |

Gradient A: B = 80:20 to 20:80 (0 to 25 min)

**Reaction of (*R*)-9 with phenylglycine**



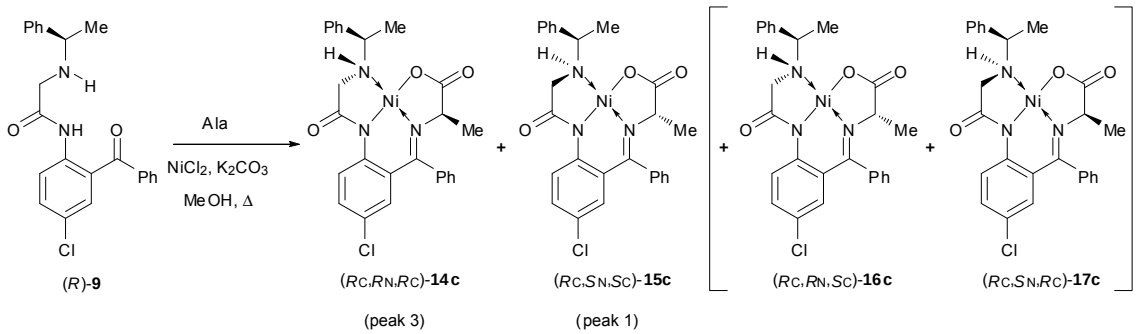



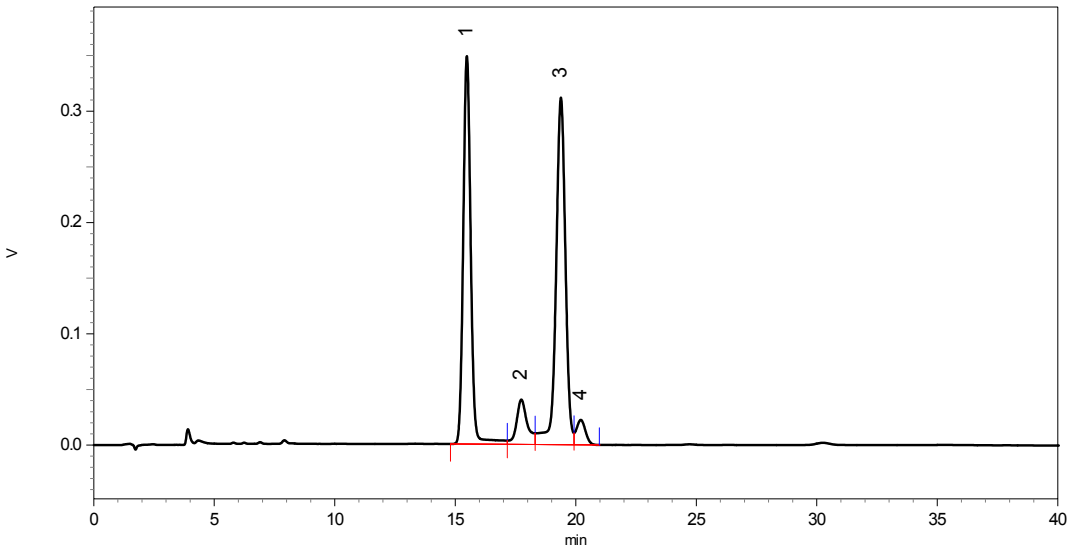

Detector A - 1 (254nm)

| Peak Number | Retention Time | Area | Area% |
|---|---|---|---|
| 1 | 8.967 | 2961579 | 38.22 |
| 2 | 9.862 | 584477 | 7.54 |
| 3 | 10.170 | 3753642 | 48.44 |
| 4 | 11.227 | 449027 | 5.79 |
| Total | | 7748724 | 100.00 |

Gradient A: B = 80:20 to 20:80 (0 to 25 min)

**Reaction of (*R*)-9 with alanine**



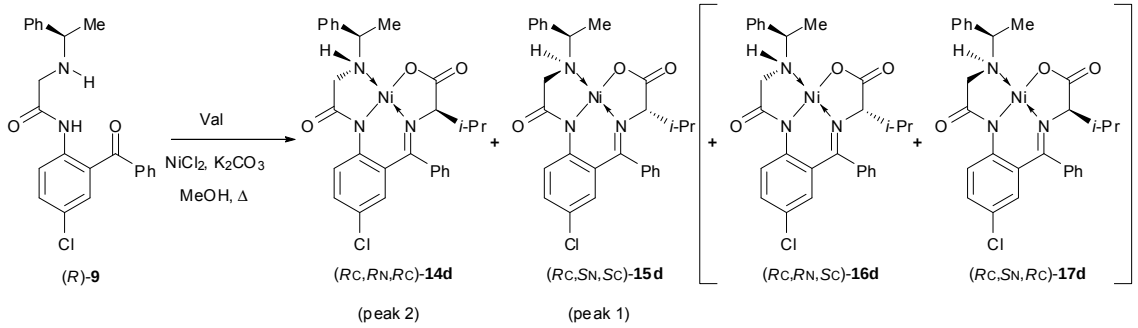

Detector A - 1 (254nm)

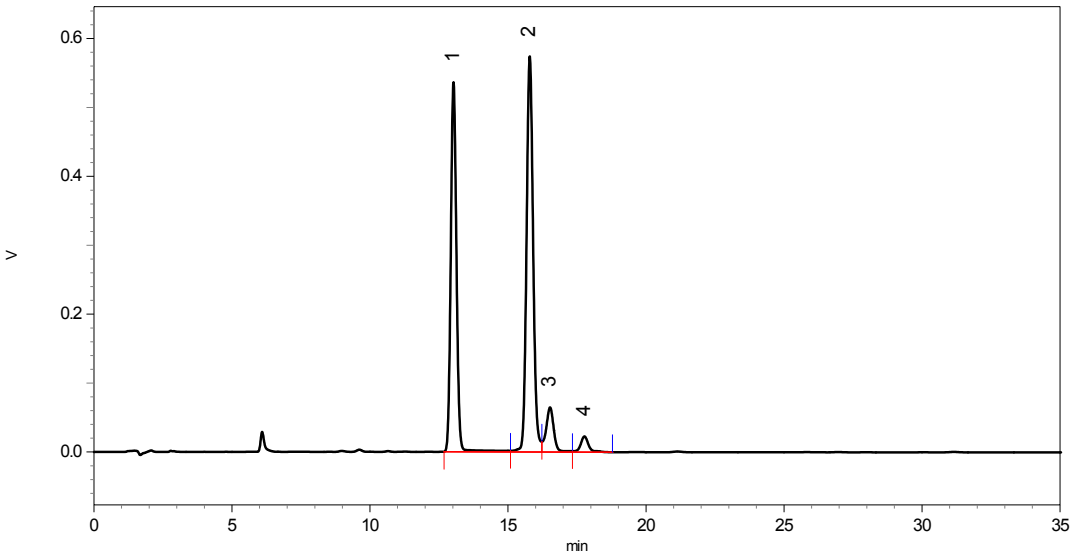
| Peak Number | Retention Time | Area | Area% |
|---|---|---|---|
| 1 | 15.476 | 7579592 | 42.25 |
| 2 | 17.737 | 1257630 | 7.01 |
| 3 | 19.379 | 8516962 | 47.47 |
| 4 | 20.205 | 587494 | 3.27 |

| | | | |
|---|---|---|---|
| Total | | 17941678 | 100.00 |

Gradient A: B = 55:45 (0 to 30 min)
55:45 to 10:90 (30 min to 50 min)

**Reaction of (*R*)-9 with valine**



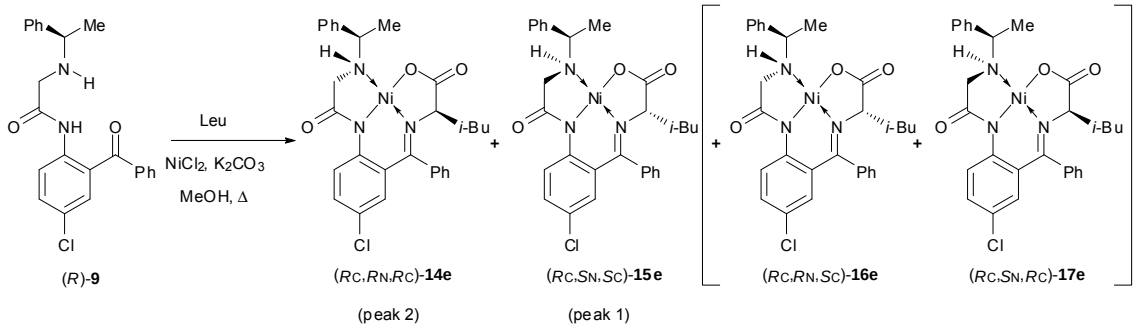



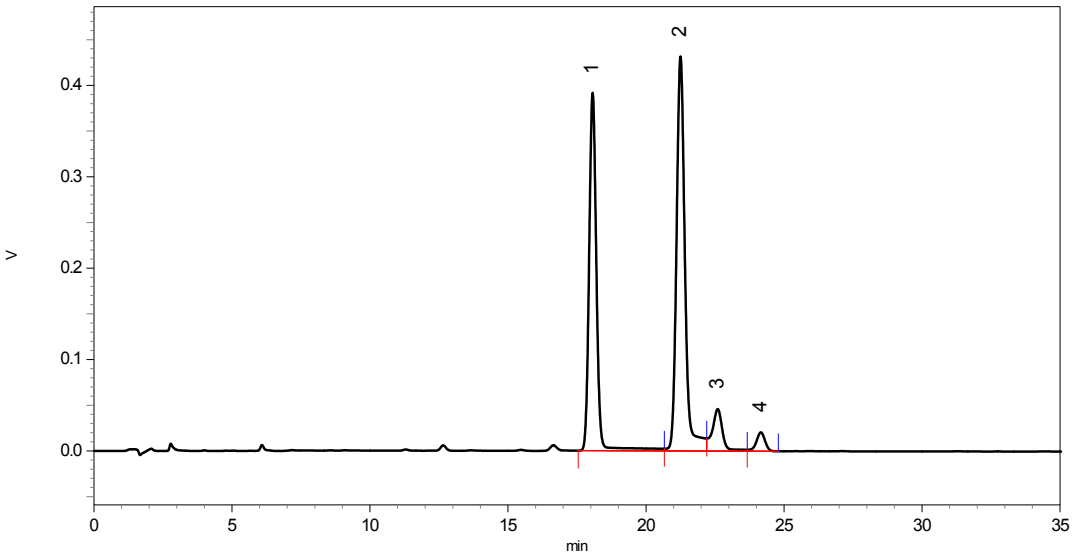

Detector A - 1 (254nm)

| Peak Number | Retention Time | Area | Area% |
|---|---|---|---|
| 1 | 13.022 | 7708983 | 40.71 |
| 2 | 15.784 | 9514754 | 50.25 |
| 3 | 16.519 | 1261960 | 6.66 |
| 4 | 17.765 | 448992 | 2.37 |
| Total | | 18934689 | 100.00 |

Gradient A: B = 50:50 to 40:60 (0 min to 30 min)
40:60 to 10:90 (30 min to 50 min)

**Reaction of (*R*)-9 with leucine**



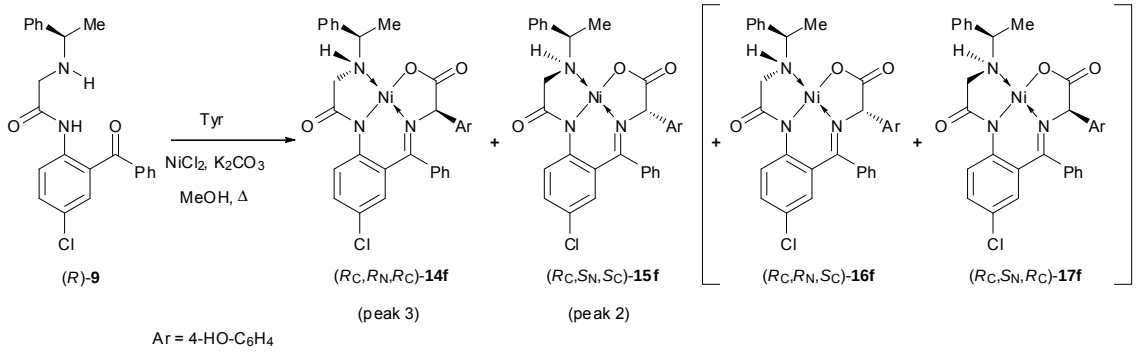

Detector A - 1 (254nm)

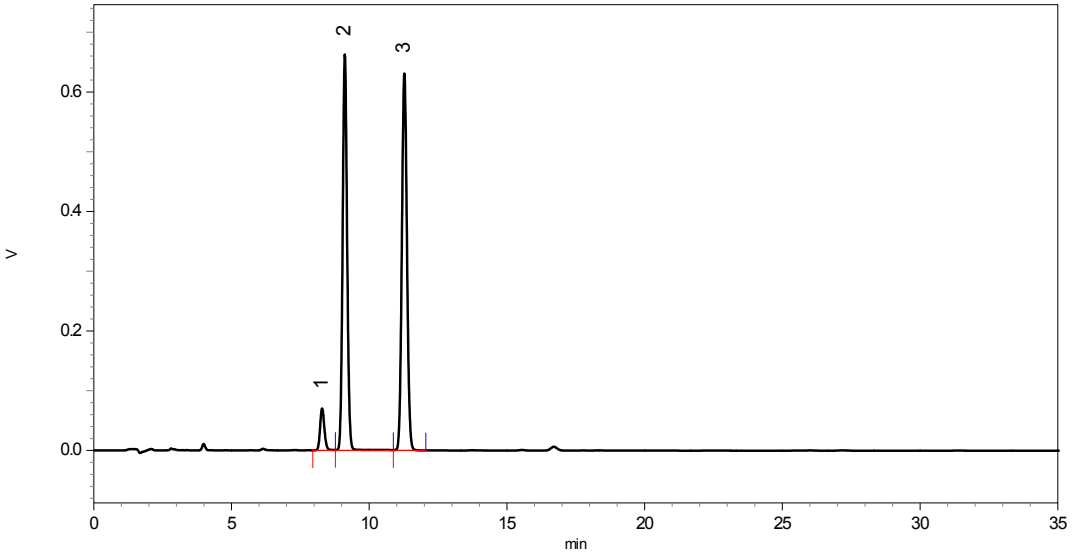
| Peak Number | Retention Time | Area | Area% |
|---|---|---|---|
| 1 | 18.062 | 7279518 | 40.12 |
| 2 | 21.245 | 9210736 | 50.76 |
| 3 | 22.594 | 1196224 | 6.59 |
| 4 | 24.158 | 457532 | 2.52 |

| | | | |
|---|---|---|---|
| Total | | 18144009 | 100.00 |

Gradient A: B = 50:50 to 40:60 (0 min to 30 min)
40:60 to 10:90 (30 min to 50 min)

**Reaction of (*R*)-9 with tyrosine**



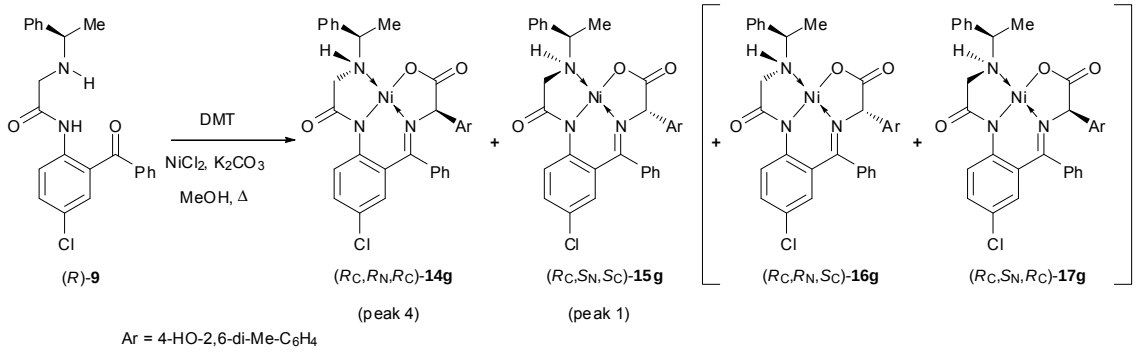



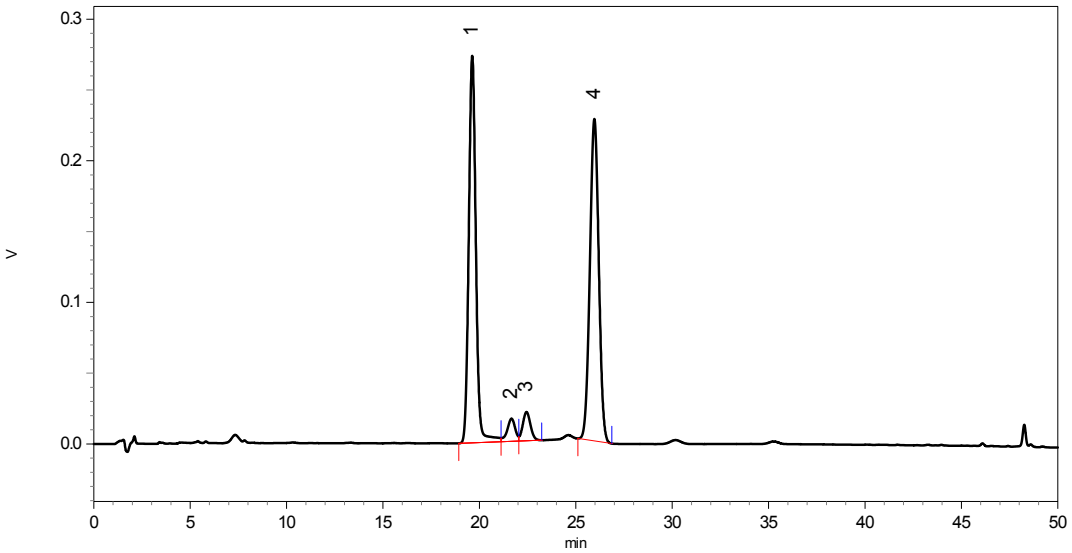

Detector A - 1 (254nm)

| Peak Number | Retention Time | Area | Area% |
|---|---|---|---|
| 1 | 8.286 | 766992 | 4.68 |
| 2 | 9.111 | 7519581 | 45.91 |
| 3 | 11.272 | 8091702 | 49.41 |
| Total | | 16378275 | 100.00 |

Gradient A: B = 50:50 to 40:60 (0 min to 30 min)
40:60 to 10:90 (30 min to 50 min)

**Reaction of (*R*)-9 with 2,6-dimethyltyrosine**




Detector A - 1 (254nm)

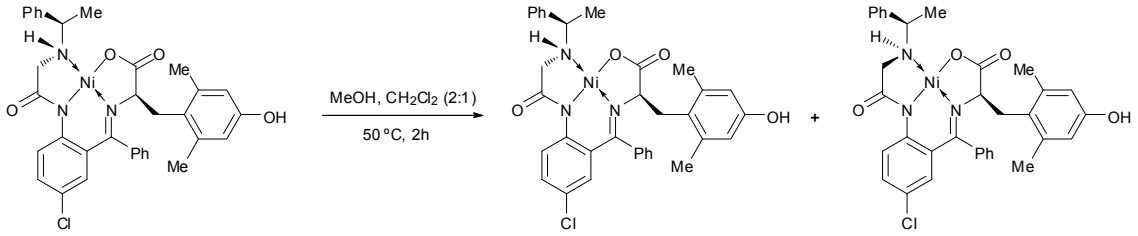
| Peak Number | Retention Time | Area | Area% |
|---|---|---|---|
| 1 | 19.626 | 6977892 | 45.65 |
| 2 | 21.664 | 461378 | 3.02 |
| 3 | 22.437 | 570492 | 3.73 |
| 4 | 25.963 | 7277190 | 47.60 |
| Total | | 15286952 | 100.00 |

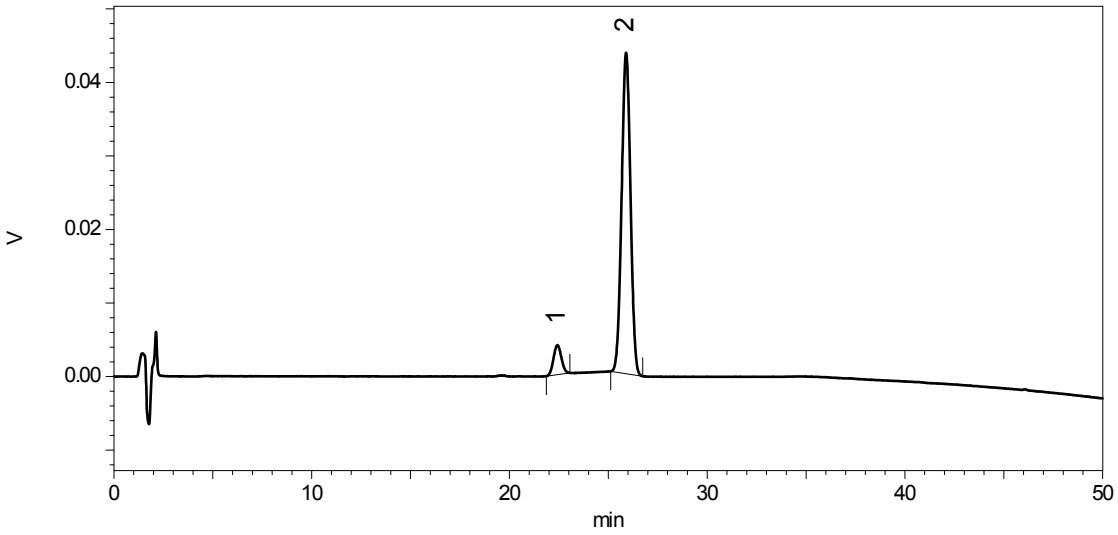
Gradient A: B = 55:45 (0 to 30 min)
55:45 to 10:90 (30 min to 50 min)

**HPLC conditions for DMT complex samples**

| | |
|---|---|
| Insturument: | SHIMADZU LC-2010CHT chromatography system and a CLASS-VP™ analysis data system (SHIMADZU CORPORATION, Kyoto, Japan). |
| Column: | Inertsil™ ODS-3 (3μm, 150*4.6 mm i.d.) |
| Eluent: | A = 10mM ammonium formate 0.1% formic acid buffer<br>B = acetonitrile |
| Gradient: | A: B = 55:45 (0 to 30 min)<br>55:45 to 10:90 (30 min to 50 min) |
| Flow rate: | 1.0 mL/min |
| Temp: | 30 ºC |
| Detector: | UV 254 nm |

**Epimerization of 14g**



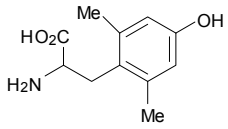

Detector A - 1 (254nm)

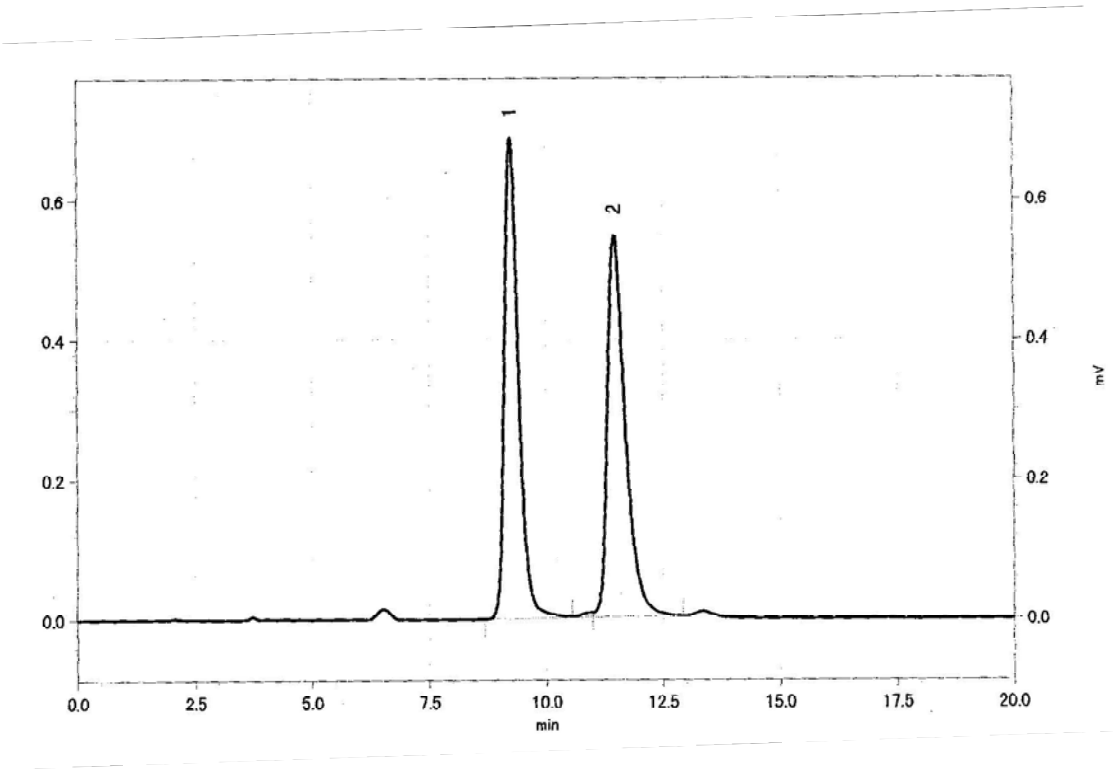
| Peak Number | Retention Time | Area | Area% |
|---|---|---|---|
| 1 | 22.423 | 111960 | 7.60 |
| 2 | 25.896 | 1360937 | 92.40 |
| Total | | 1472897 | 100.00 |

**HPLC conditions for chiral analysis of free DMT**

| | |
|---|---|
| Insturument: | SHIMADZU chromatography system, consisting of a LC-10ADvp high-pressure gradient pump, a SPD-10Avp UV-VIS detector, and a CLASS-VP™ analysis data system (SHIMADZU CORPORATION, Kyoto, Japan) |
| Column: | Astec CHIROBIOTIC™ R |
| Eluent: | $H_2O$/ MeOH = 8: 2 |
| Flow rate: | 0.5 mL/min |
| Temp: | 25 ºC |
| Detector: | UV 205 nm |
| $t_R$: | 9.2 min (*R*)-(-)-DMT<br>11.4 min (*S*)-(+)-DMT |

**HPLC of racemic DMT, (±)-18**

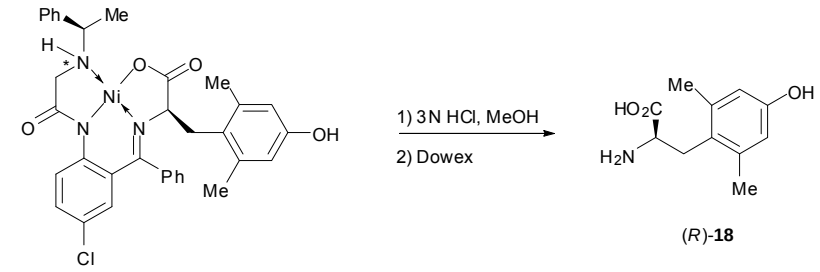


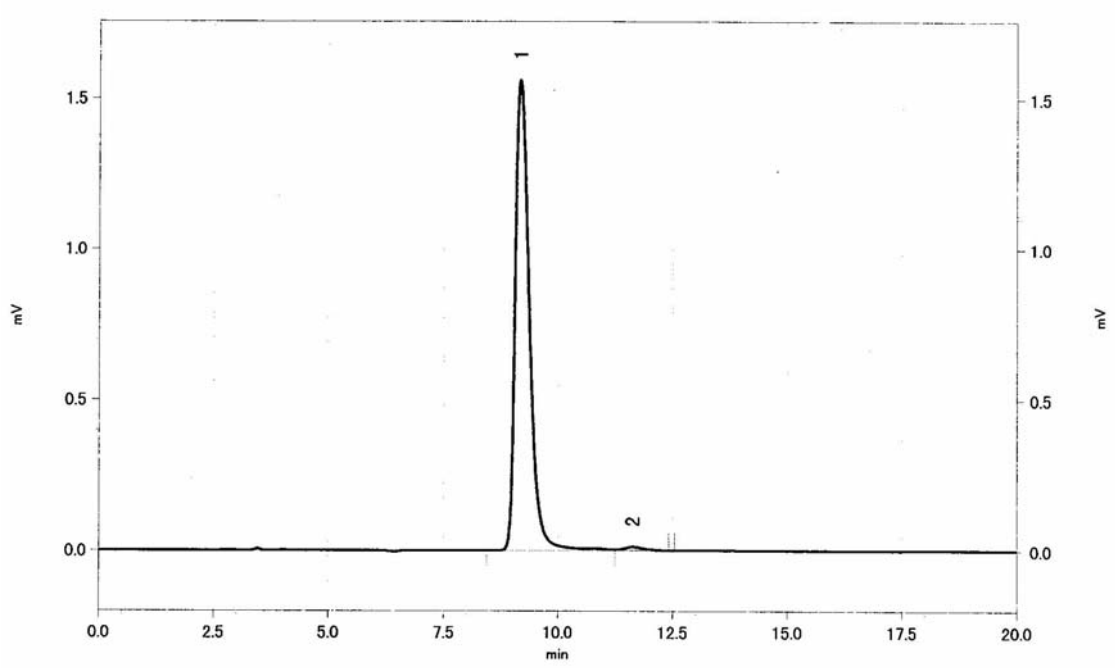

Detector A - 1 (205nm)

| Peak Number | Retention Time | Area | Area% |
|---|---|---|---|
| 1 | 9.243 | 14451749 | 49.72 |
| 2 | 11.465 | 14615997 | 50.28 |
| Total | | 29067746 | 100.00 |

**Disassembly of 14 and 17**




(*R*C,*R*N,*R*C)-**14g** + (*R*C,*S*N,*R*C)-**17g** (*R*)-**18**

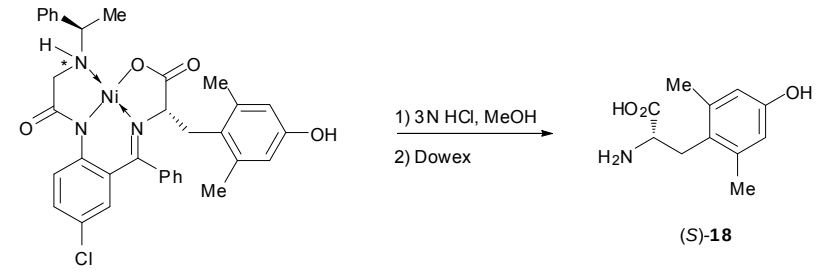



Detector A - 1 (205nm)

| Peak Number | Retention Time | Area | Area% |
|---|---|---|---|
| 1 | 9.173 | 34001570 | 99.24 |
| 2 | 11.631 | 34263359 | 0.76 |

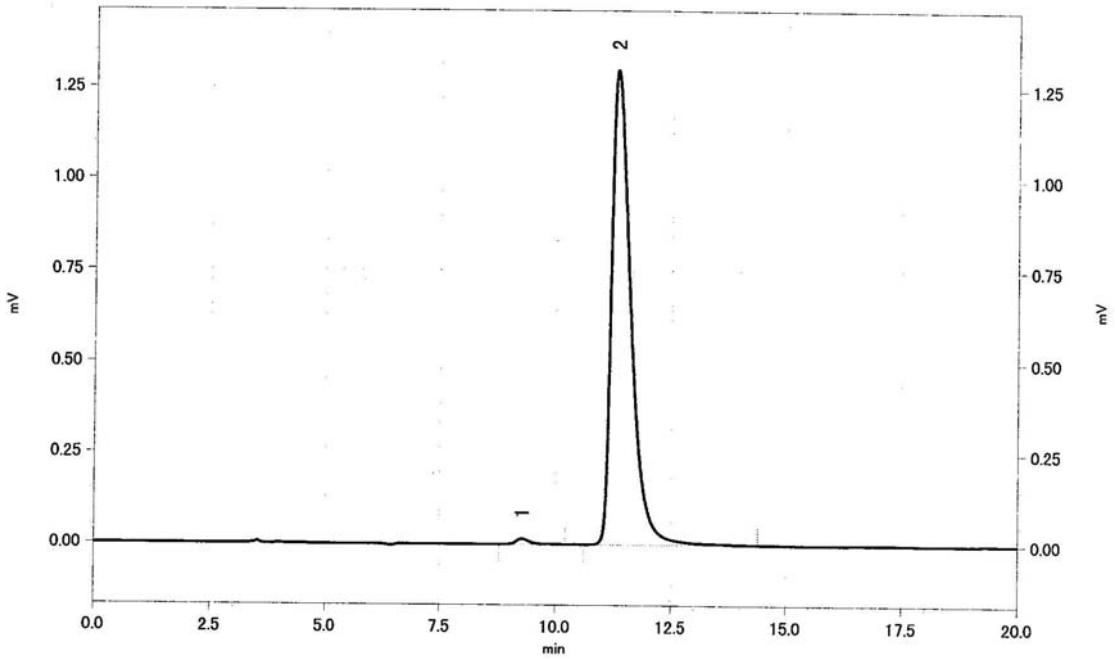
| | | | |
|---|---|---|---|
| Total | | 34263359 | 100.00 |

**Disassembly of 15 and 16**




(*R*C,*S*N,*S*C)-**15g** + (*R*C,*R*N,*S*C)-**16g**

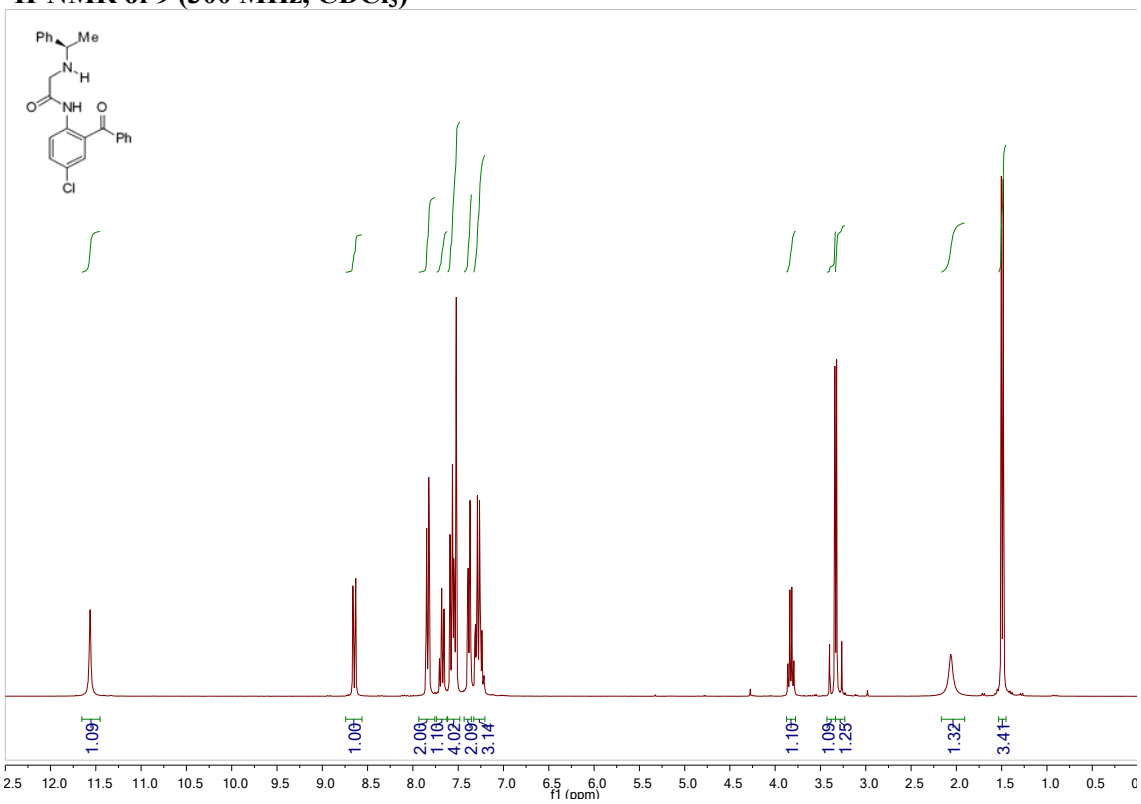
(*S*)-**18**



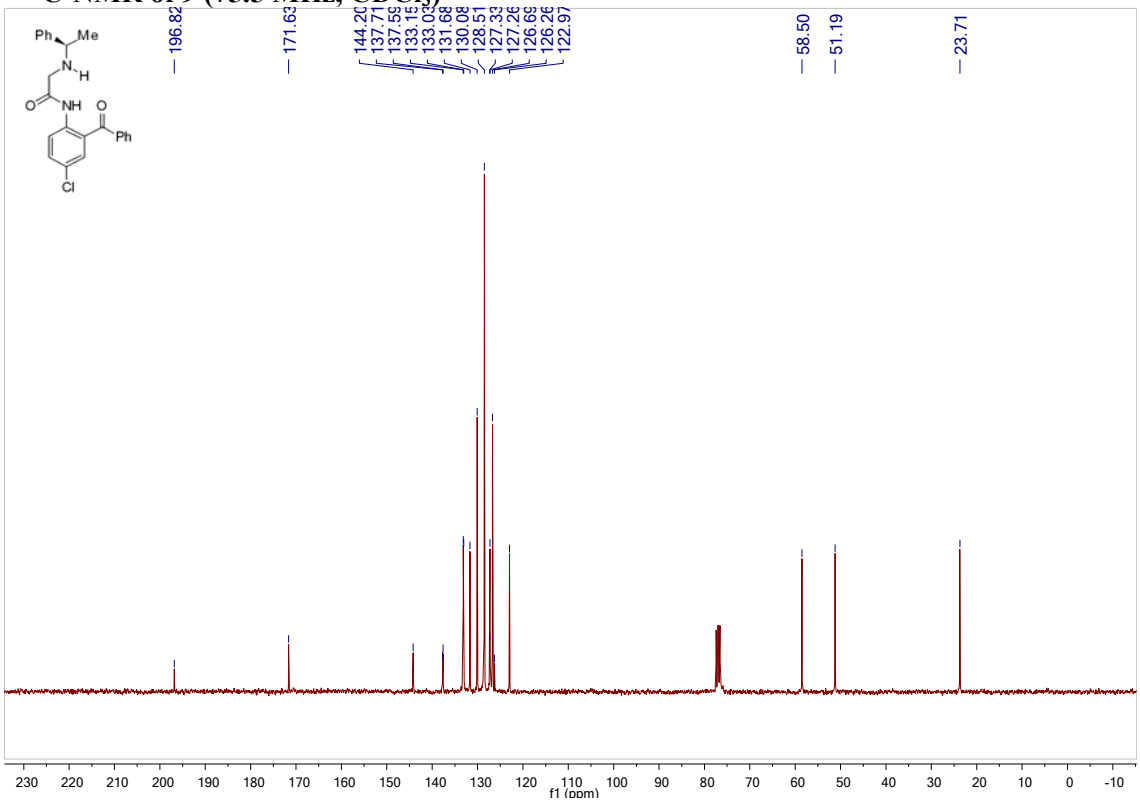

Detector A - 1 (205nm)

| Peak Number | Retention Time | Area | Area% |
|---|---|---|---|
| 1 | 9.276 | 302164 | 0.79 |
| 2 | 11.304 | 37923747 | 99.21 |
| Total | | 38225911 | 100.00 |

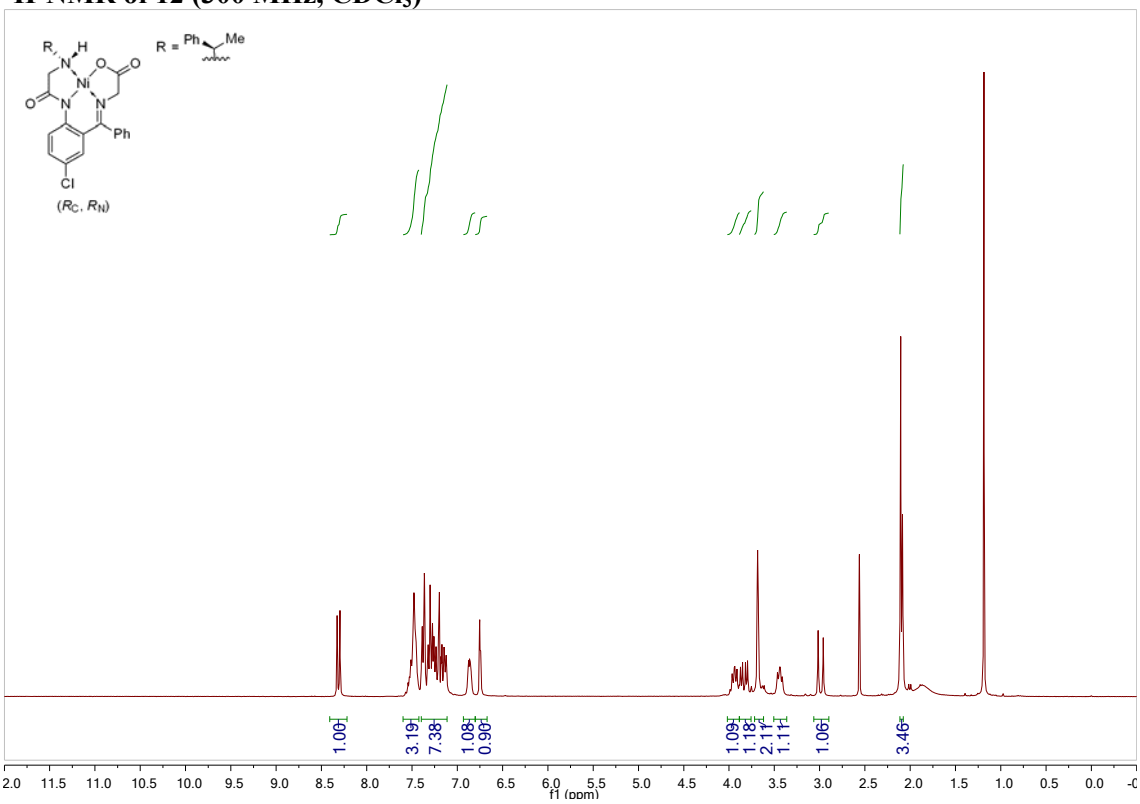
**$^{1}$H-NMR of 9 (300 MHz, $CDCl_3$)**



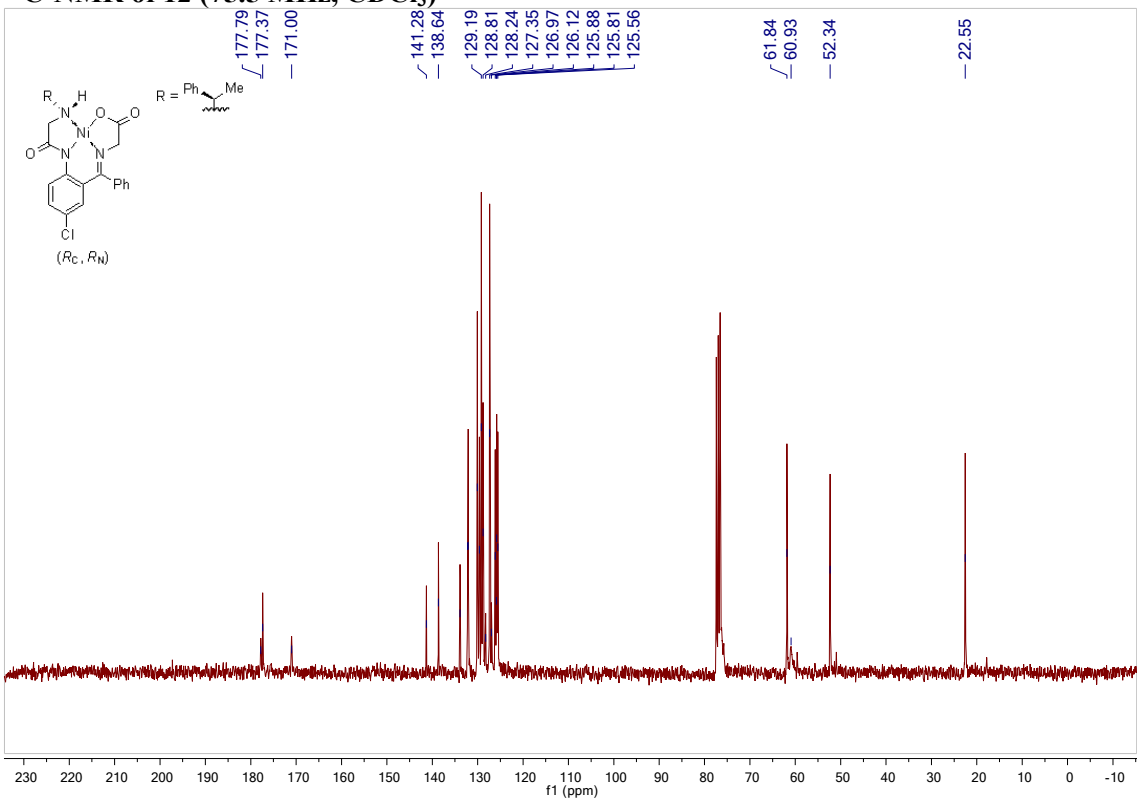

**$^{13}$C-NMR of 9 (75.5 MHz, $CDCl_3$)**



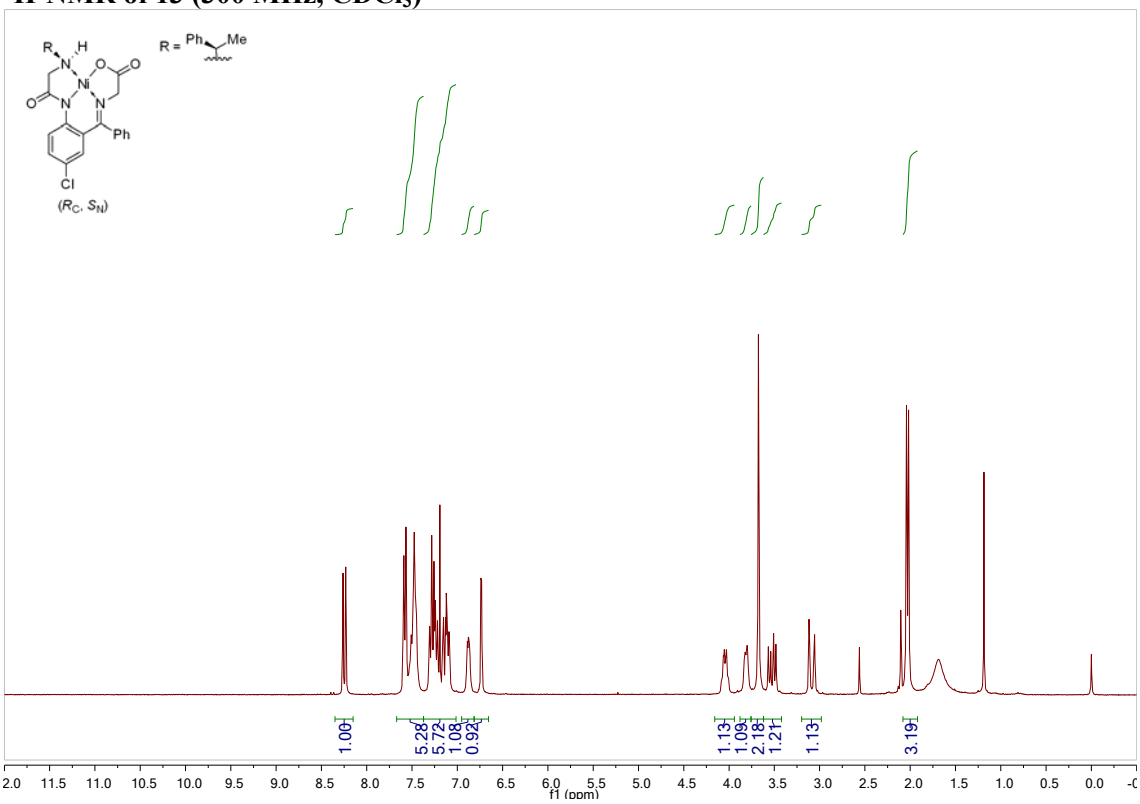
**$^{1}$H-NMR of 12 (300 MHz, $CDCl_3$)**



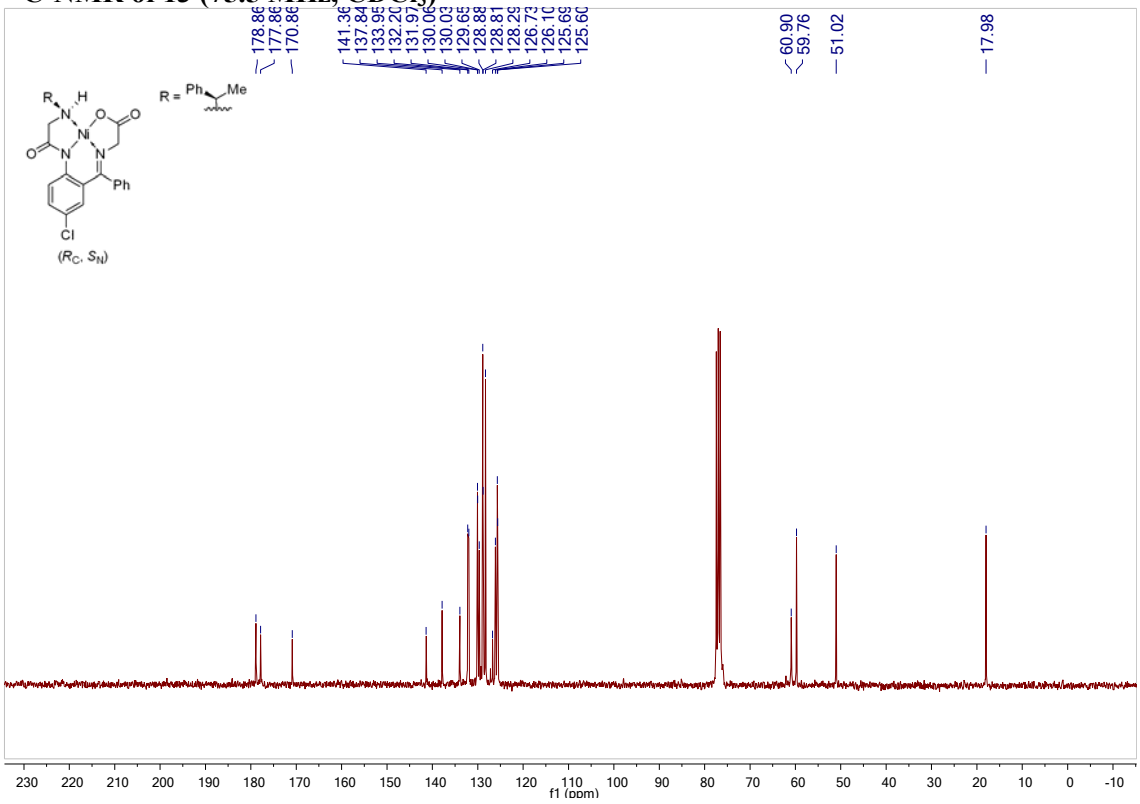

**$^{13}$C-NMR of 12 (75.5 MHz, $CDCl_3$)**



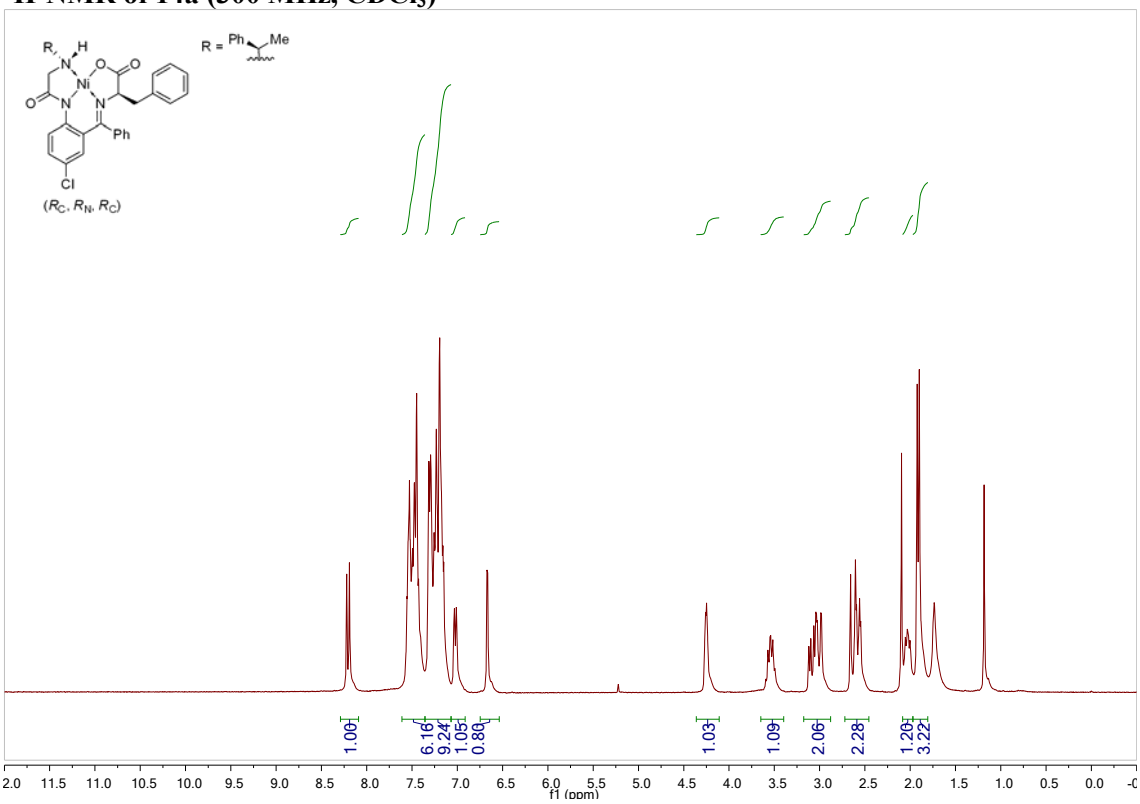
**$^{1}$H-NMR of 13 (300 MHz, $CDCl_3$)**



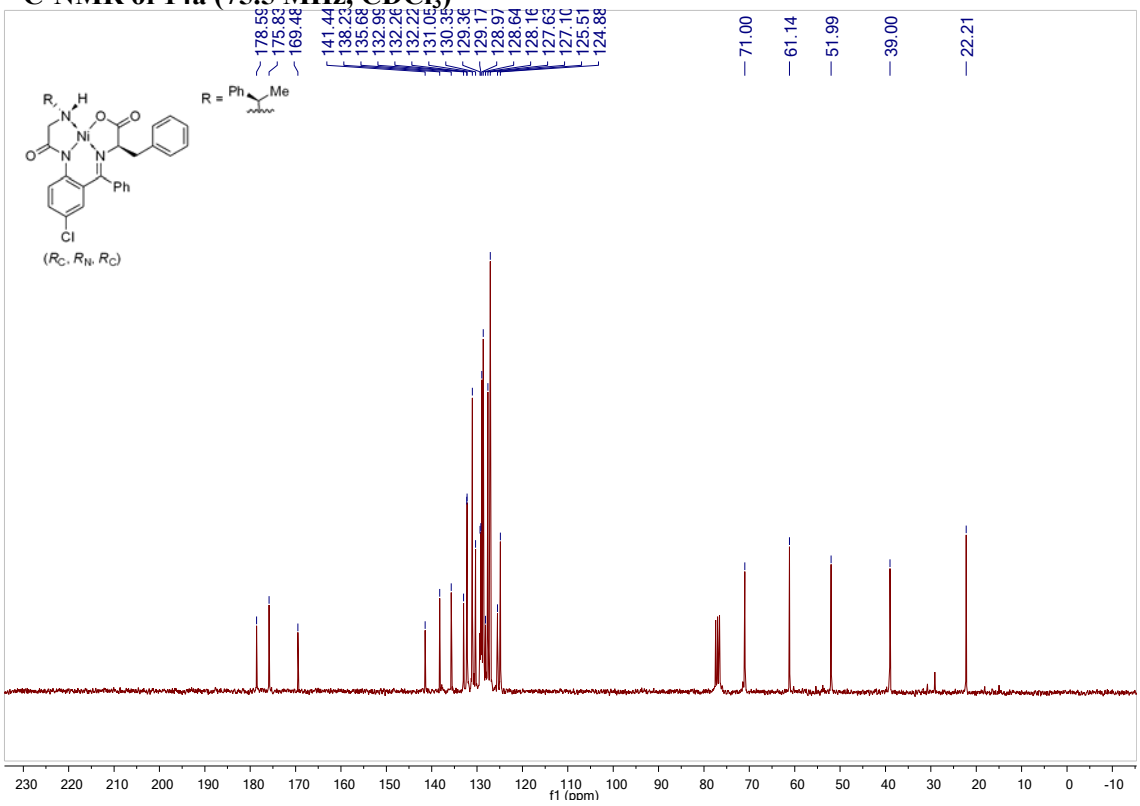

**$^{13}$C-NMR of 13 (75.5 MHz, $CDCl_3$)**



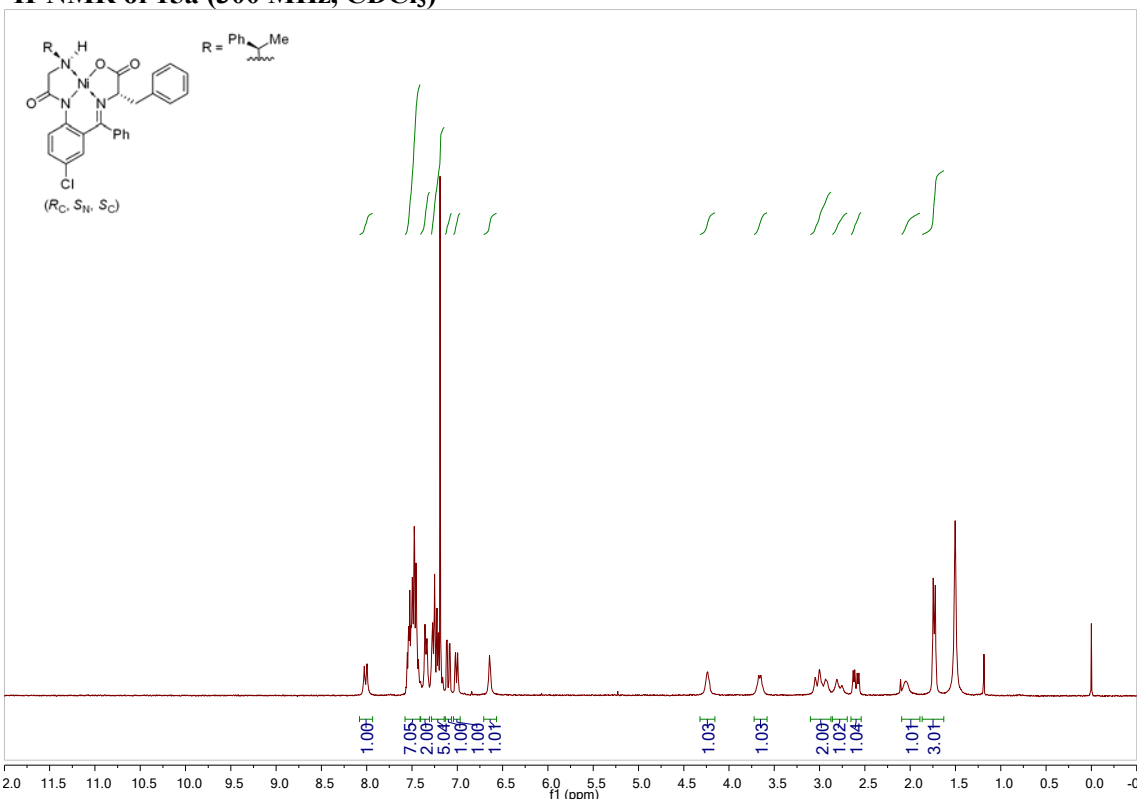
**$^{1}$H-NMR of 14a (300 MHz, $CDCl_3$)**



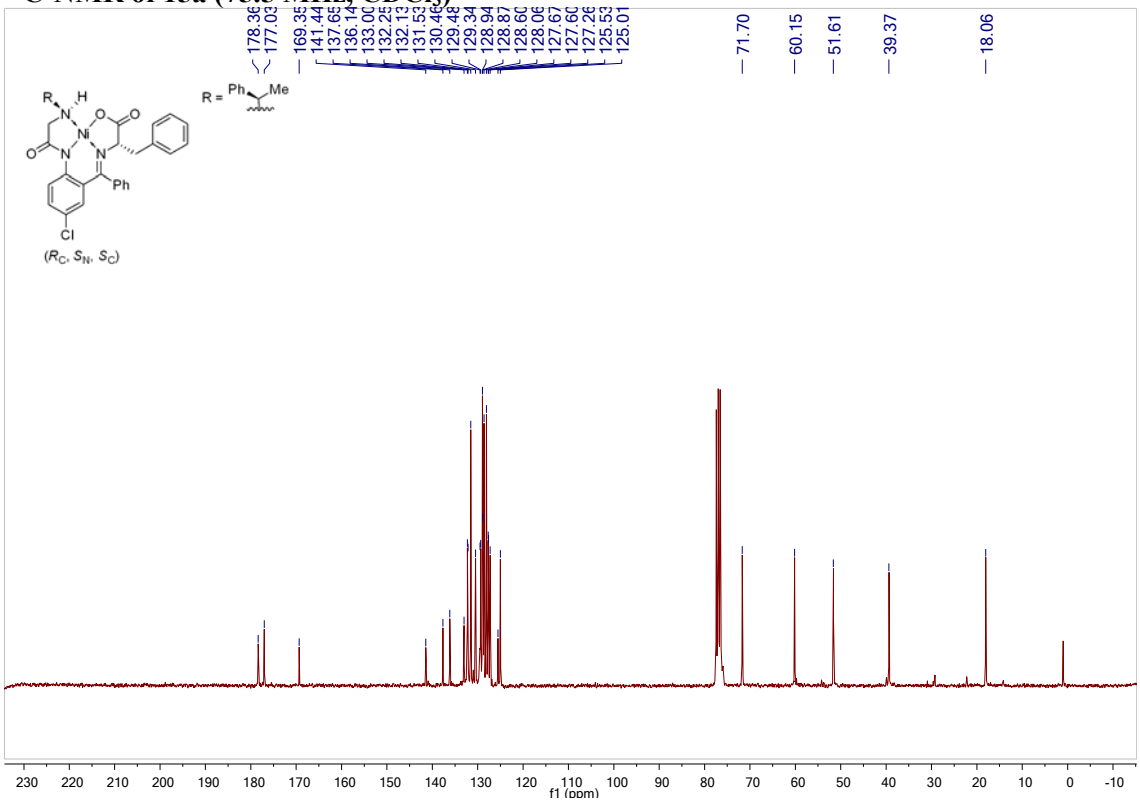

**$^{13}$C-NMR of 14a (75.5 MHz, $CDCl_3$)**



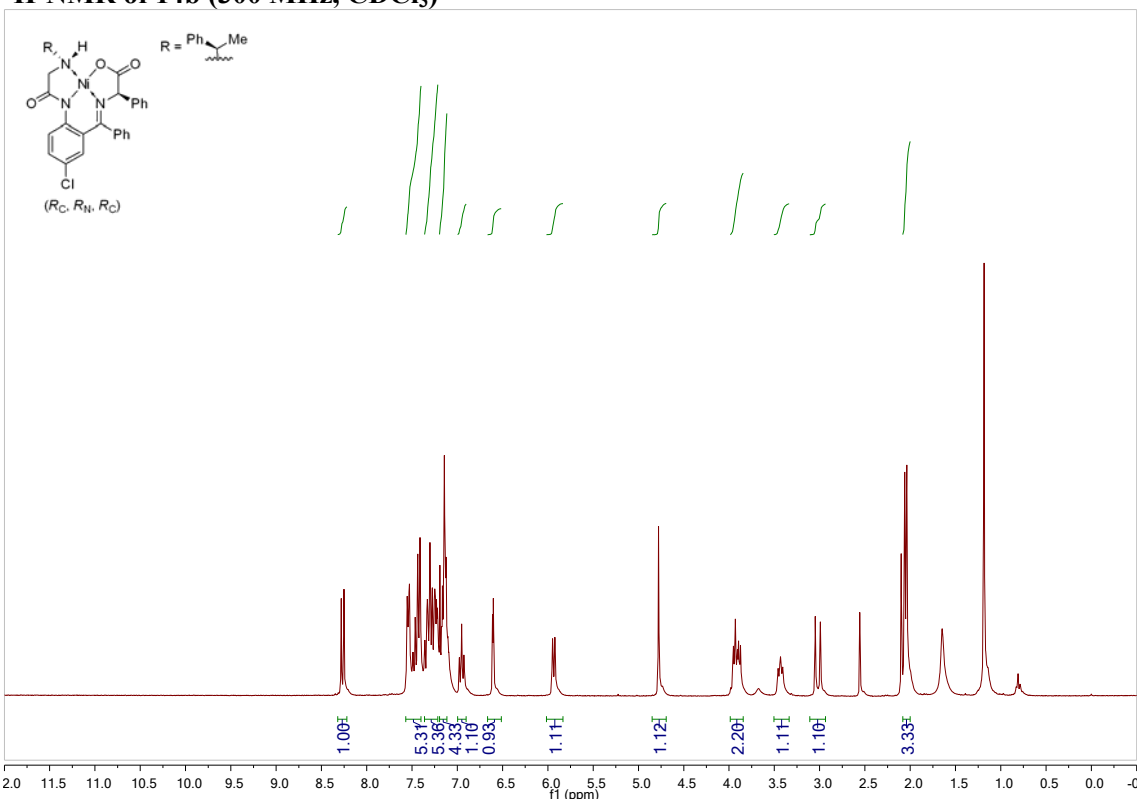
**$^{1}$H-NMR of 15a (300 MHz, $CDCl_3$)**



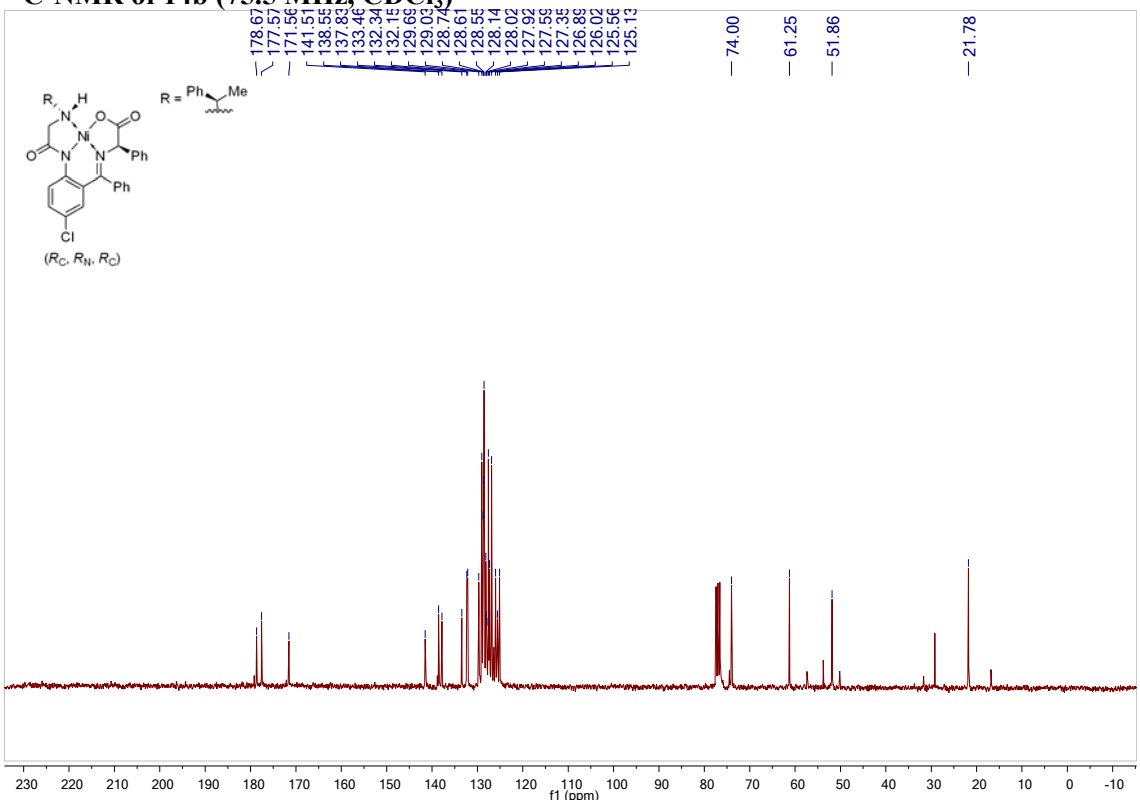

**$^{13}$C-NMR of 15a (75.5 MHz, $CDCl_3$)**



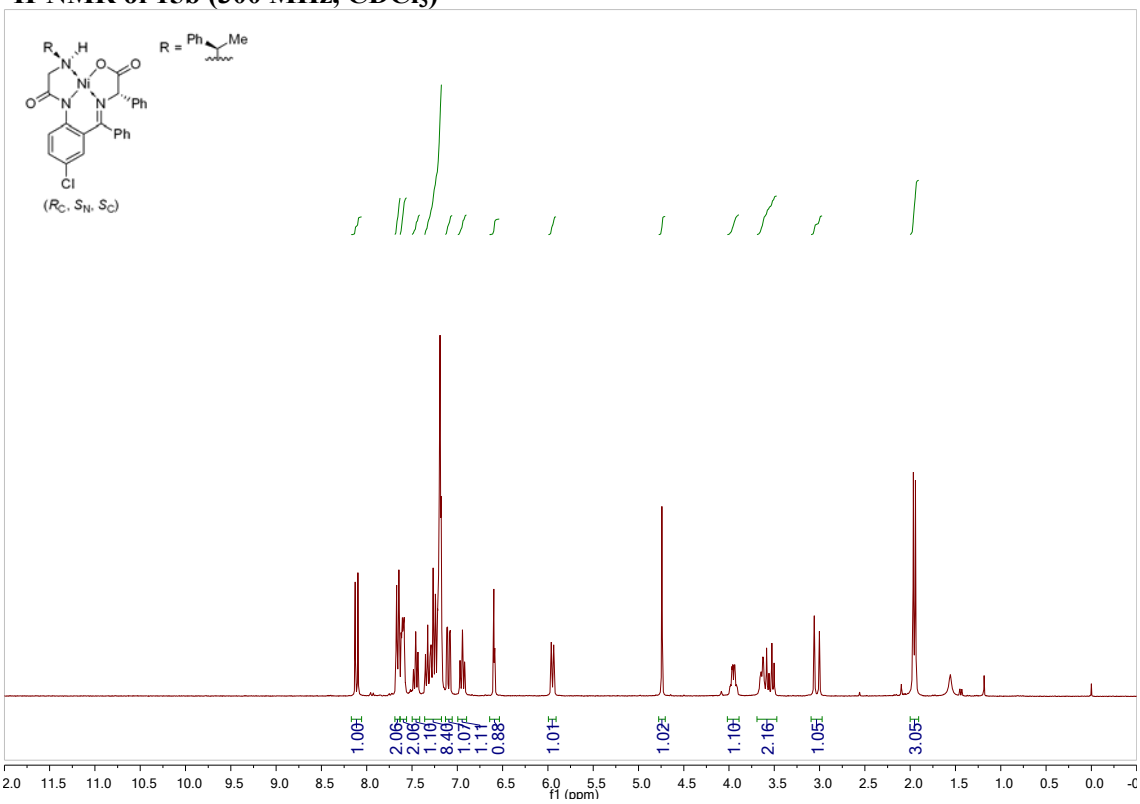
**$^{1}$H-NMR of 14b (300 MHz, $CDCl_3$)**



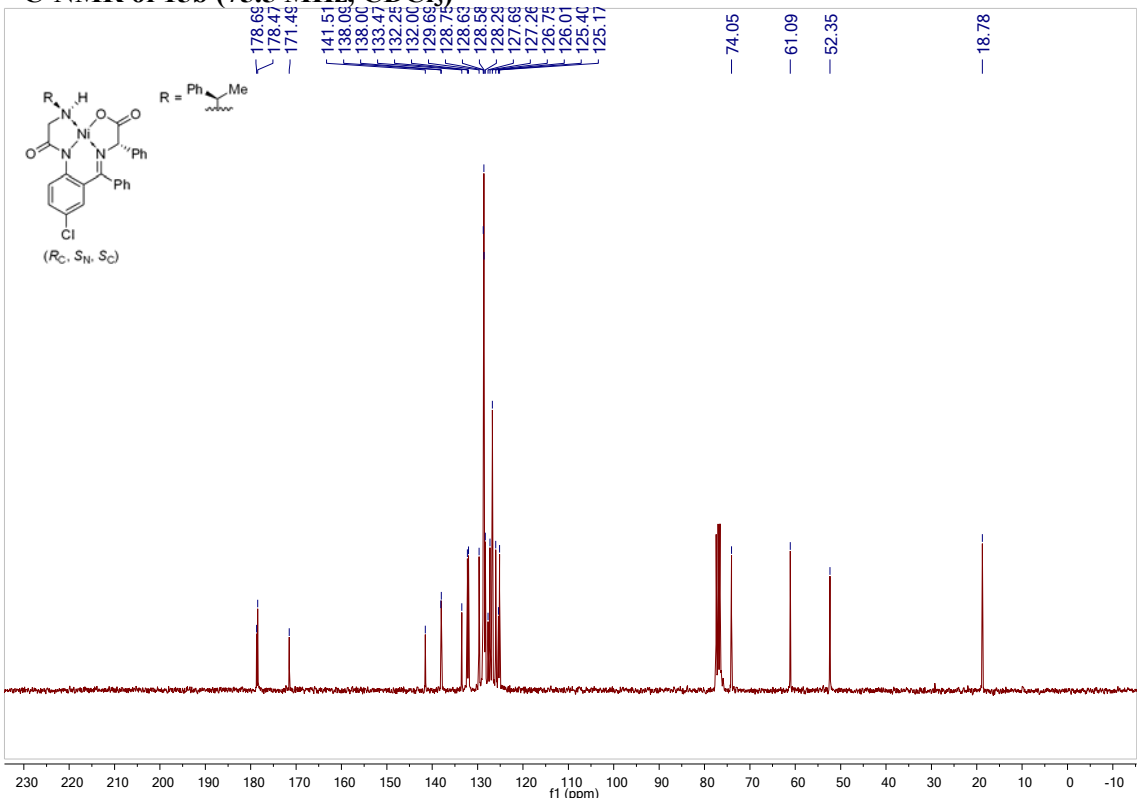

**$^{13}$C-NMR of 14b (75.5 MHz, $CDCl_3$)**



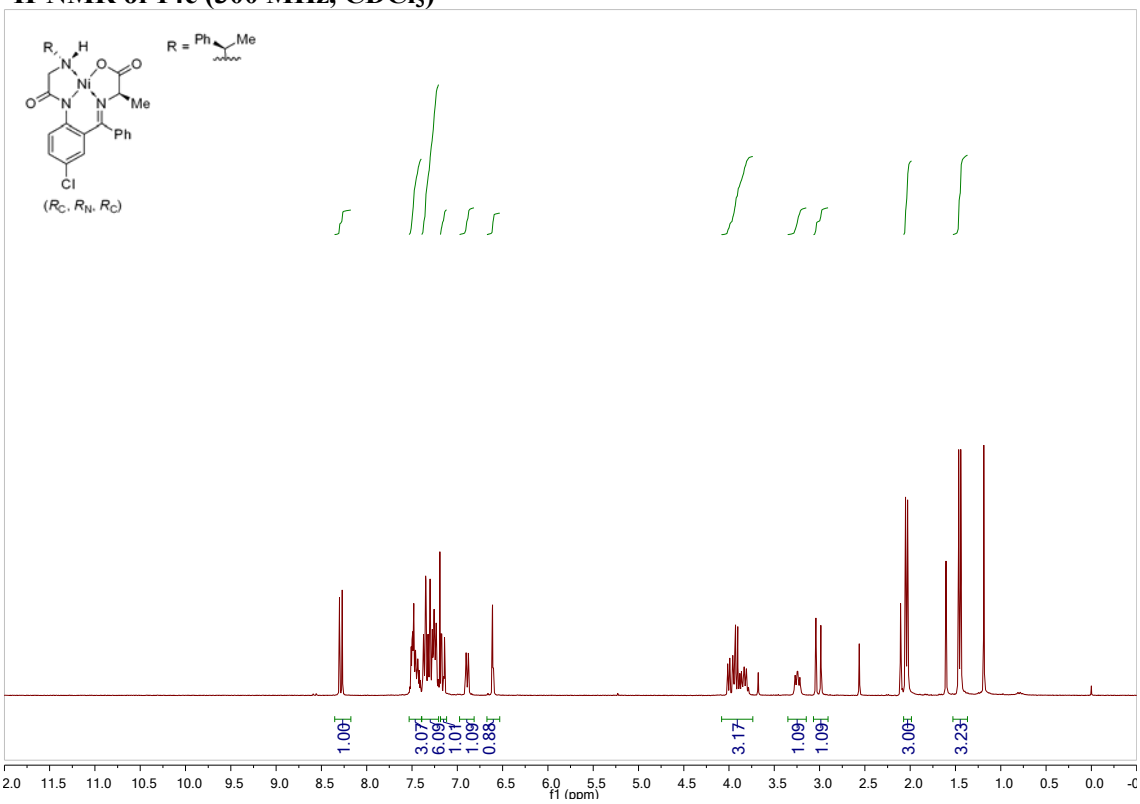
**$^{1}$H-NMR of 15b (300 MHz, $CDCl_3$)**



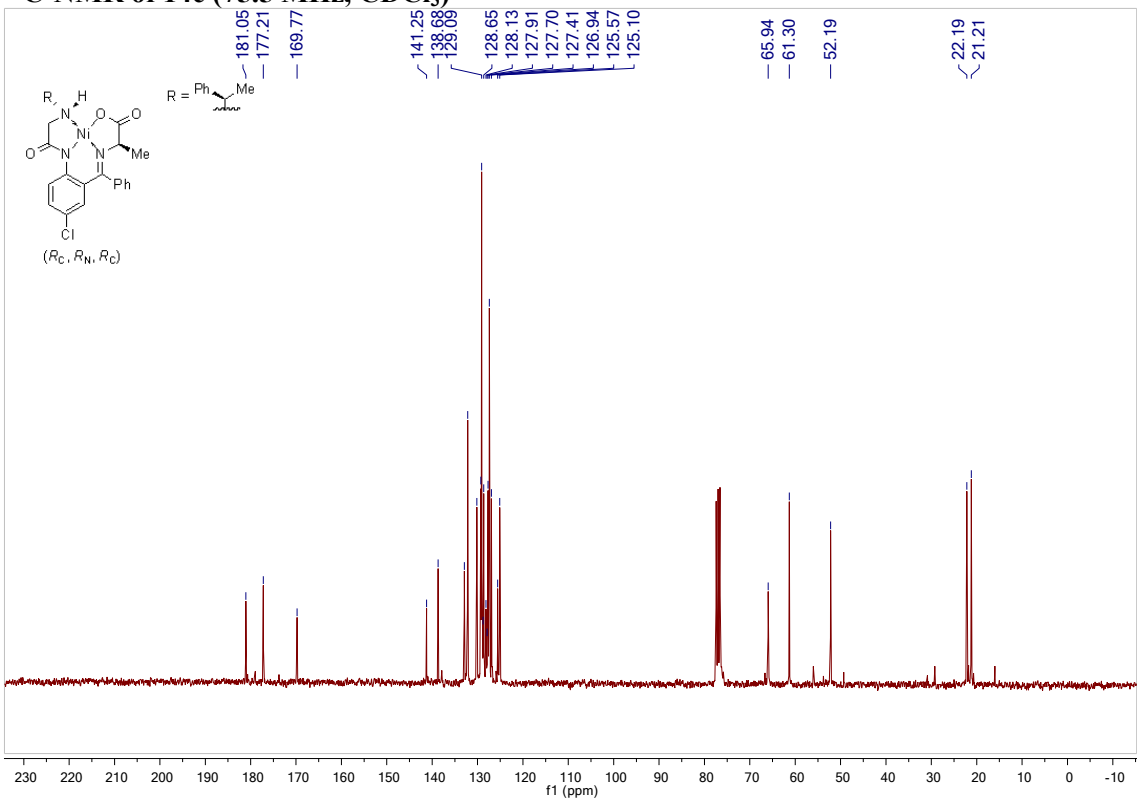

**$^{13}$C-NMR of 15b (75.5 MHz, $CDCl_3$)**



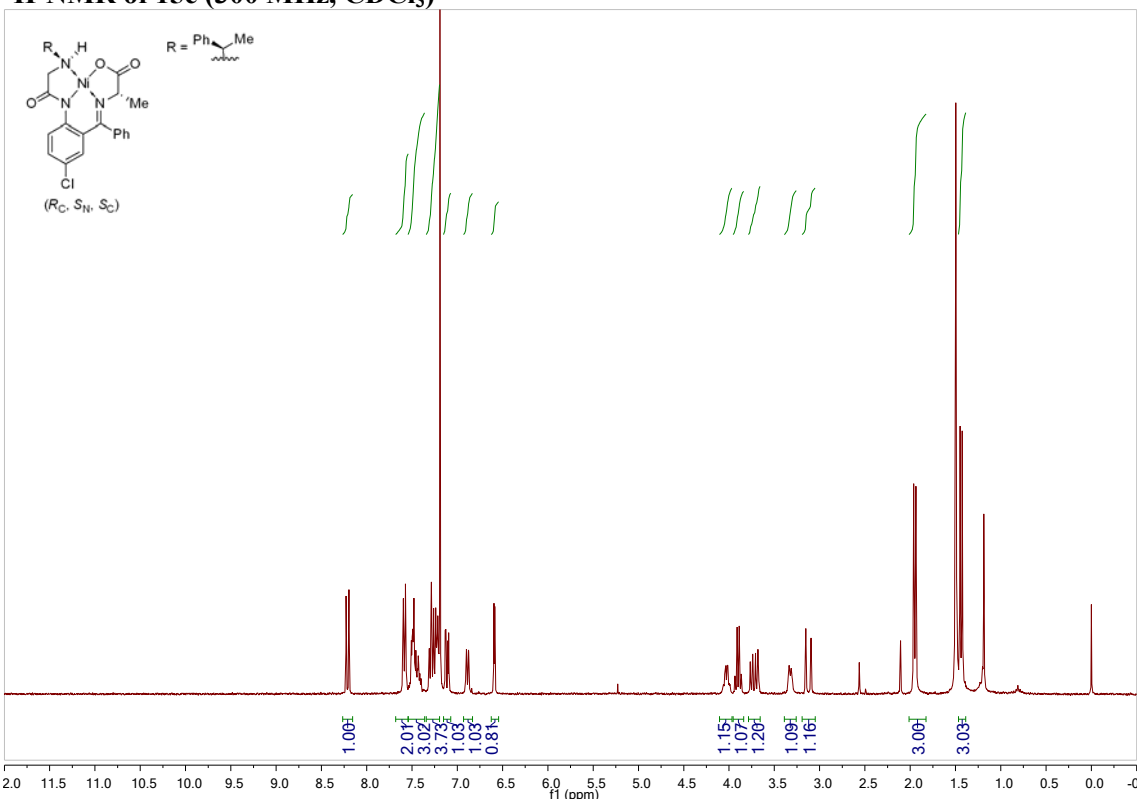
**$^{1}$H-NMR of 14c (300 MHz, $CDCl_3$)**



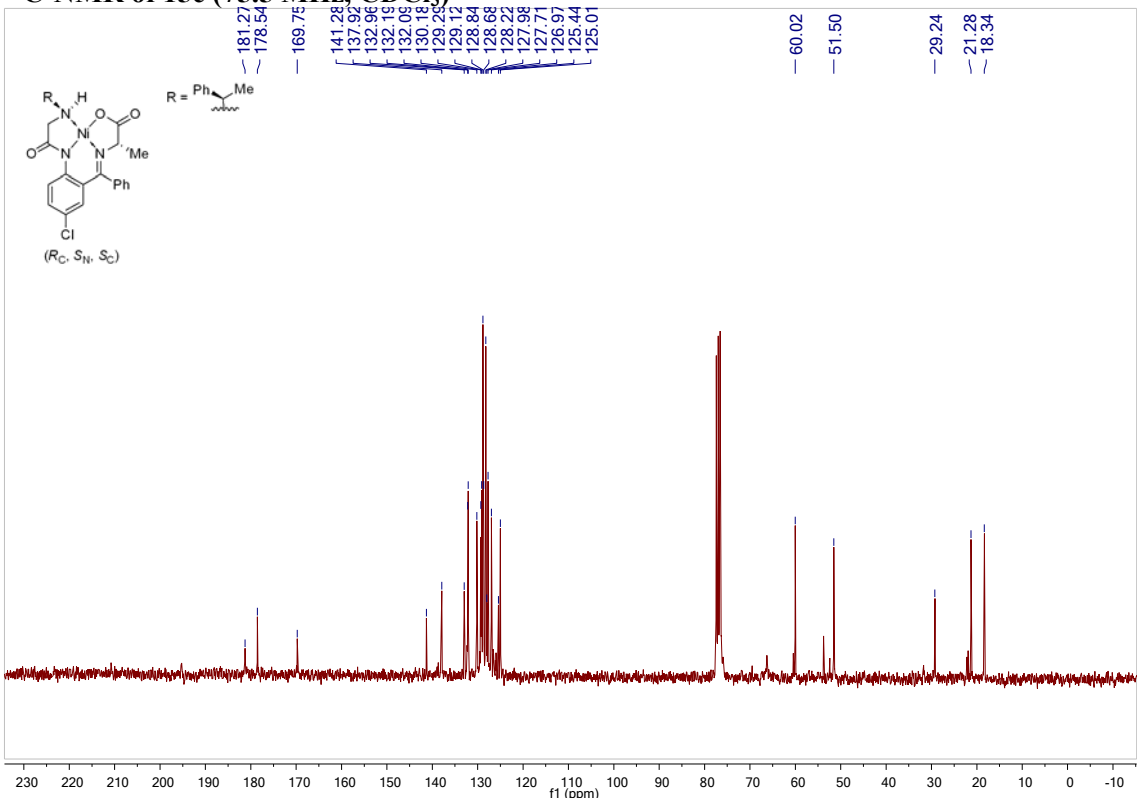

**$^{13}$C-NMR of 14c (75.5 MHz, $CDCl_3$)**



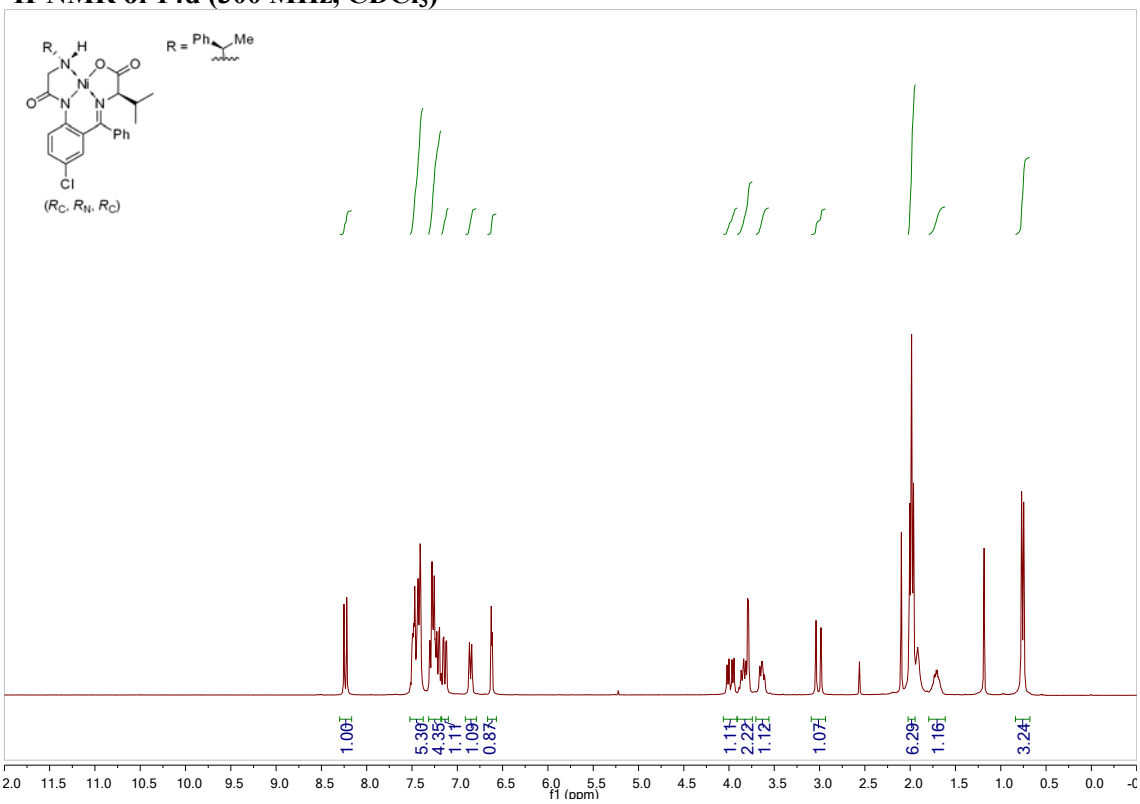
**$^{1}$H-NMR of 15c (300 MHz, $CDCl_3$)**



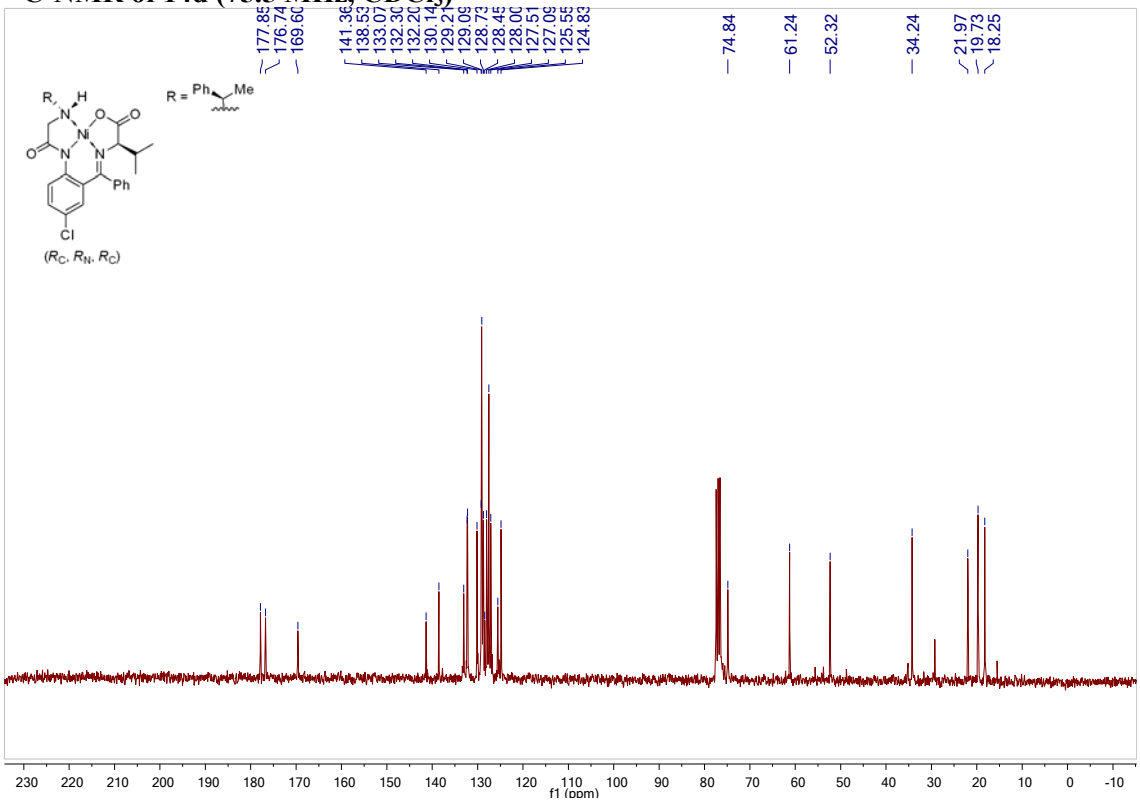

**$^{13}$C-NMR of 15c (75.5 MHz, $CDCl_3$)**



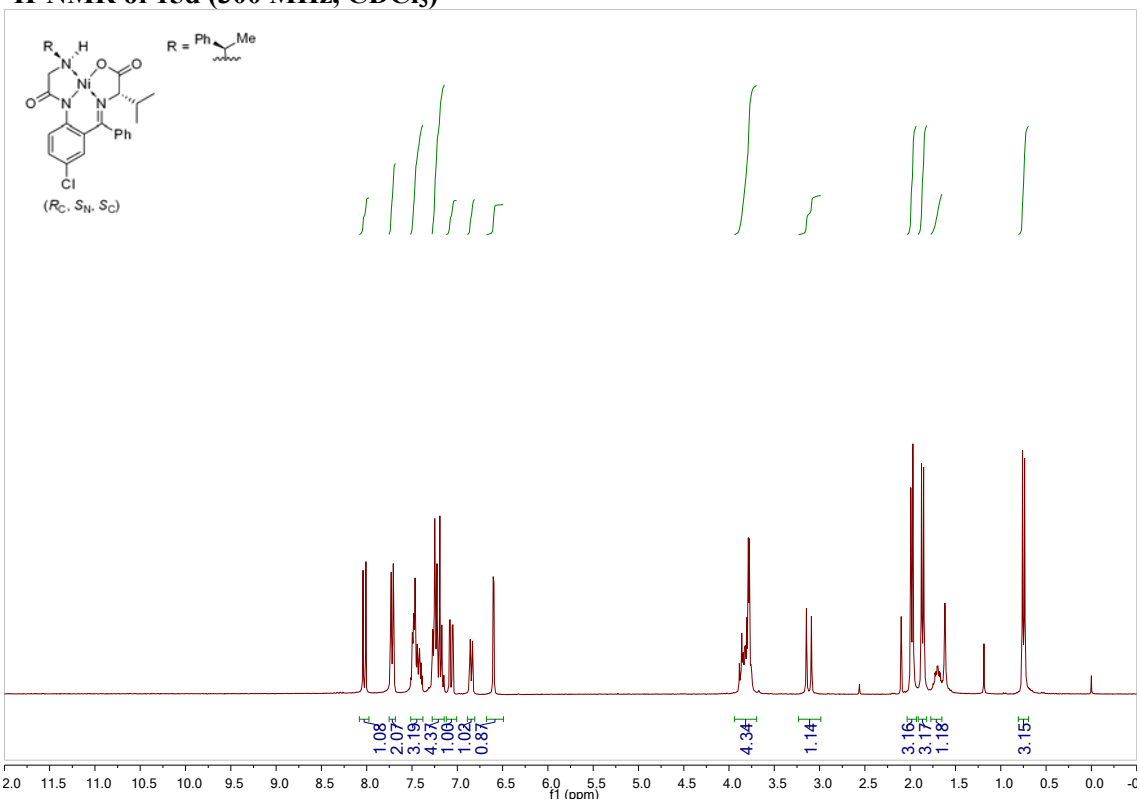
**$^{1}$H-NMR of 14d (300 MHz, $CDCl_3$)**



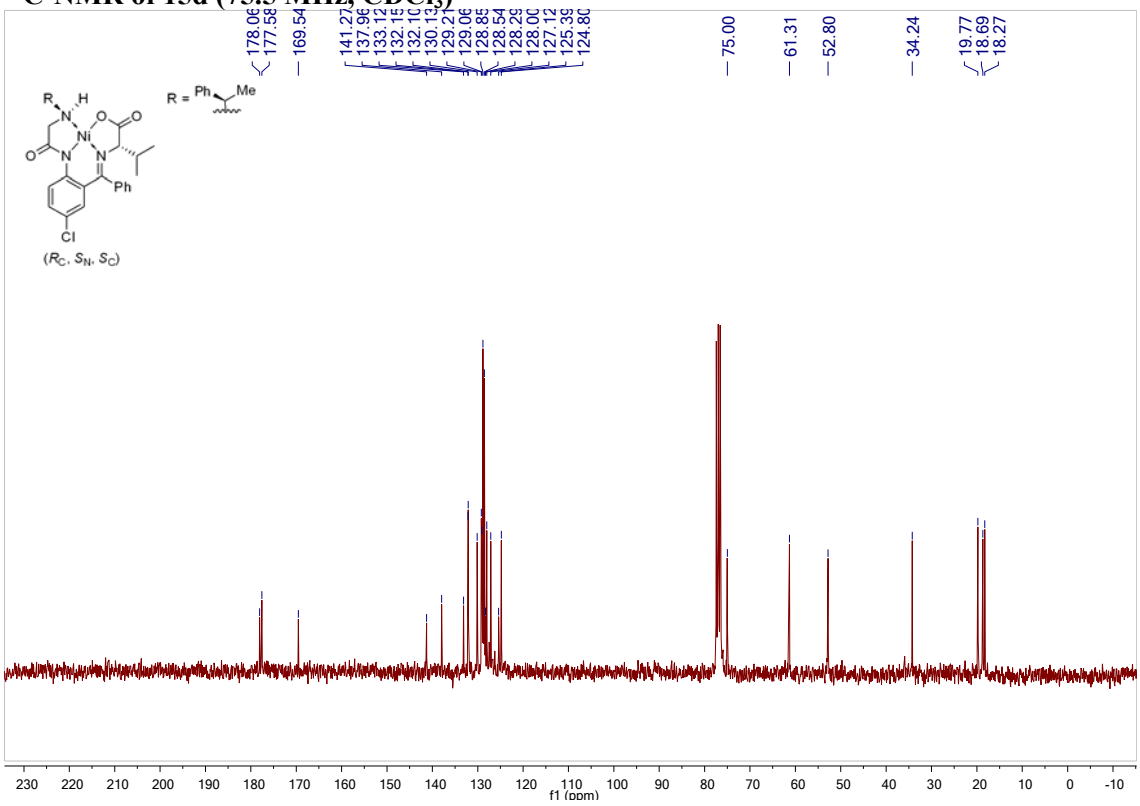

**$^{13}$C-NMR of 14d (75.5 MHz, $CDCl_3$)**



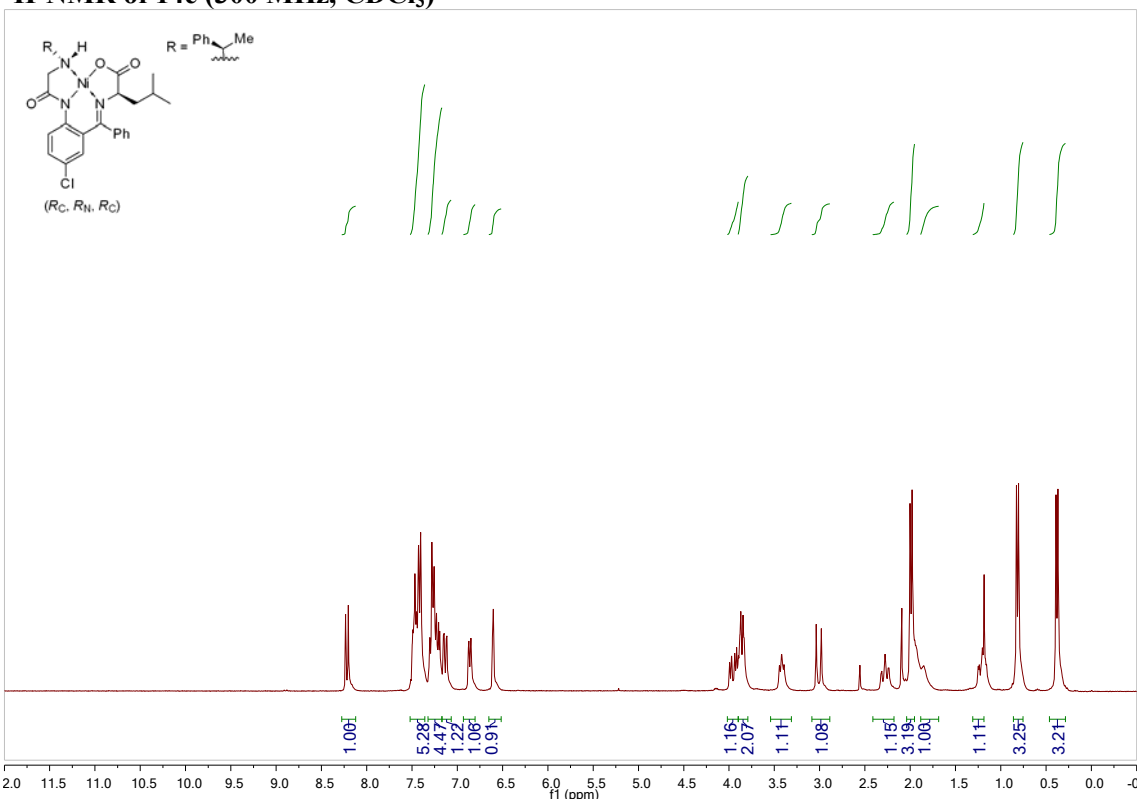
**$^{1}$H-NMR of 15d (300 MHz, $CDCl_3$)**



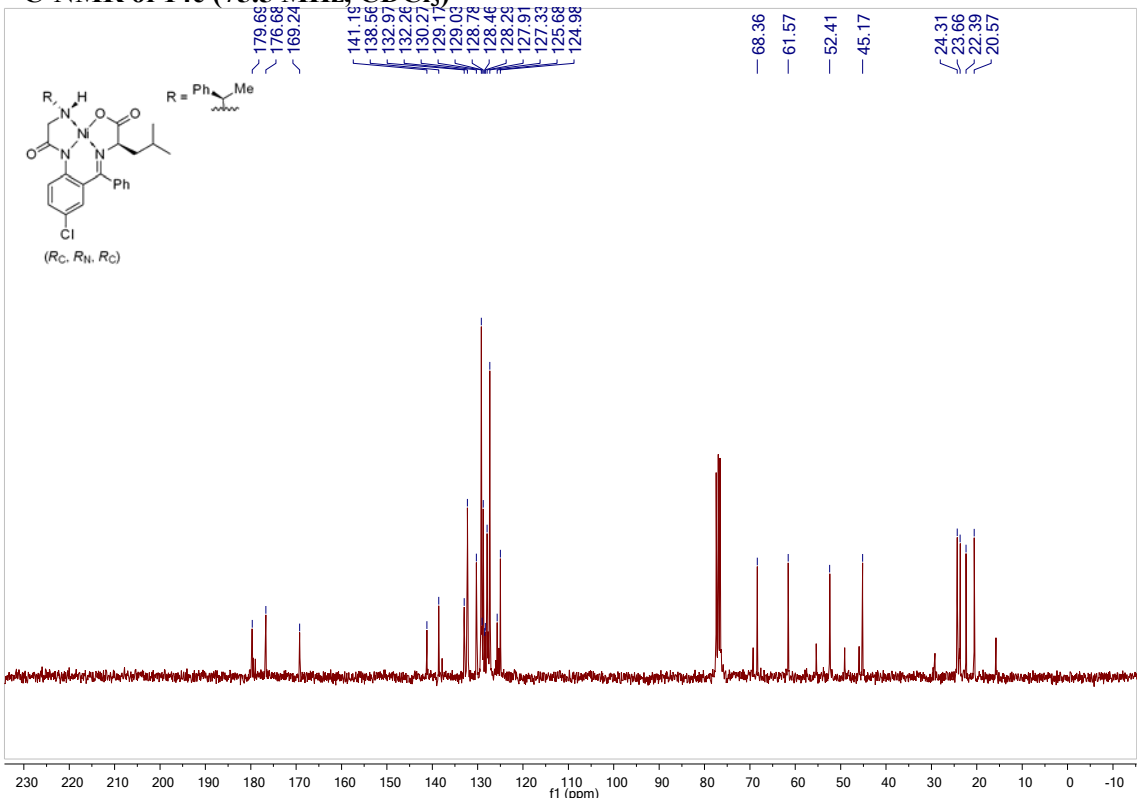

**$^{13}$C-NMR of 15d (75.5 MHz, $CDCl_3$)**



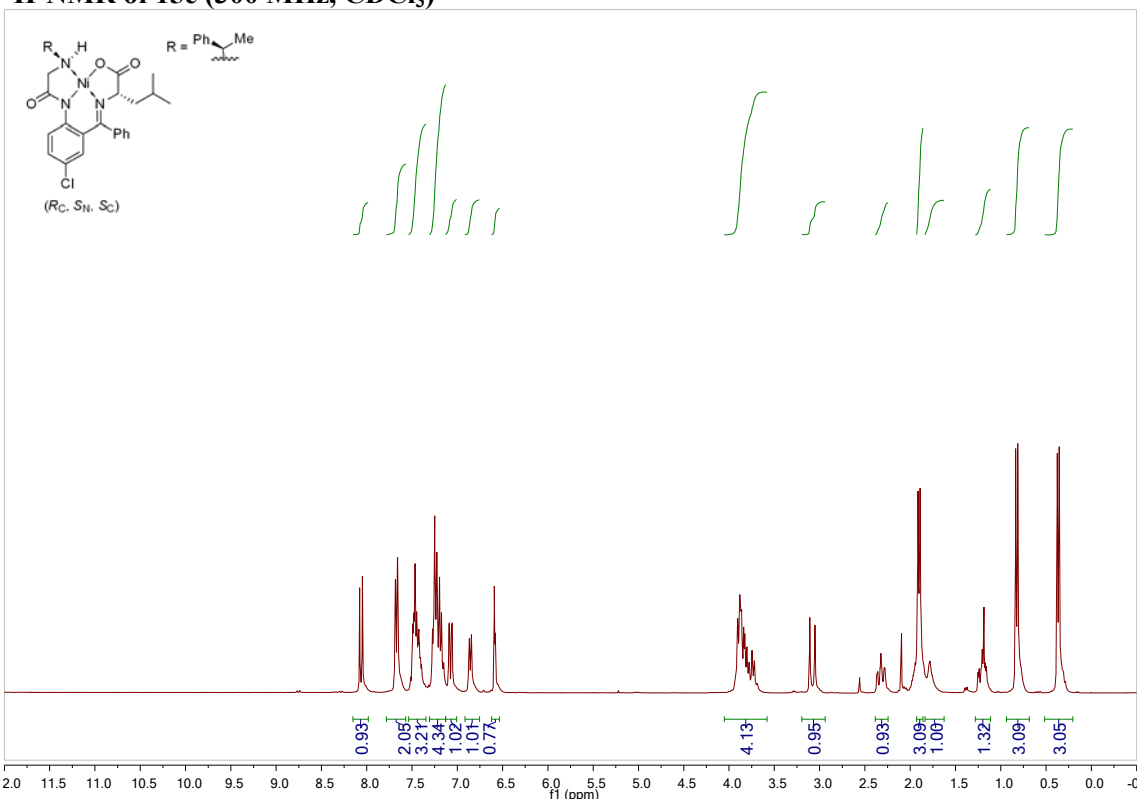
**$^{1}$H-NMR of 14e (300 MHz, $CDCl_3$)**



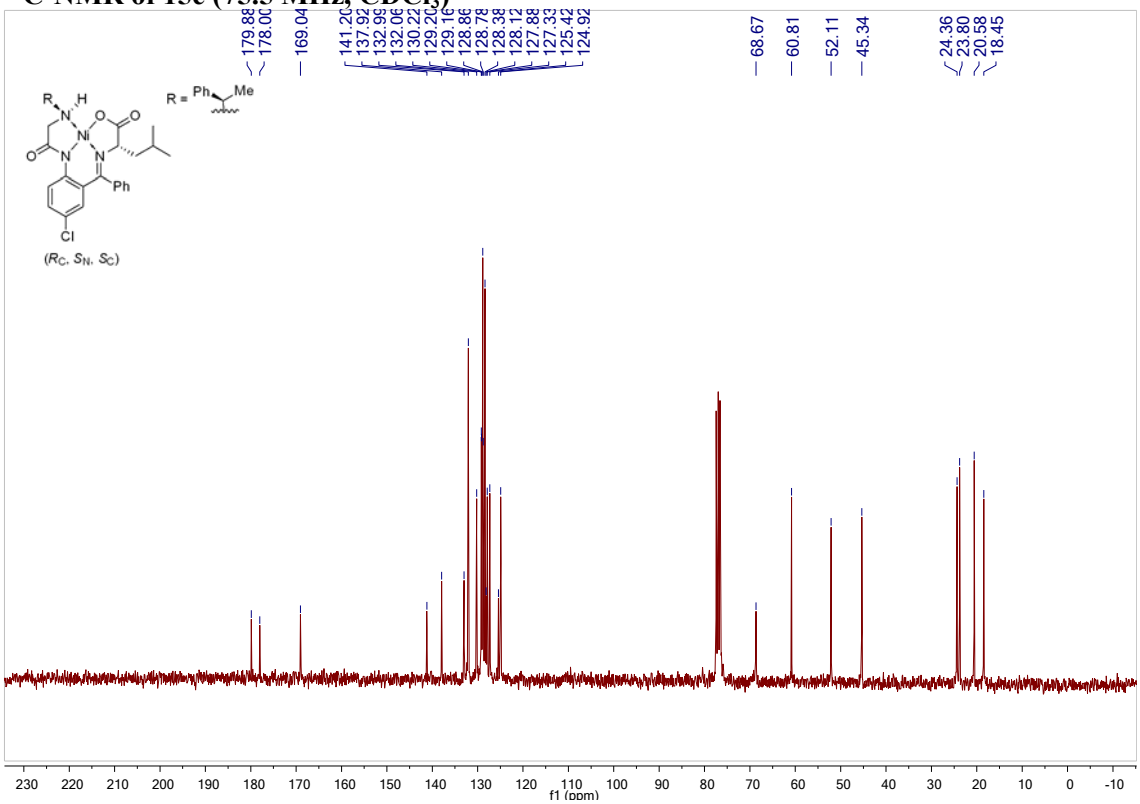

**$^{13}$C-NMR of 14e (75.5 MHz, $CDCl_3$)**



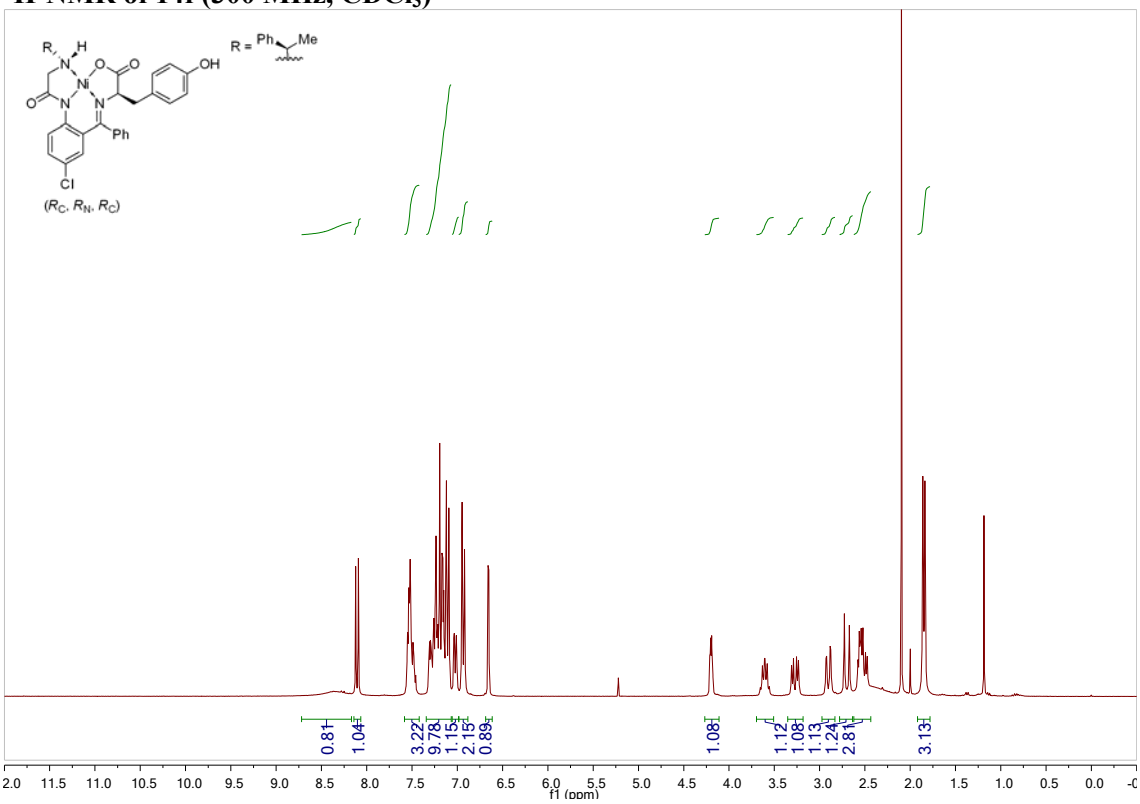
**$^{1}$H-NMR of 15e (300 MHz, $CDCl_3$)**



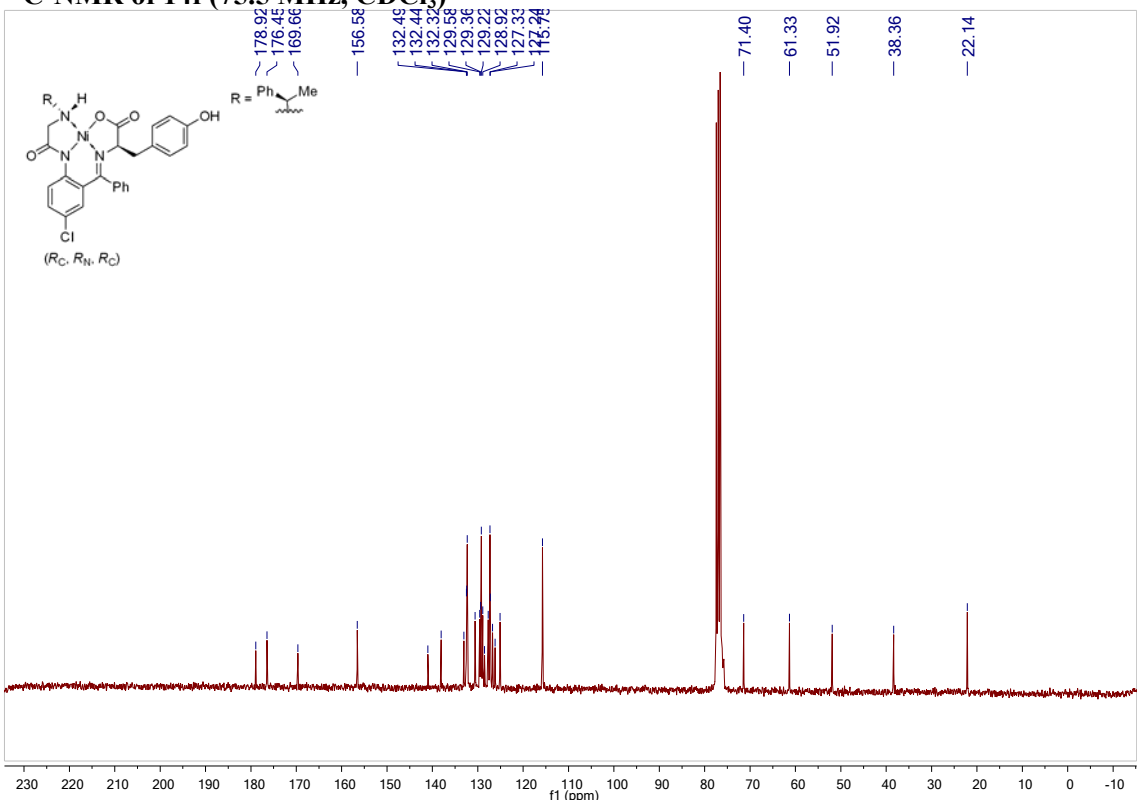

**$^{13}$C-NMR of 15e (75.5 MHz, $CDCl_3$)**



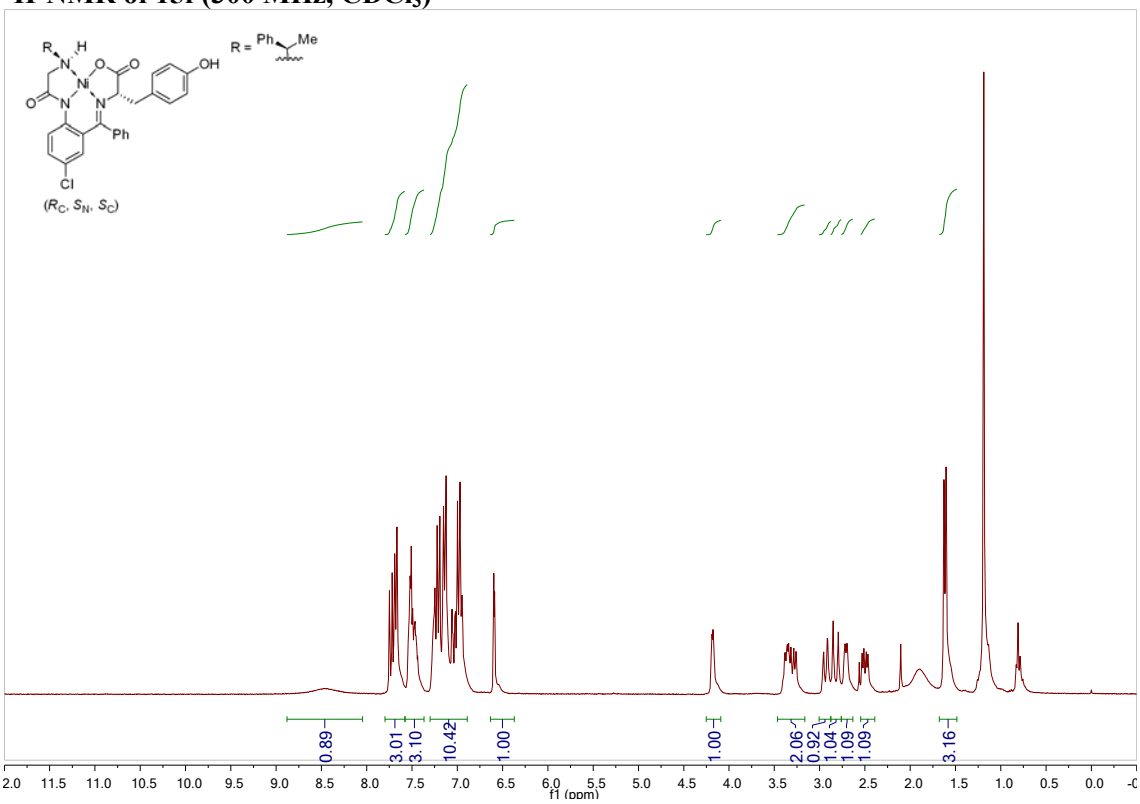
**$^{1}$H-NMR of 14f (300 MHz, $CDCl_3$)**



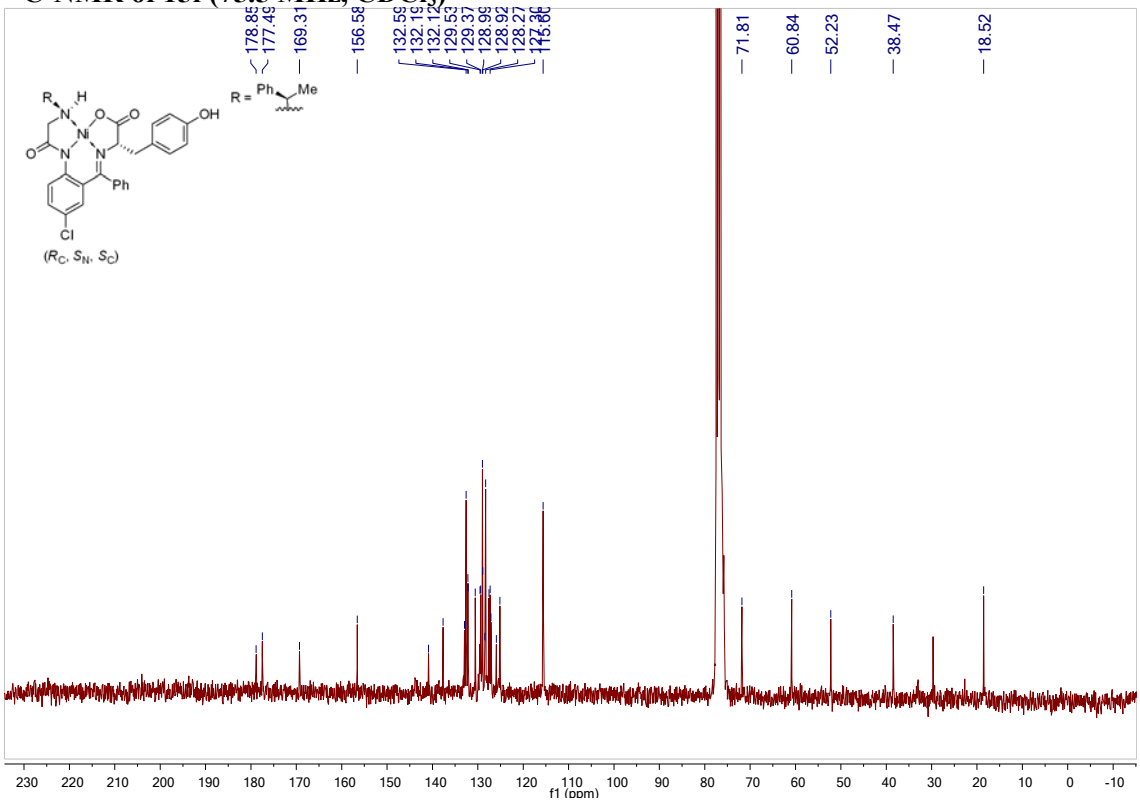

**$^{13}$C-NMR of 14f (75.5 MHz, $CDCl_3$)**



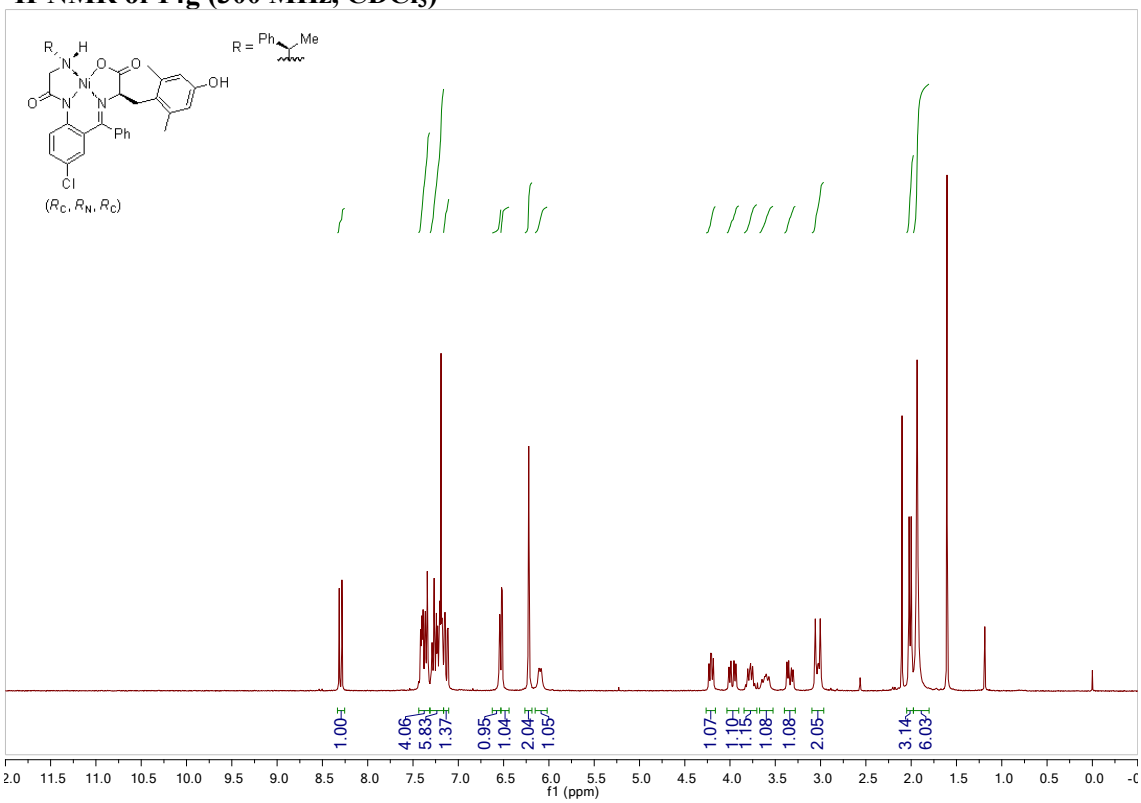
**$^{1}$H-NMR of 15f (300 MHz, $CDCl_3$)**



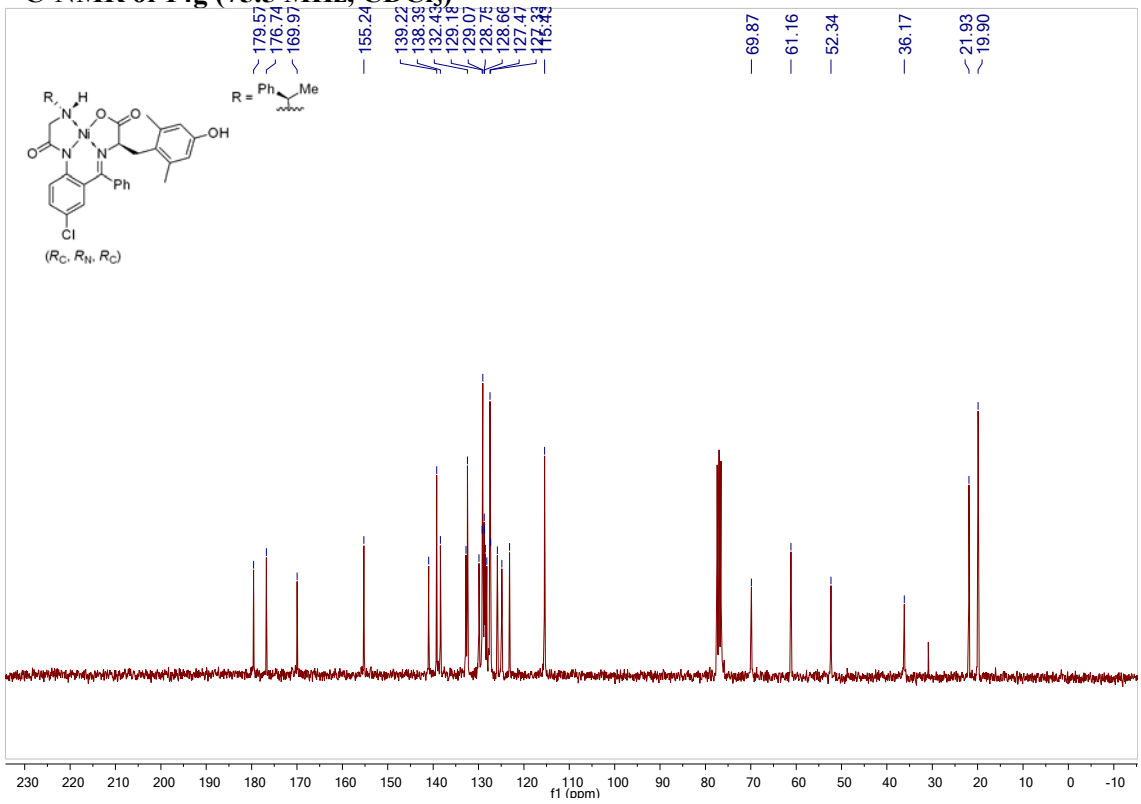

**$^{13}$C-NMR of 15f (75.5 MHz, $CDCl_3$)**



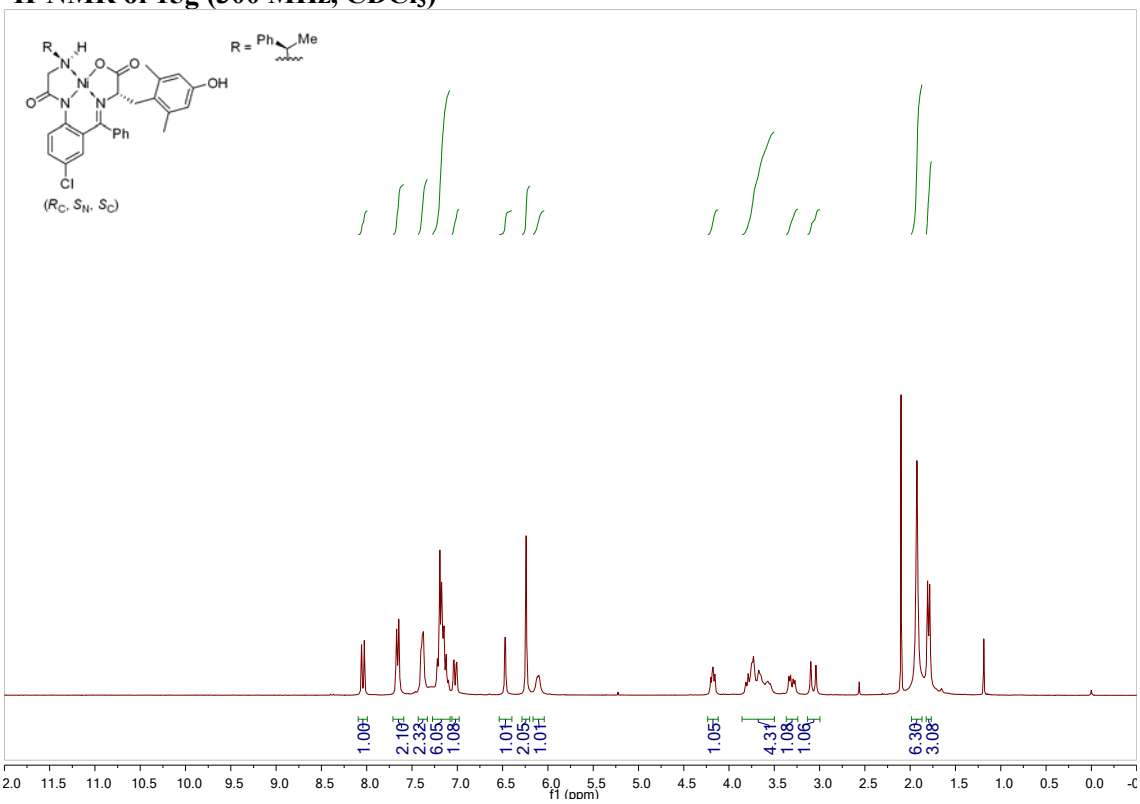
**$^{1}$H-NMR of 14g (300 MHz, $CDCl_3$)**



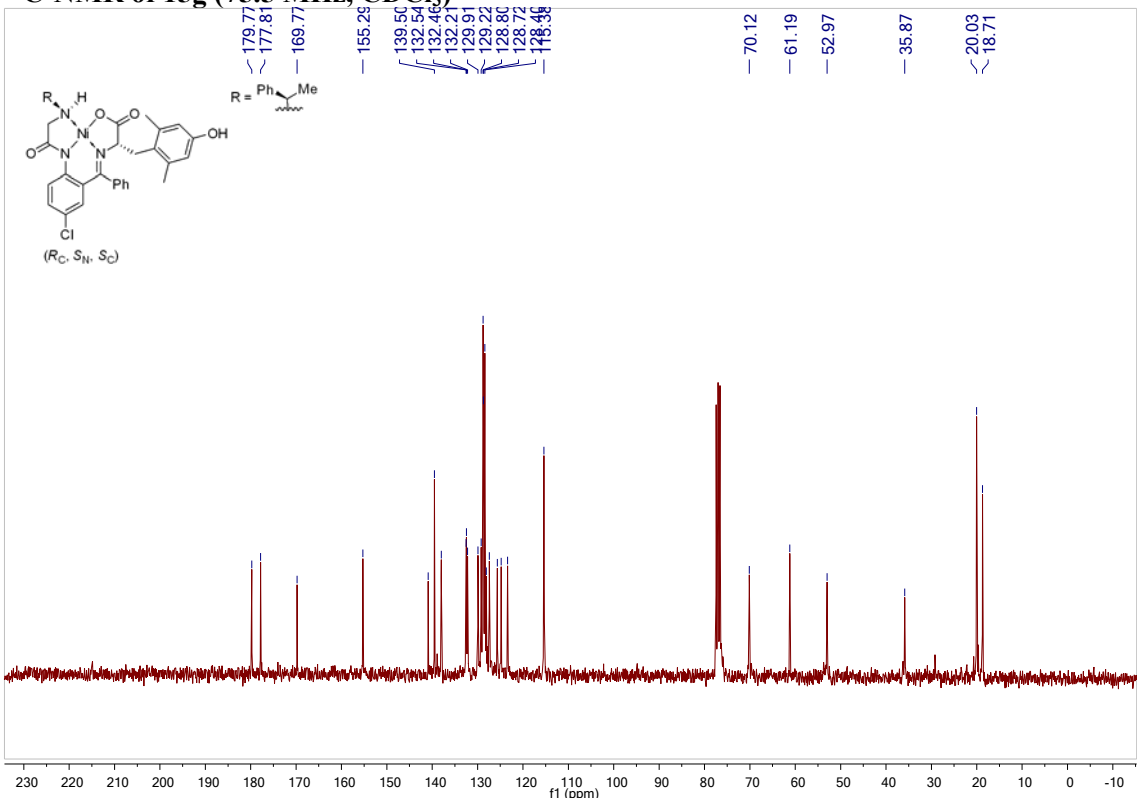

**$^{13}$C-NMR of 14g (75.5 MHz, $CDCl_3$)**



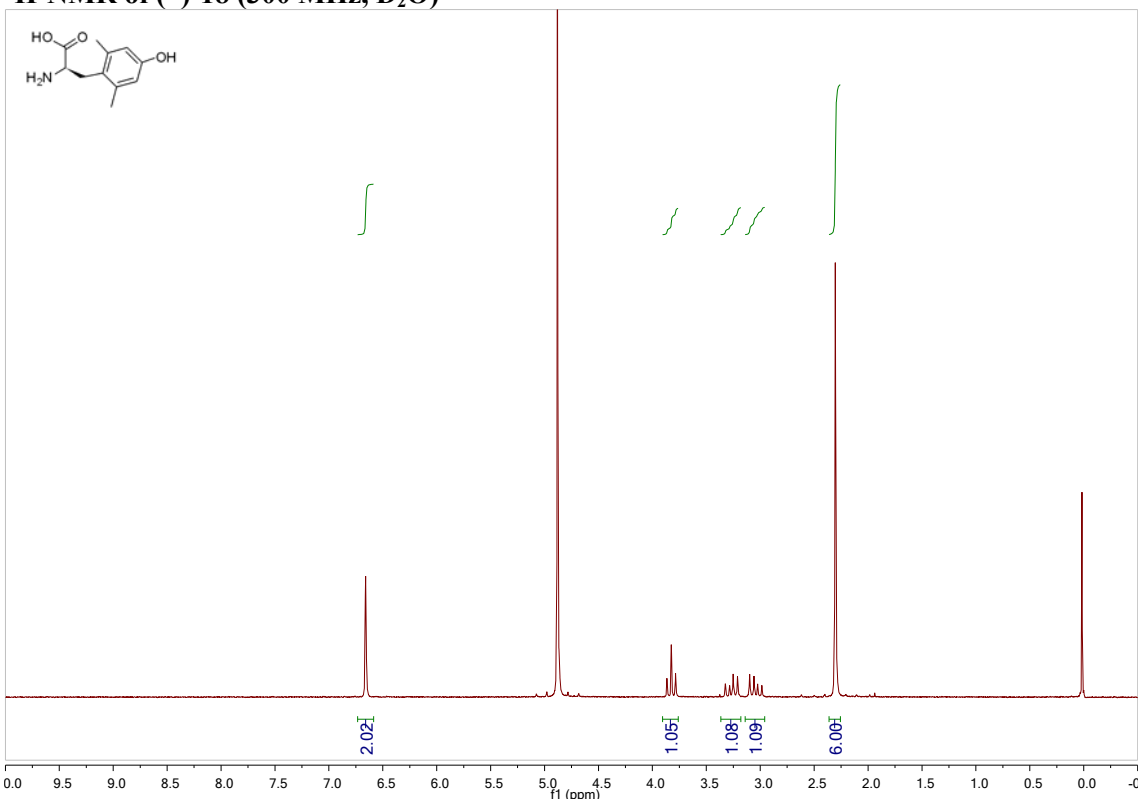
**$^{1}$H-NMR of 15g (300 MHz, $CDCl_3$)**



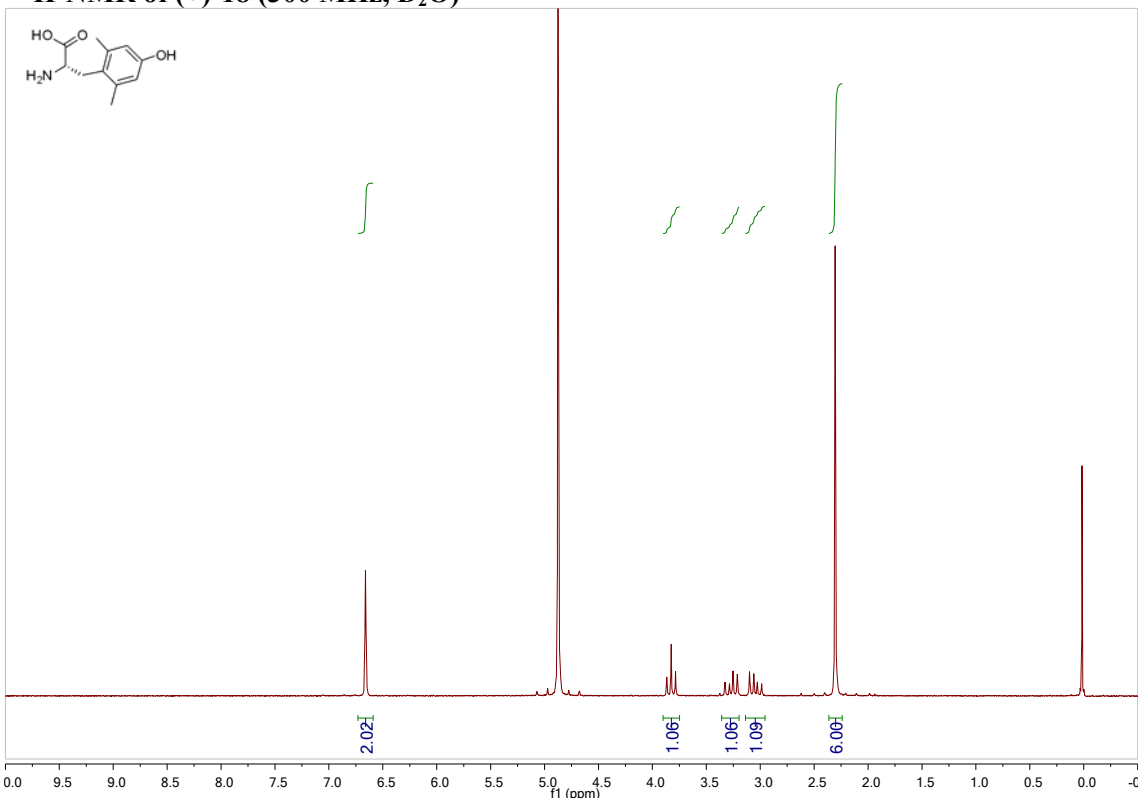

**$^{13}$C-NMR of 15g (75.5 MHz, $CDCl_3$)**



**$^1$H-NMR of (–)-18 (300 MHz, $D_2O$)**




**$^1$H-NMR of (+)-18 (300 MHz, $D_2O$)**



**$^1$H-NMR of recovered (*R*)-9 (300 MHz, $CDCl_3$)**