

# **Evaluating polymer-supported isothiourea catalysis in industrially-preferable solvents for the acylative kinetic resolution of secondary and tertiary heterocyclic alcohols in batch and flow**

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## **Supporting Information**

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## General Experimental

Reactions involving moisture sensitive reagents were carried out in flame-dried glassware under an argon or nitrogen atmosphere using standard vacuum line techniques, and using anhydrous solvents. Anhydrous solvents (THF and toluene) were obtained from an anhydrous solvent system (purified using an alumina column, Mbraun SPS-800). All other reactions were performed in standard glassware with no precautions to exclude air or moisture. Solvents and commercial reagents were used as supplied without further purification unless otherwise stated.

Room temperature (r.t.) refers to 20–25 °C. Temperatures of 0 °C and –78 °C were obtained using ice/water and CO<sub>2</sub>(s)/acetone baths respectively. Reflux conditions were obtained using a DrySyn, oil bath or sand bath equipped with a contact thermometer.

‘*in vacuo*’ refers to the use of either a Büchi Rotavapor R-200 with a Büchi V-491 heating bath and Büchi V-800 vacuum controller, a Büchi Rotavapor R-210 with a Büchi V-491 heating bath and Büchi V-850 vacuum controller, a Heidolph Laborota 4001 with vacuum controller, an IKA RV10 rotary evaporator with a IKA HB10 heating bath and ILMVAC vacuum controller, or an IKA RV10 rotary evaporator with a IKA HB10 heating bath and Vacuubrand CVC3000 vacuum controller. Rotary evaporator condensers are fitted to Julabo FL601 Recirculating Coolers filled with ethylene glycol and set to –5 °C.

Analytical thin layer chromatography was performed on pre-coated aluminium plates (Kieselgel 60 F<sub>254</sub> silica). TLC visualisation was carried out with ultraviolet light (254 nm), followed by staining with a 1% aqueous KMnO<sub>4</sub> solution. Manual column chromatography was performed in glass columns fitted with porosity 3 sintered discs over Kieselgel 60 silica using the solvent system stated. Automated chromatography was performed on a Biotage Isolera Four running Biotage OS578 with a UV/Vis detector using the method stated and cartridges filled with Kieselgel 60 silica.

Melting points were recorded on an Electrothermal 9100 melting point apparatus and are uncorrected.

Optical rotations were measured on a Perkin Elmer Precisly/Model-341 polarimeter operating at the sodium D line with a 100 mm path cell at 20 °C.

HPLC analyses were obtained using either a Shimadzu HPLC consisting of a DGU-20A5 degassing unit, LC-20AT liquid chromatography pump, SIL-20AHT autosampler, CMB-20A communications bus module, SPD-M20A diode array detector and a CTO-20A column oven; or a Shimadzu HPLC consisting of a DGU-20A5R degassing unit, LC-20AD liquid chromatography pump, SIL-20AHT autosampler, SPD-20A UV/Vis detector and a CTO-20A column oven. Separation was achieved using DAICEL CHIRALCEL OD-H and OJ-H columns or DAICEL CHIRALPAK AD-H and AS-H columns. All HPLC traces of enantiomerically-enriched compounds were compared with authentic racemic spectra.

$^1\text{H}$ , and  $^{13}\text{C}$  nuclear magnetic resonance (NMR) spectra were acquired on either a Bruker Avance II 400 ( $^1\text{H}$  400 MHz;  $^{13}\text{C}$  101 MHz) or a Bruker Avance II 500 ( $^1\text{H}$  500 MHz;  $^{13}\text{C}$  126 MHz) spectrometer at ambient temperature in the deuterated solvent stated. All chemical shifts are quoted in parts per million (ppm) and referenced to the residual solvent peak. All coupling constants,  $J$ , are quoted in Hz. Multiplicities are indicated by: s (singlet), d (doublet), t (triplet), q (quartet), sept (septet), dd (doublet of doublets), dt (doublet of triplets), dq (doublet of quartets), td (triplet of doublets), ddd (doublet of doublet of doublets), ddt (doublet of doublet of triplets) and m (multiplet). The abbreviation Ar is used to denote aromatic, Ph to denote phenyl, Bn to denote benzyl, br to denote broad and app to denote apparent.

Infrared spectra were recorded on a Shimadzu IRAffinity-1 Fourier transform IR spectrophotometer fitted with a Specac Quest ATR accessory (diamond puck). Spectra were recorded of either thin films or solids, with characteristic absorption wave numbers ( $\nu_{\text{max}}$ ) reported in  $\text{cm}^{-1}$ .

**Continuous flow experiments.** The catalyst resin was packed into an Omnifit column [borosilicate glass; length = 100 mm (70 mm adjustable bed height); internal diameter = 10 mm; maximum bed volume 5.6 mL]. A Gilson 305 HPLC pump was used to pump solvent for column equilibration and regeneration. A Legato 200 series syringe pump (World Precision Instruments) was used to deliver solutions of reagents. A Huber Ministat was used to circulate ethylene glycol at  $-5\text{ }^\circ\text{C}$ .

**Selectivity factors** were calculated using the following equations, with all ees determined by chiral HPLC analysis. See reference 1a for the derivation, and alternative forms, of these equations.

$$s = \frac{\ln[(1-\text{conv})(1-\text{ee}_{\text{alcohol}})]}{\ln[(1-\text{conv})(1+\text{ee}_{\text{alcohol}})]} \quad \text{and,} \quad \text{conv} = \frac{\text{ee}_{\text{alcohol}}}{\text{ee}_{\text{alcohol}} + \text{ee}_{\text{ester}}}$$

where both ee and conv are given as between 0 and 1

## General Procedures

### General procedure A: Preparation of $\alpha$ -substituted arylacetic acids

Following a modified literature method<sup>2</sup>, *n*BuLi (2.2 equiv.) was added to a solution of HN<sup>*i*</sup>Pr<sub>2</sub> (2.2 equiv.) in anhydrous THF in a flame-dried round-bottomed flask under a N<sub>2</sub> atmosphere at 0 °C. The LDA solution was stirred for 30 minutes, the arylacetic acid (1.0 equiv.) was added and the reaction mixture stirred for 1 h at 0 °C. The dihaloalkane (2.2 equiv.) was added and the reaction stirred overnight at r.t.. HCl (20 mL) was added until pH 1 was reached. The aqueous layer was extracted with EtOAc (3 × 20 mL). The organic layers were combined, dried (Na<sub>2</sub>SO<sub>4</sub>), filtered and concentrated *in vacuo* to give the crude  $\alpha$ -substituted aryl acetic acid.

### General procedure B: Amidation of $\alpha$ -substituted arylacetic acids

Following a literature method<sup>3</sup>, the crude acid (1 equiv.) was dissolved in anhydrous THF and stirred at 0 °C under N<sub>2</sub>. 1,1'-Carbonyldiimidazole (0.95 equiv.) was added and the mixture stirred for 1 h. The desired amine (1.2 equiv.) was added and the reaction mixture warmed to r.t. and stirred for 2 h. Et<sub>2</sub>O (30 mL) and Na<sub>2</sub>CO<sub>3</sub> (5 mL) were then added and the organic layer separated, washed with brine (30 mL), dried (MgSO<sub>4</sub>), filtered and concentrated *in vacuo*.

### General procedure C: Preparation of racemic pyrrolidine alcohol substrates

Following a literature method<sup>3</sup>, NaH (60% in mineral oil) (5 equiv.) was added to the amide (1 equiv.) in anhydrous THF under N<sub>2</sub>, and the mixture stirred for 2 h. The reaction was then exposed to air and stirred for 16 h. On completion, NH<sub>4</sub>Cl (30 mL) was added and the aqueous layer was extracted with EtOAc (3 × 30 mL). The organics were combined, dried (MgSO<sub>4</sub>), filtered and concentrated *in vacuo*. On occasions when hydroperoxide formation was observed

by  $^1\text{H}$  NMR spectroscopic analysis of the crude product, the mixture was dissolved in anhydrous MeOH (15 mL) and  $\text{NaBH}_4$  (1.5 equiv.) was added and the mixture stirred for 3 h. 1 M HCl (10 mL) was added and the mixture stirred for a further 1 h. The product was extracted with  $\text{CH}_2\text{Cl}_2$  ( $3 \times 20$  mL), washed with brine (20 mL), dried ( $\text{MgSO}_4$ ), filtered and concentrated *in vacuo*.

**General procedure D:** *Preparation of racemic esters*

An anhydride (1.2 equiv.) and DMAP (10 mol%) were added to a solution of alcohol (1 equiv.) in  $\text{CH}_2\text{Cl}_2$ . *i*- $\text{Pr}_2\text{NEt}$  (1.2 equiv.) was added and the reaction mixture was stirred at r.t. for 18 h.  $\text{CH}_2\text{Cl}_2$  was added and the organic phase washed sequentially with 1 M HCl ( $2 \times 10$  mL), sat. aq.  $\text{NaHCO}_3$  ( $2 \times 10$  mL) and brine (10 mL), dried ( $\text{MgSO}_4$ ), filtered and concentrated *in vacuo*. The ester products were purified by Biotage® Isolera™ 4 [SNAP Ultra 10 g,  $40 \text{ mL min}^{-1}$ , hexane:EtOAc (100:0 2 CV, 100:0 to 70:40 30 CV, (16 ml each))] to afford pure esters.

**General Procedure E:** *Acylative kinetic resolution of secondary alcohols using solid supported isothiourea catalyst*

A solid supported isothiourea catalyst (5 mol%), appropriate anhydride (0.55 equiv) and *i*- $\text{Pr}_2\text{NEt}$  (0.55 equiv) were added to a solution of the appropriate alcohol (1 equiv.) in the required solvent at r.t.. The solution was allowed to stir for the time given. The reaction mixture was filtered under vacuum through a sintered funnel (porosity 4), and the catalyst resin washed with  $\text{CH}_2\text{Cl}_2$  (30 mL). The filtrate was concentrated *in vacuo* and the residue purified by Biotage® Isolera™ 4 [SNAP Ultra 10 g,  $75 \text{ mL min}^{-1}$ , hexane:EtOAc (100:0 2 CV, 100:0 to 70:30 30 CV, (16 ml each))] to afford the ester and alcohol.

For catalyst recycling studies, the catalyst resin was washed sequentially with  $\text{CH}_2\text{Cl}_2/\text{MeOH}$  (1:1, 50 mL), MeOH (50 mL), THF (50 mL) and  $\text{CH}_2\text{Cl}_2$  (50 mL) and then dried under high vacuum at  $40^\circ\text{C}$  for 2 h.

**General procedure F:** *Acylative kinetic resolution of tertiary alcohols using solid supported isothiourea catalyst*

A solid supported isothiourea catalyst (5 mol%), appropriate anhydride (0.7 equiv.) and *i*- $\text{Pr}_2\text{NEt}$  (0.6 equiv.) were added to a solution of the appropriate alcohol (1 equiv.) in the required solvent at r.t.. The solution was allowed to stir for the time given. The reaction mixture was filtered

under vacuum through a sintered funnel (porosity 4), and the catalyst resin washed with CH<sub>2</sub>Cl<sub>2</sub> (30 mL). The filtrate was concentrated *in vacuo* and the residue purified by Biotage® Isolera™ 4 [SNAP Ultra 10 g, 75 mL min<sup>-1</sup>, hexane:EtOAc (100:0 2 CV, 100:0 to 70:30 30 CV, (16 ml each))] to afford the ester and alcohol.

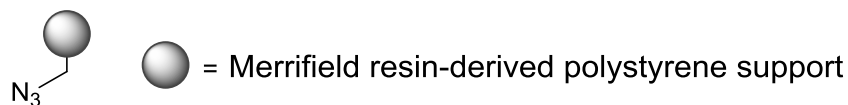
For catalyst recycling studies, the catalyst resin was washed sequentially with CH<sub>2</sub>Cl<sub>2</sub>/MeOH (1:1, 50 mL), MeOH (50 mL), THF (50 mL) and CH<sub>2</sub>Cl<sub>2</sub> (50 mL) and then dried under high vacuum at 40 °C for 2 h.

**General Procedure G:** *Hydrolysis of esters.*

The appropriate ester (1.0 equiv.) was dissolved in MeOH (0.20 M) and 1 M aq. NaOH (3.0 equiv.) was added and the solution stirred at 50-55°C for 30 min for esters derived from secondary alcohols and heated at reflux for 24 h for esters derived from tertiary alcohols. The reaction was cooled to r.t. and concentrated *in vacuo*. The residue was acidified with 1 M HCl and extracted with EtOAc (× 2). The combined organic fractions were washed sequentially with sat. aq. NaHCO<sub>3</sub> and brine, dried (MgSO<sub>4</sub>), filtered and concentrated *in vacuo* to give the corresponding alcohol.

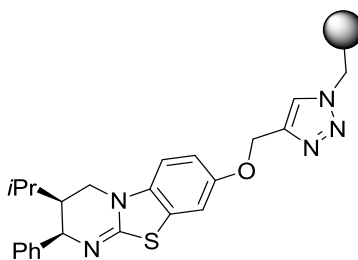
## Synthesis of Polymer Supported Catalysts

### Azide-functionalised Merrifield resin S1-M



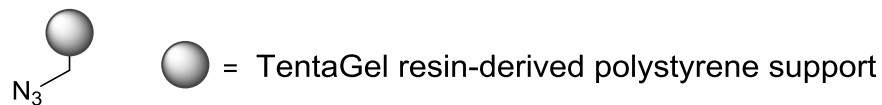
Following a literature procedure,<sup>4</sup> (chloromethyl)polystyrene resin (3.0 g,  $f = 1.23 \text{ mmol g}^{-1}$ ) was added to  $\text{NaN}_3$  (780 mg, 51 mmol) in DMSO (30 mL). The mixture was heated at 60 °C (without stirring) for 16 h and then cooled to r.t.. The suspension was filtered and washed sequentially with  $\text{H}_2\text{O}$  (500 mL), THF-MeOH 1:1 (250 mL), MeOH (250 mL) and THF (250 mL). The resulting solid was dried *in vacuo* for 24 h at 40 °C to afford (azidomethyl)polystyrene<sup>5</sup> **S1-M** (12.6 g). IR  $\nu_{\text{max}}$  (solid,  $\text{cm}^{-1}$ ) 2094 ( $\text{N}_3$ ); Elemental analysis (%) C 85.61, H 6.75, N 5.48;  $f = 1.20 \text{ mmol g}^{-1}$

### Merrifield resin-supported (2*R*,3*S*)-HyperBTM derivative 2



(2*R*,3*S*)-3-Isopropyl-2-phenyl-8-(prop-2-yn-1-yloxy)-3,4-dihydro-2*H*-benzo[4,5]thiazolo[3,2-*a*]pyrimidine **11** (1.86 g, 5.13 mmol, 1.1 equiv.),  $i\text{Pr}_2\text{NEt}$  (2.84 mL, 16.33 mmol, 3.5 equiv.) and CuI (44 mg, 0.233 mmol, 5 mol%) were added to a suspension of (azidomethyl)polystyrene **S1-M** (3.89 g, 4.665 mmol,  $f = 1.20 \text{ mmol/g}$ , 1 equiv.) in THF:DMF 1:1 (52 mL) with slow stirring (100 rpm). The reaction mixture was stirred until disappearance of the azide band ( $\sim 2094 \text{ cm}^{-1}$ ) was confirmed by IR (*ca.* 20 h). The suspension was filtered and washed sequentially with THF (1:1, 200 mL),  $\text{H}_2\text{O}$  (200 mL),  $\text{H}_2\text{O}$ -MeOH (1:1, 200 mL), MeOH (200 mL), MeOH-THF (1:1, 200 mL), THF (200 mL) and  $\text{CH}_2\text{Cl}_2$  (200 mL) and the resin was dried *in vacuo* at 40 °C for 24 h to afford a pale brown resin (2*R*,3*S*)-8-((1-ethyl-1*H*-1,2,3-triazol-4-yl)methoxy)-3-isopropyl-2-phenyl-3,4-dihydro-2*H*-benzo[4,5]thiazolo[3,2-*a*]pyrimidine<sup>5</sup> on polymer support **2** (5.58 g, 100% yield). Elemental analysis (%) C 81.3, H 6.7, N 6.21  $f = 0.89 \text{ mmol g}^{-1}$ .

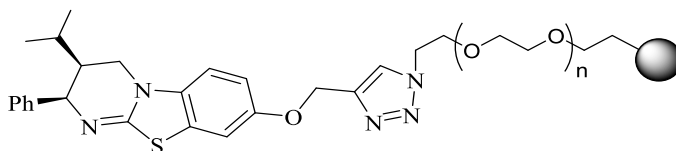
### Azide-functionalised TentaGel resin S1-T



Following a literature procedure,<sup>4</sup> TentaGel bromide resin (2.0 g,  $f = 0.26 \text{ mmol g}^{-1}$ ) was added to  $\text{NaN}_3$  (1.56 g, 51 mmol) in DMSO (60 mL). The mixture was heated at 60 °C (without stirring) for 16 h and then cooled to r.t.. The suspension was filtered and washed sequentially with  $\text{H}_2\text{O}$  (750 mL), THF-MeOH (1:1, 500 mL), MeOH (500 mL) and THF (500 mL). The resulting solid was dried *in vacuo* for 24 h at 40 °C to afford azide-functionalised TentaGel **S1-T** (2.0 g). Elemental analysis (%) C 65.14, H 8.9, N 1.425;  $f = 0.34 \text{ mmol g}^{-1}$ .

Functionality ( $f$ ) calculated according to literature method<sup>6</sup>

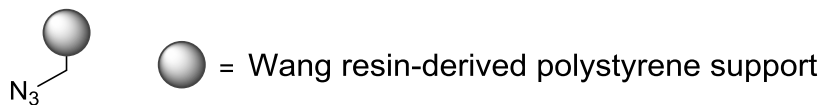
### TentaGel resin-supported (2*R*,3*S*)-HyperBTM derivative 3



(2*R*,3*S*)-3-Isopropyl-2-phenyl-8-(prop-2-yn-1-yloxy)-3,4-dihydro-2*H*-benzo[4,5]thiazolo[3,2-*a*]pyrimidine **1** (253 mg, 0.975 mmol, 1.1 equiv.), *i*Pr<sub>2</sub>NEt (400  $\mu\text{L}$ , 2.31 mmol, 3.5 equiv.) and CuI (6.3 mg, 0.033 mmol, 5 mol%) were added to a suspension of TentaGel azide **S1-T** (2.0 g, 0.66 mmol,  $f = 0.34 \text{ mmol/g}$ , 1 equiv.) in THF:DMF (1:1, 35 mL) with slow stirring (100 rpm). The reaction mixture was stirred for 24 h. The suspension was filtered and washed sequentially with THF (1:1, 400 mL),  $\text{H}_2\text{O}$  (400 mL),  $\text{H}_2\text{O}$ -MeOH (1:1, 400 mL), MeOH (400 mL), MeOH-THF (1:1, 400 mL), THF (400 mL) and  $\text{CH}_2\text{Cl}_2$  (400 mL) and the resin was dried *in vacuo* at 40 °C for 24 h to give TentaGel resin-supported (2*R*,3*S*)-HyperBTM derivative **3** as a brown resin (1.96 g, 88% yield). Elemental analysis (%) C 63.61, H 8.75, N 1.83.  $f = 0.26 \text{ mmol g}^{-1}$ .



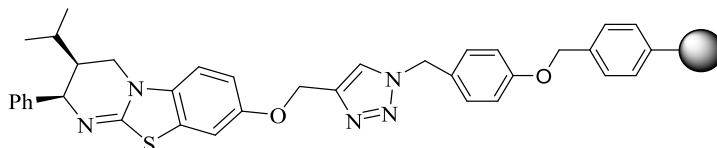
### Azide-functionalised Wang resin S1-W



Following a literature procedure,<sup>4</sup> brominated Wang resin (1.5 g,  $f = 0.5\text{-}1.5 \text{ mmol g}^{-1}$ ) was added to  $\text{NaN}_3$  (1.17 g, 51 mmol) in DMSO (45 mL). The mixture was heated at 60 °C (without stirring) for 16 h and then cooled to r.t.. The suspension was filtered and washed sequentially with  $\text{H}_2\text{O}$  (500 mL), THF-MeOH (1:1, 250 mL), MeOH (250 mL) and THF (250 mL). The resulting solid was dried *in vacuo* for 24 h at 40 °C to afford azide-functionalised Wang resin **S1-W** (1.00 g). Elemental analysis (%) C 84.09, H 8.12, N 2.72;  $f = 0.65 \text{ mmol g}^{-1}$ .

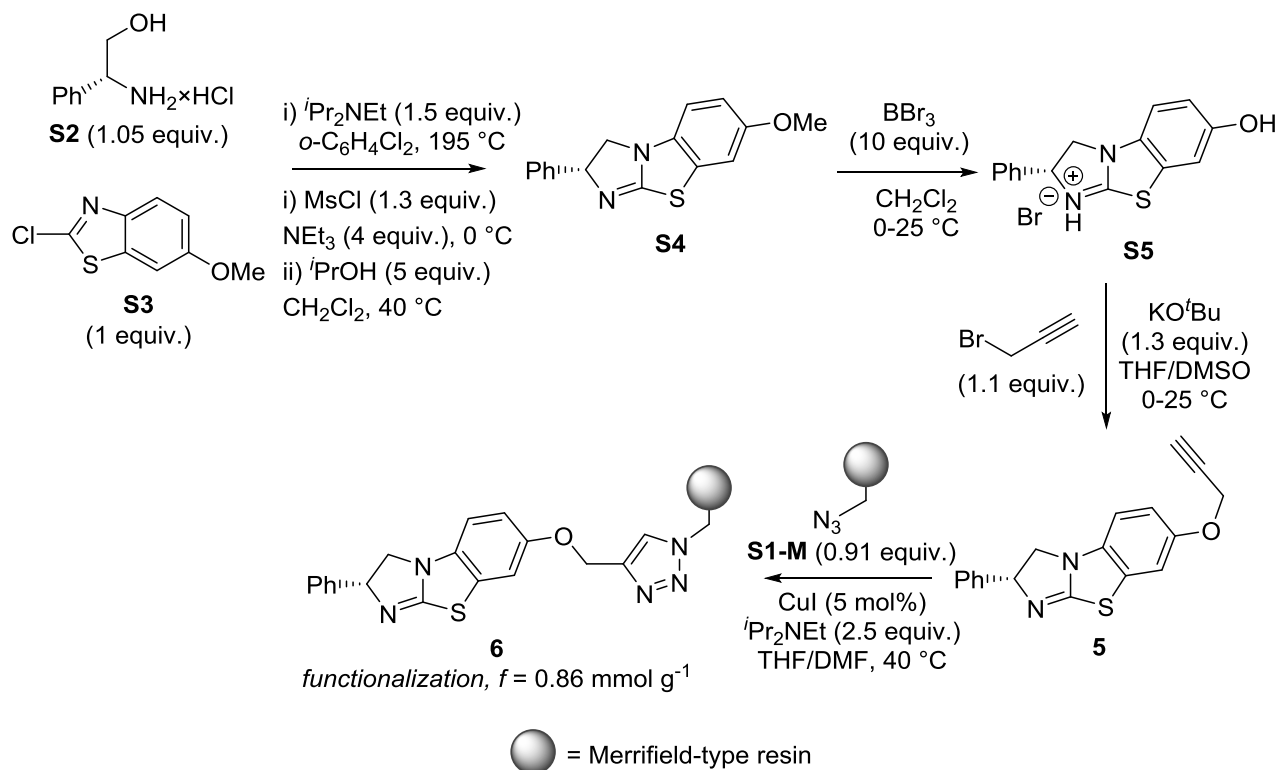
Functionality ( $f$ ) calculated according to literature method.<sup>6</sup>

### Wang resin-supported (2*R*,3*S*)-HyperBTM derivative 4



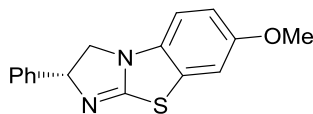
(2*R*,3*S*)-3-Isopropyl-2-phenyl-8-(prop-2-yn-1-yloxy)-3,4-dihydro-2*H*-benzo[4,5]thiazolo[3,2-*a*]pyrimidine<sup>5</sup> (374 mg, 1.07 mmol, 1.1 equiv.),  $i\text{Pr}_2\text{NEt}$  (594  $\mu\text{L}$ , 3.41 mmol, 3.5 equiv.) and CuI (9.3 mg, 0.049 mmol, 5 mol%) were added to a suspension of Wang azide **S1-W** (1.5 g, 0.975 mmol,  $f = 0.65 \text{ mmol/g}$ , 1 equiv.) in THF:DMF (1:1, 30 mL) with slow stirring (100 rpm). The reaction mixture was stirred for 24 h. The suspension was filtered and washed sequentially with THF (1:1, 300 mL),  $\text{H}_2\text{O}$  (300 mL),  $\text{H}_2\text{O}$ -MeOH (1:1, 300 mL), MeOH (300 mL), MeOH-THF (1:1, 300 mL), THF (300 mL) and  $\text{CH}_2\text{Cl}_2$  (300 mL) and the resin was dried *in vacuo* at 40 °C for 24 h to give Wang resin-supported (2*R*,3*S*)-HyperBTM derivative **4** as a brown resin (1.47 g, 80% yield). Elemental analysis (%) C 82.16, H 7.07, N 2.755.  $f = 0.39 \text{ mmol g}^{-1}$ .

## Synthesis of Polymer Supported BTM 6



The multi-step sequence for the synthesis of polystyrene-supported variant of BTM **6**, started with an  $\text{S}_{\text{N}}\text{Ar}$  reaction of the HCl salt of (*R*)-phenylglycinol **S2** with 2-chloro-6-methoxybenzo[*d*]thiazole **S3** followed by *in situ* mesylation and heating to afford cyclized product (*R*)-7-methoxy-2-phenyl-2,3-dihydrobenzo[*d*]imidazo[2,1-*b*]thiazole **S4**. This upon demethylation gave (*R*)-7-hydroxy-2-phenyl-2,3-dihydrobenzo[*d*]imidazo[2,1-*b*]thiazol-1-ium bromide **S5**. *O*-Propargylation of **S5** generated alkyne-substituted BTM derivative **5**. Finally, the attachment of Alkyne **5** to an azidomethyl polystyrene support **S1-M**, synthesized from commercially available (chloromethyl)polystyrene (Merrifield resin) by the procedure described by Pericàs, was achieved by a Cu-catalyzed azide-alkyne cycloaddition reaction<sup>7</sup>. The nitrogen content of polymer **S1-M**, determined by elemental analysis, was used to calculate the functionalization<sup>6</sup> of **6** ( $0.89 \text{ mmol g}^{-1}$ ), with this value used to determine catalyst loading in all subsequent KRs. The extent of functionalization ( $f$ ) ( $\text{mmol/g}$ ) of **6** was analysed by nitrogen (%) elemental analysis using the formula outlined by Pericàs<sup>6</sup> ( $f = \%N \times 1000 \times (\text{number of N atoms in functional unit})^{-1} \times (14.001)^{-1} \times 100^{-1}$ ) and found to be  $0.86 \text{ mmol g}^{-1}$ .

### (R)-7-Methoxy-2-phenyl-2,3-dihydrobenzo[*d*]imidazo[2,1-*b*]thiazole S4

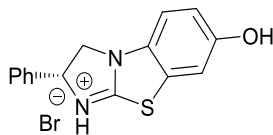


Following a modification of a literature procedure,<sup>8</sup> a yellow suspension of (*R*)-phenylglycinol **S2** (3.61 g, 26.3 mmol, 1.05 equiv), *i*Pr<sub>2</sub>NEt (6.50 mL, 37.6 mmol, 1.5 equiv.), 2-chloro-6-methoxybenzo[*d*]thiazole **S3** (5.0 g, 25.0 mmol, 1 equiv.) and *o*-dichlorobenzene (15 mL) was heated at reflux (195 °C DrySyn<sup>®</sup>) until completion as judged by TLC (*ca.* 48 h). The orange mixture was allowed to cool to r.t., H<sub>2</sub>O (40 mL) was added and the aqueous phase was extracted with CH<sub>2</sub>Cl<sub>2</sub> (3 × 50 mL). The organic layers were combined, washed with brine, dried (MgSO<sub>4</sub>), filtered and concentrated *in vacuo*. The resulting residue was triturated with hexane to afford the crude product as an off-white solid that was recrystallised from toluene to give (*R*)-2-((6-methoxybenzo[*d*]thiazol-2-yl)amino)-2-phenylethan-1-ol as fluffy colourless crystals (5.80 g, 82% yield).  $[\alpha]_D^{20} = -36.5$  (*c* 1.0 CHCl<sub>3</sub>); mp 130-133 °C;  $\nu_{\max}$  (thin film, cm<sup>-1</sup>) 1604 (C=C), 1548 (C=N); <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)  $\delta_H$ : 3.80 (3H, s, OCH<sub>3</sub>), 3.85 – 4.06 (2H, m, C(1)H<sub>2</sub>), 4.80 (1H, dd, *J* 6.3, 4.0, C(2)H), 5.98 (1H, bs, NH), 6.88 (1H, dd, *J* 8.8, 2.6, C(5)ArH), 7.04 (1H, d, *J* 2.6, C(7)ArH), 7.22 – 7.40 (5H, m, PhC(2,3,4,5,6)H), 7.44 (1H, d, *J* 8.8, C(4)ArH); <sup>13</sup>C{<sup>1</sup>H} NMR (126 MHz, CDCl<sub>3</sub>)  $\delta_C$ : 56.0 (OCH<sub>3</sub>), 62.4 (C(1)H<sub>2</sub>), 66.8 (C(2)H), 105.4 (ArC(5)H), 113.8 (ArC), 119.1 (ArC), 127.0 (2 × PhCH), 128.2 (PhCH), 128.9 (2 × PhCH), 131.4 (PhC), 138.7 (ArC(7)), 145.5 (ArC(3a)), 155.3 (ArC(6)), 166.9 (ArC=N), HRMS (ESI<sup>+</sup>) C<sub>16</sub>H<sub>17</sub>N<sub>2</sub>O<sub>2</sub>S [M+H]<sup>+</sup>, found 301.1005, requires 301.1011 (-1.9 ppm).

(*R*)-2-((6-Methoxybenzo[*d*]thiazol-2-yl)amino)-2-phenylethan-1-ol (5.8g, 19.31 mmol, 1 equiv.) and Et<sub>3</sub>N (10.80 mL, 77.24 mmol, 4 equiv.) in anhydrous CH<sub>2</sub>Cl<sub>2</sub> was stirred at 0 °C. After 10 min methanesulfonyl chloride (1.74 mL, 25.1 mmol, 1.3 equiv.) was added with stirring. The ice/water bath was removed, and the reaction stirred for 15 mins. Once complete consumption of (*R*)-2-((6-methoxybenzo[*d*]thiazol-2-yl)amino)-2-phenylethan-1-ol was observed by TLC, *i*PrOH (0.3 mL) was added and the reaction was heated at reflux for 16 h. The reaction was quenched with 1 M NaOH (50 mL) and the biphasic mixture stirred vigorously for 30 mins. The aqueous layer was extracted with CH<sub>2</sub>Cl<sub>2</sub> (3 × 50 mL) and the combined organic phases washed with brine (50 mL), dried (MgSO<sub>4</sub>), filtered and concentrated *in vacuo* to afford the crude product

which was purified by Biotage® Isolera™ 4 [SNAP Ultra 50 g, 100 mL min<sup>-1</sup>, CH<sub>2</sub>Cl<sub>2</sub> :EtOAc (95 : 5 5CV, 95 : 5 to 80 : 20 10 CV, 80 : 20 3 CV)] to give (*R*)-7-methoxy-2-phenyl-2,3-dihydrobenzo[*d*]imidazo[2,1-*b*]thiazole **S4** as a colourless crystalline solid (2.90 g, 53%); [ $\alpha$ ]<sub>D</sub><sup>20</sup> = +58.2 (*c* 0.5 CHCl<sub>3</sub>); mp 106-108 °C;  $\nu_{\max}$ (thin film) 1597 (C=C), 1573 (C=N); <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>)  $\delta_{\text{H}}$ : 3.68 (1H, app. t, *J* 8.6, C(3)*H*<sup>A</sup>*H*<sup>B</sup>), 3.78 (3H, s, OCH<sub>3</sub>), 4.26 (1H, dd, *J* 10.1, 8.6, C(3)*H*<sup>A</sup>*H*<sup>B</sup>), 5.65 (1H, dd, *J* 10.1, 8.6, C(2)*H*), 6.60 (1H, d, *J* 8.5, C(5)*H*), 6.74 (1H, dd, *J* 8.6, 2.5, C(6)Ar*H*), 6.93 (1H, d, *J* 2.6, C(8)Ar*H*), 7.27-7.32 (1H, m, Ph*H*), 7.33-7.41 (4H, m, 4 × Ph*H*); <sup>13</sup>C{<sup>1</sup>H} NMR (126 MHz, CDCl<sub>3</sub>)  $\delta_{\text{C}}$ : 53.2 (C(3)H<sub>2</sub>), 56.1 (OCH<sub>3</sub>), 75.2 (C(2)H), 109.0 (ArC(5)H), 109.7 (ArC(6)H), 112.3 (ArC(8)H), 126.6 (2 × PhCH), 127.7 (PhCH), 128.6 (PhC(1)), 128.8 (2 × PhCH), 131.4 (ArC(8a)), 142.9 (ArC(4a)), 155.2 (ArC(7)), 167.4 (ArC=N); HRMS (ESI<sup>+</sup>) C<sub>16</sub>H<sub>15</sub>N<sub>2</sub>OS [M+H]<sup>+</sup>, found 283.0900, requires 283.0905 (-1.7 ppm).

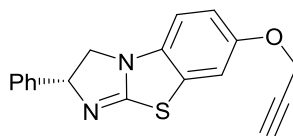
**(*R*)-7-Hydroxy-2-phenyl-2,3-dihydrobenzo[*d*]imidazo[2,1-*b*]thiazol-1-ium bromide **S5****



BBr<sub>3</sub> (33.6 mL, 33.60 mmol, 1 M in CH<sub>2</sub>Cl<sub>2</sub>, 10 equiv.) was added dropwise to a solution of (*R*)-7-methoxy-2-phenyl-2,3-dihydrobenzo[*d*]imidazo[2,1-*b*]thiazole **S3** (950 mg, 3.36 mmol, 1 equiv.) in CH<sub>2</sub>Cl<sub>2</sub> (10 mL) at 0 °C. The solution was stirred at 0 °C for 2 h then warmed to r.t. and stirred for 16 h. The reaction was carefully quenched with MeOH (10 mL) at 0 °C and warmed to r.t.. CH<sub>2</sub>Cl<sub>2</sub> (10 mL) was added and the aqueous phase was extracted with CH<sub>2</sub>Cl<sub>2</sub> (3 × 20 mL). The organic layers were combined, dried (MgSO<sub>4</sub>), filtered and concentrated *in vacuo* to give (*R*)-7-hydroxy-2-phenyl-2,3-dihydrobenzo[*d*]imidazo[2,1-*b*]thiazol-1-ium bromide **S4** as a colorless solid (1.15 g, 97%); [ $\alpha$ ]<sub>D</sub><sup>20</sup> = +93.6 (*c* 1.0 MeOH), mp 182-185 °C;  $\nu_{\max}$ (thin film, cm<sup>-1</sup>) 3026 (C-H), 1558 (C=N), 1550 (N-C); <sup>1</sup>H NMR (500 MHz, *d*<sub>6</sub>-DMSO)  $\delta_{\text{H}}$ : 4.34 (1H, dd, *J* 10.7, 8.4, C(3)*H*<sup>A</sup>*H*<sup>B</sup>), 4.92 (1H, app. t, *J* 10.7, C(3)*H*<sup>A</sup>*H*<sup>B</sup>), 5.92 (1H, dd, *J* 10.7, 8.4, C(2)*H*), 6.97 (1H, dd, *J* 8.7, 2.4, ArC(6)*H*), 7.36 (1H, d, *J* 8.7, ArC(5)*H*), 7.40-7.51 (4H, m, PhC(3,4,5)*H*, ArC(8)*H*), 7.53-7.58 (2H, m, PhC(2,6)*H*), 9.98 (1H, s, NH), 10.66 (1H, s, OH); <sup>13</sup>C{<sup>1</sup>H} NMR (126 MHz, *d*<sub>6</sub>-DMSO)  $\delta_{\text{C}}$ : 53.3 (C(3)H<sub>2</sub>), 66.1 (C(2)H), 111.0 (ArC(8)H), 113.5 (ArC(5)H), 115.8 (ArC(6)H), 127.2 (PhC(2,6)H), 127.4 (ArC(8a)), 128.7 (ArC(4a)), 129.03 (PhC(4)H),

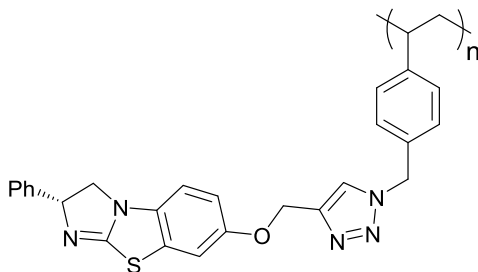
129.05 (PhC(3,5)H), 138.8 (PhC(1)), 154.9 (ArC(7)), 168.7 (C=N); HRMS (ESI<sup>+</sup>) C<sub>15</sub>H<sub>13</sub>N<sub>2</sub>OS [M+H]<sup>+</sup>, found 269.0736, requires 269.0743 (-2.6 ppm).

**(R)-2-Phenyl-7-(prop-2-yn-1-yloxy)-2,3-dihydrobenzo[d]imidazo[2,1-b]thiazole 5**



KOtBu (919 mg, 8.19 mmol, 2.6 equiv.) was added to a solution of (*R*)-7-hydroxy-2-phenyl-2,3-dihydrobenzo[d]imidazo[2,1-*b*]thiazol-1-ium bromide **S4** (1.1g, 3.15 mmol, 1 equiv.) in THF/DMSO (1 mL of each) and the reaction mixture was stirred at 0 °C for 2 h. Propargyl bromide (526 μL, 4.73 mmol, 80% in toluene, 1.5 equiv.) was added and the reaction mixture was allowed to warm to r.t. over 2 h. Brine (20 mL) was added and the aqueous phase was extracted with EtOAc (3 × 30 mL). The organic layers were combined, washed with brine, dried (MgSO<sub>4</sub>), filtered and concentrated *in vacuo*. The residue was purified by Biotage® Isolera™ 4 [SNAP Ultra 25 g, 75 mL min<sup>-1</sup>, CH<sub>2</sub>Cl<sub>2</sub>:EtOAc (95 : 5 5CV, 95 : 5 to 60 : 40 10 CV, 60 : 40 5 CV)] to give (*R*)-2-phenyl-7-(prop-2-yn-1-yloxy)-2,3-dihydrobenzo[d]imidazo[2,1-*b*]thiazole **5** as a colorless semi-solid (0.89 g, 92%); [ $\alpha$ ]<sub>D</sub><sup>20</sup> +26.4 (*c* 1.0 CHCl<sub>3</sub>);  $\nu_{\max}$ (thin film, cm<sup>-1</sup>) 1591 (C=C), 1575 (C=N); <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>)  $\delta_{\text{H}}$ : 2.53 (1H, t, *J* 2.4, C≡H), 3.67 (1H, app. t, *J* 8.5, C(3)H<sup>A</sup>H<sup>B</sup>), 4.24 (1H, dd, *J* 10.2, 8.7, C(3)H<sup>A</sup>H<sup>B</sup>), 4.65 (2H, d, *J* 2.4, OCH<sub>2</sub>), 5.64 (1H, dd, *J* 10.2, 8.2, C(2)H), 6.59 (1H, d, *J* 8.5, ArC(5)H), 6.83 (1H, dd, *J* 8.5, 2.5, ArC(6)H), 7.01 (1H, d, *J* 2.5, ArC(8)H), 7.26-7.32 (1H, m, PhH), 7.34-7.40 (4H, m, PhC(2,3,5,6)H); <sup>13</sup>C{<sup>1</sup>H} NMR (126 MHz, CDCl<sub>3</sub>)  $\delta_{\text{C}}$ : 53.0 (C(3)H<sub>2</sub>), 57.0 (OCH<sub>2</sub>), 75.5 (C(2)H), 75.9 (C≡CH), 78.5 (C≡CH), 108.8 (ArC(5)H), 111.3 (ArC(6)H), 113.7 (ArC(8)H), 126.6 (2 × PhCH), 127.7 (PhC(4)H), 128.5 (PhC(1)), 128.8 (2 × PhCH), 132.3 (ArC(8a)), 143.0 (ArC(4a)), 152.8 (ArC(7)), 167.1 (C=N); HRMS(ESI<sup>+</sup>) C<sub>18</sub>H<sub>15</sub>N<sub>2</sub>OS [M+H]<sup>+</sup>, found 307.0895, requires 307.0900 (-1.6 ppm).

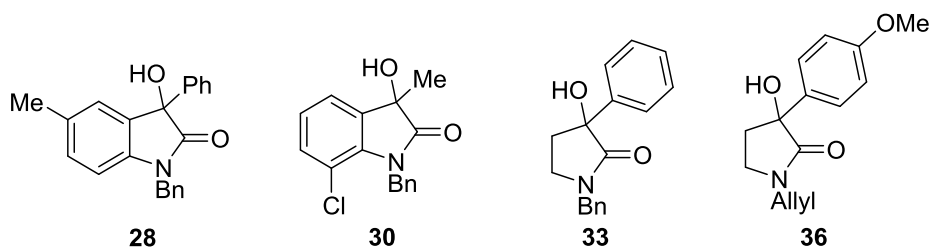
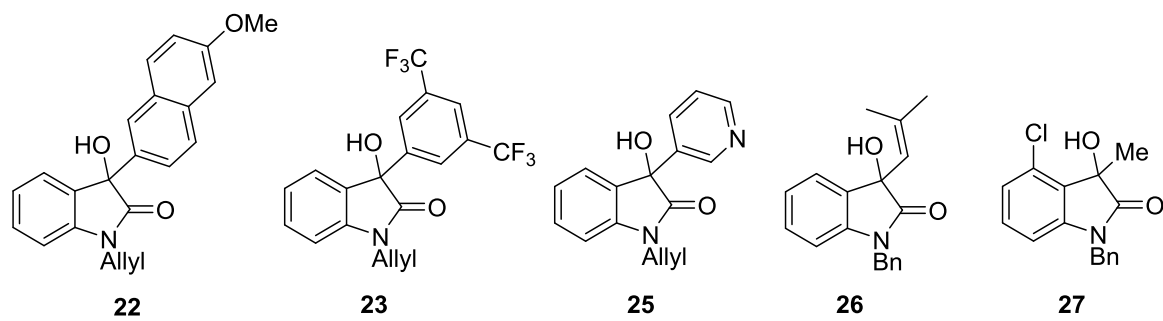
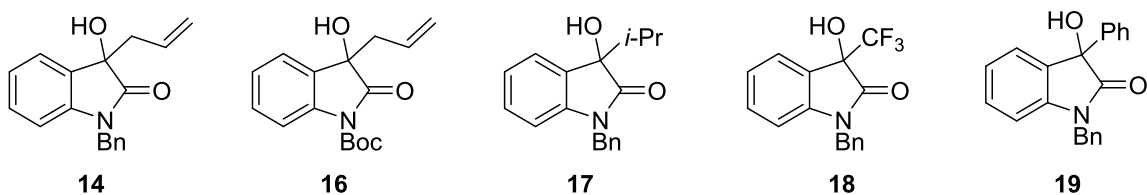
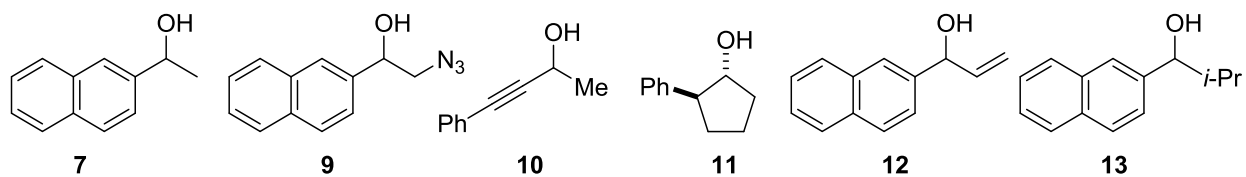
## Merrifield resin-supported (*R*)-BTM derivative **6**



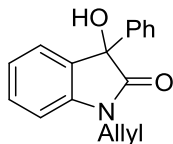
To a round bottomed flask containing (azidomethyl)polystyrene<sup>5</sup> **S1-M** (1.6 g, 2.55 mmol,  $f = 1.20$  mmol/g, 1 equiv.) suspended in THF:DMF (1:1, 60 mL) was added (*R*)-2-phenyl-7-(prop-2-yn-1-yloxy)-2,3-dihydrobenzo[*d*]imidazo[2,1-*b*]thiazole **5** (860 mg, 2.81 mmol, 1.1 equiv.), *i*Pr<sub>2</sub>NEt (1.6 mL, 8.90 mmol, 3.5 equiv.) and CuI (24 mg, 0.126 mmol, 5 mol%) with slow stirring. The reaction mixture was stirred until disappearance of the azide band ( $\sim 2094$  cm<sup>-1</sup>) was confirmed by IR (*ca.* 21 h). The suspension was filtered and washed sequentially with THF (130 mL), H<sub>2</sub>O (130 mL), H<sub>2</sub>O-MeOH (1:1, 130 mL), MeOH (130 mL), MeOH-THF (1:1, 200 mL), THF (100 mL) and CH<sub>2</sub>Cl<sub>2</sub> (100 mL) and the resin was dried *in vacuo* at 35-40 °C for 24 h to give Merrifield resin-supported (*R*)-BTM derivative **6** as a dark brown resin (2.45 g, quantitative yield); Elemental analysis (%) C 79.84, H 6.71, N 6.04;  $f = 0.86$  mmol/g

## Synthesis of Racemic Alcohols

Racemic alcohols given below were prepared according to the literature reported<sup>5,9</sup> from this group.

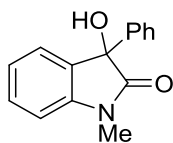


### 1-Allyl-3-hydroxy-3-phenylindolin-2-one **20**



Phenylmagnesium bromide (3.0 M, 1.2 mL, 3.6 mmol) was added dropwise to a solution of 1-allylindoline-2,3-dione (555 mg, 3.0 mmol) in anhydrous THF (30 mL) at  $-78\text{ }^{\circ}\text{C}$  under a  $\text{N}_2$  atmosphere. The solution stirred at  $-78\text{ }^{\circ}\text{C}$  for 20 mins, then at  $0\text{ }^{\circ}\text{C}$  with the reaction monitored by TLC until completion (typically within 30 min). The reaction mixture reaction was poured into aqueous  $\text{NH}_4\text{Cl}$  solution (20 mL) and extracted with EtOAc ( $3 \times 20\text{ mL}$ ). The organic layers were combined, dried ( $\text{MgSO}_4$ ), filtered and concentrated *in vacuo*. The residue was purified by flash column chromatography ( $\text{CH}_2\text{Cl}_2$ :EtOAc 9:1,  $R_F$  0.40) to give 1-allyl-3-hydroxy-3-phenylindolin-2-one **20** as a yellow powder (702 mg, 2.6 mmol, 88%). m.p.  $132\text{-}134\text{ }^{\circ}\text{C}$  {Lit.  $134.5\text{-}135.5\text{ }^{\circ}\text{C}$ };  $^1\text{H NMR}$  (400 MHz,  $\text{CDCl}_3$ )  $\delta_{\text{H}}$ : 3.38 (1H, br s, OH), 4.28 (1H, ddt,  $J$  16.4, 5.4, 1.7,  $\text{CH}_A\text{H}_B\text{CH}=\text{CH}_2$ ), 4.46 (1H, ddt,  $J$  16.4, 5.4, 1.7,  $\text{CH}_A\text{H}_B\text{C}=\text{CH}_2$ ), 5.27 (2H, m,  $\text{HRC}=\text{CH}_2$ ), 5.87 (1H, m,  $\text{CH}_2\text{CH}=\text{CH}_2$ ), 6.90 (1H, app dt,  $J$  7.8, 0.8, C(7)H), 7.08 (1H, app td,  $J$  7.5, 1.0, C(5)H), 7.27-7.43 (7H, m, ArCH). Data were in accordance with those previously reported.<sup>10</sup>

### 3-Hydroxy-1-methyl-3-phenylindolin-2-one **21**

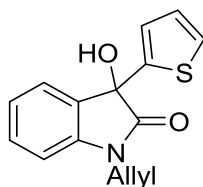


Phenylmagnesium bromide (3.0 M, 1.5 mL, 4.4 mmol) was added dropwise to a solution of 1-methylindoline-2,3-dione (600 mg, 3.7 mmol) in anhydrous THF (35 mL) at  $-78\text{ }^{\circ}\text{C}$  under a  $\text{N}_2$  atmosphere. The solution stirred at  $-78\text{ }^{\circ}\text{C}$  for 20 mins, then at  $0\text{ }^{\circ}\text{C}$  with the reaction monitored by TLC until completion (typically within 30 min). The reaction mixture reaction was poured into aqueous  $\text{NH}_4\text{Cl}$  solution (20 mL) and extracted with EtOAc ( $3 \times 20\text{ mL}$ ). The organic layers were combined, dried ( $\text{MgSO}_4$ ), filtered and concentrated *in vacuo*. The residue was purified by flash column chromatography ( $\text{CH}_2\text{Cl}_2$ :EtOAc 9:1,  $R_F$  0.26) to give 3-hydroxy-1-methyl-3-phenylindolin-2-one **21** as a yellow powder (730 mg, 3.0 mmol, 82%). m.p.  $123\text{-}125\text{ }^{\circ}\text{C}$  {Lit.



141-142 °C}; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ<sub>H</sub>: 3.25 (3H, s, NCH<sub>3</sub>), 3.41 (1H, s, OH), 6.91 (1H, app dt, *J* 7.9, 0.7, C(7)*H*), 7.09 (1H, app td, *J* 7.5, 1.0, C(5)*H*), 7.26-7.41 (7H, m, ArC*H*); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ<sub>C</sub>: 26.7 (NCH<sub>3</sub>), 78.0 (C(3)), 108.7 (ArC(7)*H*), 123.6 (ArC(5)*H*), 124.9 (ArC(6)*H*), 125.3 (C(3)ArC(2,6)*H*), 128.3 (C(3)ArC(4)*H*), 128.6 (C(3)ArC(3,5)*H*), 129.9 (ArC(4)*H*), 131.5 (C(3)ArC(1)), 140.1 (ArC(3a)), 143.5 (ArC(7a)), 177.5 (C=O). Data were in accordance with those previously reported.<sup>11</sup>

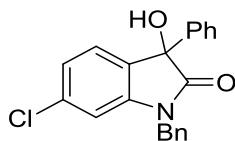
### 1-Allyl-3-hydroxy-3-(thiophen-2-yl)indolin-2-one **24**



*n*-Butyl lithium (2.5 M in hexanes, 1.6 mL, 4.00 mmol) was added dropwise to a solution of thiophene (264 μL, 3.3 mmol) in anhydrous THF (13 mL) at 0 °C under N<sub>2</sub>, and the reaction stirred for 1 hour. In a separate flask, 1-allylindoline-2,3-dione (561 mg, 3 mmol) was dissolved in anhydrous THF (15 mL), cooled to 0 °C under N<sub>2</sub>, and the solution of 2-thienyllithium added dropwise over 15 mins. The reaction was stirred at 0 °C for 1 h. On completion, saturated aqueous NH<sub>4</sub>Cl was added, and the aqueous phase extracted with EtOAc (3 × 50 mL). The organic layer was washed with brine (3 × 50 mL), dried (MgSO<sub>4</sub>), filtered and concentrated *in vacuo*. The crude product was purified by Biotage® Isolera 4 chromatography (eluent: 0%→30% EtOAc in hexanes) to give 1-allyl-3-hydroxy-3-(thiophen-2-yl)indolin-2-one **24** as a yellow solid (594 mg, 2.2 mmol, 73%). m.p. 126-128 °C; <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>) δ<sub>H</sub>: 3.42 (1H, s, OH), 4.23-4.30 (1H, m, NCH<sub>A</sub>H<sub>B</sub>), 4.41-4.48 (1H, m, NCH<sub>A</sub>H<sub>B</sub>), 5.20-5.27 (2H, m, CH=CH<sub>2</sub>), 5.80-5.89 (1H, m, CH=CH<sub>2</sub>), 6.88 (1H, app d, *J* 7.8, ArC(7)*H*), 6.94 (1H, d, *J* 5.0, 3.7, C(3)ArC(4)*H*), 6.99 (1H, dd, *J* 3.6, 1.0, C(3)ArC(3)*H*), 7.14 (1H, app t, *J* 7.5, ArC(5)*H*), 7.32 (1H, dd, *J* 5.0, 1.0, C(3)ArC(5)*H*), 7.34 (1H, app td, *J* 7.7, 1.0, ArC(6)*H*), 7.54 (1H, app. d, *J* 7.5, ArC(4)*H*); <sup>13</sup>C NMR (126 MHz, CDCl<sub>3</sub>) δ<sub>C</sub>: 42.7 (NCH<sub>2</sub>), 75.5 (C(3)), 109.9 (ArC(7)*H*), 118.0 (CH=CH<sub>2</sub>), 123.5 (ArC(5)*H*), 125.2 (ArC(4)*H*), 126.0 (C(3)ArC(4)*H*), 126.9 (C(3)ArC(5)*H*), 127.0 (C(3)ArC(3)*H*), 130.3 (ArC(6)*H*), 130.5 (ArC(3a)), 131.2 (CH=CH<sub>2</sub>), 142.5 (C(3)ArC(2)), 143.6 (ArC(7a)), 175.9 (C=O); IR (neat) ν<sub>max</sub> cm<sup>-1</sup> 3337 (OH), 3103, 3057,

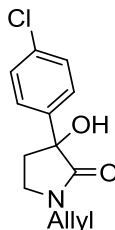
1692 (C=O), 1612, 1487, 1466, 1373, 1180, 1159; HRMS (NSI<sup>+</sup>) calculated for C<sub>15</sub>H<sub>13</sub>NO<sub>2</sub>SNa<sup>+</sup> ([M+Na]<sup>+</sup>) requires 294.0559; found 294.0560 (+0.3 ppm).

### 1-Benzyl-6-chloro-3-hydroxy-3-phenylindolin-2-one **29**



Phenylmagnesium bromide (3.0 M, 0.91 mL, 2.7 mmol) was added dropwise to a solution of 1-benzyl-6-chloroindoline-2,3-dione (615 mg, 2.26 mmol) in anhydrous THF (22 mL) at  $-78\text{ }^{\circ}\text{C}$  under a N<sub>2</sub> atmosphere. The solution stirred at  $-78\text{ }^{\circ}\text{C}$  for 20 mins, then at  $0\text{ }^{\circ}\text{C}$  with the reaction monitored by TLC until completion (typically within 30 min). The reaction mixture reaction was poured into aqueous NH<sub>4</sub>Cl solution (20 mL) and extracted with EtOAc (3 × 20 mL). The organic layers were combined, dried (MgSO<sub>4</sub>), filtered and concentrated *in vacuo*. The residue was dissolved in the minimum amount of hot CH<sub>2</sub>Cl<sub>2</sub> and then cooled in an ice bath to give 1-benzyl-6-chloro-3-hydroxy-3-phenylindolin-2-one **29** as a colourless solid (541 mg, 1.55 mmol, 68%). m.p. 190-191  $^{\circ}\text{C}$ ; <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>) δ<sub>H</sub>: 3.41 (1H, br s, OH), 4.81 (1H, d, *J* 15.7, CH<sub>A</sub>H<sub>B</sub>Ph), 5.02 (1H, d, *J* 15.7, CH<sub>A</sub>H<sub>B</sub>Ph), 6.78 (1H, d, *J* 1.8, ArC(7)H), 7.02 (1H, dd, *J* 7.9, 1.8, ArC(5)H), 7.19 (1H, d, *J* 7.9, ArC(4)H), 7.28-7.41 (10H, m, CH<sub>2</sub>ArH + C(3)ArH); <sup>13</sup>C NMR (126 MHz, CDCl<sub>3</sub>) δ<sub>C</sub>: 44.2 (CH<sub>2</sub>Ph), 77.6 (C(3)), 110.4 (ArC(7)H), 123.5 (ArC(5)H), 125.2 (C(3)ArC(2,6)H), 126.0 (ArC(4)H), 127.2 (CH<sub>2</sub>ArC(2,6)H), 128.1 (CH<sub>2</sub>ArC(4)H), 128.6 (C(3)ArC(4)H), 128.8 (C(3)ArC(3,5)H), 129.1 (CH<sub>2</sub>ArC(3,5)H), 129.9 (ArC(3a)), 134.8 (CH<sub>2</sub>ArC(1)), 135.6 (ArC(6)), 139.6 (C(3)ArC(1)), 143.9 (ArC(7a)), 177.5 (C=O). Data were in accordance with those previously reported<sup>12</sup>.

### 1-Allyl-3-(4-chlorophenyl)-3-hydroxypyrrolidin-2-one **31**

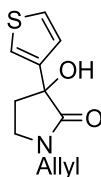


Following general procedure A, *n*BuLi (13.2 mL, 33 mmol, 2.5 M in hexanes),  $\text{HN}^i\text{Pr}_2$  (4.6 mL, 33 mmol), 4-chlorophenylacetic acid (2.55 g, 15 mmol) and 1-bromo-2-chloroethane (2.75 mL, 33 mmol) in anhydrous THF (50 mL) gave 4-chloro-2-phenylbutanoic acid, which was used without further purification. Following general procedure B, 4-chloro-2-phenylbutanoic acid (3.60 g, 15.5 mmol), 1,1'-carbonyldiimidazole (2.39 g, 14.73 mmol) and allylamine (1.4 mL, 18.6 mmol) in anhydrous THF (50 mL) gave, after column chromatography (eluent  $\text{CH}_2\text{Cl}_2/\text{EtOAc}$ , 9:1;  $R_F$  0.45) *N*-allyl-4-chloro-2-(4-chlorophenyl)butanamide as a cream solid (2.02 g, 7.45 mmol, 50%), mp 70-72 °C;  $\nu_{\text{max}}$  (ATR) 3296 (NH), 2970, 1639 (C=O), 1555, 1489, 1261;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta_{\text{H}}$ : 2.06 (1H, app. dtd,  $J$  14.6, 7.2, 4.8, C(3) $H^A H^B$ ), 2.45 (1H, app. dtd,  $J$  14.9, 7.6, 4.9, C(3) $H_A H_B$ ), 3.28 (1H, ddd,  $J$  11.1, 7.8, 4.8, C(4) $H_A H_B$ ), 3.46 (1H, ddd,  $J$  11.6, 7.0, 4.9, C(4) $H_A H_B$ ), 3.65 (1H, app. t,  $J$  7.5, C(2) $H$ ), 3.66-3.80 (2H, m,  $\text{NCH}_2\text{CH}=\text{CH}_2$ ), 4.91-5.00 (2H, m,  $\text{NCH}_2\text{CH}=\text{CH}_2$ ), 5.65 (1H, app. ddt,  $J$  16.9, 10.7, 5.4,  $\text{NCH}_2\text{CH}=\text{CH}_2$ ), 5.99-6.04 (1H, br s, NH), 7.16-7.24 (4H, m,  $\text{ArC}(2,3,5,6)H$ );  $^{13}\text{C}\{^1\text{H}\}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta_{\text{C}}$ : 35.8 (C(3) $H_2$ ), 42.0 ( $\text{NCH}_2$ ), 43.0 (C(4) $H_2$ ), 48.8 (C(2) $H$ ), 116.2 ( $\text{NCH}_2\text{CH}=\text{CH}_2$ ), 129.1 ( $\text{ArC}(3,5)H$ ), 129.4 ( $\text{ArC}(2,6)H$ ), 133.5 ( $\text{ArC}(4)$ ), 133.9 ( $\text{NCH}_2\text{CH}=\text{CH}_2$ ), 137.3 ( $\text{ArC}(1)$ ), 172.0 (C=O);  $m/z$  (NSI) 272 ( $[\text{M}+\text{H}]^+$ , 100%)  $\text{C}_{13}\text{H}_{16}\text{NOCl}_2^+$  ( $[\text{M}+\text{H}]^+$ ) requires 272.0603; found 272.0606 (+0.9 ppm).

Following general procedure C, *N*-allyl-4-chloro-2-(4-chlorophenyl)butanamide (2.02 g, 7.45 mmol) and NaH (60% in mineral oil) (1.49 mg, 37.25 mmol) in anhydrous THF (50 mL) gave, after column chromatography (eluent  $\text{CH}_2\text{Cl}_2/\text{EtOAc}$ , 4:1;  $R_F$  0.24) 1-allyl-3-(4-chlorophenyl)-3-hydroxypyrrolidin-2-one **31** as a colourless solid (898 mg, 3.58 mmol, 48%), mp 76-78 °C;  $\nu_{\text{max}}$  (ATR) 3202 (OH), 2876, 1668 (C=O), 1489, 1271;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta_{\text{H}}$ : 2.29 (1H, ddd,  $J$  13.1, 7.3, 3.8, C(4) $H_A H_B$ ), 2.42 (1H, ddd,  $J$  13.2, 8.4, 7.0, C(4) $H_A H_B$ ), 3.25 (1H, app. dt,  $J$  10.0, 7.1, C(5) $H_A H_B$ ), 3.40 (1H, ddd,  $J$  10.0, 8.5, 3.8, C(5) $H_A H_B$ ), 3.93 (1H, app. ddt,  $J$  15.1, 6.1,

1.3,  $NCH_AH_BCH=CH_2$ ), 4.01 (1H, app. ddt,  $J$  15.1, 6.2, 1.3,  $NCH_AH_BCH=CH_2$ ), 4.23 (1H, s, OH), 5.20-5.27 (2H, m,  $NCH_2CH=CH_2$ ), 5.75 (1H, app. ddt,  $J$  17.7, 9.7, 6.2,  $NCH_2CH=CH_2$ ), 7.24-7.31 (4H, m, ArC(2,3,5,6)H);  $^{13}C\{^1H\}$  NMR (100 MHz,  $CDCl_3$ )  $\delta_C$ : 36.2 (C(4)H<sub>2</sub>), 43.2 (C(5)H<sub>2</sub>), 46.0 ( $NCH_2CH=CH_2$ ), 78.5 (C(3)), 118.9 ( $NCH_2CH=CH_2$ ), 126.8 (ArC(3,5)H), 128.7 (ArC(2,6)H), 131.7 ( $NCH_2CH=CH_2$ ), 133.7 (ArC(4)), 141.2 (ArC(1)), 174.6 (C=O);  $m/z$  (NSI) 252 ( $[M+H]^+$ , 100%)  $C_{13}H_{15}NO_2Cl^+$  ( $[M+H]^+$ ) requires 252.0786; found 252.0784 (-0.7 ppm).

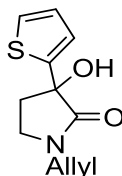
### 1-Allyl-3-hydroxy-3-(thiophen-3-yl)pyrrolidin-2-one **32**



Following general procedure A,  $nBuLi$  (8.8 mL, 22 mmol, 2.5 M in hexanes),  $HN^iPr_2$  (3.1 mL, 22 mmol), 3-thienylacetic acid (1.42 g, 10 mmol) and 1-bromo-2-chloroethane (1.82 mL, 22 mmol) in anhydrous THF (50 mL) gave 4-chloro-2-(thiophen-3-yl)butanoic acid, which was used without further purification. Following general procedure B, 4-chloro-2-(thiophen-3-yl)butanoic acid (1.89 g, 10 mmol), 1,1'-carbonyldiimidazole (1.54 g, 9.5 mmol) and allylamine (898  $\mu$ L, 12 mmol) in anhydrous THF (50 mL) gave, after column chromatography (eluent Petrol/EtOAc, 7:3), impure 4-chloro-*N*-phenyl-2-(thiophen-3-yl)butanamide, which was used without further purification. Following general procedure C, 4-chloro-*N*-phenyl-2-(thiophen-3-yl)butanamide (1.23 g, 5.1 mmol) and NaH (60% in mineral oil) (1.02 g, 25.5 mmol) in anhydrous THF (50 mL) gave, after column chromatography (eluent  $CH_2Cl_2$ /EtOAc, 4:1;  $R_F$  0.14), 1-allyl-3-hydroxy-3-(thiophen-3-yl)pyrrolidin-2-one **32** as a yellow oil (459 mg, 2.06 mmol, 40%);  $\nu_{max}$  (ATR) 3345 (OH), 2964, 1674 (C=O), 1416, 1271;  $^1H$  NMR (400 MHz,  $CDCl_3$ )  $\delta_H$ : 2.38-2.54 (2H, m, C(4)H<sub>2</sub>), 3.23-3.33 (1H, m, C(5)H<sub>A</sub>H<sub>B</sub>), 3.32 (1H, s, OH), 3.37 (1H, ddd,  $J$  9.9, 8.4, 2.9, C(5)H<sub>A</sub>H<sub>B</sub>), 3.94 (1H, app. ddt,  $J$  15.2, 6.1, 1.1,  $NCH_AH_BCH=CH_2$ ), 4.01 (1H, app. ddt,  $J$  15.1, 6.2, 1.1,  $NCH_AH_BCH=CH_2$ ), 5.18-5.26 (2H, m,  $NCH_2CH=CH_2$ ), 5.75 (1H, app. ddt,  $J$  16.5, 10.4, 6.1,  $NCH_2CH=CH_2$ ), 7.14 (1H, dd,  $J$  5.0, 1.4, ArC(4)H), 7.28 (1H, dd,  $J$  3.0, 1.4, ArC(2)H), 7.32 (1H, dd,  $J$  5.0, 3.0, ArC(5)H);  $^{13}C\{^1H\}$  NMR (100 MHz,  $CDCl_3$ )  $\delta_C$ : 34.9 (C(4)H<sub>2</sub>), 42.9 (C(5)H<sub>2</sub>), 45.9 ( $NCH_2$ ), 76.3 (C(3)), 118.7 ( $NCH_2CH=CH_2$ ), 121.5 (ArC(2)H), 125.5 (ArC(4)H),

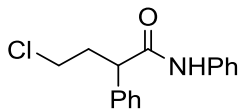
126.8 (ArC(5)H), 131.7 (NCH<sub>2</sub>CH=CH<sub>2</sub>), 143.0 (ArC(3)), 173.7 (C=O); *m/z* (NSI) 224 ([M+H]<sup>+</sup>, 100%) C<sub>11</sub>H<sub>14</sub>NO<sub>2</sub>S<sup>+</sup> ([M+H]<sup>+</sup>) requires 224.0740; found 224.0738 (−0.8 ppm).

### 1-Allyl-3-hydroxy-3-(thiophen-2-yl)pyrrolidin-2-one **34**



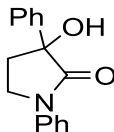
Following general procedure A, *n*BuLi (8.8 mL, 22 mmol, 2.5 M in hexanes), HN<sup>*t*</sup>Pr<sub>2</sub> (3.1 mL, 22 mmol), 2-thiopheneacetic acid (1.42 g, 10 mmol) and 1-bromo-2-chloroethane (1.82 mL, 22 mmol) in anhydrous THF (50 mL) gave 4-chloro-2-(thiophen-2-yl)butanoic acid, which was used without further purification. Following general procedure B, 4-chloro-2-(thiophen-2-yl)butanoic acid (1.89 g, 10 mmol), 1,1'-carbonyldiimidazole (1.54 g, 9.5 mmol) and allylamine (898 μL, 12 mmol) in anhydrous THF (25 mL) gave, after column chromatography (eluent Petrol/EtOAc, 7:3), impure *N*-allyl-4-chloro-2-(thiophen-2-yl)butanamide, which was used without further purification. Following general procedure C, *N*-allyl-4-chloro-2-(thiophen-2-yl)butanamide (559 mg, 2.3 mmol) and NaH (60% in mineral oil) (460 mg, 11.5 mmol) in anhydrous THF (25 mL) gave, after column chromatography (eluent CH<sub>2</sub>Cl<sub>2</sub>/EtOAc, 4:1; R<sub>F</sub> 0.29), 1-allyl-3-hydroxy-3-(thiophen-2-yl)pyrrolidin-2-one **34** as a colourless oil (209 mg, 0.93 mmol, 9%); *v*<sub>max</sub> (ATR) 3327 (OH), 2949, 1674 (C=O), 1271; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ<sub>H</sub>: 2.43-2.59 (2H, m, C(4)H<sub>2</sub>), 3.26-3.40 (2H, m, C(5)H<sub>2</sub>), 3.89 (1H, ddd, *J* 15.2, 6.1, 1.3, NCH<sub>A</sub>H<sub>B</sub>CH=CH<sub>2</sub>), 3.98 (1H, app. ddt, *J* 15.2, 6.1, 1.3, NCH<sub>A</sub>H<sub>B</sub>CH=CH<sub>2</sub>), 4.25 (1H, s, OH), 5.15-5.24 (2H, m, NCH<sub>2</sub>CH=CH<sub>2</sub>), 5.72 (1H, app. ddt, *J* 16.6, 10.6, 6.1, NCH<sub>2</sub>CH=CH<sub>2</sub>), 6.93 (1H, dd, *J* 5.1, 3.6, ArC(4)H), 7.01 (1H, dd, *J* 3.6, 1.2, ArC(3)H), 7.26 (1H, dd, *J* 5.1, 1.2, ArC(5)H); <sup>13</sup>C{<sup>1</sup>H} NMR (100 MHz, CDCl<sub>3</sub>) δ<sub>C</sub>: 36.1 (C(4)H<sub>2</sub>), 42.9 (C(5)H<sub>2</sub>), 45.9 (NCH<sub>2</sub>), 76.3 (C(3)), 118.7 (NCH<sub>2</sub>CH=CH<sub>2</sub>), 124.1 (ArC(4)H), 125.5 (ArC(5)H), 126.8 (ArC(3)H), 131.6 (NCH<sub>2</sub>CH=CH<sub>2</sub>), 145.7 (ArC(2)), 173.7 (C=O); *m/z* (NSI) 224 ([M+H]<sup>+</sup>, 100%) C<sub>11</sub>H<sub>14</sub>NO<sub>2</sub>S<sup>+</sup> ([M+H]<sup>+</sup>) requires 224.0740; found 224.0739 (−0.3 ppm).

#### 4-Chloro-*N*,2-diphenylpropanamide **S6**



Following general procedure B, 4-chloro-2-phenylbutanoic acid<sup>9</sup> (990 mg, 5 mmol), 1,1'-carbonyldiimidazole (770 mg, 4.75 mmol) and aniline (449  $\mu$ L, 6 mmol) in anhydrous THF (50 mL) gave, after column chromatography (eluent CH<sub>2</sub>Cl<sub>2</sub>/EtOAc, 95:5; R<sub>F</sub> 0.26), 4-chloro-*N*,2-diphenylpropanamide **S7** as a pale yellow solid (683 mg, 2.60 mmol, 53%), mp 102-104 °C;  $\nu_{\max}$  (ATR) 3258 (NH), 2953, 1661 (C=O), 1597 (C=C), 1543, 1443, 1329; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)  $\delta_{\text{H}}$ : 2.28 (1H, dddd, *J* 14.5, 7.8, 6.8, 4.9, C(3)*H<sub>A</sub>H<sub>B</sub>*), 2.70 (1H, dddd, *J* 14.5, 7.8, 6.8, 4.9, C(3)*H<sub>A</sub>H<sub>B</sub>*), 3.44 (1H, ddd, *J* 11.1, 8.0, 4.5, C(4)*H<sub>A</sub>H<sub>B</sub>*), 3.65 (1H, ddd, *J* 11.5, 6.7, 5.0, C(4)*H<sub>A</sub>H<sub>B</sub>*), 3.92 (1H, app. t, *J* 7.4, C(2)*H*), 7.07-7.14 (1H, m, NHArC(4)*H*), 7.26-7.50 (9H, m, ArCH); <sup>13</sup>C{<sup>1</sup>H} NMR (100 MHz, CDCl<sub>3</sub>)  $\delta_{\text{C}}$ : 35.7 (C(3)*H<sub>2</sub>*), 43.2 (C(4)*H<sub>2</sub>*), 50.5 (C(2)*H*), 120.0 (NHArC(3,5)*H*), 124.5 (NHArC(4)*H*), 127.9 (C(2)ArC(4)*H*), 128.1 (NHArC(2,6)*H*), 129.0 (C(2)ArC(3,5)*H*), 129.3 (C(2)ArC(2,6)*H*), 137.7 (NHArC(1)), 138.3 (C(2)ArC(1)), 172.4 (C=O); *m/z* (NSI) 274 ([M+H]<sup>+</sup>, 100%) C<sub>16</sub>H<sub>17</sub>ONCl<sup>+</sup> ([M+H]<sup>+</sup>) requires 274.0993; found 274.0995 (+0.7 ppm).

#### 3-Hydroxy-1,3-diphenylpyrrolidin-2-one **35**

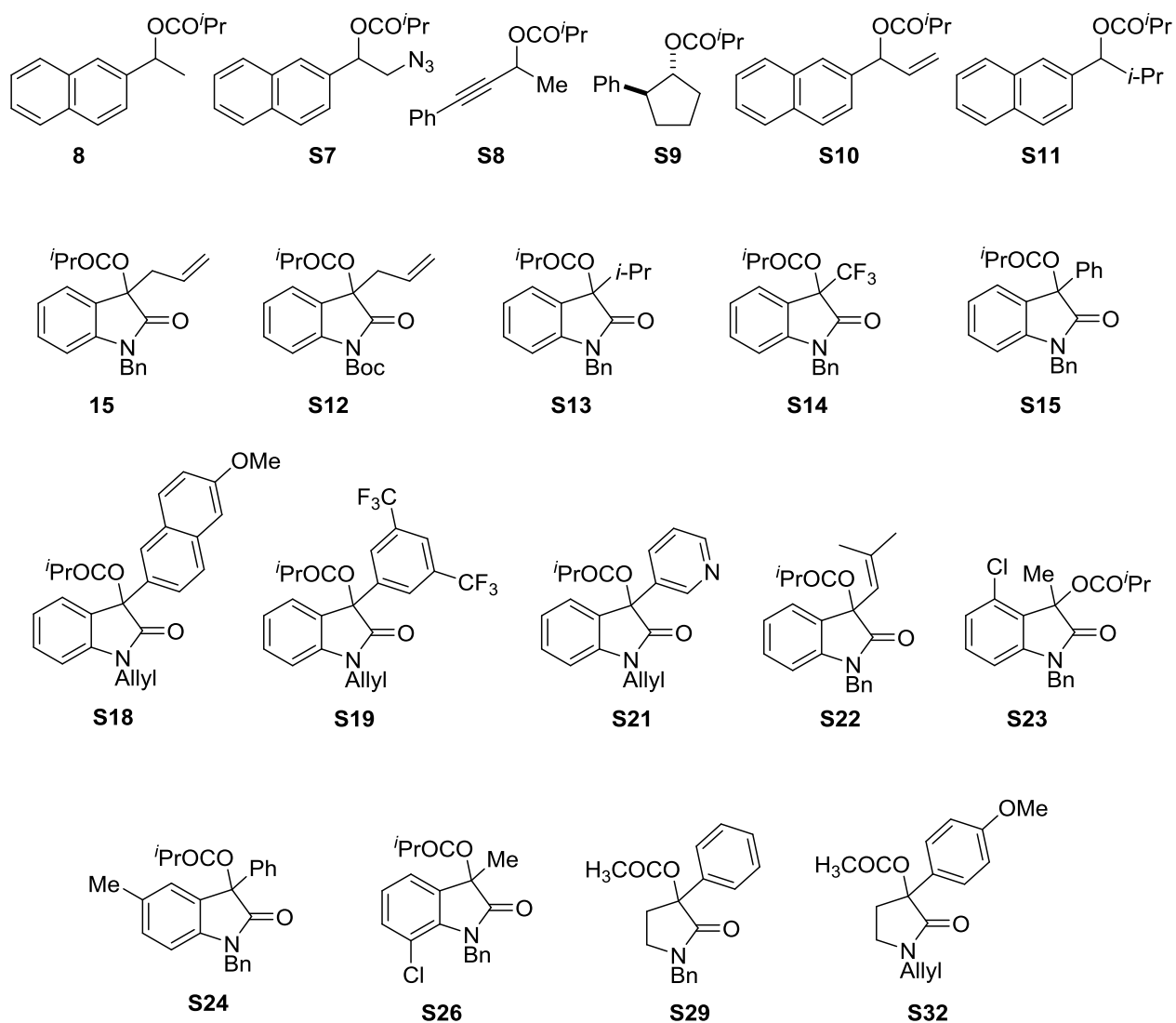


Following general procedure C, 4-chloro-*N*,2-diphenylpropanamide **S7** (683 mg, 2.6 mmol) and NaH (60% in mineral oil) (530 mg, 13.23 mmol) in anhydrous THF (25 mL) gave, after column chromatography (eluent CH<sub>2</sub>Cl<sub>2</sub>/EtOAc, 9:1; R<sub>F</sub> 0.32), 3-hydroxy-1,3-diphenylpyrrolidin-2-one **35** as a yellow solid (208 mg, 0.83 mmol, 32%), mp 81-83 °C;  $\nu_{\max}$  (ATR) 3358 (OH), 3059, 1676 (C=O), 1591, 1489, 1292; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)  $\delta_{\text{H}}$ : 2.50-2.63 (2H, m, C(4)*H<sub>2</sub>*), 3.73 (1H, ddd, *J* 9.7, 8.2, 7.0, C(5)*H<sub>A</sub>H<sub>B</sub>*), 3.86 (1H, ddd, *J* 9.8, 7.9, 3.4, C(5)*H<sub>A</sub>H<sub>B</sub>*), 4.26 (1H, s, OH), 7.21-7.27 (1H, m, ArCH), 7.29-7.39 (3H, m, ArCH), 7.40-7.49 (4H, m, ArCH), 7.70-7.77 (2H, m, ArCH); <sup>13</sup>C{<sup>1</sup>H} NMR (100 MHz, CDCl<sub>3</sub>)  $\delta_{\text{C}}$ : 35.4 (C(4)*H<sub>2</sub>*), 44.5 (C(5)*H<sub>2</sub>*), 79.4

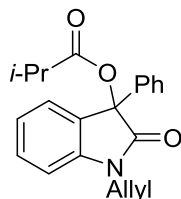
(C(3)), 119.9 (NArC(2,6)H), 125.2 (NArC(4)H), 125.3 (C(3)ArC(2,6)H), 128.1 (C(3)ArC(4)H), 128.7 (C(3)ArC(3,5)H), 129.0 (NArC(3,5)H), 139.0 (NArC(1)), 142.0 (C(3)ArC(1)), 174.7 (C=O);  $m/z$  (NSI) 254 ( $[M+H]^+$ , 100%)  $C_{16}H_{16}O_2N^+$  ( $[M+H]^+$ ) requires 254.1176; found 254.1175 (-0.2 ppm).

## Synthesis of Racemic Esters

Racemic esters given below were prepared as previously reported<sup>5,9</sup> from this group.

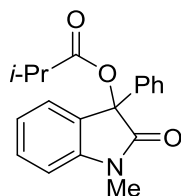


### 1-Allyl-2-oxo-3-phenylindolin-3-yl isobutyrate S16



Following general Procedure D, 1-allyl-3-hydroxy-3-phenylindolin-2-one **20** (42 mg, 0.16 mmol), isobutyric anhydride (30  $\mu$ L, 0.18 mmol), DMAP (2.0 mg, 0.016 mmol, 10 mol%) and *i*Pr<sub>2</sub>NEt (28  $\mu$ L, 0.16 mmol) were reacted in CH<sub>2</sub>Cl<sub>2</sub> (2.0 mL) to give the crude product, which was purified by column chromatography (eluent EtOAc:hexane 3:7, R<sub>F</sub> 0.55) to give 1-allyl-2-oxo-3-phenylindolin-3-yl isobutyrate **S16** as a yellow solid (42 mg, 0.12 mmol, 78%). m.p. 61-63 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)  $\delta$ <sub>H</sub>: 1.20 (3H, d, *J* 7.0, CH(CH<sub>3</sub>)<sub>A</sub>(CH<sub>3</sub>)<sub>B</sub>), 1.24 (3H, d, *J* 7.0, CH(CH<sub>3</sub>)<sub>A</sub>(CH<sub>3</sub>)<sub>B</sub>), 2.71 (1H, sept, *J* 7.0, CH(CH<sub>3</sub>)<sub>2</sub>), 4.35 (2H, m, NCH<sub>2</sub>), 5.23 (1H, dq, *J* 10.4, 1.5, CH=CH<sub>cis</sub>H<sub>trans</sub>), 5.32 (1H, dq, *J* 17.2, 1.5, CH=CH<sub>cis</sub>H<sub>trans</sub>), 5.86 (1H, ddt, *J* 17.2, 10.4, 5.2, CH=CH<sub>2</sub>), 6.91 (1H, app dt, *J* 7.9, 0.8, C(7)H), 7.08 (1H, app td, *J* 7.4, 1.0, C(5)H), 7.20 (1H, ddd, *J* 7.4, 1.5, 0.6, C(6)H), 7.31-7.39 (6H, m, ArH); <sup>13</sup>C NMR (126 MHz, *d*<sub>6</sub>-DMSO)  $\delta$ <sub>C</sub>: 18.98 (CH(CH<sub>3</sub>)<sub>A</sub>(CH<sub>3</sub>)<sub>B</sub>), 19.04 (CH(CH<sub>3</sub>)<sub>A</sub>(CH<sub>3</sub>)<sub>B</sub>), 33.4 (CH(CH<sub>3</sub>)<sub>2</sub>), 42.3 (CH<sub>2</sub>CH=CH<sub>2</sub>), 80.8 (C(3)), 110.2 (ArC(7)H), 117.5 (CH<sub>2</sub>CH=CH<sub>2</sub>), 123.5 (ArC(5)H), 123.9 (ArC(6)H), 126.1 (C(3)ArC(2,6)H), 128.6 (C(3)ArC(1)), 129.2 (C(3)ArC(3,5)H), 129.3 (C(3)ArC(4)H), 130.4 (ArC(4)H), 132.0 (CH<sub>2</sub>CH=CH<sub>2</sub>), 137.3 (ArC(3a)), 143.5 (ArC(7a)), 173.4 (C(2)=O), 174.8 (C(=O)CH(CH<sub>3</sub>)<sub>2</sub>); IR (neat)  $\nu$ <sub>max</sub> cm<sup>-1</sup> 2972, 1724 (C=O), 1614 (C=O), 1466, 1348, 1146; HRMS (NSI<sup>+</sup>) calculated for C<sub>21</sub>H<sub>21</sub>NO<sub>3</sub>Na<sup>+</sup> ([M+Na]<sup>+</sup>) requires 358.1414; found 314.1415 (+0.4 ppm).

### 1-Methyl-2-oxo-3-phenylindolin-3-yl isobutyrate S17

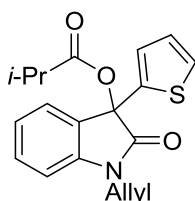


Following general Procedure D, 3-hydroxy-1-methyl-3-phenylindolin-2-one **21** (38 mg, 0.16 mmol), isobutyric anhydride (30  $\mu$ L, 0.18 mmol), DMAP (2.0 mg, 0.016 mmol, 10 mol%) and



*i*Pr<sub>2</sub>NEt (28  $\mu$ L, 0.16 mmol) were reacted in CH<sub>2</sub>Cl<sub>2</sub> (2.0 mL) to give the crude product, which was purified by flash column chromatography (eluent CH<sub>2</sub>Cl<sub>2</sub>:EtOAc 9:1, R<sub>F</sub> 0.69) to give 1-methyl-2-oxo-3-phenylindolin-3-yl isobutyrate **S17** as a colourless powder (39 mg, 0.12 mmol, 78%). m.p. 123-125 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)  $\delta$ <sub>H</sub>: 1.20 (3H, d, *J* 7.0, CH(CH<sub>3</sub>)<sub>A</sub>(CH<sub>3</sub>)<sub>B</sub>), 1.24 (3H, *J* 7.0, CH(CH<sub>3</sub>)<sub>A</sub>(CH<sub>3</sub>)<sub>B</sub>), 2.71 (1H, sept, *J* 7.0, CH(CH<sub>3</sub>)<sub>2</sub>), 3.24 (3H, s, NCH<sub>3</sub>), 6.93 (1H, app dt, *J* 7.8, 0.7, C(7)*H*), 7.10 (1H, app td, *J* 7.5, 1.0, C(5)*H*), 7.10 (1H, ddd, *J* 7.3, 1.4, 0.5, C(4)*H*), 7.31-7.43 (6H, m, Ar*H*); <sup>13</sup>C NMR (126 MHz, *d*<sub>6</sub>-DMSO)  $\delta$ <sub>C</sub>: 18.96 (CH(CH<sub>3</sub>)<sub>A</sub>(CH<sub>3</sub>)<sub>B</sub>), 19.03 (CH(CH<sub>3</sub>)<sub>A</sub>(CH<sub>3</sub>)<sub>B</sub>), 26.9 (CH<sub>3</sub>), 33.4 (CH(CH<sub>3</sub>)<sub>2</sub>), 76.4 (C(3)), 109.6 (ArC(7)*H*), 123.4 (ArC(5)*H*), 123.8 (ArC(6)*H*), 126.2 (C(3)ArC(2,6)*H*), 128.6 (C(3)ArC(1)), 129.1 (C(3)ArC(2,6)*H*), 129.2 (C(3)ArC(3,5)*H*), 129.3 (C(3)ArC(4)*H*), 130.7 (ArC(4)*H*), 137.2 (ArC(3a)), 144.6 (ArC(7a)), 173.7 (C(2)=O), 174.8 (C(=O)CH(CH<sub>3</sub>)<sub>2</sub>); IR (neat)  $\nu$ <sub>max</sub> cm<sup>-1</sup> 2978, 1721 (C=O), 1613 (C=C). 1470, 1342, 1148; HRMS (NSI<sup>+</sup>) calculated for C<sub>19</sub>H<sub>19</sub>NO<sub>3</sub>Na<sup>+</sup> ([M+Na]<sup>+</sup>) requires 332.1257; found 332.1259 (+0.6 ppm).

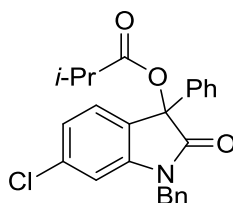
### 1-Allyl-2-oxo-3-(thiophen-2-yl)indolin-3-yl isobutyrate **S20**



Following general Procedure D, 1-allyl-3-hydroxy-3-(thiophen-2-yl)indolin-2-one **24** (41 mg, 0.15 mmol), isobutyric anhydride (28  $\mu$ L, 0.17 mmol), DMAP (1.8 mg, 0.015 mmol, 10 mol%) and *i*Pr<sub>2</sub>NEt (26  $\mu$ L, 0.15 mmol) were reacted in CH<sub>2</sub>Cl<sub>2</sub> (2 mL) to give the crude product, which was purified by Biotage® Isolera 4 chromatography (eluent: 0%→20% EtOAc in hexanes) to give 1-allyl-2-oxo-3-(thiophen-2-yl)indolin-3-yl isobutyrate **S20** as a yellow solid (46 mg, 0.13 mmol, 90%). m.p. 80-82 °C; <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>)  $\delta$ <sub>H</sub>: 1.17 (3H, d, *J* 7.0 Hz, CH(CH<sub>3</sub>)<sub>A</sub>(CH<sub>3</sub>)<sub>B</sub>), 1.21 (3H, d, *J* 7.0 Hz, CH(CH<sub>3</sub>)<sub>A</sub>(CH<sub>3</sub>)<sub>B</sub>), 2.67 (1H, sept, *J* 7.0 Hz, CH(CH<sub>3</sub>)<sub>2</sub>), 4.30-4.40 (2H, m, NCH<sub>2</sub>), 5.19-5.24 (1H, m, CH=CH<sub>trans</sub>H<sub>cis</sub>), 5.27-5.34 (1H, m, CH=CH<sub>trans</sub>H<sub>cis</sub>), 5.85 (1H, app ddt, *J* 17.2, 10.3, 5.1, CH=CH<sub>2</sub>), 6.87-6.92 (2H, m, ArC(7)*H* + C(3)ArC(3)*H*), 6.94 (1H, d, *J* 5.0, 3.6, C(3)ArC(4)*H*), 7.11 (1H, app t, *J* 7.8, ArC(5)*H*), 7.34-7.39 (3H, m, C(3)ArC(5)*H* + ArC(4,6)*H*); <sup>13</sup>C NMR (126 MHz, CDCl<sub>3</sub>)  $\delta$ <sub>C</sub>: 18.7 (CH(CH<sub>3</sub>)<sub>A</sub>(CH<sub>3</sub>)<sub>B</sub>), 18.8 (CH(CH<sub>3</sub>)<sub>A</sub>(CH<sub>3</sub>)<sub>B</sub>), 33.7 (CH(CH<sub>3</sub>)<sub>2</sub>), 42.8 (NCH<sub>2</sub>), 78.7 (C(3)), 109.8

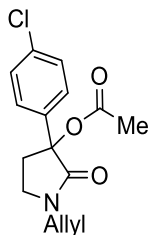
(ArC(7)H), 117.8 (CH=CH<sub>2</sub>), 123.0 (ArC(5)H), 123.8 (ArC(4)H), 126.6 (C(3)ArC(4)H), 127.1 (C(3)ArC(5)H), 127.8 (C(3)ArC(3)H), 127.9 (ArC(3a)), 130.4 (ArC(6)H), 131.2 (CH=CH<sub>2</sub>), 139.3 (C(3)ArC(2)), 143.4 (ArC(7a)), 172.7 (C=O), 175.2 (CO<sub>2</sub>R); IR (neat)  $\nu_{\max}$  cm<sup>-1</sup> 3103, 3076, 2972, 2930, 1724 (C=O), 1695, 1614, 1487, 1464, 1371, 1350, 1184, 1143, 1098; HRMS (NSI<sup>+</sup>) calculated for C<sub>19</sub>H<sub>19</sub>NO<sub>3</sub>SNa<sup>+</sup> ([M+Na]<sup>+</sup>) requires 364.0983; found 364.0981 (-0.5 ppm).

### 1-Benzyl-7-chloro-2-oxo-3-phenylindolin-3-yl isobutyrate S25



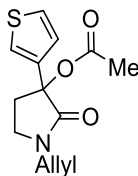
Following general Procedure D, 1-benzyl-6-chloro-3-hydroxy-3-phenylindolin-2-one **29** (70 mg, 0.2 mmol), isobutyric anhydride (37  $\mu$ L, 0.22 mmol), DMAP (2.4 mg, 0.02 mmol, 10 mol%) and *i*Pr<sub>2</sub>NEt (35  $\mu$ L, 0.2 mmol) were reacted in CH<sub>2</sub>Cl<sub>2</sub> (6 mL) to give the crude product, which was purified by Biotage® Isolera 4 chromatography (eluent: 0%→30% EtOAc in hexanes) to give 1-benzyl-6-chloro-2-oxo-3-phenylindolin-3-yl isobutyrate **S25** as a colourless solid (71 mg, 0.17 mmol, 85%). m.p. 120-122 °C; <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>)  $\delta_{\text{H}}$ : 1.23 (3H, d, *J* 7.0, CH(CH<sub>3</sub>)<sub>A</sub>(CH<sub>3</sub>)<sub>B</sub>), 1.27 (3H, d, *J* 7.0, CH(CH<sub>3</sub>)<sub>A</sub>(CH<sub>3</sub>)<sub>B</sub>), 2.74 (1H, sept, *J* 7.0, CH(CH<sub>3</sub>)<sub>2</sub>), 4.83 (1H, d, *J* 16.0, CH<sub>A</sub>H<sub>B</sub>Ph), 4.98 (1H, d, *J* 16.0, CH<sub>A</sub>H<sub>B</sub>Ph), 6.72 (1H, d, *J* 1.8, ArC(7)H), 7.04 (1H, dd, *J* 7.9, 1.8, ArC(5)H), 7.12 (1H, d, *J* 7.9, ArC(4)H), 7.24-7.39 (10H, m, CH<sub>2</sub>ArH + C(3)ArH); <sup>13</sup>C NMR (126 MHz, CDCl<sub>3</sub>)  $\delta_{\text{C}}$ : 18.8 (CH(CH<sub>3</sub>)<sub>A</sub>(CH<sub>3</sub>)<sub>B</sub>), 18.9 (CH(CH<sub>3</sub>)<sub>A</sub>(CH<sub>3</sub>)<sub>B</sub>), 33.9 (CH(CH<sub>3</sub>)<sub>2</sub>), 44.5 (CH<sub>2</sub>Ph), 80.5 (C(3)), 110.5 (ArC(7)H), 123.2 (ArC(5)H), 124.8 (ArC(4)H), 126.3 (C(3)ArC(2,6)H), 127.0 (ArC(3a)), 127.3 (CH<sub>2</sub>ArC(2,6)H), 127.9 (CH<sub>2</sub>ArC(4)H), 128.9 (C(3)ArC(3,5)H), 129.0 (CH<sub>2</sub>ArC(3,5)H), 129.2 (C(3)ArC(4)H), 135.2 (CH<sub>2</sub>ArC(1)), 135.9 (ArC(6)), 136.4 (C(3)ArC(1)), 145.0 (ArC(7a)), 174.1 (C(2)=O), 175.3 (CO<sub>2</sub>R). IR (neat)  $\nu_{\max}$  cm<sup>-1</sup> 3030, 2974, 2934, 2876, 1736 (C=O), 1612, 1489, 1449, 1369, 1354, 1339, 1256, 1184, 1146, 1115, 1070; HRMS (NSI<sup>+</sup>) calculated for C<sub>25</sub>H<sub>26</sub>N<sub>2</sub>O<sub>3</sub><sup>35</sup>Cl ([M+NH<sub>4</sub>]<sup>+</sup>) requires 437.1626; found 437.1626 (-0.1 ppm).

### 1-Allyl-3-(4-chlorophenyl)-2-oxopyrrolidin-3-yl acetate S27



Following general procedure D, 1-allyl-3-(4-chlorophenyl)-3-hydroxypyrrolidin-2-one **31** (40 mg, 0.16 mmol), acetic anhydride (20  $\mu$ L, 0.21 mmol), DMAP (2 mg, 0.016 mmol, 10 mol %) and *i*Pr<sub>2</sub>NEt (70  $\mu$ L, 0.38 mmol) in CH<sub>2</sub>Cl<sub>2</sub> (3 mL) gave, after column chromatography (eluent CH<sub>2</sub>Cl<sub>2</sub>/EtOAc, 9:1; R<sub>F</sub> 0.29), 1-allyl-3-(4-chlorophenyl)-2-oxopyrrolidin-3-yl acetate **S27** as a colourless oil (44 mg, 0.15 mmol, 94%);  $\nu_{\max}$  (ATR) 2974, 1742 (C=O), 1686 (C=O), 1371, 1223; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)  $\delta_{\text{H}}$ : 2.16 (3H, s, CH<sub>3</sub>), 2.69-2.81 (2H, m, C(4)H<sub>2</sub>), 3.38 (1H, app. dt, *J* 9.8, 7.6, C(5)H<sub>A</sub>H<sub>B</sub>), 3.53 (1H, ddd, *J* 9.8, 7.3, 5.1, C(5)H<sub>A</sub>H<sub>B</sub>), 3.91 (1H, app. ddt, *J* 15.2, 6.2, 1.3, NCH<sub>A</sub>H<sub>B</sub>CH=CH<sub>2</sub>), 3.99 (1H, app. ddt, *J* 15.2, 5.9, 1.4, NCH<sub>A</sub>H<sub>B</sub>CH=CH<sub>2</sub>), 5.20-5.29 (2H, m, NCH<sub>2</sub>CH=CH<sub>2</sub>), 5.74 (1H, app. ddt, *J* 17.1, 10.2, 6.1, NCH<sub>2</sub>CH=CH<sub>2</sub>), 7.32-7.37 (2H, m, ArC(2,6)H), 7.41-7.47 (2H, m, ArC(3,5)H); <sup>13</sup>C{<sup>1</sup>H} NMR (100 MHz, CDCl<sub>3</sub>)  $\delta_{\text{C}}$ : 21.5 (CH<sub>3</sub>), 31.5 (C(4)H<sub>2</sub>), 43.1 (C(5)H<sub>2</sub>), 45.9 (NCH<sub>2</sub>), 82.8 (C(3)), 118.7 (NCH<sub>2</sub>CH=CH<sub>2</sub>), 126.7 (ArC(3,5)H), 128.8 (ArC(2,6)H), 131.6 (NCH<sub>2</sub>CH=CH<sub>2</sub>), 134.5 (ArC(4)), 137.5 (ArC(1)), 169.9 (C=O(CH<sub>3</sub>)), 170.1 (C(2)=O); *m/z* (NSI) 294 ([M+H]<sup>+</sup>, 100%) C<sub>15</sub>H<sub>17</sub>NO<sub>3</sub>Cl<sup>+</sup> ([M+H]<sup>+</sup>) requires 294.0891; found 294.0896 (+1.5 ppm).

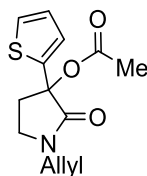
### 1-Allyl-2-oxo-3-(thiophen-3-yl)pyrrolidin-3-yl acetate S28



Following general procedure D, 1-allyl-3-hydroxy-3-(thiophen-3-yl)pyrrolidin-2-one **32** (36 mg, 0.16 mmol), acetic anhydride (21  $\mu$ L, 0.21 mmol), DMAP (2 mg, 0.016 mmol, 10 mol %) and *i*Pr<sub>2</sub>NEt (70  $\mu$ L, 0.38 mmol) in CH<sub>2</sub>Cl<sub>2</sub> (3 mL) gave, after column chromatography (eluent CH<sub>2</sub>Cl<sub>2</sub>/EtOAc, 9:1; R<sub>F</sub> 0.30), 1-allyl-2-oxo-3-(thiophen-3-yl)pyrrolidin-3-yl acetate **S28** as a

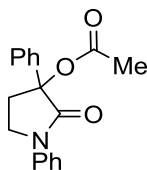
colourless oil (40 mg, 0.15 mmol, 94%);  $\nu_{\max}$  (ATR) 2978, 1730 (C=O), 1697 (C=O), 1423, 1240;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta_{\text{H}}$ : 2.13 (3H, s,  $\text{CH}_3$ ), 2.75-2.82 (2H, m,  $\text{C}(4)\text{H}_2$ ), 3.34 (1H, app. q,  $J$  8.6,  $\text{C}(5)\text{H}_\text{A}\text{H}_\text{B}$ ), 3.49 (1H, app. dt,  $J$  11.3, 6.1,  $\text{C}(5)\text{H}_\text{A}\text{H}_\text{B}$ ), 3.90 (1H, dd,  $J$  15.2, 6.0,  $\text{NCH}_\text{A}\text{H}_\text{B}\text{CH}=\text{CH}_2$ ), 3.98 (1H, dd,  $J$  15.4, 5.8,  $\text{NCH}_\text{A}\text{H}_\text{B}\text{CH}=\text{CH}_2$ ), 5.17-5.26 (2H, m,  $\text{NCH}_2\text{CH}=\text{CH}_2$ ), 5.73 (1H, app. ddt,  $J$  16.2, 10.9, 5.9,  $\text{NCH}_2\text{CH}=\text{CH}_2$ ), 7.23 (1H, d,  $J$  5.1,  $\text{ArC}(4)\text{H}$ ), 7.31-7.35 (1H, m,  $\text{ArC}(5)\text{H}$ ), 7.42 (1H, br s,  $\text{ArC}(2)\text{H}$ );  $^{13}\text{C}\{^1\text{H}\}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta_{\text{C}}$ : 21.5 ( $\text{CH}_3$ ), 31.4 ( $\text{C}(4)\text{H}_2$ ), 42.9 ( $\text{C}(5)\text{H}_2$ ), 45.9 ( $\text{NCH}_2$ ), 81.3 ( $\text{C}(3)$ ), 118.4 ( $\text{NCH}_2\text{CH}=\text{CH}_2$ ), 122.5 ( $\text{ArC}(2)\text{H}$ ), 125.7 ( $\text{ArC}(4)\text{H}$ ), 126.6 ( $\text{ArC}(5)\text{H}$ ), 131.7 ( $\text{NCH}_2\text{CH}=\text{CH}_2$ ), 139.9 ( $\text{ArC}(3)$ ), 170.0 ( $\text{C}=\text{O}(\text{CH}_3)$ ), 170.1 ( $\text{C}(2)=\text{O}$ );  $m/z$  (NSI) 266 ( $[\text{M}+\text{H}]^+$ , 100%)  $\text{C}_{13}\text{H}_{16}\text{NO}_3\text{S}^+$  ( $[\text{M}+\text{H}]^+$ ) requires 266.0844; found 266.0847 (+1.3 ppm).

### 1-Allyl-2-oxo-3-(thiophen-2-yl)pyrrolidin-3-yl acetate **S30**



Following general procedure D, 1-allyl-3-hydroxy-3-(thiophen-2-yl)pyrrolidin-2-one **34** (36 mg, 0.16 mmol), acetic anhydride (20  $\mu\text{L}$ , 0.21 mmol), DMAP (2 mg, 0.016 mmol, 10 mol %) and  $i\text{Pr}_2\text{NEt}$  (70  $\mu\text{L}$ , 0.38 mmol) in  $\text{CH}_2\text{Cl}_2$  (3 mL) gave, after column chromatography (eluent  $\text{CH}_2\text{Cl}_2/\text{EtOAc}$ , 9:1;  $R_{\text{F}}$  0.46), 1-allyl-2-oxo-3-(thiophen-2-yl)pyrrolidin-3-yl acetate **S30** as a colourless oil (34 mg, 0.13 mmol, 79%);  $\nu_{\max}$  (ATR) 2982, 1740 (C=O), 1699 (C=O), 1435, 1223;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta_{\text{H}}$ : 2.13 (3H, s,  $\text{CH}_3$ ), 2.79-2.93 (2H, m,  $\text{C}(4)\text{H}_2$ ), 3.36 (1H, app. td,  $J$  9.7, 7.7,  $\text{C}(5)\text{H}_\text{A}\text{H}_\text{B}$ ), 3.49 (1H, ddd,  $J$  9.6, 9.0, 2.9,  $\text{C}(5)\text{H}_\text{A}\text{H}_\text{B}$ ), 3.88 (1H, app. ddt,  $J$  15.3, 6.1, 1.3,  $\text{NCH}_\text{A}\text{H}_\text{B}\text{CH}=\text{CH}_2$ ), 3.98 (1H, app. ddt,  $J$  15.3, 5.8, 1.4,  $\text{NCH}_\text{A}\text{H}_\text{B}\text{CH}=\text{CH}_2$ ), 5.16-5.25 (2H, m,  $\text{NCH}_2\text{CH}=\text{CH}_2$ ), 5.66-77 (1H, m,  $\text{NCH}_2\text{CH}=\text{CH}_2$ ), 6.99 (1H, dd,  $J$  5.1, 3.7,  $\text{ArC}(4)\text{H}$ ), 7.20 (1H, dd,  $J$  3.7, 1.2,  $\text{ArC}(3)\text{H}$ ), 7.34 (1H, dd,  $J$  5.1, 1.2,  $\text{ArC}(5)\text{H}$ );  $^{13}\text{C}\{^1\text{H}\}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta_{\text{C}}$ : 21.5 ( $\text{CH}_3$ ), 32.2 ( $\text{C}(4)\text{H}_2$ ), 42.8 ( $\text{C}(5)\text{H}_2$ ), 45.9 ( $\text{NCH}_2$ ), 81.3 ( $\text{C}(3)$ ), 118.4 ( $\text{NCH}_2\text{CH}=\text{CH}_2$ ), 125.4 ( $\text{ArC}(3)\text{H}$ ), 126.69 ( $\text{ArC}(5)\text{H}$ ), 126.74 ( $\text{ArC}(4)\text{H}$ ), 131.6 ( $\text{NCH}_2\text{CH}=\text{CH}_2$ ), 141.0 ( $\text{ArC}(2)$ ), 169.5 ( $\text{C}(2)=\text{O}$ ), 169.9 ( $\text{C}=\text{O}(\text{CH}_3)$ );  $m/z$  (NSI) 266 ( $[\text{M}+\text{H}]^+$ , 100%)  $\text{C}_{13}\text{H}_{16}\text{NO}_3\text{S}^+$  ( $[\text{M}+\text{H}]^+$ ) requires 266.0845; found 266.0847 (+0.6 ppm).

## 2-Oxo-1,3-diphenylpyrrolidin-3-yl acetate **S31**

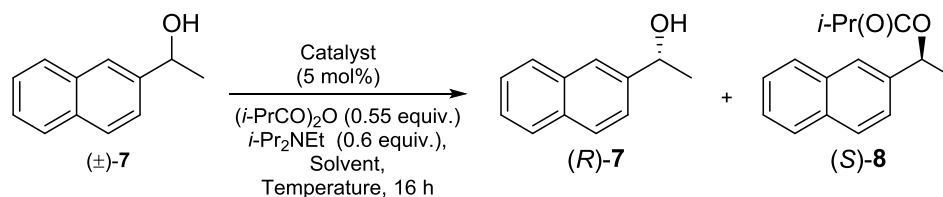


Following general procedure D, 3-hydroxy-1,3-diphenylpyrrolidin-2-one **35** (41 mg, 0.16 mmol), acetic anhydride (20  $\mu$ L, 0.21 mmol), DMAP (2.0 mg, 0.016 mmol, 10 mol %) and *i*Pr<sub>2</sub>NEt (70  $\mu$ L, 0.38 mmol) in CH<sub>2</sub>Cl<sub>2</sub> (3 mL) gave, after column chromatography (eluent CH<sub>2</sub>Cl<sub>2</sub>/EtOAc, 9:1;R<sub>F</sub> 0.62), 2-oxo-1,3-diphenylpyrrolidin-3-yl acetate **S31** as a clear oil (41 mg, 0.14 mmol, 86%);  $\nu_{\max}$  (ATR) 3055, 1740 (C=O), 1701 (C=O), 1495, 1371, 1223; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)  $\delta_{\text{H}}$ : 2.20 (3H, s, CH<sub>3</sub>), 2.87-3.01 (2H, m, C(4)H<sub>2</sub>), 3.88 (1H, app. dt, *J* 9.6, 8.0, C(5)H<sub>A</sub>H<sub>B</sub>), 4.01 (1H, app. td, *J* 9.2, 3.0, C(5)H<sub>A</sub>H<sub>B</sub>), 7.15-7.21 (1H, m, ArCH), 7.31-7.42 (5H, m, ArCH), 7.53-7.59 (2H, m, ArCH), 7.65-7.71 (2H, m, ArCH); <sup>13</sup>C{<sup>1</sup>H} NMR (100 MHz, CDCl<sub>3</sub>)  $\delta_{\text{C}}$ : 21.6 (CH<sub>3</sub>), 30.9 (C(4)H<sub>2</sub>), 44.7 (C(5)H<sub>2</sub>), 83.7 (C(3)), 120.0 (NArC(2,6)H), 125.2 (NArC(4)H), 125.4 (C(3)ArC(2,6)H), 128.7 (C(3)ArC(4)H), 128.8 (C(3)ArC(3,5)H), 128.9 (NArC(3,5)H), 138.2 (NArC(1)), 139.1 (C(3)ArC(1)), 169.9 (C(=O)CH<sub>3</sub>), 170.0 (C(2)=O); *m/z* (NSI) 296 ([M+H]<sup>+</sup>, 100%) C<sub>18</sub>H<sub>18</sub>NO<sub>3</sub><sup>+</sup> ([M+H]<sup>+</sup>) requires 296.1281; found 296.1283 (+0.6 ppm).

## Kinetic Resolution of Secondary Alcohols

### Optimisation

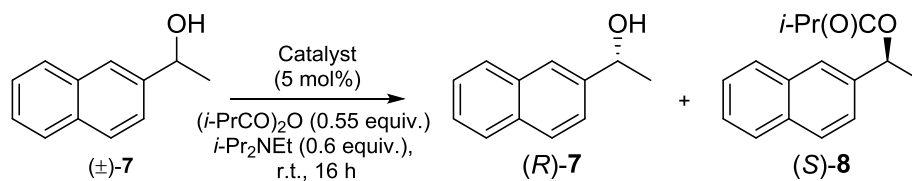
Initial solvent screen using TentaGel and Wang-supported HyperBTM derivatives **3** and **4**:



Solvent	Temp	$(i\text{-PrCO})_2\text{O}$ (equiv.)	TentaGel-HyperBTM <b>3</b>		Wang-HyperBTM <b>4</b>	
			c	s	c	s
CHCl <sub>3</sub>	r.t.	0.55	35	46	37	50
CHCl <sub>3</sub>	0 °C	0.55	39	70	30	80
THF	r.t.	0.55	49	28	46	45
CH <sub>2</sub> Cl <sub>2</sub>	r.t.	0.55	49	38	42	33
CH <sub>3</sub> CN	r.t.	0.55	50	21	46	19
EtOAc	r.t.	0.55	46	45	44	43
Et <sub>2</sub> O	r.t.	0.55	47	80	47	50
Et <sub>2</sub> O	0 °C	0.55	46	45	NP <sup>a</sup>	NP <sup>a</sup>
Toluene	r.t.	0.55	52	60	32	71
Toluene	0 °C	0.55	NP <sup>a</sup>	NP <sup>a</sup>	43	80

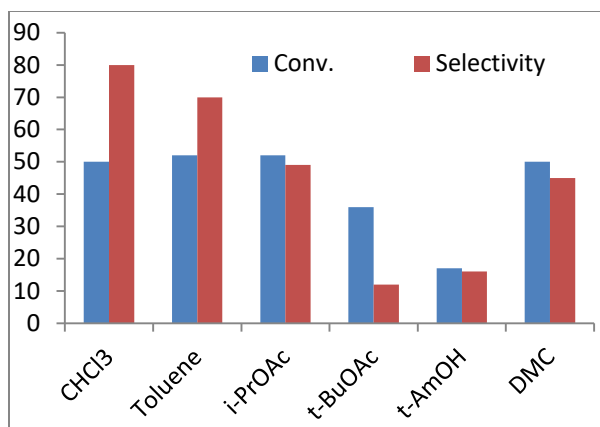
Reaction conditions: **7** (0.2 mmol), **3** or **4** (3 mol%),  $(i\text{-PrCO})_2\text{O}$  (0.55 equiv.),  $i\text{-Pr}_2\text{NEt}$  (0.6 equiv.), solvent (0.2 M), 16 h. Conversion (c) and er determined by chiral HPLC analysis. Selectivity factors (*s*) calculated using er of **7** and reaction conversion (see ref. 1a), and rounded according to estimated associated errors (see ref. 1b). <sup>a</sup> NP = not performed

## Industrially-preferable solvent screen using polymer supported-catalysts 2–4 and 6

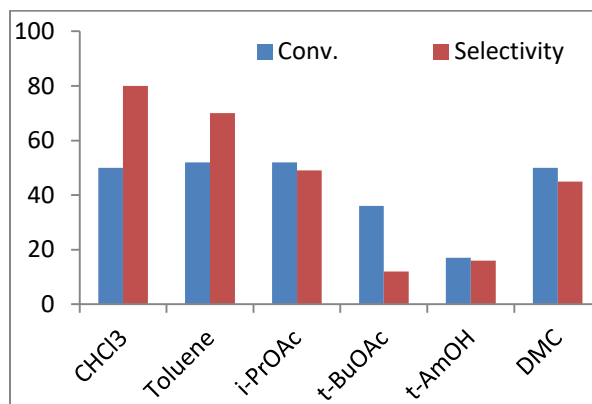


Solvent (0.2 M)	Catalyst (mol%)	$(i\text{-PrCO})_2\text{O}$ (equiv.)	ee (ester)	ee (alcohol)	c	s
DMC	<b>2</b>		87.65	88.97	50	45
DMC	<b>3</b>	0.55	92.11	77.19	46	60
DMC	<b>4</b>	0.55	91.29	75.05	45	50
DMC	<b>6</b>	0.55	92.95	34.37	27	38
$t\text{BuOAc}$	<b>2</b>	0.55	77.53	44.45	36	12
$t\text{BuOAc}$	<b>3</b>	0.55	89.11	81.27	48	46
$t\text{BuOAc}$	<b>4</b>	0.55	78.73	6.19	7	9
$t\text{PrOAc}$	<b>2</b>	0.55	86.41	94.08	52	49
$t\text{PrOAc}$	<b>3</b>	0.55	88.62	77.68	47	39
$t\text{PrOAc}$	<b>4</b>	0.55	79.42	62.7	44	16
$t\text{AmOH}$	<b>2</b>	0.55	86.47	17.51	17	16
$t\text{AmOH}$	<b>3</b>	0.55	88.33	84.29	49	43
$t\text{AmOH}$	<b>4</b>	0.55	74.26	2.66	3	7
$t\text{BuOMe}$	<b>2</b>	0.55	89.81	30.28	25	25
$t\text{BuOMe}$	<b>3</b>	0.55	88.21	77.35	47	37
$t\text{BuOMe}$	<b>4</b>	0.55	92.3	39.28	30	37

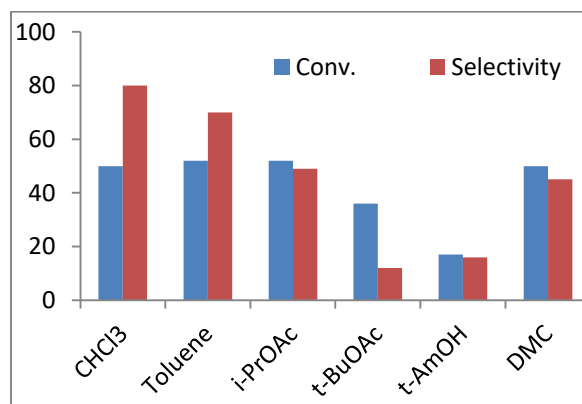
Reaction conditions: **7** (0.2 mmol), **2**, **3**, **4** or **6** (5 mol%),  $(i\text{-PrCO})_2\text{O}$  (0.55 equiv.),  $i\text{-Pr}_2\text{NEt}$  (0.6 equiv.), solvent (0.2 m), 0-r.t., 16 h. Conversion (c) and er determined by chiral HPLC analysis. Selectivity factors (s) calculated using er of **7** and reaction conversion (see ref. 1a), and rounded according to estimated associated errors (see ref. 1b). DMC = dimethyl carbonate,  $t\text{BuOAc}$  = *tert*-butyl acetate,  $t\text{PrOAc}$  = isopropyl acetate,  $t\text{AmOH}$  = *tert*-amyl alcohol,  $t\text{BuOMe}$  = *tert*-butyl methyl ether,



**Figure 1** Screening of solvents using Merifield-HyperBTM 2

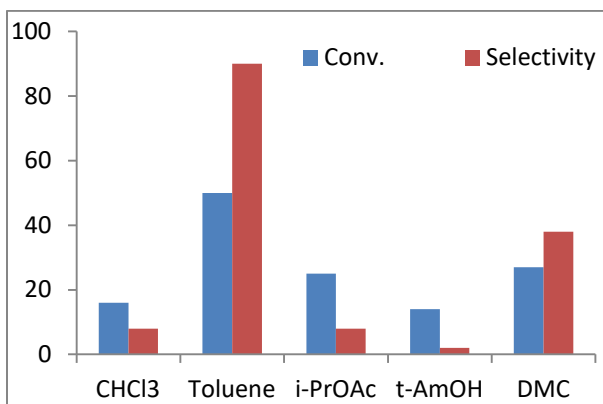


**Figure 2** Screening of solvents using TentaGel-HyperBTM 3



**Figure 3** Screening of solvents using Wang-HyperBTM 4

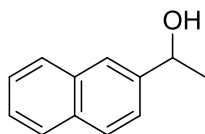




**Figure 4** Screening of solvents using Merifield-BTM 6

### Kinetic resolution of 1-(naphthalen-2-yl)ethan-1-ol **12** (Table 1, entries 13-16)

#### Table 1: Reaction Optimisation



#### With Wang-HyperBTM:

Following General Procedure E, 1-(naphthalen-2-yl)ethan-1-ol **7** (34 mg, 0.2 mmol), Wang-HyperBTM **4** (15 mg, 5 mol%), *i*-Pr<sub>2</sub>NEt (21  $\mu$ L, 0.12 mmol, 0.6 equiv.) and (*i*-PrCO)<sub>2</sub>O (18  $\mu$ L, 0.11 mmol, 0.55 equiv.) in DMC (1 mL) for 16 h at room temperature gave the crude product, which was purified by Biotage® Isolera™ 4 to give (*S*)-1-(naphthalen-2-yl)ethyl isobutyrate **8** (20 mg, 41%) and (*R*)-1-(naphthalen-2-yl)ethan-1-ol **7** (17 mg, 49%).

#### Chiral HPLC analysis:

**(S)-1-(Naphthalen-2-yl)ethyl isobutyrate 8:**  $[\alpha]_D^{20} = -88$  (*c* 1.0, CHCl<sub>3</sub>) Chiral HPLC analysis, Chiralcel OJ-H (98:2 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C)  $t_R$  (*R*): 9.8 min,  $t_R$  (*S*): 12.2 min, 4.364:95.636 er. *s* = 50.

**(R)-1-(Naphthalen-2-yl)ethan-1-ol 7:** mp 67-70 °C {Lit.<sup>13</sup> 69-72 °C}.  $[\alpha]_D^{20} = +35.5$  (*c* 1.0, CHCl<sub>3</sub>) {Lit.<sup>8</sup>  $[\alpha]_D^{20} = +46.5$  (98% ee, *c* 1.2, CHCl<sub>3</sub>); Chiral HPLC analysis, Chiralcel OJ-H

(90:10 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C) t<sub>R</sub> (S): 12.2 min, t<sub>R</sub> (R): 19.5 min, 12.474:87.526 er.

**With TentaGel-HyperBTM 3:** Yield of (*R*)-1-(naphthalen-2-yl)ethan-1-ol **7** = 52% (18 mg) and (*S*)-1-(naphthalen-2-yl)ethyl isobutyrate **8** = 39% (19 mg)

**Chiral HPLC analysis:**

**(*S*)-1-(Naphthalen-2-yl)ethyl isobutyrate 8:** Chiralcel OJ-H (98:2 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 254 nm, 30 °C) t<sub>R</sub> (R): 9.4 min, t<sub>R</sub> (S): 11.6 min, 3.946:96.054 er. *s* = 57.

**(*R*)-1-(Naphthalen-2-yl)ethan-1-ol 7:** Chiralcel OJ-H (90:10 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 254 nm, 30 °C) t<sub>R</sub> (S): 15.0 min, t<sub>R</sub> (R): 19.1 min, 11.403:88.597 er.

**With Merrifield-HyperBTM 2:** Yield of (*R*)-1-(naphthalen-2-yl)ethan-1-ol **7** = 41% (14 mg) and (*S*)-1-(naphthalen-2-yl)ethyl isobutyrate **8** = 45% (22 mg)

**Chiral HPLC analysis:**

**(*R*)-1-(Naphthalen-2-yl)ethan-1-ol 7:** Chiralcel OJ-H (90:10 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 254 nm, 30 °C) t<sub>R</sub> (S): 15.0 min, t<sub>R</sub> (R): 19.1 min, 5.5:94.5 er.

**(*S*)-1-(Naphthalen-2-yl)ethyl isobutyrate 8:** Chiralcel OJ-H (98:2 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 254 nm, 30 °C) t<sub>R</sub> (R): 9.4 min, t<sub>R</sub> (S): 11.6 min, 6.2:93.8 er. *s* = 45.

**With Merrifield-BTM 6:** Yield of (*R*)-1-(naphthalen-2-yl)ethan-1-ol **7** = 70% (24 mg) and (*S*)-1-(naphthalen-2-yl)ethyl isobutyrate **8** = 25% (12 mg)

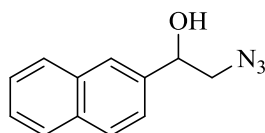
**Chiral HPLC analysis:**

**(*S*)-1-(Naphthalen-2-yl)ethyl isobutyrate 8:** Chiralcel OJ-H (98:2 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 254 nm, 30 °C) t<sub>R</sub> (R): 9.4 min, t<sub>R</sub> (S): 11.6 min, 96.5:3.5 er. *s* = 38.

**(R)-1-(Naphthalen-2-yl)ethan-1-ol 7:** Chiralcel OJ-H (90:10 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 254 nm, 30 °C) t<sub>R</sub> (S): 15.0 min, t<sub>R</sub> (R): 19.1 min, 67.2:32.8 er.

**Chiral HPLC data for Table 2:** Recycling experiments of supported catalysts **2-4** and **6** for the sequential KR of five secondary alcohols **9-13**

**Cycle 1: 2-Azido-1-(naphthalen-3-yl)ethan-1-ol 9**



**With Merrifield-HyperBTM 2:**

Following General Procedure E, 2-azido-1-(naphthalen-3-yl)ethan-1-ol **9** (85 mg, 0.4 mmol), Merrifield-HyperBTM **2** (23 mg, 5 mol%), *i*-Pr<sub>2</sub>NEt (42 μL, 0.24 mmol, 0.6 equiv.) and (*i*-PrCO)<sub>2</sub>O (36 μL, 0.22 mmol, 0.55 equiv.) in DMC (2 mL) for 24 h at r.t. gave the crude product, which was purified by Biotage® Isolera™ 4 to give (*S*)-2-azido-1-(naphthalen-3-yl)ethan-1-ol **9** (37 mg, 43%) and (*R*)-2-azido-1-(naphthalen-3-yl)ethyl isobutyrate **S7** (50 mg, 44%). The catalyst was recovered by simple filtration and washed with MeOH (250 ml), CH<sub>2</sub>Cl<sub>2</sub> (250 ml), CHCl<sub>3</sub> (250 ml) and THF (250 ml) respectively. Finally, the washed catalyst was dried under vacuum for 3 hrs, weighed (23 mg) and used for next cycle.

**(R)-2-Azido-1-(naphthalen-2-yl)ethyl isobutyrate S7:** [ $\alpha$ ]<sub>D</sub><sup>20</sup> = -103 (*c* 1.0, CHCl<sub>3</sub>) {Lit.<sup>5</sup> [ $\alpha$ ]<sub>D</sub><sup>20</sup> = -78 (75% ee, *c* 1.0, CHCl<sub>3</sub>); Chiral HPLC analysis, Chiralcel AD-H (99.8:0.2 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C) t<sub>R</sub> (S): 14.3 min, t<sub>R</sub> (R): 25.5 min, 10.236:89.764 er.

**(S)-2-Azido-1-(naphthalen-3-yl)ethan-1-ol 9:** [ $\alpha$ ]<sub>D</sub><sup>20</sup> = +94.7 (*c* 1.0, CHCl<sub>3</sub>); {Lit.<sup>14</sup> [ $\alpha$ ]<sub>D</sub><sup>20</sup> = +125.2 (99 %ee, *c* 1.3, CHCl<sub>3</sub>), Chiral HPLC analysis, Chiralcel OD-H (95:5 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 220 nm, 30 °C) t<sub>R</sub> (R): 31.1 min, t<sub>R</sub> (S): 35.4 min, 6.124:93.876 er. *s* = 25.

**With TentaGel-HyperBTM 3 (used 47 mg):** Yield of (*S*)-2-Azido-1-(naphthalen-3-yl)ethan-1-ol **9** = 52% (44 mg) and (*R*)-2-Azido-1-(naphthalen-2-yl)ethyl isobutyrate **S7** = 41% (46 mg)

**(*R*)-2-Azido-1-(naphthalen-2-yl)ethyl isobutyrate S7:**  $[\alpha]_D^{20} = -107$  (*c* 1.0, CHCl<sub>3</sub>) {Lit.<sup>5</sup>  $[\alpha]_D^{20} = -78$  (75% ee, *c* 1.0, CHCl<sub>3</sub>); Chiralcel AD-H (99.8:0.2 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C) *t*<sub>R</sub> (*S*): 13.4 min, *t*<sub>R</sub> (*R*): 21.4 min, 8.747:91.253 er.

**(*S*)-2-Azido-1-(naphthalen-3-yl)ethan-1-ol 9:**  $[\alpha]_D^{20} = +75$  (*c* 1.0, CHCl<sub>3</sub>); {Lit.<sup>14</sup>  $[\alpha]_D^{20} = +125.2$  (99 %ee, *c* 1.3, CHCl<sub>3</sub>), Chiral HPLC analysis, Chiralcel OD-H (95:5 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 220 nm, 30 °C) *t*<sub>R</sub> (*R*): 30.2 min, *t*<sub>R</sub> (*S*): 34.2 min, 14.640:85.360 er. *s* = 22.

The quantity of recovered catalyst after proper washing and vacuum drying was 47 mg.

**With Wang-HyperBTM 4 (used 31 mg):** Yield of (*S*)-2-Azido-1-(naphthalen-3-yl)ethan-1-ol **9** = 48% (41 mg) and (*R*)-2-Azido-1-(naphthalen-2-yl)ethyl isobutyrate **S7** = 46% (52 mg).

**(*R*)-2-Azido-1-(naphthalen-2-yl)ethyl isobutyrate S7:** mp 35-37 °C;  $[\alpha]_D^{20} = -107$  (*c* 1.0, CHCl<sub>3</sub>) {Lit.<sup>5</sup>  $[\alpha]_D^{20} = -78$  (75% ee, *c* 1.0, CHCl<sub>3</sub>); Chiral HPLC analysis, Chiralcel AD-H (99.8:0.2 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C) *t*<sub>R</sub> (*S*): 13.4 min, *t*<sub>R</sub> (*R*): 21.6 min, 8.220:91.780 er.

**(*S*)-2-Azido-1-(naphthalen-3-yl)ethan-1-ol 9:** mp 84-86 °C {Lit.<sup>15</sup> 82-83 °C}.  $[\alpha]_D^{20} = +85$  (*c* 1.0, CHCl<sub>3</sub>) {Lit.<sup>14</sup>  $[\alpha]_D^{20} = +125.2$  (99 %ee, *c* 1.3, CHCl<sub>3</sub>); Chiral HPLC analysis, Chiralcel OD-H (95:5 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 220 nm, 30 °C) *t*<sub>R</sub> (*R*): 30.3 min, *t*<sub>R</sub> (*S*): 34.0 min, 8.421:91.579 er. *s* = 29

The quantity of recovered catalyst after proper washing and vacuum drying was 31 mg.

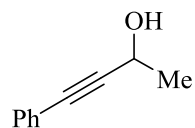
**With Merrifield-BTM 6 (used 23 mg):** Yield of (*R*)-2-Azido-1-(naphthalen-3-yl)ethan-1-ol **9** = 82% (70 mg) and (*S*)-2-Azido-1-(naphthalen-2-yl)ethyl isobutyrate **S7** = 13% (15 mg)

**(S)-2-Azido-1-(naphthalen-2-yl)ethyl isobutyrate S7:**  $[\alpha]_D^{20} = +48$  (*c* 1.0, CHCl<sub>3</sub>) {Lit.<sup>5</sup> (*ent*, 75% ee)  $[\alpha]_D^{20} = -78$  (*c* 1.0, CHCl<sub>3</sub>); Chiral HPLC analysis, Chiralcel AD-H (99.8:0.2 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C) *t<sub>R</sub>* (S): 15.1 min, *t<sub>R</sub>* (R): 25.6 min, 69.814:30.186 er

**(R)-2-Azido-1-(naphthalen-3-yl)ethan-1-ol 9:**  $[\alpha]_D^{20} = -7.25$  (*c* 1.0, CHCl<sub>3</sub>) {Lit.<sup>14</sup> (*ent*, 99% ee)  $[\alpha]_D^{20} = +125.2$  (*c* 1.3, CHCl<sub>3</sub>); Chiralcel OD-H (95:5 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 220 nm, 30 °C) *t<sub>R</sub>* (R): 30.6 min, *t<sub>R</sub>* (S): 35.1 min, 53.792:46.208 er. *s* = 2.

The quantity of recovered catalyst after proper washing and vacuum drying was 21 mg.

### Cycle 2: Kinetic resolution of 4-phenylbut-3-yn-2-ol 10



Following General Procedure E, 4-phenylbut-3-yn-2-ol **10** (58 mg, 0.4 mmol), Merrifield-HyperBTM **2** (23 mg, 5 mol%), *i*-Pr<sub>2</sub>NEt (42 μL, 0.24 mmol, 0.6 equiv.) and (*i*-PrCO)<sub>2</sub>O (36 μL, 0.22 mmol, 0.55 equiv.) in DMC (2 mL) for 24 h at r.t. gave the crude product, which was purified by Biotage® Isolera™ 4 to give (*R*)-4-phenylbut-3-yn-2-ol **10** (26 mg, 44%) and (*S*)-4-phenylbut-3-yn-2-yl isobutyrate **S8** (39 mg, 45%).

Following General Procedure G, (*S*)-4-phenylbut-3-yn-2-yl isobutyrate **S8** was hydrolysed to corresponding (*S*)-4-phenylbut-3-yn-2-ol for HPLC analysis.  $[\alpha]_D^{20} = -90$  (*c* 0.8, CHCl<sub>3</sub>) {Lit.<sup>5</sup>  $[\alpha]_D^{20} = -23$  (77% ee, *c* 1.0, CHCl<sub>3</sub>); Chiral HPLC analysis, Chiralcel OD-H (95:5 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C) *t<sub>R</sub>* (R): 11.2 min, *t<sub>R</sub>* (S): 28.7 min, 19.002:80.998 er. *s* = 10.

**(R)-4-Phenylbut-3-yn-2-ol 10:**  $[\alpha]_D^{20} = +23$  (*c* 0.8, CHCl<sub>3</sub>) {Lit.<sup>16</sup>  $[\alpha]_D^{20} = +32.4$  (96% ee, *c* 0.966, CHCl<sub>3</sub>); Chiral HPLC analysis, Chiralcel OD-H (95:5 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C) *t<sub>R</sub>* (R): 11.1 min, *t<sub>R</sub>* (S): 27.7 min, 88.823:11.177 er.

The quantity of recovered catalyst after proper washing and vacuum drying was 21 mg.

**With TentaGel-HyperBTM 3 (catalyst used is 47 mg):** Yield of **(R)-4-Phenylbut-3-yn-2-ol 10** = 46% (27 mg) and **(S)-4-phenylbut-3-yn-2-yl isobutyrate S8** = 44% (38 mg).

Following General Procedure G, **(S)-4-phenylbut-3-yn-2-yl isobutyrate S8** was hydrolysed to corresponding (S)-4-phenylbut-3-yn-2-ol for HPLC analysis.  $[\alpha]_D^{20} = -61.5$  (*c* 0.8, CHCl<sub>3</sub>) {Lit.<sup>5</sup>  $[\alpha]_D^{20} = -23$  (77% ee, *c* 1.0, CHCl<sub>3</sub>); Chiral HPLC analysis, Chiralcel OD-H (95:5 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C) *t<sub>R</sub>* (R): 11.1 min, *t<sub>R</sub>* (S): 27.6 min, 21.073:78.927 er.

**(R)-4-Phenylbut-3-yn-2-ol 10:**  $[\alpha]_D^{20} = +21.4$  (*c* 0.8, CHCl<sub>3</sub>) {Lit.<sup>16</sup>  $[\alpha]_D^{20} = +32.4$  (96% ee, *c* 0.966, CHCl<sub>3</sub>); Chiral HPLC analysis, Chiralcel OD-H (95:5 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C) *t<sub>R</sub>* (R): 11.1 min, *t<sub>R</sub>* (S): 27.7 min, 81.202:18.798 er. *s* = 7.

The quantity of recovered catalyst after proper washing and vacuum drying was 43 mg.

**With Wang-HyperBTM 4 (catalyst used is 31 mg):** Yield of **(R)-4-Phenylbut-3-yn-2-ol 10** = 44% (26 mg) and **(S)-4-phenylbut-3-yn-2-yl isobutyrate S8** = 42% (36 mg).

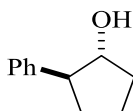
Following General Procedure G, **(S)-4-phenylbut-3-yn-2-yl isobutyrate S8** was hydrolysed to corresponding (S)-4-phenylbut-3-yn-2-ol for HPLC analysis.  $[\alpha]_D^{20} = -105$  (*c* 1.0, CHCl<sub>3</sub>); {Lit.<sup>5</sup>  $[\alpha]_D^{20} = -23$  (77% ee, *c* 1.0, CHCl<sub>3</sub>); Chiral HPLC analysis, Chiralcel OD-H (95:5 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C) *t<sub>R</sub>* (R): 11.2 min, *t<sub>R</sub>* (S): 27.8 min, 13.368:86.632 er.

**(R)-4-Phenylbut-3-yn-2-ol 10:**  $[\alpha]_D^{20} = +24$  (*c* 0.8, CHCl<sub>3</sub>); {Lit.<sup>16</sup>  $[\alpha]_D^{20} = +32.4$  (96% ee, *c* 0.966, CHCl<sub>3</sub>); Chiral HPLC analysis, Chiralcel OD-H (95:5 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C) *t<sub>R</sub>* (R): 11.1 min, *t<sub>R</sub>* (S): 27.7 min, 88.132:11.868 er. *s* = 15.

The quantity of recovered catalyst after proper washing and vacuum drying was 29 mg

**With Merrifield-BTM 6:** No reaction.

**Cycle 3: *trans*-2-Phenylcyclopentan-1-ol 11**



Following General Procedure E, *trans*-2-phenylcyclopentan-1-ol **11** (49 mg, 0.3 mmol), Merrifield-HyperBTM **2** (17 mg, 5 mol%), *i*-Pr<sub>2</sub>NEt (31 μL, 0.18 mmol, 0.6 equiv.) and (*i*-PrCO)<sub>2</sub>O (27 μL, 0.165 mmol, 0.55 equiv.) in DMC (1.5 mL) for 24 h at r.t gave the crude product, which was purified by Biotage® Isolera™ 4 to give (1*R*,2*S*)-2-phenylcyclopentan-1-ol **11** (21 mg, 43%) and (1*S*,2*R*)-2-phenylcyclopentyl isobutyrate **S9** (26 mg, 37%).

**(1*S*,2*R*)-2-Phenylcyclopentyl isobutyrate S9:**  $[\alpha]_D^{20} = +33.8$  (*c* 1.0, CHCl<sub>3</sub>) {Lit.<sup>5</sup>  $[\alpha]_D^{20} = +67.2$  (90% ee, *c* 1.0, CHCl<sub>3</sub>); Following General Procedure G, (1*S*,2*R*)-2-phenylcyclopentyl isobutyrate **S9** was hydrolysed to corresponding alcohol (1*S*,2*R*)-2-phenylcyclopentan-1-ol **11** for HPLC analysis. Chiral HPLC analysis, Chiralcel OD-H (98:2 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C) *t*<sub>R</sub> (1*S*,2*R*): 14.4 min, *t*<sub>R</sub> (1*R*,2*S*): 16.1 min, 90.046:9.954 er.

**(1*R*,2*S*)-2-Phenylcyclopentan-1-ol 11:**  $[\alpha]_D^{20} = -49.3$  (*c* 1.0, CHCl<sub>3</sub>) {Lit.<sup>5</sup>  $[\alpha]_D^{20} = -60.7$  (95% ee, *c* 1.0, CHCl<sub>3</sub>); Chiral HPLC analysis Chiralcel OD-H (98:2 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C) *t*<sub>R</sub> (1*S*,2*R*): 14.4 min, *t*<sub>R</sub> (1*R*,2*S*): 16.0 min, 4.997:95.003 er. *s* = 27.

The quantity of recovered catalyst after proper washing and vacuum drying was 17 mg.

**With TentaGel-HyperBTM 3 (catalyst used is 35 mg):** Yield of (1*R*,2*S*)-2-Phenylcyclopentan-1-ol **11** = 45% (22 mg) and (1*S*,2*R*)-2-Phenylcyclopentyl isobutyrate **S9** = 46% (32 mg).

**(1*S*,2*R*)-2-Phenylcyclopentyl isobutyrate S9:**  $[\alpha]_D^{20} = +35.6$  (*c* 1.0, CHCl<sub>3</sub>) {Lit.<sup>5</sup>  $[\alpha]_D^{20} = +67.2$  (90% ee, *c* 1.0, CHCl<sub>3</sub>); Following General Procedure G, (1*S*,2*R*)-2-phenylcyclopentyl

isobutyrate **S9** was hydrolysed to corresponding alcohol (1*S*,2*R*)-2-phenylcyclopentan-1-ol **11** for HPLC analysis. Chiral HPLC analysis, Chiralcel OD-H (98:2 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C) t<sub>R</sub> (1*S*,2*R*): 14.4 min, t<sub>R</sub> (1*R*,2*S*): 16.1 min, 92.331:7.669 er. *s* = 29.

**(1*R*,2*S*)-2-Phenylcyclopentan-1-ol 11**: [ $\alpha$ ]<sub>D</sub><sup>20</sup> = -45 (*c* 1.0, CHCl<sub>3</sub>) {Lit.<sup>5</sup> [ $\alpha$ ]<sub>D</sub><sup>20</sup> = -60.7 (95% ee, *c* 1.0, CHCl<sub>3</sub>); Chiral HPLC analysis Chiralcel OD-H (98:2 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C) t<sub>R</sub> (1*S*,2*R*): 14.4 min, t<sub>R</sub> (1*R*,2*S*): 16.1 min, 10.359:89.641 er.

The quantity of recovered catalyst after proper washing and vacuum drying was 30 mg.

**With Wang-HyperBTM 4 (catalyst used is 23 mg):** Yield of **(1*R*,2*S*)-2-Phenylcyclopentan-1-ol 11** = 45% (22 mg) and **(1*S*,2*R*)-2-Phenylcyclopentyl isobutyrate S9** = 47% (33 mg).

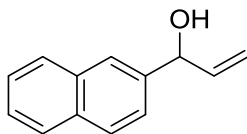
**(1*S*,2*R*)-2-Phenylcyclopentyl isobutyrate S9**: [ $\alpha$ ]<sub>D</sub><sup>20</sup> = +32.6 (*c* 1.0, CHCl<sub>3</sub>) {Lit.<sup>5</sup> [ $\alpha$ ]<sub>D</sub><sup>20</sup> = +67.2 (90% ee, *c* 1.0, CHCl<sub>3</sub>); Following General Procedure G, (1*S*,2*R*)-2-phenylcyclopentyl isobutyrate hydrolysed to corresponding alcohol (1*S*,2*R*)-2-phenylcyclopentan-1-ol **41** for HPLC analysis. Chiral HPLC analysis, Chiralcel OD-H (98:2 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C) t<sub>R</sub> (1*S*,2*R*): 14.4 min, t<sub>R</sub> (1*R*,2*S*): 16.1 min, 92.068:7.932 er.

**(1*R*,2*S*)-2-Phenylcyclopentan-1-ol 11**: [ $\alpha$ ]<sub>D</sub><sup>20</sup> = -40.9 (*c* 1.0, CHCl<sub>3</sub>) {Lit.<sup>5</sup> [ $\alpha$ ]<sub>D</sub><sup>20</sup> = -60.7 (95% ee, *c* 1.0, CHCl<sub>3</sub>); Chiral HPLC analysis, Chiralcel OD-H (98:2 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C) t<sub>R</sub> (1*S*,2*R*): 14.5 min, t<sub>R</sub> (1*R*,2*S*): 16.1 min, 9.266:90.734 er. *s* = 29.

The quantity of recovered catalyst after proper washing and vacuum drying was 21 mg.



#### Cycle 4: Kinetic resolution of 1-(naphthalen-2-yl)prop-2-en-1-ol **12**



Following General Procedure E, 1-(naphthalen-2-yl)prop-2-en-1-ol **12** (46 mg, 0.25 mmol), Merrifield-HyperBTM **2** (14 mg, 5 mol%), *i*-Pr<sub>2</sub>NEt (26 μL, 0.15 mmol, 0.6 equiv.) and (*i*-PrCO)<sub>2</sub>O (23 μL, 0.137 mmol, 0.55 equiv.) in DMC (1.25 mL) for 24 h at room temperature gave the crude product, which was purified by Biotage® Isolera™ 4 to give (*R*)-1-(naphthalen-2-yl)prop-2-en-1-ol **12** (22 mg, 48%) and (*S*)-1-(naphthalen-2-yl)allyl isobutyrate **S10** (30 mg, 47%).

**(S)-1-(Naphthalen-2-yl)allyl isobutyrate S10:**  $[\alpha]_D^{20} = -54.7$  (*c* 1.0, CHCl<sub>3</sub>) {Lit.<sup>17</sup>  $[\alpha]_D^{20} = +54$  (>99 %ee, *c* 1.0, CHCl<sub>3</sub>); Chiral HPLC analysis Chiralcel OJ-H (95:5 hexane:IPA, flow rate 0.5 mLmin<sup>-1</sup>, 211 nm, 30 °C) *t*<sub>R</sub> (*R*): 15.6 min, *t*<sub>R</sub> (*S*): 22.6 min, 12.460:87.540 er.

**(R)-1-(Naphthalen-2-yl)prop-2-en-1-ol 12:**  $[\alpha]_D^{20} = -5.6$  (*c* 1.0, CHCl<sub>3</sub>) {Lit.<sup>17</sup>  $[\alpha]_D^{20} = +10.1$  (94 %ee, *c* 0.8, CHCl<sub>3</sub>); Chiral HPLC analysis, Chiralcel OJ-H (80:20 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C) *t*<sub>R</sub> (*S*): 11.4 min, *t*<sub>R</sub> (*R*): 13.7 min, 15.133:84.867 er. *s* = 14.

The quantity of recovered catalyst after proper washing and vacuum drying was 17 mg.

**With TentaGel-HyperBTM 3 (catalyst used is 29 mg):** Yield of (*R*)-1-(Naphthalen-2-yl)prop-2-en-1-ol **12** = 56% (26 mg) and (*S*)-1-(Naphthalen-2-yl)allyl isobutyrate **S10** = 39% (25 mg)

**(S)-1-(Naphthalen-2-yl)allyl isobutyrate S10:**  $[\alpha]_D^{20} = -62.3$  (*c* 1.0, CHCl<sub>3</sub>) {Lit.<sup>17</sup>  $[\alpha]_D^{20} = +54$  (>99 %ee, *c* 1.0, CHCl<sub>3</sub>); Chiral HPLC analysis, Chiralcel OJ-H (95:5 hexane:IPA, flow rate 0.5 mLmin<sup>-1</sup>, 211 nm, 30 °C) *t*<sub>R</sub> (*R*): 15.6 min, *t*<sub>R</sub> (*S*): 22.5 min, 10.258:89.742 er.

**(R)-1-(Naphthalen-2-yl)prop-2-en-1-ol 12:**  $[\alpha]_D^{20} = -5$  ( $c$  1.0,  $\text{CHCl}_3$ ) {Lit.<sup>17</sup> $[\alpha]_D^{20} = +10.1$  (94 %ee,  $c$  0.8,  $\text{CHCl}_3$ ); Chiral HPLC analysis, Chiralcel OJ-H (80:20 hexane:IPA, flow rate 1  $\text{mLmin}^{-1}$ , 211 nm, 30 °C)  $t_R$  (S): 11.4 min,  $t_R$  (R): 13.7 min, 15.227:84.773 er.  $s = 18$ .

The quantity of recovered catalyst after proper washing and vacuum drying was 25 mg.

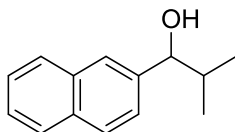
**With Wang-HyperBTM 4 (catalyst used is 19 mg):** Yield of **(R)-1-(Naphthalen-2-yl)prop-2-en-1-ol 12** = 50% (23 mg) and **(S)-1-(Naphthalen-2-yl)allyl isobutyrate S10** = 41% (26 mg).

**(S)-1-(Naphthalen-2-yl)allyl isobutyrate S10:**  $[\alpha]_D^{20} = -53.1$  ( $c$  1.0,  $\text{CHCl}_3$ ) {Lit.<sup>17</sup> $[\alpha]_D^{20} = +54$  (>99 %ee,  $c$  1.0,  $\text{CHCl}_3$ ); Chiral HPLC analysis, Chiralcel OJ-H (95:5 hexane:IPA, flow rate 0.5  $\text{mLmin}^{-1}$ , 211 nm, 30 °C)  $t_R$  (R): 15.6 min,  $t_R$  (S): 22.6 min, 11.374:88.626 er.

**(R)-1-(Naphthalen-2-yl)prop-2-en-1-ol 12:**  $[\alpha]_D^{20} = -4.8$  ( $c$  1.0,  $\text{CHCl}_3$ ) {Lit.<sup>17</sup> $[\alpha]_D^{20} = +10.1$  (94 %ee,  $c$  0.8,  $\text{CHCl}_3$ ); Chiral HPLC analysis, Chiralcel OJ-H (80:20 hexane:IPA, flow rate 1  $\text{mLmin}^{-1}$ , 211 nm, 30 °C)  $t_R$  (S): 11.5 min,  $t_R$  (R): 13.7 min, 15.382:84.618 er.  $s = 16$ .

The quantity of recovered catalyst after proper washing and vacuum drying was 16 mg.

### Cycle 5: Kinetic resolution of 2-methyl-1-(naphthalen-2-yl)propan-1-ol 13



Following General Procedure E, 2-methyl-1-(naphthalen-2-yl)propan-1-ol **13** (40 mg, 0.2 mmol), Merrifield-HyperBTM **2** (11 mg, 5 mol%),  $i\text{-Pr}_2\text{NEt}$  (21  $\mu\text{L}$ , 0.12 mmol, 0.6 equiv.) and  $(i\text{-PrCO})_2\text{O}$  (18  $\mu\text{L}$ , 0.11 mmol, 0.55 equiv.) in DMC (1 mL) for 24 h at room temperature gave the crude product, which was purified by Biotage® Isolera™ 4 to give **(R)-2-methyl-1-(naphthalen-2-yl)propan-1-ol 13** (19 mg, 47%) and **(S)-2-methyl-1-(naphthalen-2-yl)propyl isobutyrate S11** (17 mg, 31%).

**(S)-2-Methyl-1-(naphthalen-2-yl)propyl isobutyrate S11:**  $[\alpha]_D^{20} = -67.5$  (*c* 1.0, CHCl<sub>3</sub>) {Lit.<sup>5</sup>  $[\alpha]_D^{20} = -78$  (99% ee, *c* 1.0, CHCl<sub>3</sub>); Chiral HPLC analysis, Chiralcel AD-H (99.8:0.2 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C) *t*<sub>R</sub> (*R*): 6.9 min, *t*<sub>R</sub> (*S*): 8.6 min, 3.935:96.065 er.

**(R)-2-Methyl-1-(naphthalen-2-yl)propan-1-ol 13:**  $[\alpha]_D^{20} = +23.7$  (*c* 1.0, CHCl<sub>3</sub>) {Lit.<sup>5</sup>  $[\alpha]_D^{20} = +25$  (82% ee, *c* 1.0, CHCl<sub>3</sub>); Chiral HPLC analysis, Chiralcel OD-H (95:5 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C) *t*<sub>R</sub> (*S*): 14.1 min, *t*<sub>R</sub> (*R*): 15.9 min, 0.301:99.699 er. *s* = 140.

The quantity of recovered catalyst after proper washing and vacuum drying was 9 mg.

**With TentaGel-HyperBTM 3 (catalyst used is 23 mg):** Yield of **(R)-2-Methyl-1-(naphthalen-2-yl)propan-1-ol 13** = 55% (22 mg) and **(S)-2-Methyl-1-(naphthalen-2-yl)propyl isobutyrate S11** = 26% (14 mg)

**(S)-2-Methyl-1-(naphthalen-2-yl)propyl isobutyrate S11:**  $[\alpha]_D^{20} = -42$  (*c* 0.5, CHCl<sub>3</sub>) {Lit.<sup>5</sup>  $[\alpha]_D^{20} = -78$  (99% ee, *c* 1.0, CHCl<sub>3</sub>); Chiral HPLC analysis, Chiralcel AD-H (99.8:0.2 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C) *t*<sub>R</sub> (*R*): 6.7 min, *t*<sub>R</sub> (*S*): 8.2 min, 1.279:98.721 er.

**(R)-2-Methyl-1-(naphthalen-2-yl)propan-1-ol 13:**  $[\alpha]_D^{20} = +20.6$  (*c* 1.0, CHCl<sub>3</sub>) {Lit.<sup>5</sup>  $[\alpha]_D^{20} = +25$  (82% ee, *c* 1.0, CHCl<sub>3</sub>); Chiral HPLC analysis, Chiralcel OD-H (95:5 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C) *t*<sub>R</sub> (*S*): 13.9 min, *t*<sub>R</sub> (*R*): 15.6 min, 12.970:87.030 er. *s* = 172.

The quantity of recovered catalyst after proper washing and vacuum drying was 20 mg.

**With Wang-HyperBTM 4 (catalyst used is 15 mg):** Yield of **(R)-2-Methyl-1-(naphthalen-2-yl)propan-1-ol 13** = 52% (21 mg) and **(S)-2-Methyl-1-(naphthalen-2-yl)propyl isobutyrate S11** = 33% (18 mg).

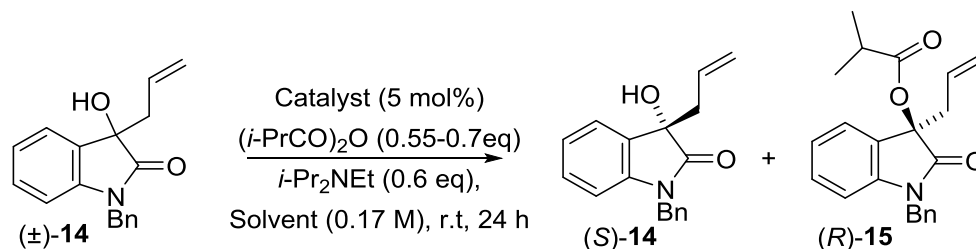
**(S)-2-Methyl-1-(naphthalen-2-yl)propyl isobutyrate S11:**  $[\alpha]_D^{20} = -46.4$  (*c* 1.0, CHCl<sub>3</sub>) {Lit.<sup>5</sup>  $[\alpha]_D^{20} = -78$  (99% ee, *c* 1.0, CHCl<sub>3</sub>); Chiralcel AD-H (99.8:0.2 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C) *t<sub>R</sub>* (*R*): 7.2 min, *t<sub>R</sub>* (*S*): 9.2 min, 1.037:98.963 er.

**(R)-2-Methyl-1-(naphthalen-2-yl)propan-1-ol 13:**  $[\alpha]_D^{20} = +20.8$  (*c* 1.0, CHCl<sub>3</sub>) {Lit.<sup>5</sup>  $[\alpha]_D^{20} = +25$  (82% ee, *c* 1.0, CHCl<sub>3</sub>); Chiral HPLC analysis, Chiralcel OD-H (95:5 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C) *t<sub>R</sub>* (*S*): 14.1 min, *t<sub>R</sub>* (*R*): 15.7 min, 12.201:87.799 er. *s* = 194.

The quantity of recovered catalyst after proper washing and vacuum drying was 12 mg.

## Kinetic Resolutions of Tertiary Alcohols

### Reaction Optimisation



Solvent (0.17 M)	Catalyst	$(i\text{-PrCO})_2\text{O}$ (equiv.)	ee (ester)	ee (alcohol)	c	<u>s</u>
DMC	2	0.55	80.68	75.24	48	21
DMC	2	0.7	75.88	86.12	53	20
DMC	3	0.55	88.83	54.73	38	29
DMC	4	0.55	84.08	48.04	36	19
DMC	6	0.55	32.72	0.43	1	2
$\text{CHCl}_3$	2	0.55	95.97	27.11	22	60
Toluene	2	0.55	81.70	70.47	46	21
$^t\text{BuOAc}$	2	0.55	76.68	7.7	9	8
$^i\text{PrOAc}$	2	0.55	82.33	49.6	38	17
EtOAc	2	0.55	81.61	73.42	47	22
EtOAc	3	0.55	76.97	55.22	42	13
EtOAc	4	0.55	80.83	71.40	47	20
EtOAc	6	0.55	5.2	0.01	0.19	1
$^t\text{AmOH}$	2	0.55	---	---	---	---

Reaction conditions: **14** (0.1 mmol), **2**, **3**, **4** or **6** (5 mol%),  $(i\text{-PrCO})_2\text{O}$  (0.55 to 0.7 equiv.),  $i\text{-Pr}_2\text{NEt}$  (0.6 equiv.), solvent (0.17 m), 0-r.t., 24 h. Conversion (c) and er determined by chiral HPLC analysis. Selectivity factors (*s*) calculated using er of **14** and reaction conversion (see ref.

1a), and rounded according to estimated associated errors (see ref. 1b). DMC = dimethyl carbonate,  $^t\text{BuOAc}$  = *tert*-butyl acetate,  $^i\text{PrOAc}$  = isopropyl acetate,  $^t\text{AmOH}$  = *tert*-amyl alcohol.

Following **General Procedure F**, 3-allyl-1-benzyl-3-hydroxyindolin-2-one **14** (27.93 mg, 0.1 mmol), (*i*-PrCO)<sub>2</sub>O (11.6 μL, 0.07 mmol, 0.7 equiv.), Merrifield-HyperBTM **2** (5.7 mg, 0.005 mmol, 5 mol%) and *i*Pr<sub>2</sub>NEt (10.5 μL, 0.06 mmol) in DMC (0.6 mL) at r.t. for 24 h to give the crude products, which were purified by Biotage® Isolera™ 4 to give *R*-3-allyl-1-benzyl-2-oxoindolin-3-yl isobutyrate **15** (18 mg, 0.0515 mmol, 52%) and (*S*)-3-allyl-1-benzyl-3-hydroxyindolin-2-one **14** (13 mg, 0.047 mmol, 47%).

**Chiral HPLC analysis:** Chiralcel OD-H (98:2 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 254 nm, 30 °C); (*R*)-3-Allyl-1-benzyl-2-oxoindolin-3-yl isobutyrate **15**: t<sub>R</sub> (*R*): 8.3 min, t<sub>R</sub> (*S*): 10.1 min, 87.773:12.227 er. (*S*)-3-Allyl-1-benzyl-3-hydroxyindolin-2-one **14**: t<sub>R</sub> (*R*): 32.6 min, t<sub>R</sub> (*S*): 37.8 min, 6.938:93.062 er. (Table 3, entry 9)

Following **General Procedure F**, 3-allyl-1-benzyl-3-hydroxyindolin-2-one **14** (28 mg, 0.1 mmol), (*i*-PrCO)<sub>2</sub>O (9.1 μL, 0.055 mmol, 0.55 equiv.), Merrifield-HyperBTM **2** (5.7 mg, 0.005 mmol, 5 mol%) and *i*Pr<sub>2</sub>NEt (10.5 μL, 0.06 mmol) in DMC (0.6 mL) at r.t. for 24 h to give the crude products, which were purified by Biotage® Isolera™ 4 to give (*R*)-3-allyl-1-benzyl-2-oxoindolin-3-yl isobutyrate **15** (16 mg, 0.0457 mmol, 46%) and (*S*)-3-allyl-1-benzyl-3-hydroxyindolin-2-one **14** (14 mg, 0.0501 mmol, 50%).

(*R*)-3-Allyl-1-benzyl-2-oxoindolin-3-yl isobutyrate **15**: [α]<sub>D</sub><sup>20</sup> = -19.5 (*c* 1.0, CHCl<sub>3</sub>) {Lit.<sup>9</sup> (*ent*, 95% ee) [α]<sub>D</sub><sup>20</sup> = +20 (*c* 1.0, CHCl<sub>3</sub>)}; Chiral HPLC analysis: Chiralcel OD-H (98:2 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 254 nm, 30 °C); ester: t<sub>R</sub> (*R*): 8.3 min, t<sub>R</sub> (*S*): 10.0 min, 90.188:9.812 er.

(*S*)-3-Allyl-1-benzyl-3-hydroxyindolin-2-one **14**: [α]<sub>D</sub><sup>20</sup> = -4.5 (*c* 1.0, CHCl<sub>3</sub>) {Lit.<sup>9</sup> (*ent*, 88% ee) [α]<sub>D</sub><sup>27</sup> = +13 (*c* 1.0, CHCl<sub>3</sub>)}; Chiral HPLC analysis, Chiralcel OD-H (98:2 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C); t<sub>R</sub> (*R*): 32.5 min, t<sub>R</sub> (*S*): 37.6 min, 13.247:86.753. *s* = 21. (Table 3, entry 6).

**Tentagel-HyperBTM 3** (19 mg, 0.005 mmol, 5 mol%), r.t.

**Chiral HPLC analysis:** Chiralcel OD-H (98:2 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 254 nm, 30 °C); (*R*)-3-Allyl-1-benzyl-2-oxoindolin-3-yl isobutyrate **15**:  $t_R$  (*R*): 8.2 min,  $t_R$  (*S*): 10.1 min, 94.414:5.586 er. (*S*)-3-Allyl-1-benzyl-3-hydroxyindolin-2-one **14**:  $t_R$  (*R*): 32.8 min,  $t_R$  (*S*): 38.5 min, 22.637:77.363 er. (Table 3, entry 7)

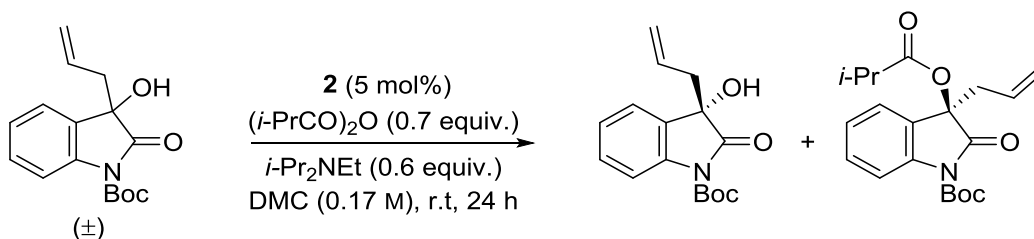
**Wang-HyperBTM 4** (13 mg, 0.005 mmol, 5 mol%), r.t.

**Chiral HPLC analysis:** Chiralcel OD-H (98:2 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 254 nm, 30 °C); (*R*)-3-Allyl-1-benzyl-2-oxoindolin-3-yl isobutyrate **15**:  $t_R$  (*R*): 8.2 min,  $t_R$  (*S*): 10.0 min, 92.040:7.960 er. (*S*)-3-Allyl-1-benzyl-3-hydroxyindolin-2-one **14**:  $t_R$  (*R*): 32.8 min,  $t_R$  (*S*): 38.6 min, 25.964:74.036 er. (Table 3, entry 8)

**Merrifield-BTM 6** (5.81 mg, 0.01 mmol, 5 mol%), r.t.

**Chiral HPLC analysis:** Chiralcel OD-H (98:2 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 254 nm, 30 °C); (*R*)-3-Allyl-1-benzyl-2-oxoindolin-3-yl isobutyrate **15**:  $t_R$  (*R*): 8.3 min,  $t_R$  (*S*): 10.1 min, 65.736:34.264 (*R*:*S*) er. (*S*)-3-Allyl-1-benzyl-3-hydroxyindolin-2-one **14**:  $t_R$  (*R*): 32.9 min,  $t_R$  (*S*): 38.8 min, 49.376:50.624 (*R*:*S*) er. (Table 3, entry 10)

#### Table 4: Substrate Scope



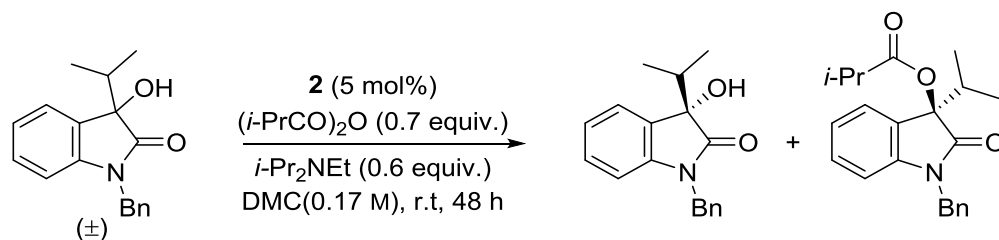
Following **General Procedure F**, *tert*-butyl 3-allyl-3-hydroxy-2-oxoindoline-1-carboxylate **16** (28.9 mg, 0.1 mmol), isobutyric anhydride (11.6  $\mu\text{L}$ , 0.07 mmol), Merrifield-HyperBTM **2** (5.7

mg, 0.005 mmol, 5 mol%) and *i*Pr<sub>2</sub>NEt (10.5 μL, 0.06 mmol) in DMC (1.2 mL) at r.t. for 24 h to give the crude products, which were purified by flash column chromatography (CH<sub>2</sub>Cl<sub>2</sub>:EtOAc 9:1) to give *tert*-butyl 3-allyl-3-(isobutyryloxy)-2-oxoindoline-1-carboxylate **S12** (19 mg, 0.052 mmol, 53%) and *tert*-butyl 3-allyl-3-hydroxy-2-oxoindoline-1-carboxylate **16** (9 mg, 0.031 mmol, 31%).

**(R)-tert-Butyl 3-allyl-3-(isobutyryloxy)-2-oxoindoline-1-carboxylate S12:**  $[\alpha]_D^{20} = -10.6$  (*c* 0.5, CHCl<sub>3</sub>) {Lit.<sup>9</sup> (*ent*, 92% ee)  $[\alpha]_D^{20} = +17$  (*c* 0.1, CHCl<sub>3</sub>)}; **Chiral HPLC analysis**, Chiralcel OD-H (99:1 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C) *t*<sub>R</sub> (*R*): 4.7 min, *t*<sub>R</sub> (*S*): 7.6 min, 77.241:22.759 (*R*:*S*) er..

**(S)-tert-Butyl 3-allyl-3-hydroxy-2-oxoindoline-1-carboxylate 16:**  $[\alpha]_D^{20} = -34.6$  (*c* 0.5, CHCl<sub>3</sub>) {Lit.<sup>9</sup> (*ent*, 98% ee)  $[\alpha]_D^{20} = +43$  (*c* 0.1, CHCl<sub>3</sub>)}; **Chiral HPLC analysis**, Chiralcel AD-H (95:5 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C) ) *t*<sub>R</sub> (*R*): 10.7 min, *t*<sub>R</sub> (*S*): 13.4 min, 1.048:98.952 (*R*:*S*) er. *s* = 14.

### 1-Benzyl-3-ethyl-3-hydroxyindolin-2-one 17



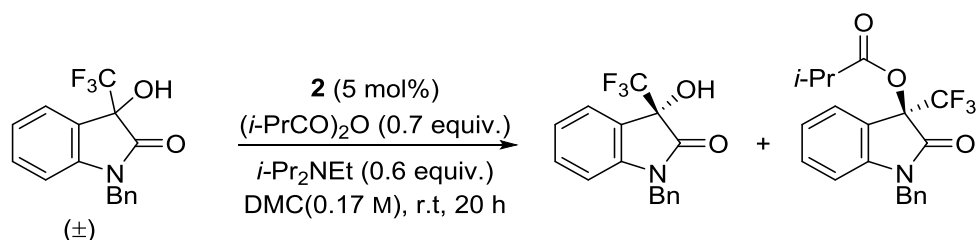
Following **General Procedure F**, 1-benzyl-3-hydroxy-3-isopropylindolin-2-one **17** (28.1 mg, 0.1 mmol), isobutyric anhydride (11.6 μL, 0.07 mmol), Merrifield-HyperBTM **2** (5.7 mg, 0.005 mmol, 5 mol%) and *i*Pr<sub>2</sub>NEt (10.5 μL, 0.06 mmol) in DMC (1.2 mL) at r.t. for 48 h to give the crude products, which were purified by Biotage® Isolera 4 chromatography (eluent: 0%→30% EtOAc in hexane) to give 1-benzyl-3-isopropyl-2-oxoindolin-3-yl isobutyrate **S13** (15 mg, 0.041 mmol, 42%) and 1-benzyl-3-hydroxy-3-isopropylindolin-2-one **17** (15 mg, 0.053 mmol, 53%).



**(R)-1-Benzyl-3-ethyl-2-oxindolin-3-yl isobutyrate S13:**  $[\alpha]_D^{20} = +26.3$  (*c* 1.0, CHCl<sub>3</sub>) {Lit.<sup>9</sup>(*ent*, 93% ee)  $[\alpha]_D^{20} = -30$  (*c* 1.0, CHCl<sub>3</sub>)}; **Chiral HPLC analysis**, Chiralpak AD-H (98:2 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) *t<sub>R</sub>* (S): 8.2 min, *t<sub>R</sub>* (R): 10.2 min, 12.511:87.489 er.

**(S)-1-Benzyl-3-ethyl-3-hydroxyindolin-2-one 17:**  $[\alpha]_D^{20} = -49.5$  (*c* 1.0, CHCl<sub>3</sub>) {Lit.<sup>9</sup>(*ent*, 70% ee)  $[\alpha]_D^{25} = +59$  (*c* 1.0, CHCl<sub>3</sub>)}; **Chiral HPLC analysis**, Chiralpak AD-H (98:2 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) *t<sub>R</sub>* (R): 38.4 min, *t<sub>R</sub>* (S): 46.9 min, 19.578:80.422 er.

### 1-Benzyl-3-hydroxy-3-(trifluoromethyl)indolin-2-one 18



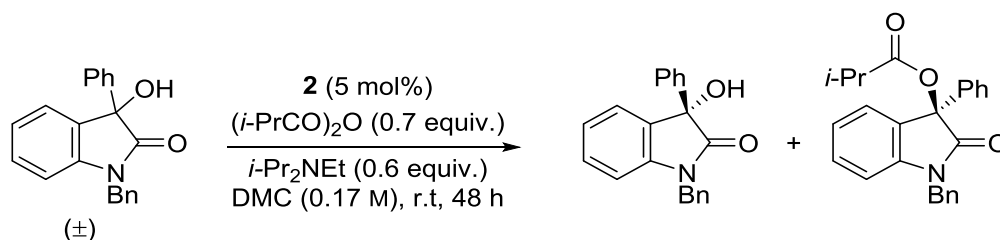
Following **General Procedure F**, 1-benzyl-3-hydroxy-3-(trifluoromethyl)indolin-2-one **18** (30.7 mg, 0.1 mmol), isobutyric anhydride (11.6  $\mu\text{L}$ , 0.07 mmol), Merrifield-HyperBTM **2** (5.7 mg, 0.005 mmol, 5 mol%) and *i*Pr<sub>2</sub>NEt (10.5  $\mu\text{L}$ , 0.06 mmol) in DMC (1.2 mL) at r.t. for 20 h to give the crude products, which were purified by flash column chromatography (hexane:EtOAc 10:2) to give 1-benzyl-2-oxo-3-(trifluoromethyl)indolin-3-yl isobutyrate **S14** (16 mg, 0.042 mmol, 42%) and 1-benzyl-3-hydroxy-3-(trifluoromethyl)indolin-2-one **18** (11 mg, 0.035 mmol, 36%).

**(R)-1-Benzyl-2-oxo-3-(trifluoromethyl)indolin-3-yl isobutyrate S14:**  $[\alpha]_D^{20} = +3.0$  (*c* 1.0, CHCl<sub>3</sub>) {Lit.<sup>9</sup> (*ent*, 70% ee)  $[\alpha]_D^{20} = -8.0$  (*c* 0.1, CHCl<sub>3</sub>)}; **Chiral HPLC analysis**, Chiralpak AD-H (99:1 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 211 nm, 30 °C) *t<sub>R</sub>* (S): 12.7 min, *t<sub>R</sub>* (R): 15.3 min, 19.991:80.009 er.

**(S)-1-Benzyl-3-hydroxy-3-(trifluoromethyl)indolin-2-one 18:**  $[\alpha]_D^{20} = -52$  (*c* 0.5, CHCl<sub>3</sub>) {Lit.<sup>9</sup> (*ent*, >99% ee)  $[\alpha]_D^{20} = +60$  (*c* 0.1, CHCl<sub>3</sub>)}; **Chiral HPLC analysis**, Chiralpak AD-H (95:5

hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 211 nm, 30 °C) t<sub>R</sub> (R): 15.8 min, t<sub>R</sub> (S): 20.5 min, 0.305:99.695 er.

### 1-Benzyl-3-hydroxy-3-phenylindolin-2-one **19**

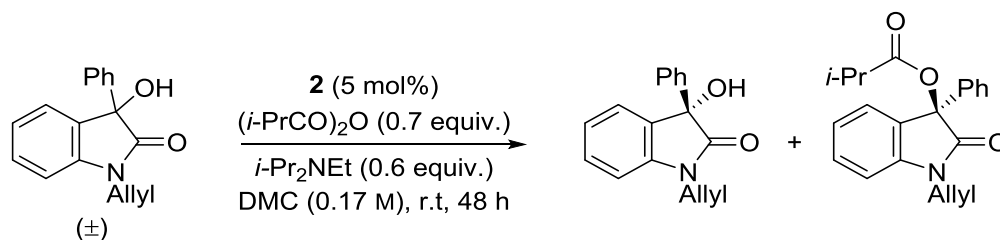


Following **General Procedure F**, 1-benzyl-3-hydroxy-3-phenylindolin-2-one **19** (31.5 mg, 0.1 mmol), isobutyric anhydride (11.6 μL, 0.07 mmol), M-HyperBTM (5.7 mg, 0.005 mmol, 5 mol%) and *i*Pr<sub>2</sub>NEt (10.5 μL, 0.06 mmol) in DMC (1.2 mL) at r.t. for 48 h to give the crude products, which were purified by Biotage® Isolera 4 chromatography (eluent: 0%→25% EtOAc in hexane) to give 1-benzyl-2-oxo-3-phenylindolin-3-yl isobutyrate **S15** (19 mg, 0.049 mmol, 49%) and 1-benzyl-3-hydroxy-3-phenylindolin-2-one **19** (15 mg, 0.047 mmol, 48%).

**(R)-1-Benzyl-2-oxo-3-phenylindolin-3-yl isobutyrate S15:**  $[\alpha]_D^{20} = -93.5$  (*c* 1.0, CHCl<sub>3</sub>) {Lit.<sup>9</sup> (*ent*, 90% ee)  $[\alpha]_D^{20} = +107$  (*c* 1.0, CHCl<sub>3</sub>)}; **Chiral HPLC analysis**, Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.25 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (S): 12.2 min, t<sub>R</sub> (R): 25.6 min, 4.968:95.032 er.

**(S)-1-Benzyl-3-hydroxy-3-phenylindolin-2-one 19:**  $[\alpha]_D^{20} = -51.5$  (*c* 1.0, CHCl<sub>3</sub>) {Lit.<sup>9</sup> (*ent*, 99.6% ee) 98% ee)  $[\alpha]_D^{20} = +55$  (*c* 1.0, CHCl<sub>3</sub>)}; **Chiral HPLC analysis**, Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.25 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (R): 19.7 min, t<sub>R</sub> (S): 25.5 min, 3.556:96.444 er.

### 1-Allyl-3-hydroxy-3-phenylindolin-2-one **20**

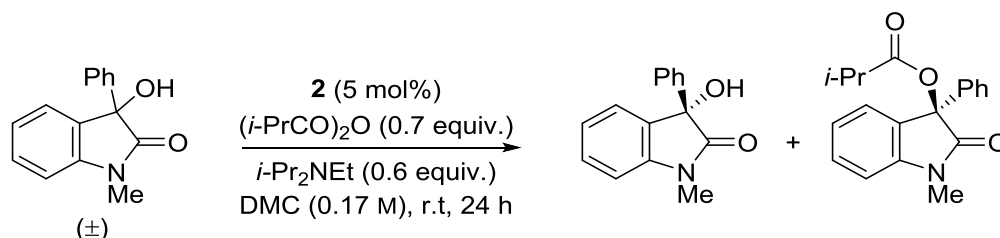


Following **General Procedure F**, 1-allyl-3-hydroxy-3-phenylindolin-2-one **20** (26.5 mg, 0.1 mmol), isobutyric anhydride (11.6  $\mu\text{L}$ , 0.07 mmol), Merrifield-HyperBTM **2** (5.7 mg, 0.005 mmol, 5 mol%) and  $i\text{Pr}_2\text{NEt}$  (10.5  $\mu\text{L}$ , 0.06 mmol) in DMC (1.2 mL) at r.t. for 48 h to give the crude products, which were purified by flash column chromatography (Petrol:EtOAc 90:10) to give 1-allyl-2-oxo-3-phenylindolin-3-yl isobutyrate **S16** (17 mg, 0.050 mmol, 51%) and 1-allyl-3-hydroxy-3-phenylindolin-2-one **20** (11 mg, 0.041 mmol, 41%).

**(R)-1-Allyl-2-oxo-3-phenylindolin-3-yl isobutyrate S16:**  $[\alpha]_D^{20} = -102.5$  ( $c$  0.1,  $\text{CHCl}_3$ ); **Chiral HPLC analysis** Chiralcel OD-H (99:1 hexane:IPA, flow rate 1.0 mL  $\text{min}^{-1}$ , 211 nm, 30 °C)  $t_R$  (*R*): 11.1 min,  $t_R$  (*S*): 12.8 min, 92.201:7.799 er.

**(S)-1-Allyl-3-hydroxy-3-phenylindolin-2-one 20:**  $[\alpha]_D^{20} = -82.5$  ( $c$  0.1,  $\text{CHCl}_3$ ); **Chiral HPLC analysis** Chiralcel OD-H (95:5 hexane:IPA, flow rate 1.0 mL  $\text{min}^{-1}$ , 211 nm, 30 °C)  $t_R$  (*S*): 13.9 min,  $t_R$  (*R*): 16.0 min, 99.852:0.148 (er).

### 3-Hydroxy-1-methyl-3-phenylindolin-2-one **21**



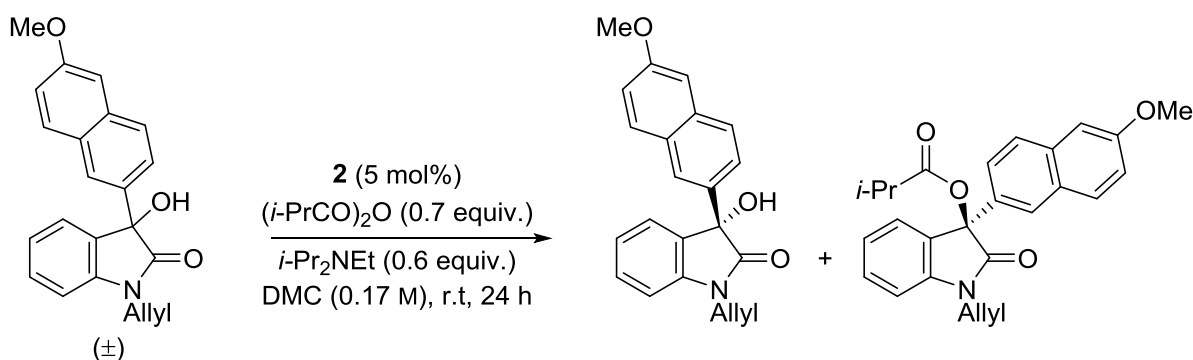
Following **General Procedure F**, 3-hydroxy-1-methyl-3-phenylindolin-2-one **21** (23.9 mg, 0.1 mmol), isobutyric anhydride (11.6  $\mu\text{L}$ , 0.07 mmol), Merrifield-HyperBTM **2** (5.7 mg, 0.005

mmol, 5 mol%) and *i*Pr<sub>2</sub>NEt (10.5 μL, 0.06 mmol) in DMC (1.2 mL) at r.t. for 24 h to give the crude products, which were purified by flash column chromatography (Petrol:EtOAc 85:15) to give 1-methyl-2-oxo-3-phenylindolin-3-yl isobutyrate **S17** (15 mg, 0.048 mmol, 48%) and 3-hydroxy-1-methyl-3-phenylindolin-2-one **21** (11 mg, 0.045 mmol, 46%).

**(R)-1-Methyl-2-oxo-3-phenylindolin-3-yl isobutyrate S17:**  $[\alpha]_D^{20} = -149$  (*c* 1.0, CHCl<sub>3</sub>) ; **Chiral HPLC analysis**, Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 211 nm, 30 °C) *t*<sub>R</sub> (*S*): 8.9 min, *t*<sub>R</sub> (*R*): 12.2 min, 5.919:94.081 (*S*:*R*) er..

**(S)-3-Hydroxy-1-methyl-3-phenylindolin-2-one 21:**  $[\alpha]_D^{20} = -77$  (*c* 1.0, CHCl<sub>3</sub>); **Chiral HPLC analysis** Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 211 nm, 30 °C) *t*<sub>R</sub> (*R*): 27.9 min, *t*<sub>R</sub> (*S*): 31.0 min, 0.994:99.006 er.

### 1-Allyl-3-hydroxy-3-(6-methoxynaphthalen-2-yl)indolin-2-one 22

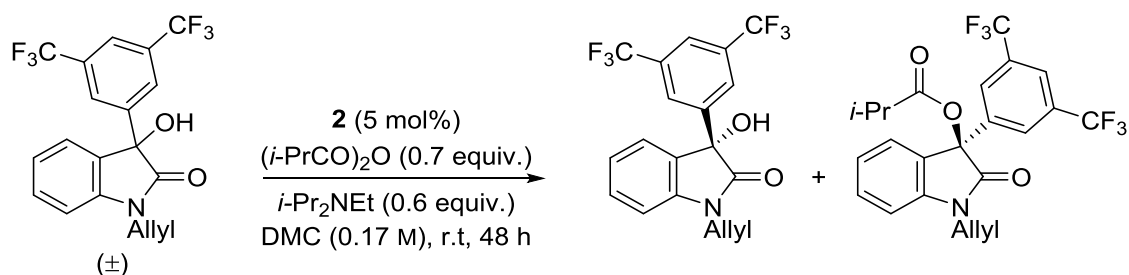


Following **General Procedure F**, 1-allyl-3-hydroxy-3-(6-methoxynaphthalen-2-yl)indolin-2-one **22** (34.5 mg, 0.1 mmol), isobutyric anhydride (11.6 μL, 0.07 mmol), M-HyperBTM (5.7 mg, 0.005 mmol, 5 mol%) and *i*Pr<sub>2</sub>NEt (10.5 μL, 0.06 mmol) in DMC (1.2 mL) at r.t. for 24 h to give the crude products, which were purified by Biotage® Isolera 4 chromatography (eluent:0%→30% EtOAc in hexane) to give 1-allyl-3-(6-methoxynaphthalen-2-yl)-2-oxoindolin-3-yl isobutyrate **S18** (23 mg, 0.055 mmol, 55%) and 1-allyl-3-hydroxy-3-(6-methoxynaphthalen-2-yl)indolin-2-one **22** (14 mg, 0.040 mmol, 41%).

**(R)-1-Allyl-3-(6-methoxynaphthalen-2-yl)-2-oxoindolin-3-yl isobutyrate S18:**  $[\alpha]_D^{20} = -98.7$  (*c* 1.0, CHCl<sub>3</sub>); **Chiral HPLC analysis**, Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) *t<sub>R</sub>* (S): 18.7 min, *t<sub>R</sub>* (R): 33.6 min, 12.592:87.408 er.

**(S)-1-Allyl-3-hydroxy-3-(6-methoxynaphthalen-2-yl)indolin-2-one 22:**  $[\alpha]_D^{20} = -21.2$  (*c* 1.0, CHCl<sub>3</sub>); **Chiral HPLC analysis** Chiralcel OJ-H (90:10 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) *t<sub>R</sub>* (R): 34.7 min, *t<sub>R</sub>* (S): 47.7 min, 0.451:99.549 er.

### 1-Allyl-3-(3,5-bis(trifluoromethyl)phenyl)-3-hydroxyindolin-2-one 23



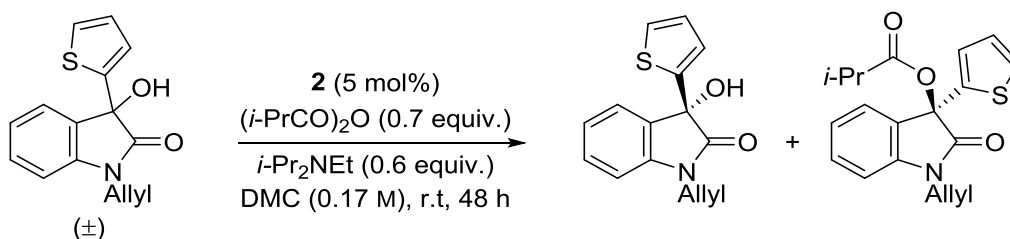
Following **General Procedure F**, 1-allyl-3-(3,5-bis(trifluoromethyl)phenyl)-3-hydroxyindolin-2-one **23** (40.1 mg, 0.1 mmol), isobutyric anhydride (11.6  $\mu$ L, 0.07 mmol), M-HyperBTM (5.7 mg, 0.005 mmol, 5 mol%) and *i*Pr<sub>2</sub>NEt (10.5  $\mu$ L, 0.06 mmol) in DMC (1.2 mL) at r.t. for 48 h to give the crude products, which were purified by Biotage® Isolera 4 chromatography (Hexane:EtOAc 90:10) to give 1-allyl-3-(3,5-bis(trifluoromethyl)phenyl)-2-oxoindolin-3-yl isobutyrate **S19** (28 mg, 0.059 mmol, 59%) and 1-allyl-3-(3,5-bis(trifluoromethyl)phenyl)-3-hydroxyindolin-2-one **23** (15 mg, 0.037 mmol, 37%).

**(R)-1-Allyl-3-(3,5-bis(trifluoromethyl)phenyl)-2-oxoindolin-3-yl isobutyrate S19:**  $[\alpha]_D^{20} = -60$  (*c* 1.0, CHCl<sub>3</sub>) {Lit.<sup>9</sup> (*ent*, 90% ee)  $[\alpha]_D^{20} = +102$  (*c* 2.0, CHCl<sub>3</sub>)}; **Chiral HPLC analysis** – suitable conditions couldn't be found to separate the enantiomers of the ester using the chiral HPLC columns Chiralcel OD-H & OJ-H, and Chiralpak AD-H, AS-H, IA, IB, IC & ID. The ester was therefore hydrolysed following general procedure G and the resulting alcohol analysed by Chiral HPLC:

Chiralpak AS-H (99:1 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (R): 6.9 min, t<sub>R</sub> (S): 27.5 min, 81.747:18.253 er.

**(S)-1-Allyl-3-(3,5-bis(trifluoromethyl)phenyl)-3-hydroxyindolin-2-one 23:**  $[\alpha]_D^{20} = -33.9$  (*c* 1.0, CHCl<sub>3</sub>) {Lit.<sup>9</sup> (*ent*, 92% ee)[ $\alpha]_D^{20} = +37$  (*c* 2.0, CHCl<sub>3</sub>)}; **Chiral HPLC analysis** Chiralpak AS-H (99:1 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (R): 7.1 min, t<sub>R</sub> (S): 28.7 min, 5.053:94.947 er.

### 1-Allyl-3-hydroxy-3-(thiophen-2-yl)indolin-2-one 24

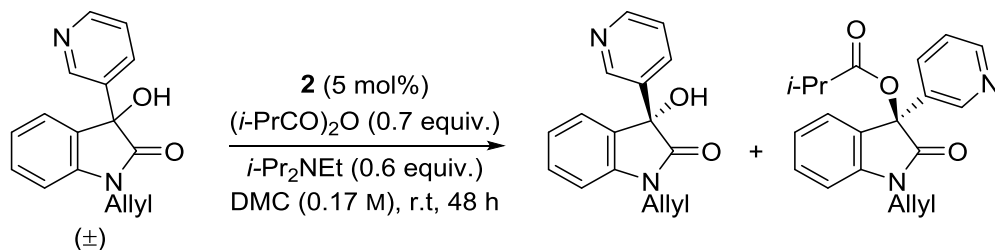


Following **General Procedure F**, 1-allyl-3-hydroxy-3-(thiophen-2-yl)indolin-2-one **24** (27.1 mg, 0.1 mmol), isobutyric anhydride (11.6 μL, 0.07 mmol), M-HyperBTM (5.7 mg, 0.005 mmol, 5 mol%) and *i*Pr<sub>2</sub>NEt (10.5 μL, 0.06 mmol) in DMC (1.2 mL) at r.t. for 48 h to give the crude products, which were purified by Biotage® Isolera 4 chromatography (Hexane:EtOAc 80:20) to give 1-allyl-2-oxo-3-(thiophen-2-yl)indolin-3-yl isobutyrate **S20** (18 mg, 0.052 mmol, 53%) and 1-allyl-3-hydroxy-3-(thiophen-2-yl)indolin-2-one **24** (17 mg, 0.040 mmol, 41%).

**(R)-1-Allyl-2-oxo-3-(thiophen-2-yl)indolin-3-yl isobutyrate S20:**  $[\alpha]_D^{20} = -127.5$  (*c* 0.2, CHCl<sub>3</sub>); Chiral HPLC analysis Chiralcel OD-H (99:1 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 211 nm, 30 °C) t<sub>R</sub> (R): 13.1 min, t<sub>R</sub> (S): 17.0 min, 87.916:12.084 er.

**(S)-1-Allyl-3-hydroxy-3-(thiophen-2-yl)indolin-2-one 24:**  $[\alpha]_D^{20} = +4.5$  (*c* 0.5, CHCl<sub>3</sub>); Chiral HPLC analysis Chiralcel OD-H (95:5 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 211 nm, 30 °C) t<sub>R</sub> (S): 17.8 min, t<sub>R</sub> (R): 22.5 min, 99.254:0.746 er.

### 1-Allyl-3-hydroxy-3-(pyridin-3-yl)indolin-2-one **25**

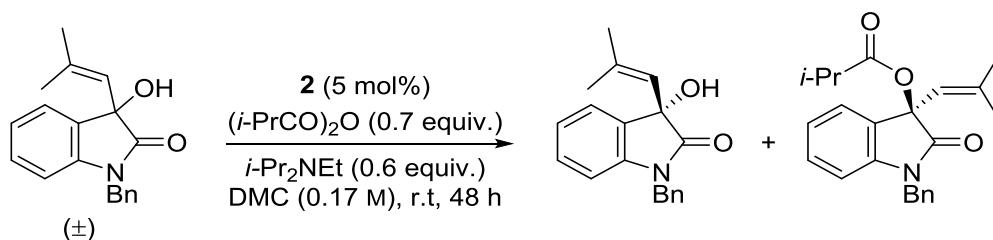


Following **General Procedure F**, 1-allyl-3-hydroxy-3-(pyridin-3-yl)indolin-2-one **25** (26.6 mg, 0.1 mmol), isobutyric anhydride (11.6  $\mu\text{L}$ , 0.07 mmol), M-HyperBTM (5.7 mg, 0.005 mmol, 5 mol%) and  $i\text{Pr}_2\text{NEt}$  (10.5  $\mu\text{L}$ , 0.06 mmol) in DMC (1.2 mL) at r.t. for 48 h to give the crude products, which were purified by Biotage® Isolera 4 chromatography (Hexane:EtOAc 75:25) to give 1-allyl-2-oxo-3-(pyridin-3-yl)indolin-3-yl isobutyrate **S21** (19 mg, 0.056 mmol, 56%) and 1-allyl-3-hydroxy-3-(pyridin-3-yl)indolin-2-one **25** (9 mg, 0.033 mmol, 34%).

**(S)-1-Allyl-2-oxo-3-(pyridin-3-yl)indolin-3-yl isobutyrate S21:**  $[\alpha]_D^{20} = -83.4$  ( $c$  0.5,  $\text{CHCl}_3$ ) {Lit.<sup>9</sup> (*ent*, 88% ee)  $[\alpha]_D^{20} = +123$  ( $c$  0.5,  $\text{CHCl}_3$ )}; Chiral HPLC analysis Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.5 mL  $\text{min}^{-1}$ , 211 nm, 40 °C)  $t_R$  (*R*): 14.8 min,  $t_R$  (*S*): 21.8 min, 15.803:84.197 er.

**(R)-1-Allyl-3-hydroxy-3-(pyridin-3-yl)indolin-2-one 25:**  $[\alpha]_D^{20} = -16.6$  ( $c$  1.0,  $\text{CHCl}_3$ ) {Lit.<sup>9</sup> (*ent*, 96.6% ee)  $[\alpha]_D^{20} = +38$  ( $c$  0.5,  $\text{CHCl}_3$ )}; Chiral HPLC analysis Chiralpak AD-H (92:8 hexane:IPA, flow rate 1.5 mL  $\text{min}^{-1}$ , 211 nm, 40 °C)  $t_R$  (*S*): 20.1 min,  $t_R$  (*R*): 22.7 min, 0.586:99.414 er.

### 1-Benzyl-3-hydroxy-3-(2-methylprop-1-en-1-yl)indolin-2-one **26**



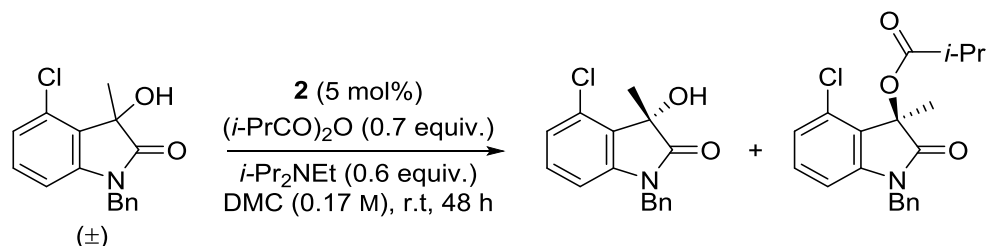
Following **General Procedure F**, 1-benzyl-3-hydroxy-3-(2-methylprop-1-en-1-yl)indolin-2-one **26** (29.3 mg, 0.1 mmol), isobutyric anhydride (11.6  $\mu\text{L}$ , 0.07 mmol), Merrifield-HyperBTM **2** (5.7 mg, 0.005 mmol, 5 mol%) and  $i\text{Pr}_2\text{NEt}$  (10.5  $\mu\text{L}$ , 0.06 mmol) in DMC (1.2 mL) at r.t. for 48 h to give the crude products, which were purified by flash column chromatography (hexane:EtOAc 4:1) to give 1-benzyl-3-(2-methylprop-1-en-1-yl)-2-oxoindolin-3-yl isobutyrate **S22** (15 mg, 0.041 mmol, 41%) and 1-benzyl-3-hydroxy-3-(2-methylprop-1-en-1-yl)indolin-2-one **26** (16 mg, 0.054 mmol, 55%).

**(R)-1-Benzyl-3-(2-methylprop-1-en-1-yl)-2-oxoindolin-3-yl isobutyrate S22:**  $[\alpha]_D^{20} = -43$  ( $c$  1.0,  $\text{CHCl}_3$ ) {Lit.<sup>9</sup> (*ent*, 94% ee)  $[\alpha]_D^{20} = +65$  ( $c$  0.1,  $\text{CHCl}_3$ )}; Chiral HPLC analysis Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.0 mL  $\text{min}^{-1}$ , 211 nm, 30  $^\circ\text{C}$ )  $t_R$  (*S*): 8.9 min,  $t_R$  (*R*): 17.2 min, 7.530:92.470 er.

**(S)-1-Benzyl-3-hydroxy-3-(2-methylprop-1-en-1-yl)indolin-2-one 26:**  $[\alpha]_D^{20} = -46.8$  ( $c$  1.0,  $\text{CHCl}_3$ ) {Lit.<sup>9</sup> (*ent*, 74% ee)  $[\alpha]_D^{20} = +97$  ( $c$  0.1,  $\text{CHCl}_3$ )}; Chiral HPLC analysis Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.0 mL  $\text{min}^{-1}$ , 211 nm, 30  $^\circ\text{C}$ )  $t_R$  (*R*): 32.7 min,  $t_R$  (*S*): 34.7 min, 16.801:83.199 er



### 1-Benzyl-4-chloro-3-hydroxy-3-methylindolin-2-one **27**

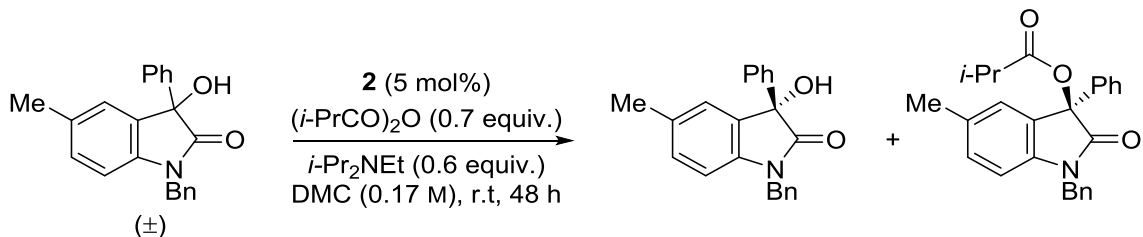


Following **General Procedure F**, 1-benzyl-4-chloro-3-hydroxy-3-methylindolin-2-one **27** (28.8 mg, 0.1 mmol), isobutyric anhydride (11.6  $\mu\text{L}$ , 0.07 mmol), Merrifield-HyperBTM **2** (5.7 mg, 0.005 mmol, 5 mol%) and  $i\text{Pr}_2\text{NEt}$  (10.5  $\mu\text{L}$ , 0.06 mmol) in DMC (1.2 mL) at r.t. for 48 h to give the crude products, which were purified by Biotage® Isolera 4 chromatography (hexane:EtOAc 80:20) to give 1-benzyl-4-chloro-3-methyl-2-oxoindolin-3-yl isobutyrate **S23** (14 mg, 0.039 mmol, 39%) and 1-benzyl-4-chloro-3-hydroxy-3-methylindolin-2-one **27** (16 mg, 0.055 mmol, 56%).

**(R)-1-Benzyl-4-chloro-3-methyl-2-oxoindolin-3-yl isobutyrate S23:**  $[\alpha]_D^{20} = +19$  ( $c$  1.0,  $\text{CHCl}_3$ ) {Lit.<sup>9</sup> (*ent*, 93% ee) $[\alpha]_D^{20} = -21$  ( $c$  1.0,  $\text{CHCl}_3$ )}; Chiral HPLC analysis, Chiralpak AD-H (98:2 hexane:IPA, flow rate 1.5 mL  $\text{min}^{-1}$ , 211 nm, 40 °C)  $t_R$  (*S*): 8.6 min,  $t_R$  (*R*): 10.3 min, 10.001:89.999 (*S*:*R*) er.

**(S)-1-Benzyl-4-chloro-3-hydroxy-3-methylindolin-2-one 27:**  $[\alpha]_D^{20} = -23.9$  ( $c$  1.0,  $\text{CHCl}_3$ ) {Lit.<sup>9</sup> (*ent*, 86% ee) $[\alpha]_D^{20} = +32$  ( $c$  1.0,  $\text{CHCl}_3$ )}; Chiral HPLC analysis Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.5 mL  $\text{min}^{-1}$ , 211 nm, 40 °C)  $t_R$  (*R*): 17.6 min,  $t_R$  (*S*): 20.3 min, 21.819:78.181 (*R*:*S*) er.

### 1-Benzyl-3-hydroxy-5-methyl-3-phenylindolin-2-one **28**

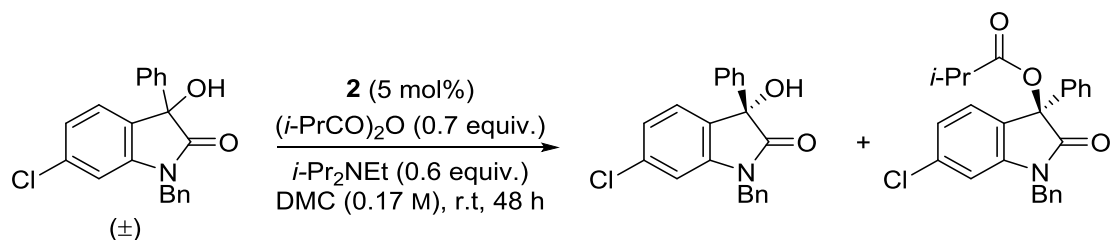


Following **General Procedure F**, 1-benzyl-3-hydroxy-5-methyl-3-phenylindolin-2-one **28** (32.9 mg, 0.1 mmol), isobutyric anhydride (11.6  $\mu\text{L}$ , 0.07 mmol), Merrifield-HyperBTM **2** (5.7 mg, 0.005 mmol, 5 mol%) and  $i\text{Pr}_2\text{NEt}$  (10.5  $\mu\text{L}$ , 0.06 mmol) in DMC (1.2 mL) at r.t. for 48 h to give the crude products, which were purified by Biotage® Isolera 4 chromatography (hexane:EtOAc 80:20) to give 1-benzyl-5-methyl-2-oxo-3-phenylindolin-3-yl isobutyrate **S24** (20 mg, 0.050 mmol, 50%) and 1-benzyl-3-hydroxy-5-methyl-3-phenylindolin-2-one **28** (15 mg, 0.045 mmol, 46%).

**(R)-1-Benzyl-5-methyl-2-oxo-3-phenylindolin-3-yl isobutyrate S24:**  $[\alpha]_D^{20} = -98.4$  ( $c$  1.0,  $\text{CHCl}_3$ ) {Lit.<sup>9</sup> (*ent*, 94% ee)  $[\alpha]_D^{20} = +107$  ( $c$  1.0,  $\text{CHCl}_3$ )}; **Chiral HPLC analysis** Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.5  $\text{mL min}^{-1}$ , 211 nm, 40  $^\circ\text{C}$ )  $t_R$  (*S*): 11.3 min,  $t_R$  (*R*): 25.2 min, 10.298:89.702 er.

**(S)-1-Benzyl-3-hydroxy-5-methyl-3-phenylindolin-2-one 28:**  $[\alpha]_D^{20} = -28.7$  ( $c$  1.0,  $\text{CHCl}_3$ ) {Lit.<sup>9</sup> (*ent*, 83% ee)  $[\alpha]_D^{20} = +23.7$  ( $c$  1.0,  $\text{CHCl}_3$ )}; **Chiral HPLC analysis** Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.5  $\text{mL min}^{-1}$ , 211 nm, 40  $^\circ\text{C}$ )  $t_R$  (*R*): 12.4 min,  $t_R$  (*S*): 15.9 min, 4.610:95.390 er.

### 1-Benzyl-6-chloro-3-hydroxy-3-phenylindolin-2-one **29**

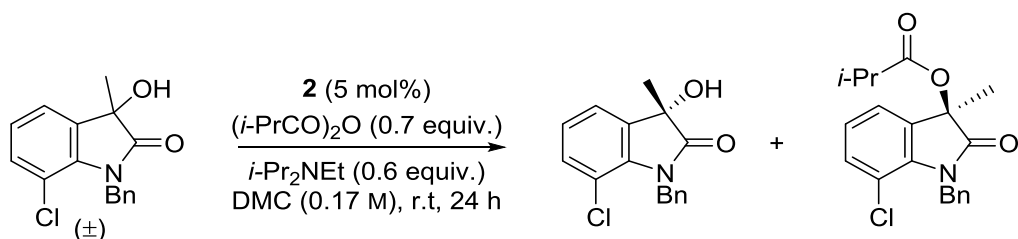


Following **General Procedure F**, 1-benzyl-6-chloro-3-hydroxy-3-phenylindolin-2-one **29** (35 mg, 0.1 mmol), isobutyric anhydride (11.6  $\mu\text{L}$ , 0.07 mmol), Merrifield-HyperBTM **2** (5.7 mg, 0.005 mmol, 5 mol%) and  $i\text{Pr}_2\text{NEt}$  (10.5  $\mu\text{L}$ , 0.06 mmol) in DMC (1.2 mL) at r.t. for 48 h to give the crude products, which were purified by Biotage® Isolera 4 chromatography (hexane:EtOAc 80:20) to give 1-benzyl-6-chloro-2-oxo-3-phenylindolin-3-yl isobutyrate **S25** (20 mg, 0.047 mmol, 48%) and 1-benzyl-6-chloro-3-hydroxy-3-phenylindolin-2-one **29** (13 mg, 0.037 mmol, 37%).

**(R)-1-Benzyl-6-chloro-2-oxo-3-phenylindolin-3-yl isobutyrate S25:**  $[\alpha]_D^{20} = -120$  ( $c$  0.5,  $\text{CHCl}_3$ ); **Chiral HPLC analysis** Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.5 mL  $\text{min}^{-1}$ , 211 nm, 40 °C)  $t_R$  (S): 7.9 min,  $t_R$  (R): 15.5 min, 20.665:79.335 er.

**(S)-1-Benzyl-6-chloro-3-hydroxy-3-phenylindolin-2-one 29:**  $[\alpha]_D^{20} = -48.8$  ( $c$  0.5,  $\text{CHCl}_3$ ); **Chiral HPLC analysis** Chiralpak AD-H (92:8 hexane:IPA, flow rate 1.5 mL  $\text{min}^{-1}$ , 211 nm, 40 °C)  $t_R$  (R): 13.8 min,  $t_R$  (S): 15.9 min, 18.545:81.455 er.

### 1-Benzyl-7-chloro-3-hydroxy-3-methylindolin-2-one **30**



Following **General Procedure F**, 1-benzyl-7-chloro-3-hydroxy-3-methylindolin-2-one **30** (28.8 mg, 0.1 mmol), isobutyric anhydride (11.6  $\mu\text{L}$ , 0.07 mmol), Merrifield-HyperBTM **2** (5.7 mg, 0.005 mmol, 5 mol%) and  $i\text{Pr}_2\text{NEt}$  (10.5  $\mu\text{L}$ , 0.06 mmol) in DMC (1.2 mL) at r.t. for 24 h to give

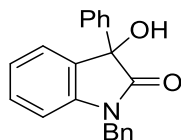
the crude products, which were purified by Biotage® Isolera 4 chromatography (hexane:EtOAc 87:13) to give 1-benzyl-7-chloro-3-methyl-2-oxoindolin-3-yl isobutyrate **S26** (18 mg, 0.050 mmol, 50%) and 1-benzyl-7-chloro-3-hydroxy-3-methylindolin-2-one **30** (11 mg, 0.038 mmol, 38%).

**(R)-1-Benzyl-7-chloro-3-methyl-2-oxoindolin-3-yl isobutyrate S26:**  $[\alpha]_D^{20} = -13.5$  (*c* 1.0, CHCl<sub>3</sub>) {Lit.<sup>9</sup> (*ent*, 77% ee)  $[\alpha]_D^{20} = +20$  (*c* 3.0, CHCl<sub>3</sub>)}; **Chiral HPLC analysis** Chiralpak AD-H (99:1 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 254 nm, 40 °C) *t<sub>R</sub>* (*S*): 11.2 min, *t<sub>R</sub>* (*R*): 12.9 min, 24.370:75.630 er.

**(S)-1-Benzyl-7-chloro-3-hydroxy-3-methylindolin-2-one 30:**  $[\alpha]_D^{20} = -37.6$  (*c* 0.5, CHCl<sub>3</sub>) {Lit.<sup>9</sup> (*ent*, 99% ee)  $[\alpha]_D^{20} = +39$  (*c* 2.0, CHCl<sub>3</sub>)}; **Chiral HPLC analysis** Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) *t<sub>R</sub>* (*R*): 11.6 min, *t<sub>R</sub>* (*S*): 13.8 min, 9.044:90.956 er.

## Recyclability of Merrifield-HyperBTM 2

### Cycle 1: 1-Benzyl-3-hydroxy-3-phenylindolin-2-one 19

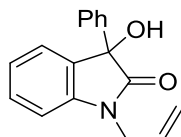


Following **General Procedure F**, 1-benzyl-3-hydroxy-3-phenylindolin-2-one **19** (150 mg, 0.47 mmol), isobutyric anhydride (55.2 μL, 0.33 mmol), Merrifield-HyperBTM **2** (27 mg, 0.023 mmol, 5 mol%) and *i*Pr<sub>2</sub>NEt (49.7 μL, 0.28 mmol) in DMC (2.8 mL) at r.t. for 48 h to give the crude products, which were purified by Biotage® Isolera 4 chromatography (hexane:EtOAc 80:20) to give 1-benzyl-2-oxo-3-phenylindolin-3-yl isobutyrate **S15** (93 mg, 0.24 mmol, 51%) and 1-benzyl-3-hydroxy-3-phenylindolin-2-one **19** (65 mg, 0.21 mmol, 43%).

**(R)-1-Benzyl-2-oxo-3-phenylindolin-3-yl isobutyrate S15: Chiral HPLC analysis** Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.25 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (S): 12.1 min, t<sub>R</sub> (R): 25.5 min, 10.228:89.772 er

**(S)-1-Benzyl-3-hydroxy-3-phenylindolin-2-one 19: Chiral HPLC analysis** Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.25 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (R): 19.5 min, t<sub>R</sub> (S): 25.1 min, 0.088:99.912 er.

**Cycle 2: 1-Allyl-3-hydroxy-3-phenylindolin-2-one 20**

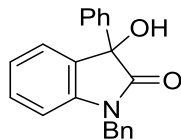


Following **General Procedure F**, 1-allyl-3-hydroxy-3-phenylindolin-2-one **20** (121.4 mg, 0.45 mmol), isobutyric anhydride (53.1 μL, 0.32 mmol), Merrifield-HyperBTM **2** (26 mg, 0.022 mmol, 5 mol%) and *i*Pr<sub>2</sub>NEt (47.8 μL, 0.27 mmol) in DMC (2.7 mL) at r.t. for 48 h to give the crude products, which were purified by flash column chromatography (Petrol:EtOAc 90:10) to give 1-allyl-2-oxo-3-phenylindolin-3-yl isobutyrate **S16** (75 mg, 0.233 mmol, 49%) and 1-allyl-3-hydroxy-3-phenylindolin-2-one **20** (561 mg, 0.211 mmol, 46%).

**(R)-1-Allyl-2-oxo-3-phenylindolin-3-yl isobutyrate S16: Chiral HPLC analysis** Chiralcel OD-H (99:1 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 211 nm, 30 °C) t<sub>R</sub> (R): 11.6 min, t<sub>R</sub> (S): 13.3 min, 92.344:7.656 er.

**(S)-1-Allyl-3-hydroxy-3-phenylindolin-2-one 20: Chiral HPLC analysis** Chiralcel OD-H (95:5 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 211 nm, 30 °C) t<sub>R</sub> (S): 13.9 min, t<sub>R</sub> (R): 15.9 min, 99.852:0.148 er.

### Cycle 3: 1-Benzyl-3-hydroxy-3-phenylindolin-2-one **19**

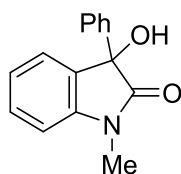


Following **General Procedure F**, 1-benzyl-3-hydroxy-3-phenylindolin-2-one (127.7 mg, 0.40 mmol), isobutyric anhydride (47.0  $\mu\text{L}$ , 0.28 mmol), Merrifield-HyperBTM **2** (23 mg, 0.020 mmol, 5 mol%) and *i*Pr<sub>2</sub>NEt (42.3  $\mu\text{L}$ , 0.24 mmol) in DMC (2.4 mL) at r.t. for 48 h to give the crude products, which were purified by Biotage® Isolera 4 chromatography (hexane:EtOAc 80:20) to give 1-benzyl-2-oxo-3-phenylindolin-3-yl isobutyrate **S15** (80 mg, 0.21 mmol, 51%) and 1-benzyl-3-hydroxy-3-phenylindolin-2-one **19** (55 mg, 0.17 mmol, 43%).

**(R)-1-Benzyl-2-oxo-3-phenylindolin-3-yl isobutyrate S15: Chiral HPLC analysis** Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.25 mL min<sup>-1</sup>, 211 nm, 40 °C)  $t_{\text{R}}$  (S): 12.1 min,  $t_{\text{R}}$  (R): 25.4 min, 7.797:92.203 er.

**(S)-1-Benzyl-3-hydroxy-3-phenylindolin-2-one 19: Chiral HPLC analysis** Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.25 mL min<sup>-1</sup>, 211 nm, 40 °C)  $t_{\text{R}}$  (R): 19.4 min,  $t_{\text{R}}$  (S): 25.1 min, 0.276:99.724 er.

### Cycle 4: 3-Hydroxy-1-methyl-3-phenylindolin-2-one **21**

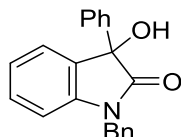


Following **General Procedure F**, 3-hydroxy-1-methyl-3-phenylindolin-2-one **21** (88.43 mg, 0.37 mmol), isobutyric anhydride (42.9  $\mu\text{L}$ , 0.25 mmol), Merrifield-HyperBTM **2** (21 mg, 0.018 mmol, 5 mol%) and *i*Pr<sub>2</sub>NEt (38.6  $\mu\text{L}$ , 0.22 mmol) in DMC (2.2 mL) at r.t. for 24 h to give the crude products, which were purified by flash column chromatography (Petrol:EtOAc 85:15) to give 1-methyl-2-oxo-3-phenylindolin-3-yl isobutyrate **S17** (57 mg, 0.184 mmol, 50%) and 3-hydroxy-1-methyl-3-phenylindolin-2-one **21** (42 mg, 0.175 mmol, 47%).

**(R)-1-Methyl-2-oxo-3-phenylindolin-3-yl isobutyrate S17: Chiral HPLC analysis** Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 211 nm, 30 °C) t<sub>R</sub> (S): 8.9 min, t<sub>R</sub> (R): 12.2 min, 5.178:94.822 er.

**(S)-3-Hydroxy-1-methyl-3-phenylindolin-2-one 21: Chiral HPLC analysis** Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 211 nm, 30 °C) t<sub>R</sub> (R): 27.8 min, t<sub>R</sub> (S): 30.9 min, 0.718:99.282 er.

### Cycle 5: 1-Benzyl-3-hydroxy-3-phenylindolin-2-one 19

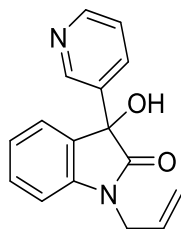


Following **General Procedure F**, 1-benzyl-3-hydroxy-3-phenylindolin-2-one **19** (111 mg, 0.35 mmol), isobutyric anhydride (40.9 μL, 0.24 mmol), Merrifield-HyperBTM **2** (20 mg, 0.018 mmol, 5 mol%) and *i*Pr<sub>2</sub>NEt (36.8 μL, 0.211 mmol) in DMC (2.1 mL) at r.t. for 48 h to give the crude products, which were purified by Biotage® Isolera 4 chromatography (hexane:EtOAc 80:20) to give 1-benzyl-2-oxo-3-phenylindolin-3-yl isobutyrate **S15** (65 mg, 0.169 mmol, 48%) and 1-benzyl-3-hydroxy-3-phenylindolin-2-one **19** (50 mg, 0.159 mmol, 45%).

**(R)-1-Benzyl-2-oxo-3-phenylindolin-3-yl isobutyrate S15: Chiral HPLC analysis** Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.25 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (S): 12.1 min, t<sub>R</sub> (R): 25.3 min, 6.376:93.624 er.

**(S)-1-Benzyl-3-hydroxy-3-phenylindolin-2-one 19: Chiral HPLC analysis** Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.25 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (R): 19.5 min, t<sub>R</sub> (S): 25.2 min, 0.983:99.017 er.

### Cycle 6: 1-Allyl-3-hydroxy-3-(pyridin-3-yl)indolin-2-one **25**

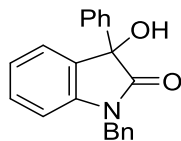


Following **General Procedure F**, 1-allyl-3-hydroxy-3-(pyridin-3-yl)indolin-2-one **25** (75.0 mg, 0.28 mmol), isobutyric anhydride (32.7  $\mu\text{L}$ , 0.197 mmol), Merrifield-HyperBTM **2** (16 mg, 0.014 mmol, 5 mol%) and *i*Pr<sub>2</sub>NEt (29.4  $\mu\text{L}$ , 0.169 mmol) in DMC (1.7 mL) at r.t. for 48 h to give the crude products, which were purified by Biotage® Isolera 4 chromatography (Hexane:EtOAc 75:25) to give 1-allyl-2-oxo-3-(pyridin-3-yl)indolin-3-yl isobutyrate **S21** (54 mg, 0.161 mmol, 57%) and 1-allyl-3-hydroxy-3-(pyridin-3-yl)indolin-2-one **25** (29 mg, 0.109 mmol, 39%).

**(S)-1-Allyl-2-oxo-3-(pyridin-3-yl)indolin-3-yl isobutyrate S21: Chiral HPLC analysis** Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (R): 15.2 min, t<sub>R</sub> (S): 22.5 min, 16.134:83.866 er.

**(R)-1-Allyl-3-hydroxy-3-(pyridin-3-yl)indolin-2-one 25: Chiral HPLC analysis** Chiralpak AD-H (92:8 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (S): 20.1 min, t<sub>R</sub> (R): 22.7 min, 0.010:99.990 er.

### Cycle 7: 1-Benzyl-3-hydroxy-3-phenylindolin-2-one **19**



Following **General Procedure F**, 1-benzyl-3-hydroxy-3-phenylindolin-2-one **19** (88.9 mg, 0.282 mmol), isobutyric anhydride (32.7  $\mu\text{L}$ , 0.197 mmol), Merrifield-HyperBTM **2** (16 mg, 0.014 mmol, 5 mol%) and *i*Pr<sub>2</sub>NEt (29.4  $\mu\text{L}$ , 0.169 mmol) in DMC (1.7 mL) at r.t. for 48 h to give the crude products, which were purified by Biotage® Isolera 4 chromatography

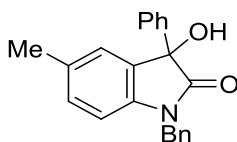


(hexane:EtOAc 80:20) to give 1-benzyl-2-oxo-3-phenylindolin-3-yl isobutyrate **S15** (54 mg, 0.140 mmol, 50%) and 1-benzyl-3-hydroxy-3-phenylindolin-2-one **19** (40 mg, 0.127 mmol, 45%).

**(R)-1-Benzyl-2-oxo-3-phenylindolin-3-yl isobutyrate S15: Chiral HPLC analysis** Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.25 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (S): 12.1 min, t<sub>R</sub> (R): 25.4 min, 7.315:92.685 er.

**(S)-1-Benzyl-3-hydroxy-3-phenylindolin-2-one 19: Chiral HPLC analysis** Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.25 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (R): 19.5 min, t<sub>R</sub> (S): 25.1 min, 0.151:99.849 er.

#### Cycle 8: 1-Benzyl-3-hydroxy-5-methyl-3-phenylindolin-2-one **28**

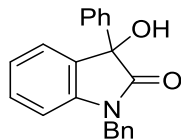


Following **General Procedure F**, 1-benzyl-3-hydroxy-5-methyl-3-phenylindolin-2-one **28** (87.0 mg, 0.264 mmol), isobutyric anhydride (30.6 μL, 0.185 mmol), Merrifield-HyperBTM **2** (15 mg, 0.013 mmol, 5 mol%) and *i*Pr<sub>2</sub>NEt (27.6 μL, 0.158 mmol) in DMC (1.6 mL) at r.t. for 48 h to give the crude products, which were purified by Biotage® Isolera 4 chromatography (hexane:EtOAc 80:20) to give 1-benzyl-5-methyl-2-oxo-3-phenylindolin-3-yl isobutyrate **S24** (55 mg, 0.138 mmol, 52%) and 1-benzyl-3-hydroxy-5-methyl-3-phenylindolin-2-one **28** (38 mg, 0.115 mmol, 44%).

**(R)-1-Benzyl-5-methyl-2-oxo-3-phenylindolin-3-yl isobutyrate S24: Chiral HPLC analysis** Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (S): 11.3 min, t<sub>R</sub> (R): 24.8 min, 10.583:89.417 er.

**(S)-1-Benzyl-3-hydroxy-5-methyl-3-phenylindolin-2-one 28: Chiral HPLC analysis** Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (R): 12.4 min, t<sub>R</sub> (S): 15.9 min, 1.127:98.873 er.

### Cycle 9: 1-Benzyl-3-hydroxy-3-phenylindolin-2-one **19**

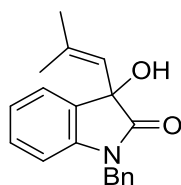


Following **General Procedure F**, 1-benzyl-3-hydroxy-3-phenylindolin-2-one **19** (77.7 mg, 0.246 mmol), isobutyric anhydride (28.6  $\mu$ L, 0.173 mmol), Merrifield-HyperBTM **2** (14 mg, 0.012 mmol, 5 mol%) and *i*Pr<sub>2</sub>NEt (25.8  $\mu$ L, 0.148 mmol) in DMC (1.5 mL) at r.t. for 48 h to give the crude products, which were purified by Biotage® Isolera 4 chromatography (hexane:EtOAc 80:20) to give 1-benzyl-2-oxo-3-phenylindolin-3-yl isobutyrate **S15** (50 mg, 0.13 mmol, 53%) and 1-benzyl-3-hydroxy-3-phenylindolin-2-one **19** (35 mg, 0.111 mmol, 45%).

**(R)-1-Benzyl-2-oxo-3-phenylindolin-3-yl isobutyrate S15: Chiral HPLC analysis** Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.25 mL min<sup>-1</sup>, 211 nm, 40 °C) *t*<sub>R</sub> (S): 12.1 min, *t*<sub>R</sub> (R): 25.4 min, 7.964:92.036 er.

**(S)-1-Benzyl-3-hydroxy-3-phenylindolin-2-one 19: Chiral HPLC analysis** Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.25 mL min<sup>-1</sup>, 211 nm, 40 °C) *t*<sub>R</sub> (R): 19.4 min, *t*<sub>R</sub> (S): 25.1 min, 0.112:99.888 er.

### Cycle 10: 1-Benzyl-3-hydroxy-3-(2-methylprop-1-en-1-yl)indolin-2-one **26**



Following **General Procedure F**, 1-benzyl-3-hydroxy-3-(2-methylprop-1-en-1-yl)indolin-2-one **26** (72.3 mg, 0.246 mmol), isobutyric anhydride (28.6  $\mu$ L, 0.173 mmol), Merrifield-HyperBTM **2** (14 mg, 0.012 mmol, 5 mol%) and *i*Pr<sub>2</sub>NEt (25.8  $\mu$ L, 0.148 mmol) in DMC (1.5 mL) at r.t. for 48 h to give the crude products, which were purified by flash column chromatography (hexane:EtOAc 4:1) to give 1-benzyl-3-(2-methylprop-1-en-1-yl)-2-oxoindolin-3-yl isobutyrate

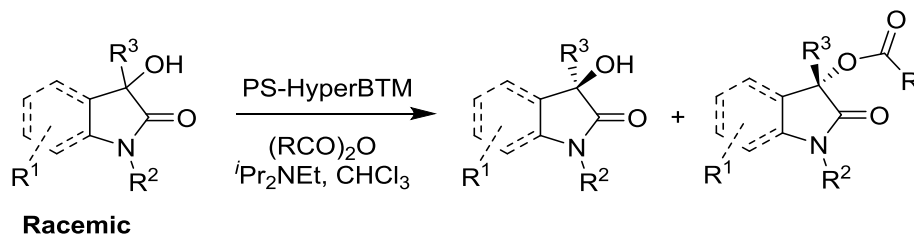
**S22** (43 mg, 0.118 mmol, 48%) and 1-benzyl-3-hydroxy-3-(2-methylprop-1-en-1-yl)indolin-2-one **26** (35 mg, 0.119 mmol, 55%).

**(R)-1-Benzyl-3-(2-methylprop-1-en-1-yl)-2-oxindolin-3-yl isobutyrate S22: Chiral HPLC analysis** Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 211 nm, 30 °C) t<sub>R</sub> (*S*): 8.9 min, t<sub>R</sub> (*R*): 17.4 min, 8.365:91.635 er

**(S)-1-Benzyl-3-hydroxy-3-(2-methylprop-1-en-1-yl)indolin-2-one 26: Chiral HPLC analysis** Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 211 nm, 30 °C) t<sub>R</sub> (*R*): 32.9 min, t<sub>R</sub> (*S*): 34.6 min, 10.526:89.474 er.

## Kinetic Resolution of Tertiary Alcohols in Flow

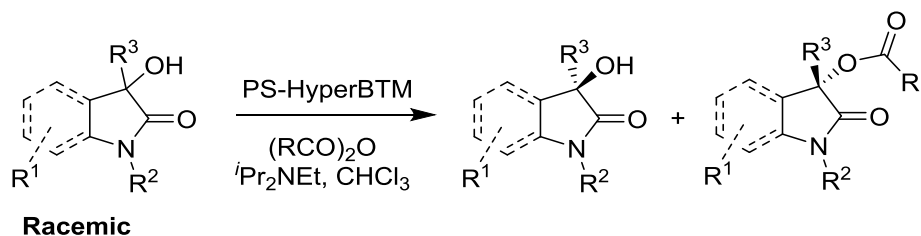
### Optimisation



Entry <sup>a</sup>	Substrate	Solvent	Temp.	Anhydride (equiv.), <i>i</i> Pr <sub>2</sub> NEt (equiv.)	<i>c</i>	<i>s</i>
1		DMC	10 °C	( <i>i</i> -PrCO) <sub>2</sub> O (0.8 equiv.) <i>i</i> Pr <sub>2</sub> NEt (0.8 equiv.)	43	11
2		DMC	10 °C	( <i>i</i> -PrCO) <sub>2</sub> O (1.5 equiv.) <i>i</i> Pr <sub>2</sub> NEt (1.5 equiv.)	56	9
3		DMC	10 °C	( <i>i</i> -PrCO) <sub>2</sub> O (2.0 equiv.) <i>i</i> Pr <sub>2</sub> NEt (2.0 equiv.)	58	9
4	 <b>14</b>	EtOAc	20 °C	( <i>i</i> -PrCO) <sub>2</sub> O (0.8 equiv.) <i>i</i> Pr <sub>2</sub> NEt (0.8 equiv.)	44	10
5		EtOAc	0 °C	( <i>i</i> -PrCO) <sub>2</sub> O (0.8 equiv.) <i>i</i> Pr <sub>2</sub> NEt (0.8 equiv.)	40	17
6		EtOAc	0 °C	( <i>i</i> -PrCO) <sub>2</sub> O (2.0 equiv.) <i>i</i> Pr <sub>2</sub> NEt (2.0 equiv.)	63	13
7	 <b>31</b>	Toluene	20 °C	(CH <sub>3</sub> CO) <sub>2</sub> O (0.8 equiv.) <i>i</i> Pr <sub>2</sub> NEt (0.8 equiv.)	37	36
8		Toluene	0 °C	(CH <sub>3</sub> CO) <sub>2</sub> O (1.0 equiv.) <i>i</i> Pr <sub>2</sub> NEt (1.0 equiv.)	40	42

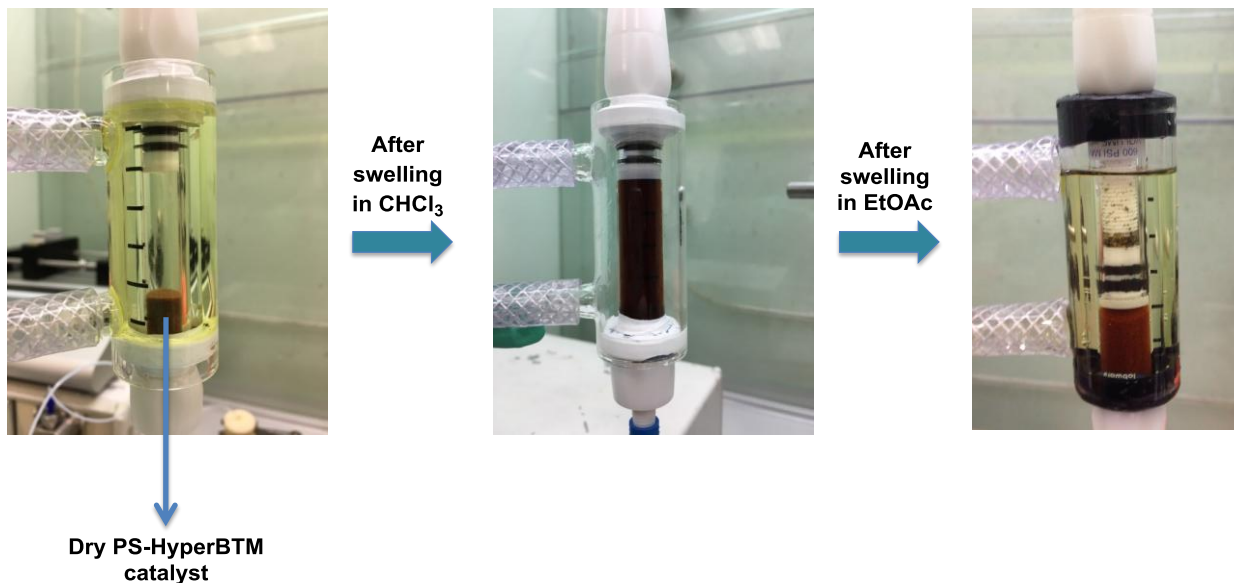
<sup>a</sup> All reactions were carried out using the same catalyst bed of 600 mg Merrifield-HyperBTM with 0.1 ml/min flow rate.

**General procedure:** *Description of Kinetic Resolution in Continuous Flow*

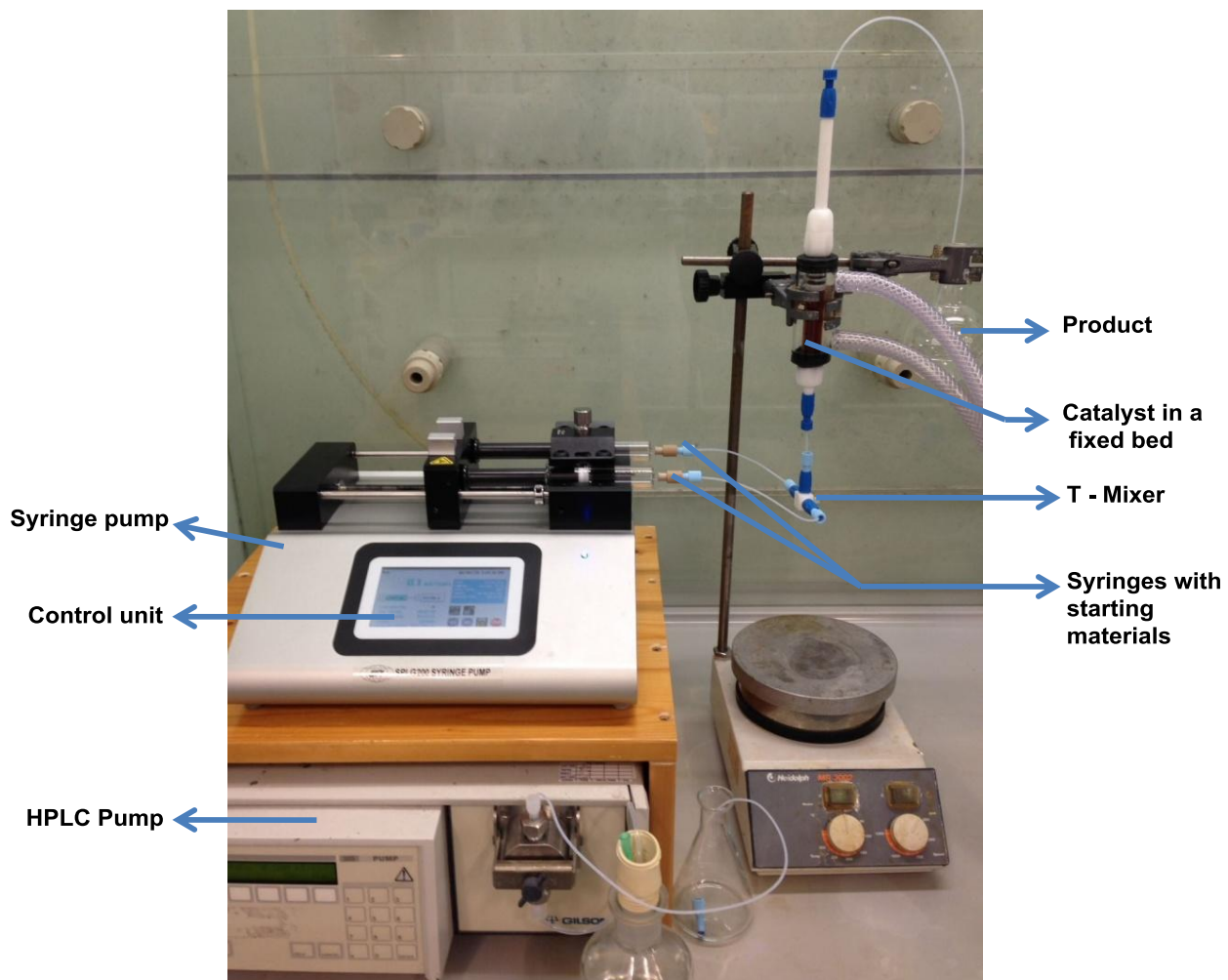


A packed bed reactor consisting of a vertically-mounted Omnifit glass chromatography column [borosilicate glass; length = 100 mm (70 mm adjustable bed height); internal diameter = 10 mm; maximum bed volume 5.6 mL], with a glass cooling jacket was loaded with PS-HyperBTM resin (600 mg;  $f = 0.89 \text{ mmol g}^{-1}$ ). The resin was allowed to swell to its maximum volume by pumping  $\text{CHCl}_3$  at  $1 \mu\text{L min}^{-1}$  for 30 min at r.t. using a Gilson 305 HPLC pump. The column was then cooled by circulating ethylene glycol ( $-5 \text{ }^\circ\text{C}$ ) using a Huber Ministat over 10 min, during which time  $\text{CHCl}_3$  was pumped through the packed bed reactor at  $100 \mu\text{L min}^{-1}$ . Two syringes were used to inject reagents using a Legato 200 series syringe pump by World Precision Instruments. The first syringe was filled with a solution of the appropriate alcohol (0.5 mmol, 1.0 equiv.) in solvent (5 mL) and the second syringe with a mixture of the appropriate anhydride (1.0 equiv. for oxindole-substrates and 0.8 equiv. for pyrrolidinone substrates) and  $i\text{-Pr}_2\text{NEt}$  (1.0 equiv. for oxindole-substrates and 0.8 equiv. for pyrrolidinone substrates) in solvent (5 mL total volume). Both solutions were injected at  $50 \mu\text{L min}^{-1}$ , mixed in a T-type mixing chamber, and passed through the reactor at a combined flow rate of  $100 \mu\text{L min}^{-1}$ . After complete addition of the reagents from the syringes, a Gilson 305 HPLC pump was connected, and  $\text{CHCl}_3$  was pumped at  $100 \mu\text{L min}^{-1}$  for 30 min to ensure elution of the products. A solution of 10% MeOH in  $\text{CHCl}_3$  was then pumped at  $200 \mu\text{L min}^{-1}$  for 30 min to wash the column and avoid cross contamination. The column was then prepared for the next KR by pumping the desired solvent ( $\text{CHCl}_3$ , EtOAc or PhMe) at  $200 \mu\text{L min}^{-1}$  for 30 min. The ester product and remaining alcohol were separated by column chromatography using a Biotage® Isolera™ 4 [SNAP Ultra 10 g,  $40 \text{ mL min}^{-1}$ ,  $\text{CH}_2\text{Cl}_2\text{:EtOAc}$  (100:0 2 CV, 100:0 to 90:10 30 CV, (16 ml each))].

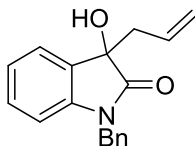
### Packed Column Set-up and Effect of Swelling:



### Continuous Flow Set-up:



### 3-Allyl-1-benzyl-3-hydroxyindolin-2-one 14



#### In CHCl<sub>3</sub>:

**(R)-3-Allyl-1-benzyl-2-oxoindolin-3-yl isobutyrate 15:** Yield: 43%;  $[\alpha]_D^{20} = -18.0$  (*c* 0.1, CHCl<sub>3</sub>); Chiral HPLC analysis - Chiralpak OD-H (98:2 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 254 nm, 30 °C) *t<sub>R</sub>* (*R*): 8.4 min, *t<sub>R</sub>* (*S*): 9.8 min, 97.369:2.631 er.

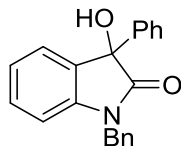
**(S)-3-Allyl-1-benzyl-3-hydroxyindolin-2-one 14:** Yield: 44%;  $[\alpha]_D^{20} = -13.6$  (*c* 0.1, CHCl<sub>3</sub>); Chiral analysis HPLC analysis - Chiralpak OD-H (98:2 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 254 nm, 30 °C) *t<sub>R</sub>* (*R*): 32.7 min, *t<sub>R</sub>* (*S*): 37.9 min, 6.296:93.704 er.

#### In EtOAc:

**(R)-3-Allyl-1-benzyl-2-oxoindolin-3-yl isobutyrate 15:** Yield: 60%; Chiral HPLC analysis - Chiralpak OD-H (98:2 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 254 nm, 30 °C) *t<sub>R</sub>* (*R*): 32.2 min, *t<sub>R</sub>* (*S*): 37.6 min, 77.959:22.041 er.

**(S)-3-Allyl-1-benzyl-3-hydroxyindolin-2-one 14:** Yield: 33%; Chiral analysis HPLC analysis - Chiralpak OD-H (98:2 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 254 nm, 30 °C) *t<sub>R</sub>* (*R*): 32.6 min, *t<sub>R</sub>* (*S*): 37.3 min, 1.796:98.204 er.

## 1-Benzyl-3-hydroxy-3-phenylindolin-2-one 19



### In CHCl<sub>3</sub>:

**(R)-1-Benzyl-2-oxo-3-phenylindolin-3-yl isobutyrate S15:** Yield: 34%;  $[\alpha]_D^{20} = -115.1$  (*c* 0.1, CHCl<sub>3</sub>); Chiral HPLC analysis - Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.25 mL min<sup>-1</sup>, 211 nm, 40 °C) *t<sub>R</sub>* (*S*): 12.2 min, *t<sub>R</sub>* (*R*): 25.6 min, 1.094:98.906 er.

**(S)-1-Benzyl-3-hydroxy-3-phenylindolin-2-one 19:** Yield: 48%;  $[\alpha]_D^{20} = -35.4$  (*c* 0.1, CHCl<sub>3</sub>); Chiral HPLC analysis - Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.25 mL min<sup>-1</sup>, 211 nm, 40 °C) *t<sub>R</sub>* (*R*): 19.6 min, *t<sub>R</sub>* (*S*): 25.3 min, 18.301:81.699 er.

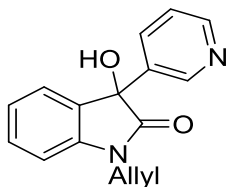
### In EtOAc:

**(R)-1-Benzyl-2-oxo-3-phenylindolin-3-yl isobutyrate S15:** Yield: 48%; Chiral HPLC analysis - Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.25 mL min<sup>-1</sup>, 211 nm, 40 °C) *t<sub>R</sub>* (*S*): 12.2 min, *t<sub>R</sub>* (*R*): 25.6 min, 4.626:95.374 er.

**(S)-1-Benzyl-3-hydroxy-3-phenylindolin-2-one 19:** Yield: 43%; Chiral HPLC analysis - Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.25 mL min<sup>-1</sup>, 211 nm, 40 °C) *t<sub>R</sub>* (*R*): 19.5 min, *t<sub>R</sub>* (*S*): 25.2 min, 4.192:95.808 er.



**1-Allyl-3-hydroxy-3-(pyridin-3-yl)indolin-2-one 25**



**In CHCl<sub>3</sub>:**

**(S)-1-Allyl-2-oxo-3-(pyridin-3-yl)indolin-3-yl isobutyrate S21:** Yield: 41%;  $[\alpha]_D^{20} = -127.2$  (*c* 0.1, CHCl<sub>3</sub>); Chiral HPLC analysis - Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) *t<sub>R</sub>* (*R*): 14.8 min, *t<sub>R</sub>* (*S*): 21.6 min, 3.549:96.451 er.

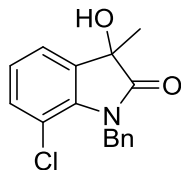
**(R)-1-Allyl-3-hydroxy-3-(pyridin-3-yl)indolin-2-one 25:** Yield: 45%;  $[\alpha]_D^{20} = -32.8$  (*c* 0.1, CHCl<sub>3</sub>); Chiral HPLC analysis - Chiralpak AD-H (92:8 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) *t<sub>R</sub>* (*S*): 20.1 min, *t<sub>R</sub>* (*R*): 22.7 min, 5.289:94.715 er.

**In EtOAc:**

**(S)-1-Allyl-2-oxo-3-(pyridin-3-yl)indolin-3-yl isobutyrate S21:** Yield: 54%; Chiral HPLC analysis - Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) *t<sub>R</sub>* (*R*): 14.9 min, *t<sub>R</sub>* (*S*): 21.8 min, 10.729:89.271 er.

**(R)-1-Allyl-3-hydroxy-3-(pyridin-3-yl)indolin-2-one 25:** Yield: 43%; Chiral HPLC analysis - Chiralpak AD-H (92:8 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) *t<sub>R</sub>* (*S*): 19.7 min, *t<sub>R</sub>* (*R*): 22.2 min, 1.906:98.094 er.

**1-Benzyl-7-chloro-3-hydroxy-3-methylindolin-2-one 30**



**In CHCl<sub>3</sub>:**

**(R)-1-Benzyl-7-chloro-3-methyl-2-oxindolin-3-yl isobutyrate S26:** Yield: 49%;  $[\alpha]_D^{20} = -21.4$  (*c* 0.1, CHCl<sub>3</sub>); Chiral HPLC analysis - Chiralpak AD-H (99:1 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) *t<sub>R</sub>* (*S*): 11.3 min, *t<sub>R</sub>* (*R*): 12.9 min, 8.003:91.997 er.

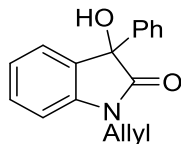
**(S)-1-Benzyl-7-chloro-3-hydroxy-3-methylindolin-2-one 30:** Yield: 40%;  $[\alpha]_D^{20} = -35.8$  (*c* 0.1, CHCl<sub>3</sub>); Chiral HPLC analysis - Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) *t<sub>R</sub>* (*R*): 11.6 min, *t<sub>R</sub>* (*S*): 13.9 min, 0.784:99.216 er.

**In EtOAc:**

**(R)-1-Benzyl-7-chloro-3-methyl-2-oxindolin-3-yl isobutyrate S26:** Yield: 73%; Chiral HPLC analysis - Chiralpak AD-H (99:1 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) *t<sub>R</sub>* (*S*): 10.9 min, *t<sub>R</sub>* (*R*): 12.7 min, 34.005:65.995 er.

**(S)-1-Benzyl-7-chloro-3-hydroxy-3-methylindolin-2-one 30:** Yield: 24%; Chiral HPLC analysis - Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) *t<sub>R</sub>* (*R*): 11.5 min, *t<sub>R</sub>* (*S*): 13.8 min, 0.544:99.456 er.

### 1-Allyl-3-hydroxy-3-phenylindolin-2-one 20

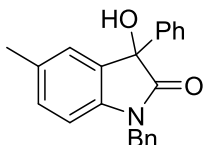


In  $\text{CHCl}_3$ :

**(R)-1-Allyl-2-oxo-3-phenylindolin-3-yl isobutyrate S16:** Yield: 34%;  $[\alpha]_D^{20} = -125.3$  ( $c$  0.1,  $\text{CHCl}_3$ ); Chiral HPLC analysis - Chiralcel OD-H (99:1 hexane:IPA, flow rate  $1.0 \text{ mL min}^{-1}$ , 211 nm,  $30^\circ\text{C}$ )  $t_R$  ( $R$ ): 11.0 min,  $t_R$  ( $S$ ): 12.8 min, 98.093:1.907 er.

**(S)-1-Allyl-3-hydroxy-3-phenylindolin-2-one 20:** Yield: 57%;  $[\alpha]_D^{20} = -38.3$  ( $c$  0.1,  $\text{CHCl}_3$ ); Chiral HPLC analysis - Chiralcel OD-H (95:5 hexane:IPA, flow rate  $1.0 \text{ mL min}^{-1}$ , 211 nm,  $30^\circ\text{C}$ )  $t_R$  ( $S$ ): 13.8 min,  $t_R$  ( $R$ ): 15.8 min, 82.999:17.001 (er).

### 1-Benzyl-3-hydroxy-5-methyl-3-phenylindolin-2-one 28



In  $\text{CHCl}_3$ :

**(R)-1-Benzyl-5-methyl-2-oxo-3-phenylindolin-3-yl isobutyrate S24:** Yield: 36%;  $[\alpha]_D^{20} = -107.5$  ( $c$  0.1,  $\text{CHCl}_3$ ); Chiralpak AD-H (95:5 hexane:IPA, flow rate  $1.5 \text{ mL min}^{-1}$ , 211 nm,  $40^\circ\text{C}$ )  $t_R$  ( $S$ ): 11.3 min,  $t_R$  ( $R$ ): 25.1 min, 3.832:96.168 er.

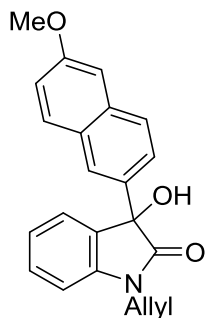
**(S)-1-Benzyl-3-hydroxy-5-methyl-3-phenylindolin-2-one 28:** Yield: 56%;  $[\alpha]_D^{20} = -18.4$  ( $c$  0.1,  $\text{CHCl}_3$ ); Chiral HPLC analysis - Chiralpak AD-H (90:10 hexane:IPA, flow rate  $1.5 \text{ mL min}^{-1}$ , 211 nm,  $40^\circ\text{C}$ )  $t_R$  ( $R$ ): 12.4 min,  $t_R$  ( $S$ ): 15.9 min, 17.311:82.686 er.

**In EtOAc:**

**(R)-1-Benzyl-5-methyl-2-oxo-3-phenylindolin-3-yl isobutyrate S24:** Yield: 41%; Chiral HPLC analysis - Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (S): 11.2 min, t<sub>R</sub> (R): 24.9 min, 5.851:94.149 er.

**(S)-1-Benzyl-3-hydroxy-5-methyl-3-phenylindolin-2-one 28:** Yield: 54%; Chiral HPLC analysis - Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (R): 12.4 min, t<sub>R</sub> (S): 15.8 min, 17.547:82.453 er.

**1-Allyl-3-hydroxy-3-(6-methoxynaphthalen-2-yl)indolin-2-one 22**

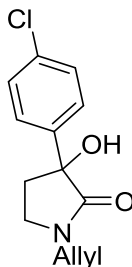


**In EtOAc:**

**(R)-1-Allyl-3-(6-methoxynaphthalen-2-yl)-2-oxoindolin-3-yl isobutyrate S18:** Yield: 51%; Chiral HPLC analysis - Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (S): 18.7 min, t<sub>R</sub> (R): 33.6 min, 9.315:90.685 er.

**(S)-1-Allyl-3-hydroxy-3-(6-methoxynaphthalen-2-yl)indolin-2-one 22:** Yield: 47%; Chiral HPLC analysis - Chiralcel OJ-H (90:10 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 254 nm, 40 °C) t<sub>R</sub> (R): 35.0 min, t<sub>R</sub> (S): 47.8 min, 5.178:94.822 er.

### 1-Allyl-3-(4-chlorophenyl)-3-hydroxypyrrolidin-2-one 31

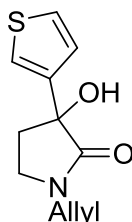


#### In PhMe:

**(S)-1-Allyl-3-(4-chlorophenyl)-2-oxopyrrolidin-3-yl acetate S27:** Yield: 33%;  $[\alpha]_D^{20} = -22.8$  (*c* 0.1, CHCl<sub>3</sub>); Chiral HPLC analysis - Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 211 nm, 30 °C) *t<sub>R</sub>* (*R*): 20.4 min, *t<sub>R</sub>* (*S*): 30.2 min, 4.205:95.795 er.

**(R)-1-Allyl-3-(4-chlorophenyl)-3-hydroxypyrrolidin-2-one 31:** Yield: 57%;  $[\alpha]_D^{20} = -29.2$  (*c* 0.1, CHCl<sub>3</sub>); Chiral HPLC analysis - Chiralpak AD-H (95:5 hexane:IPA, flow rate 1 mL min<sup>-1</sup>, 211 nm, 30 °C) *t<sub>R</sub>* (*S*): 18.8 min, *t<sub>R</sub>* (*R*): 21.4 min, 19.811:80.189 er.

### 1-Allyl-3-hydroxy-3-(thiophen-3-yl)pyrrolidin-2-one 32

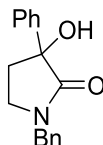


#### In PhMe:

**(S)-1-Allyl-2-oxo-3-(thiophen-3-yl)pyrrolidin-3-yl acetate S28:** Yield: 41%;  $[\alpha]_D^{20} = +17.7$  (*c* 0.1, CHCl<sub>3</sub>); Chiral HPLC analysis - Chiralpak AD-H (95:5 hexane:IPA, flow rate 1 mL min<sup>-1</sup>, 211 nm, 30 °C) *t<sub>R</sub>* (*R*): 20.8 min, *t<sub>R</sub>* (*S*): 23.5 min, 6.793:93.207 er.

**(R)-1-Allyl-3-hydroxy-3-(thiophen-3-yl)pyrrolidin-2-one 32:** Yield: 50%;  $[\alpha]_D^{20} = -33.1$  (*c* 0.1, CHCl<sub>3</sub>); Chiral HPLC analysis - Chiralpak AD-H (95:5 hexane:IPA, flow rate 1 mL min<sup>-1</sup>, 211 nm, 30 °C) *t<sub>R</sub>* (*S*): 25.8 min, *t<sub>R</sub>* (*R*): 32.5 min, 14.503:85.497 er.

### 1-Benzyl-3-hydroxy-3-phenylpyrrolidin-2-one 33



#### In PhMe:

**(S)-1-Benzyl-2-oxo-3-phenylpyrrolidin-3-yl acetate S29:** Yield: 46%;  $[\alpha]_D^{20} = -22.5$  (*c* 0.1, CHCl<sub>3</sub>); Chiral HPLC analysis - Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) *t<sub>R</sub>* (*R*): 11.8 min, *t<sub>R</sub>* (*S*): 18.5 min, 9.629:90.371 er.

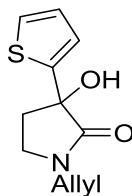
**(R)-1-Benzyl-3-hydroxy-3-phenylpyrrolidin-2-one 33:** Yield: 43%;  $[\alpha]_D^{20} = -27.0$  (*c* 0.1, CHCl<sub>3</sub>); Chiral HPLC analysis - Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) *t<sub>R</sub>* (*S*): 11.7 min, *t<sub>R</sub>* (*R*): 12.7 min, 7.025:92.975 er.

#### Scale up in PhMe:

**(S)-1-Benzyl-2-oxo-3-phenylpyrrolidin-3-yl acetate S29:** Yield: 37%;  $[\alpha]_D^{20} = -24.7$  (*c* 0.1, CHCl<sub>3</sub>); Chiral HPLC analysis - Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) *t<sub>R</sub>* (*R*): 11.8 min, *t<sub>R</sub>* (*S*): 18.5 min, 5.267:94.733 er.

**(R)-1-Benzyl-3-hydroxy-3-phenylpyrrolidin-2-one 33:** Yield: 57%;  $[\alpha]_D^{20} = -15.9$  (*c* 0.1, CHCl<sub>3</sub>); Chiral HPLC analysis - Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) *t<sub>R</sub>* (*S*): 11.6 min, *t<sub>R</sub>* (*R*): 12.7 min, 21.021:78.975 er.

### 1-Allyl-3-hydroxy-3-(thiophen-2-yl)pyrrolidin-2-one 34

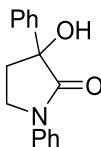


#### In PhMe:

**(R)-1-Allyl-2-oxo-3-(thiophen-2-yl)pyrrolidin-3-yl acetate S30:** Yield: 48%;  $[\alpha]_D^{20} = +11.6$  (*c* 0.1, CHCl<sub>3</sub>); Chiral HPLC analysis - Chiralpak OD-H (95:5 hexane:IPA, flow rate 1 mL min<sup>-1</sup>, 211 nm, 30 °C) *t<sub>R</sub>* (*S*): 20.9 min, *t<sub>R</sub>* (*R*): 28.9 min, 10.279:89.721 er.

**(S)-1-Allyl-3-hydroxy-3-(thiophen-2-yl)pyrrolidin-2-one 34:** Yield: 41%;  $[\alpha]_D^{20} = -50.1$  (*c* 0.1, CHCl<sub>3</sub>); Chiral HPLC analysis - Chiralpak AD-H (98:2 hexane:IPA, flow rate 1 mL min<sup>-1</sup>, 211 nm, 30 °C) *t<sub>R</sub>* (*R*): 58.9 min, *t<sub>R</sub>* (*S*): 65.7 min, 6.365:93.635 er.

### 3-Hydroxy-1,3-diphenylpyrrolidin-2-one 35

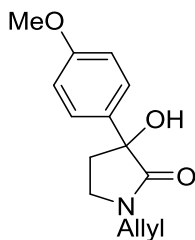


#### In PhMe:

**(S)-2-Oxo-1,3-diphenylpyrrolidin-3-yl acetate S31:** Yield: 45%;  $[\alpha]_D^{20} = +26.6$  (*c* 0.1, CHCl<sub>3</sub>); Chiral HPLC analysis - Chiralpak AD-H (90:10 hexane:IPA, flow rate 1 mL min<sup>-1</sup>, 211 nm, 30 °C) *t<sub>R</sub>* (*R*): 32.3 min, *t<sub>R</sub>* (*S*): 38.2 min, 9.153:90.847 er.

**(R)-3-Hydroxy-1,3-diphenylpyrrolidin-2-one 35:** Yield: 42%;  $[\alpha]_D^{20} = -129.1$  (*c* 0.1, CHCl<sub>3</sub>); Chiral HPLC analysis - Chiralpak AD-H (95:5 hexane:IPA, flow rate 1 mL min<sup>-1</sup>, 211 nm, 30 °C) *t<sub>R</sub>* (*S*): 19.2 min, *t<sub>R</sub>* (*R*): 26.8 min, 5.717:94.283 er.

**1-Allyl-3-hydroxy-3-(4-methoxyphenyl)pyrrolidin-2-one 36**



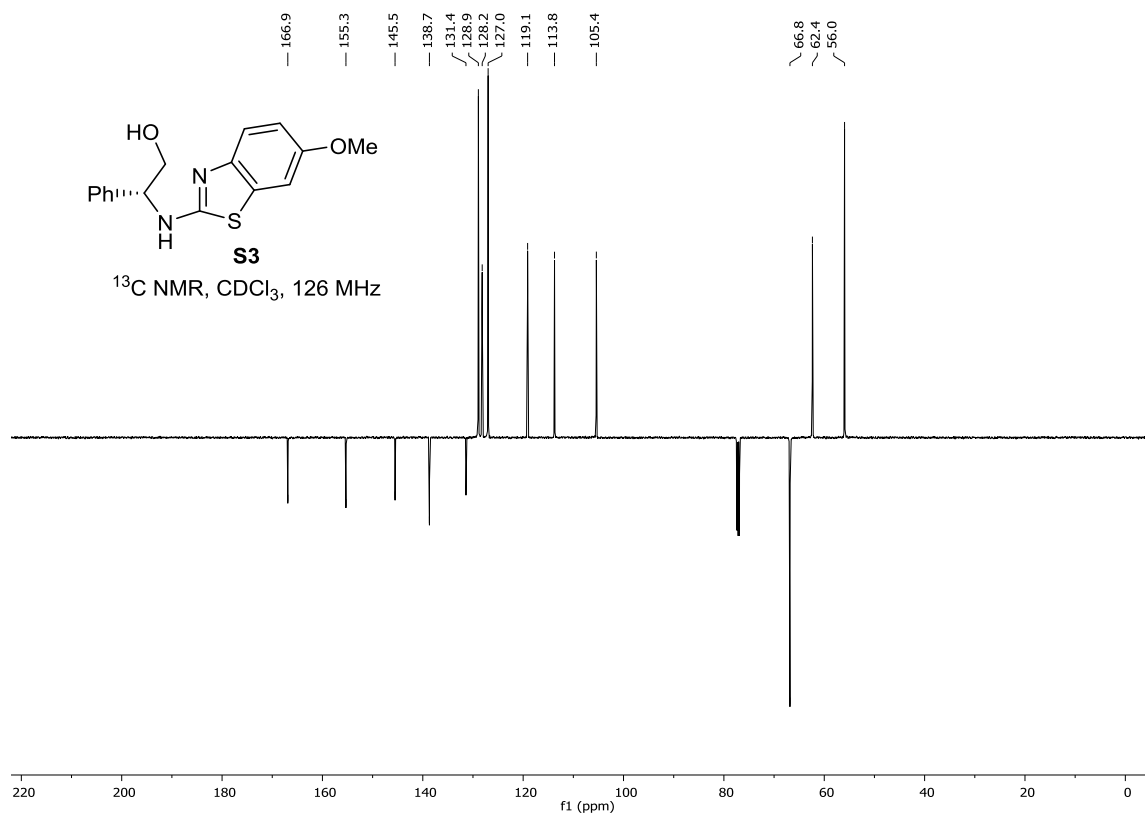
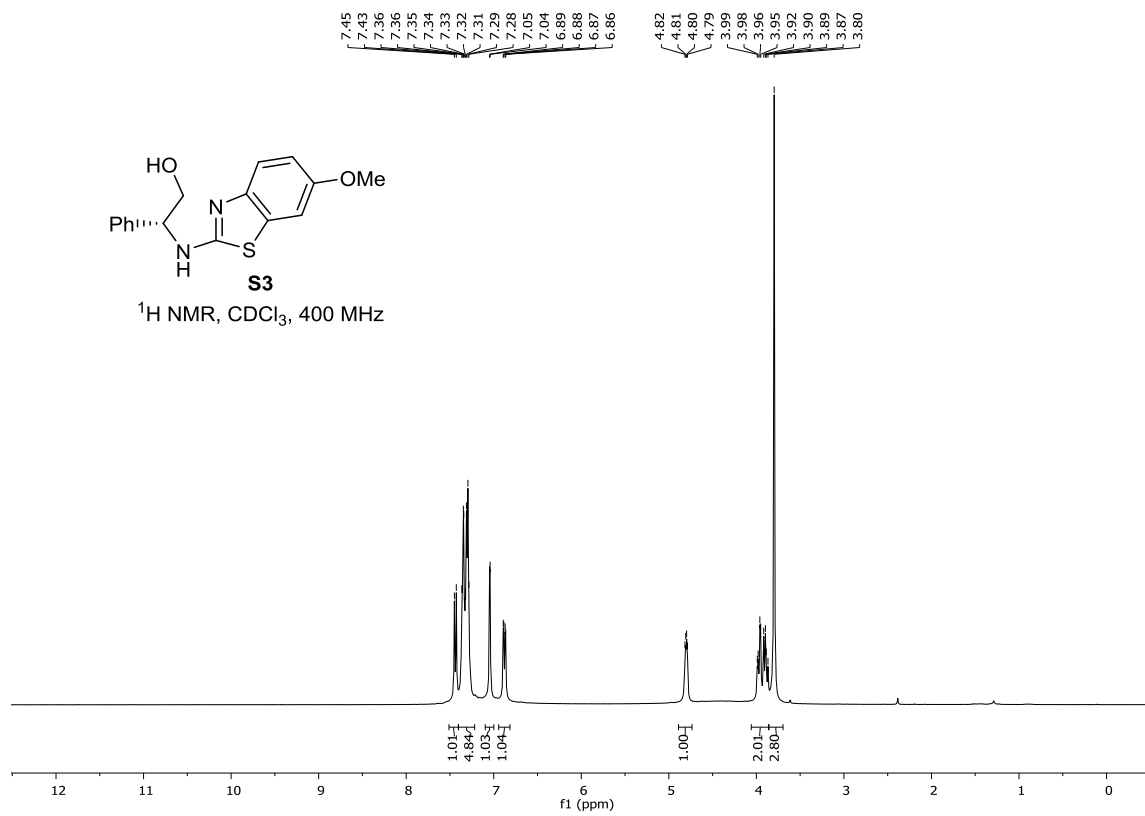
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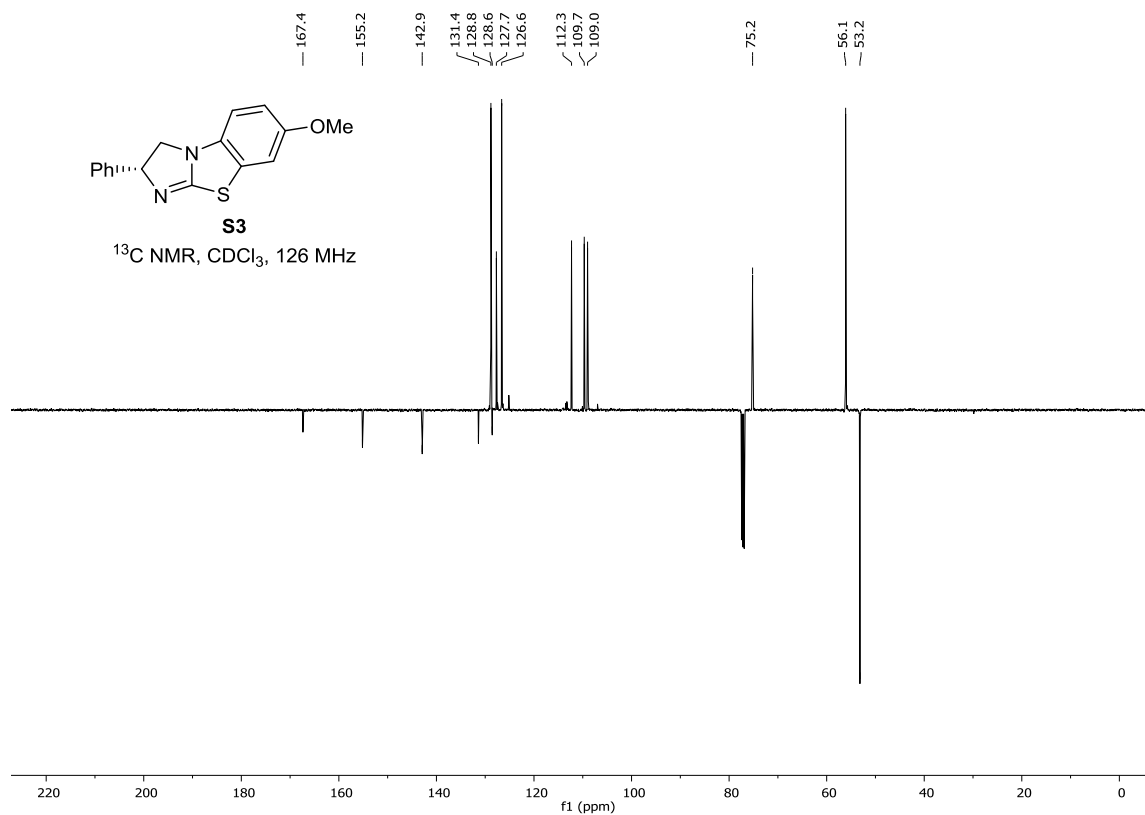
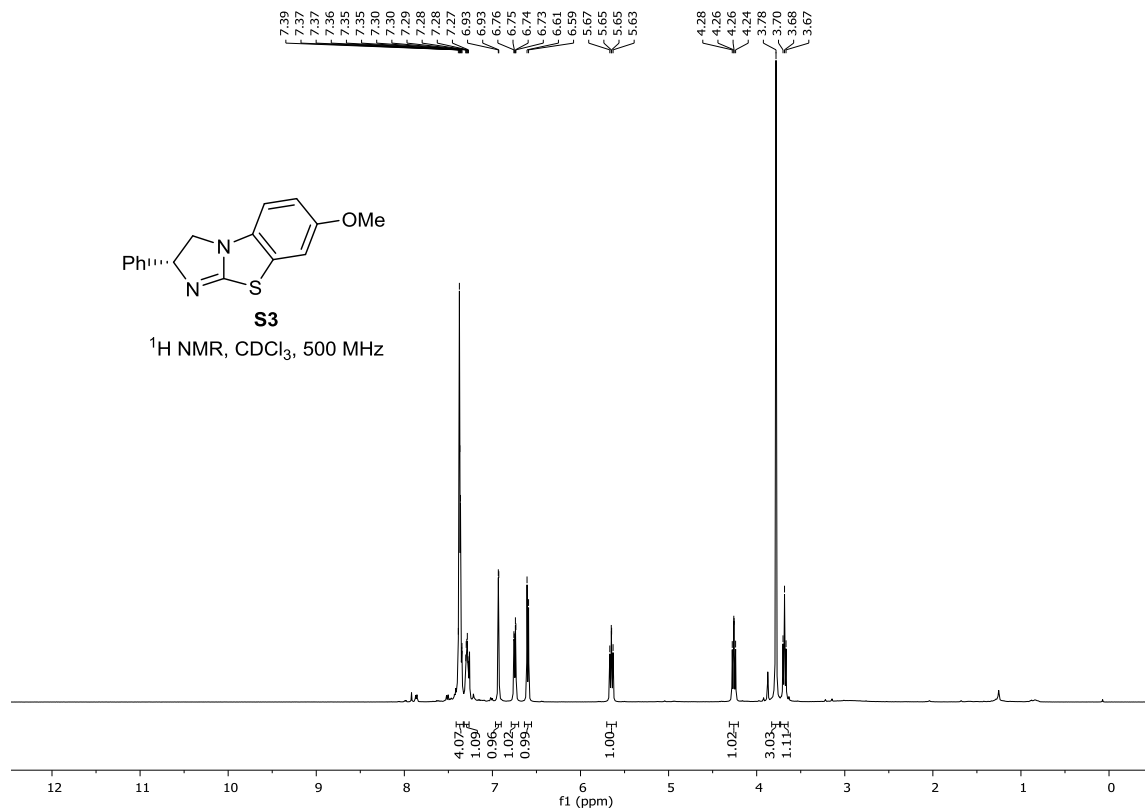
**(S)-1-Allyl-3-(4-methoxyphenyl)-2-oxopyrrolidin-3-yl acetate S32:** Yield: 44%;  $[\alpha]_D^{20} = -13.6$  (*c* 0.1, CHCl<sub>3</sub>); Chiral HPLC analysis - Chiralpak AD-H (95:5 hexane:IPA, flow rate 1 mL min<sup>-1</sup>, 211 nm, 30 °C) *t<sub>R</sub>* (*R*): 31.8 min, *t<sub>R</sub>* (*S*): 45.5 min, 12.686:87.314 er.

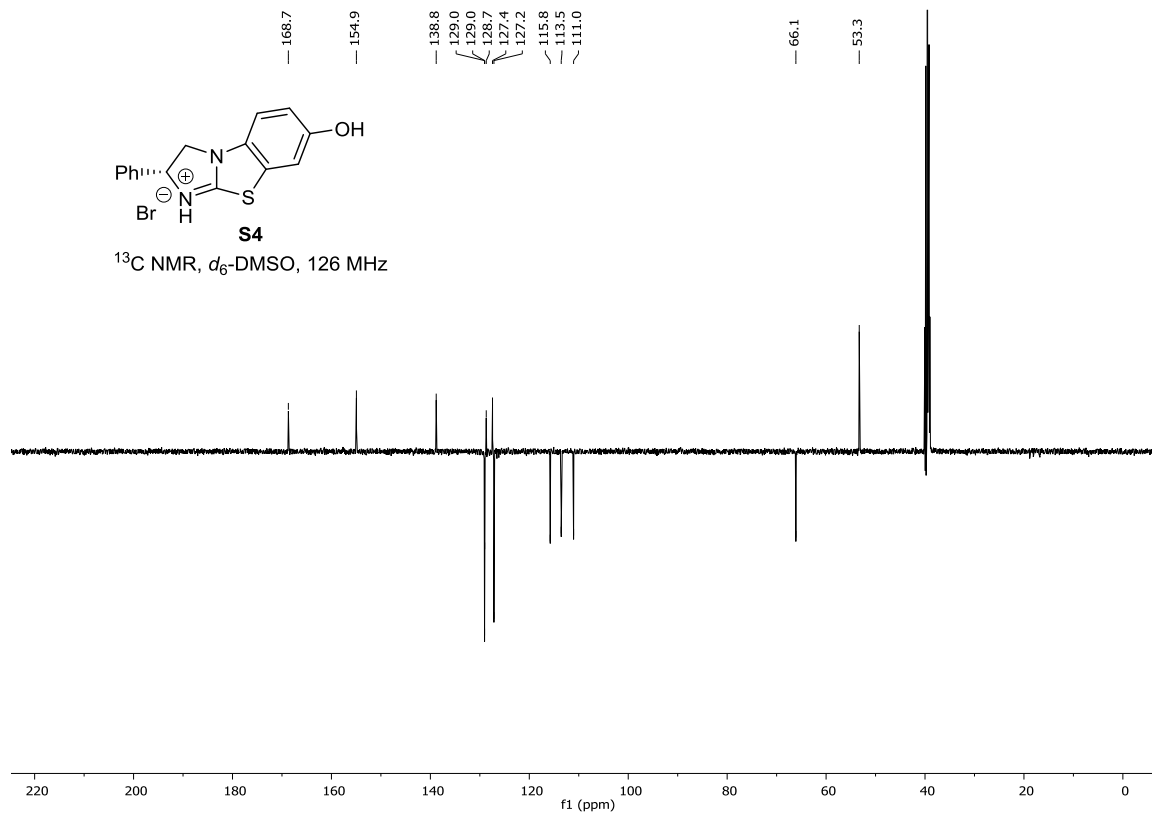
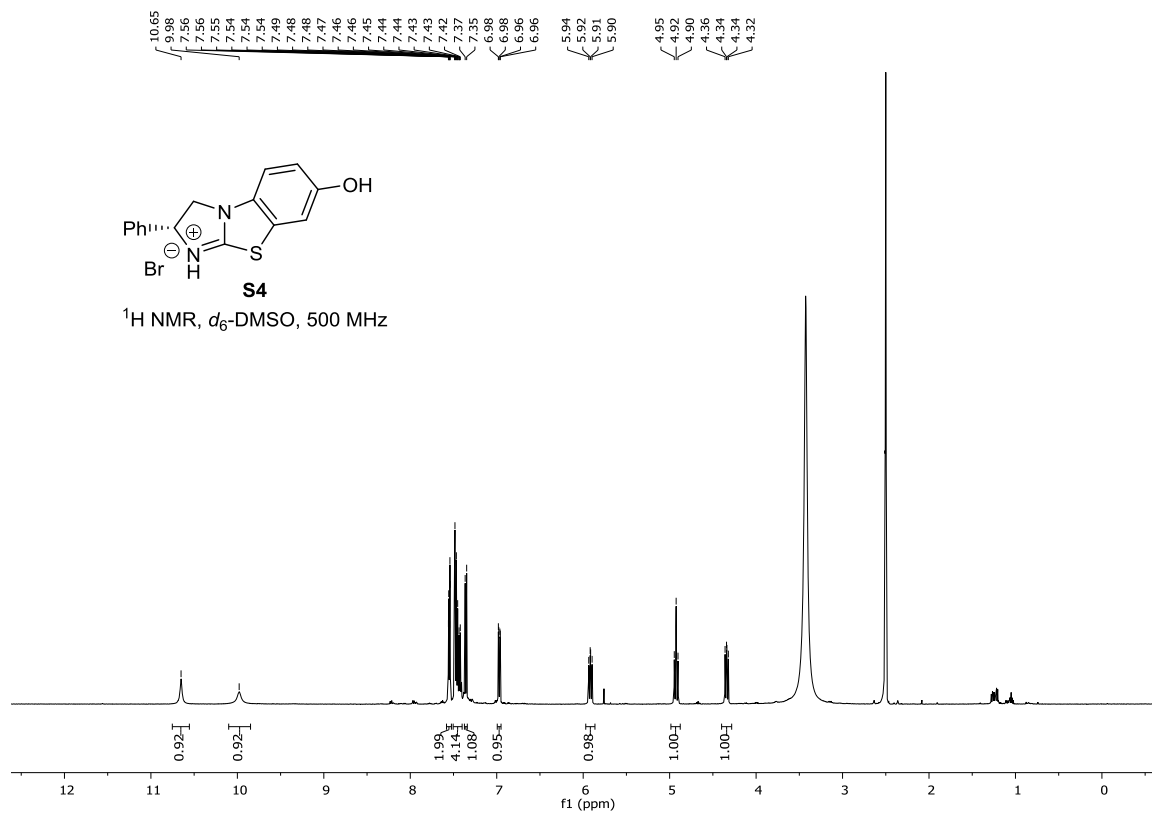
**(R)-1-Allyl-3-hydroxy-3-(4-methoxyphenyl)pyrrolidin-2-one 36:** Yield: 40%;  $[\alpha]_D^{20} = -39.5$  (*c* 0.1, CHCl<sub>3</sub>); Chiral HPLC analysis - Chiralpak AD-H (95:5 hexane:IPA, flow rate 1 mL min<sup>-1</sup>, 211 nm, 30 °C) *t<sub>R</sub>* (*S*): 38.5 min, *t<sub>R</sub>* (*R*): 42.3 min, 8.165:91.835 er.

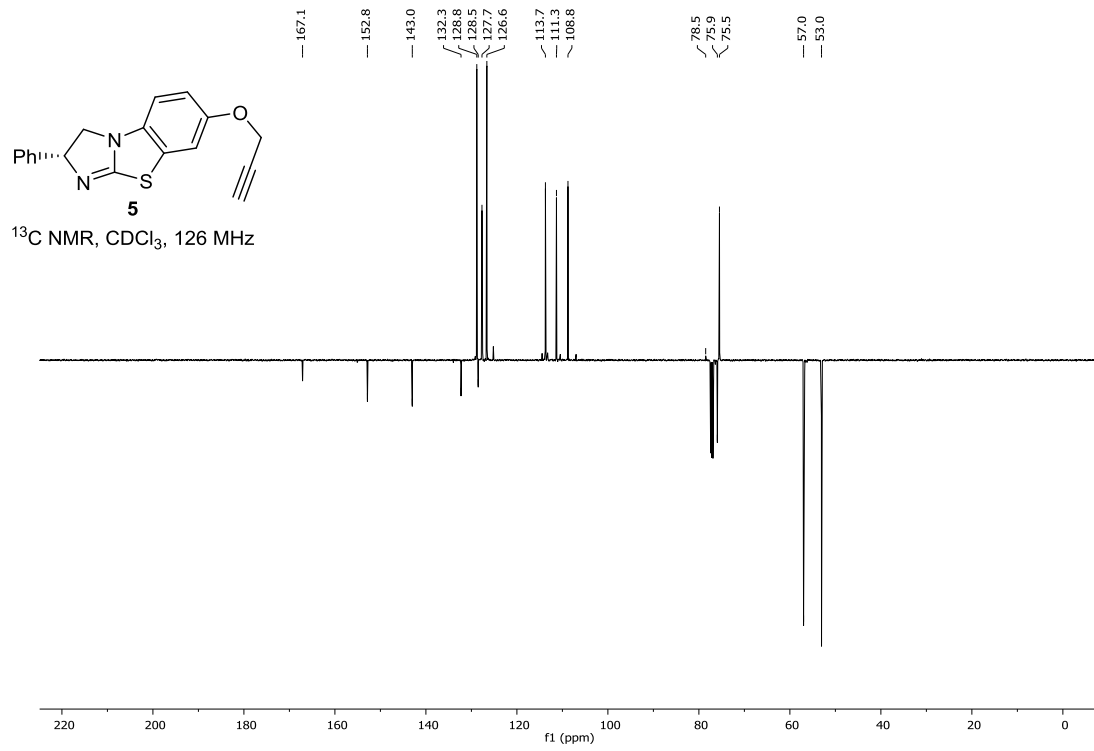
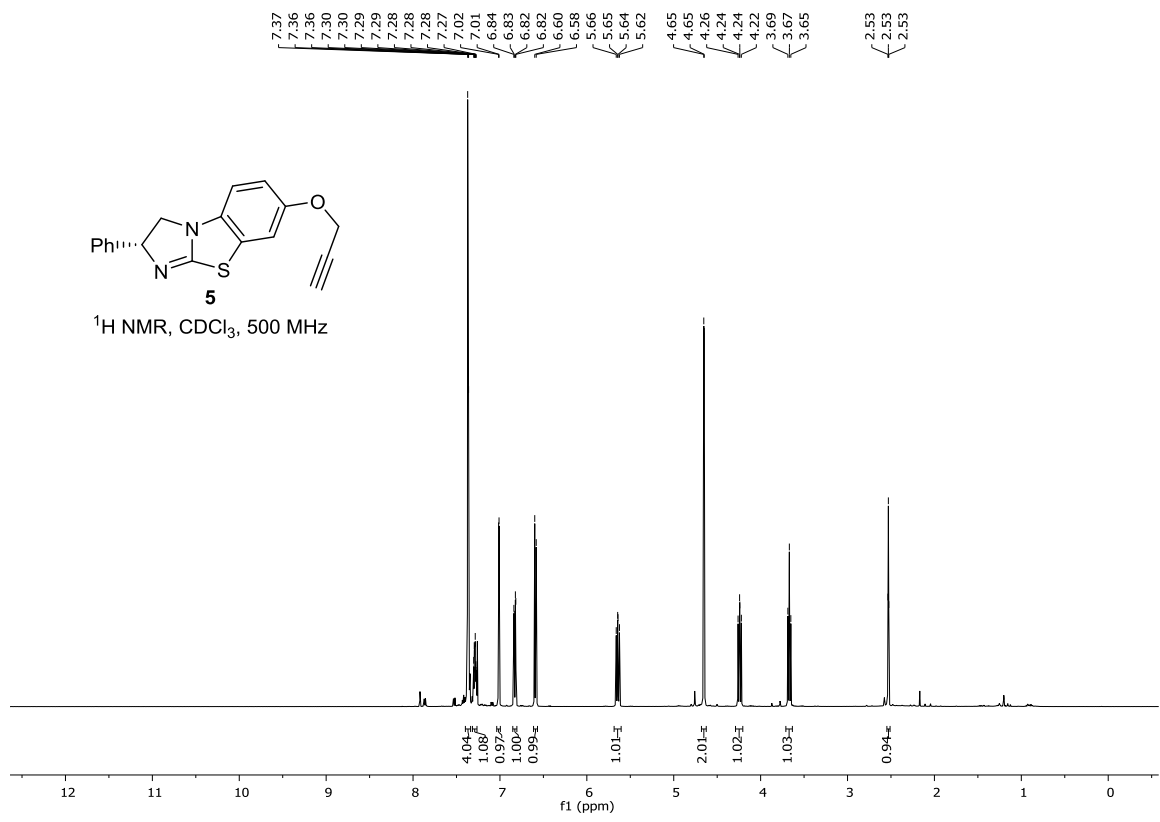


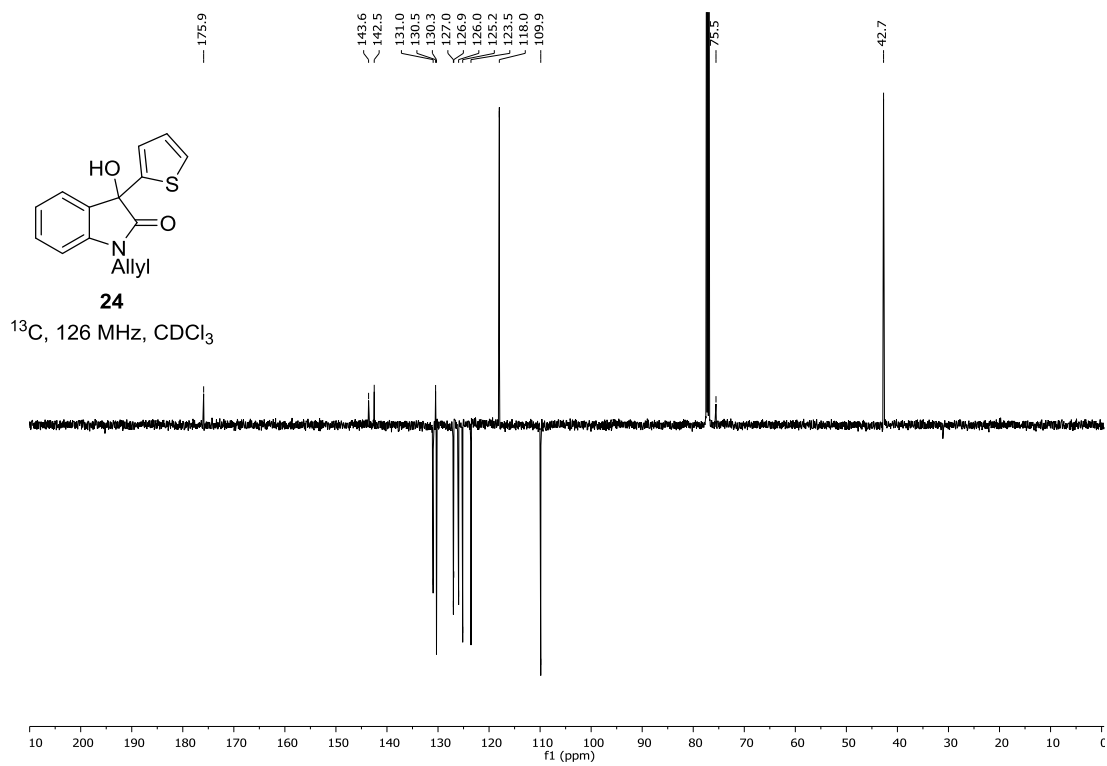
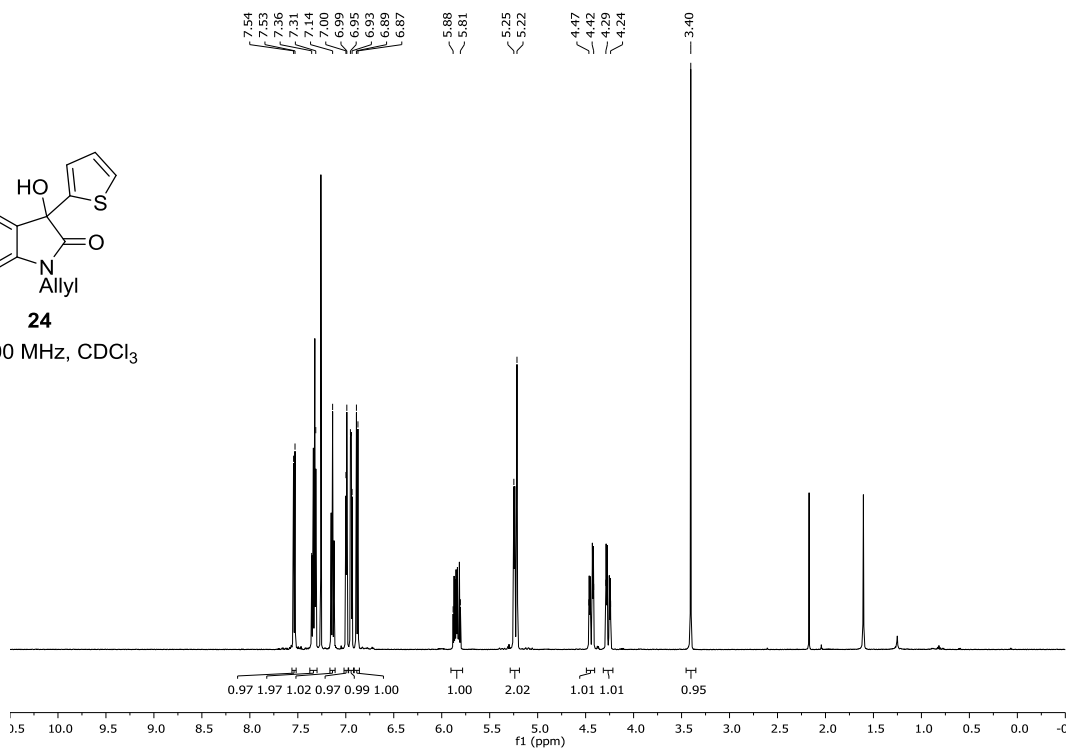
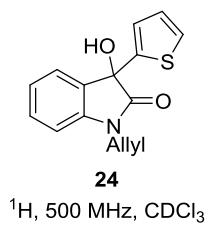
# NMR Spectra

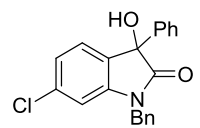






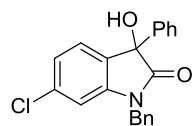
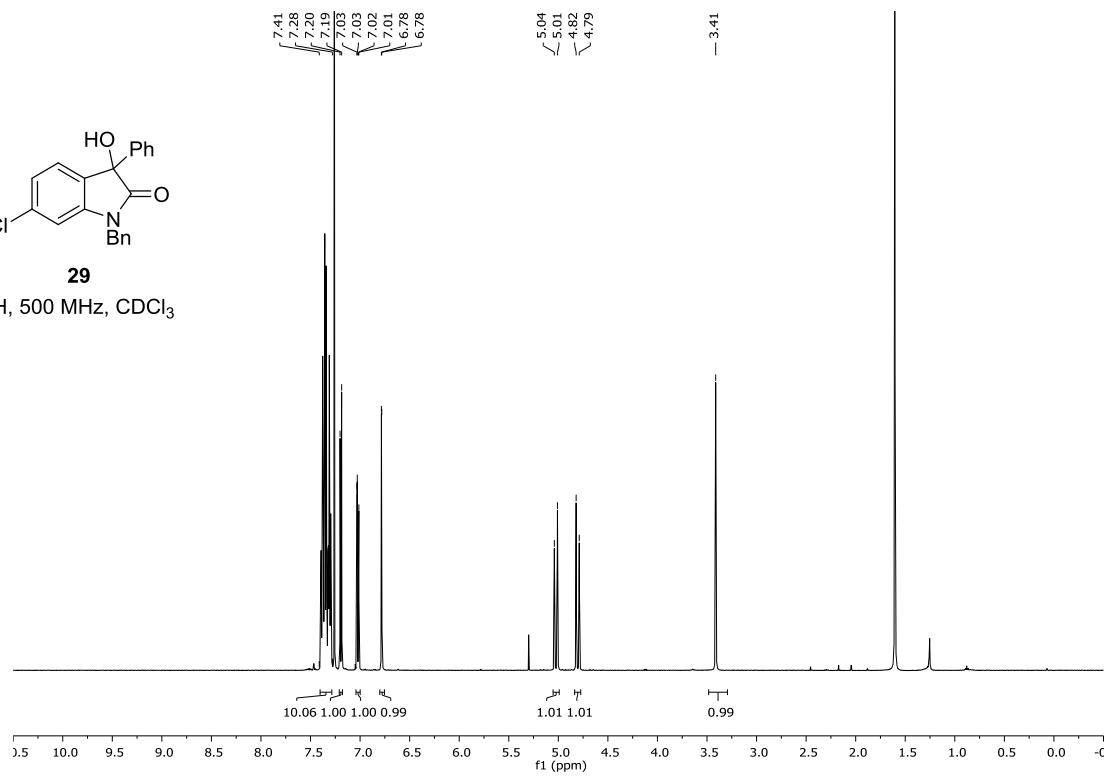






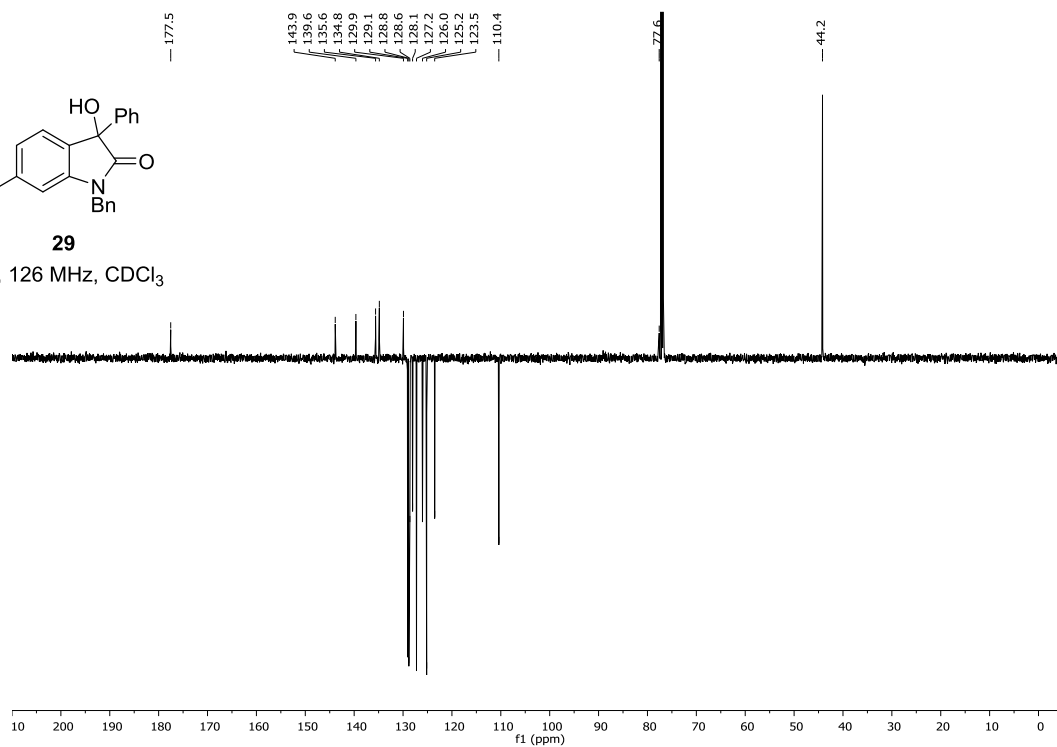
**29**

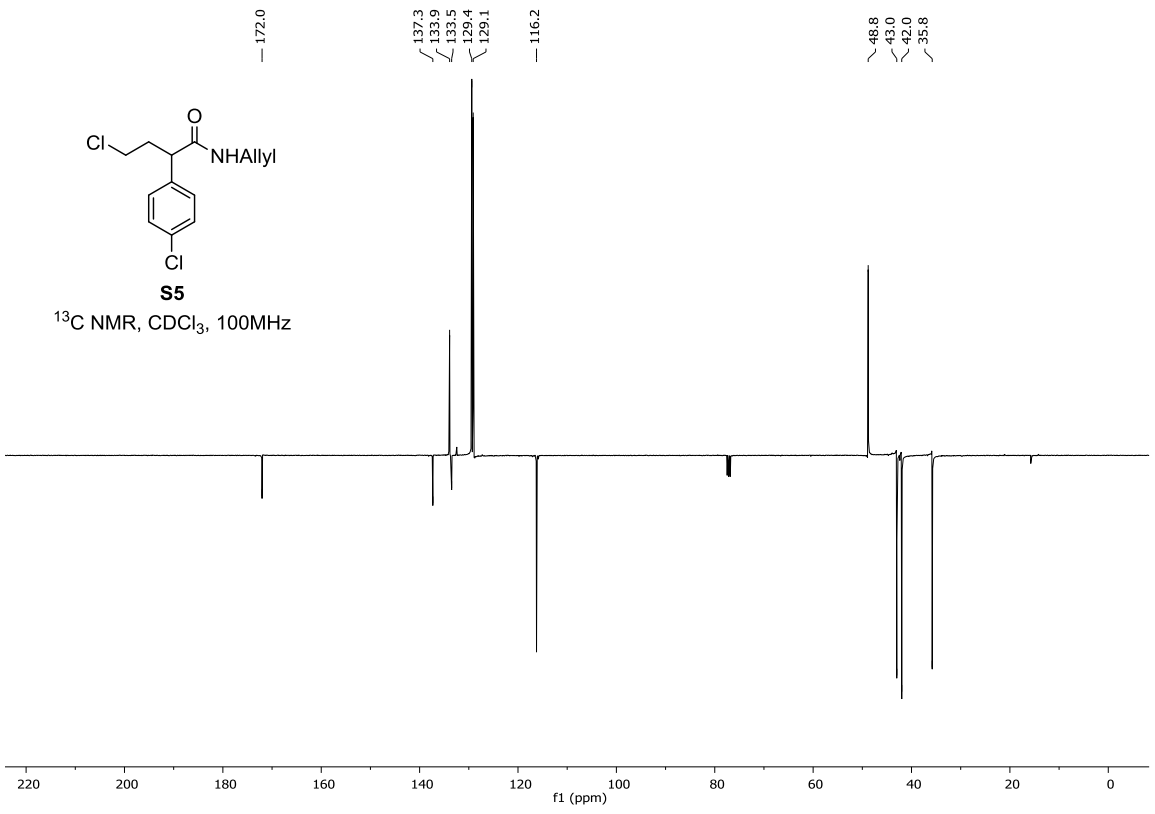
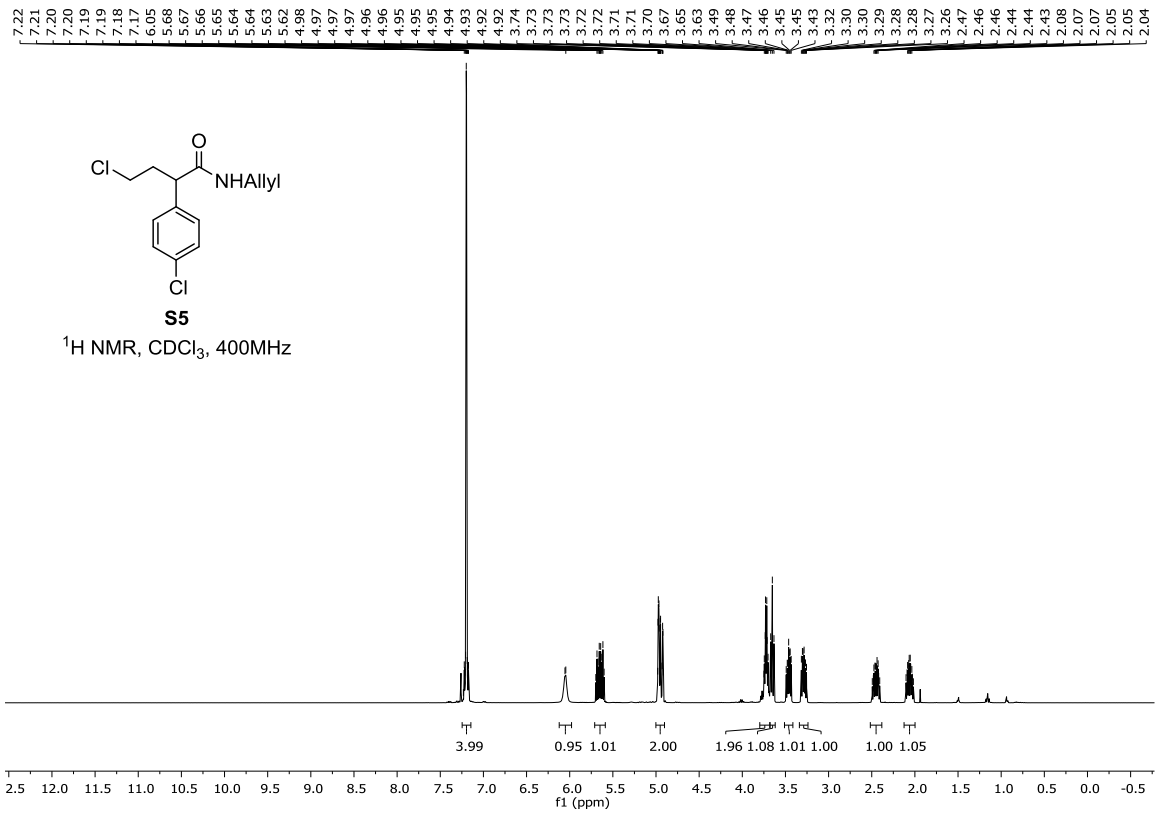
<sup>1</sup>H, 500 MHz, CDCl<sub>3</sub>



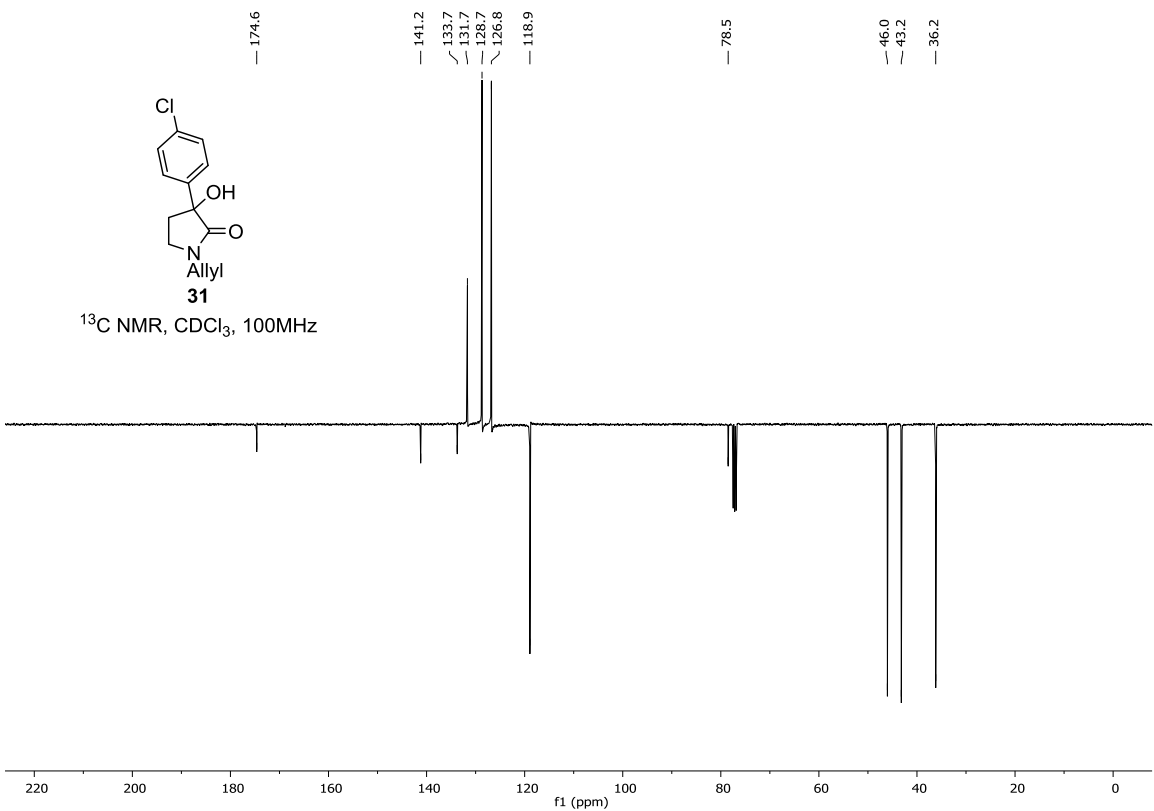
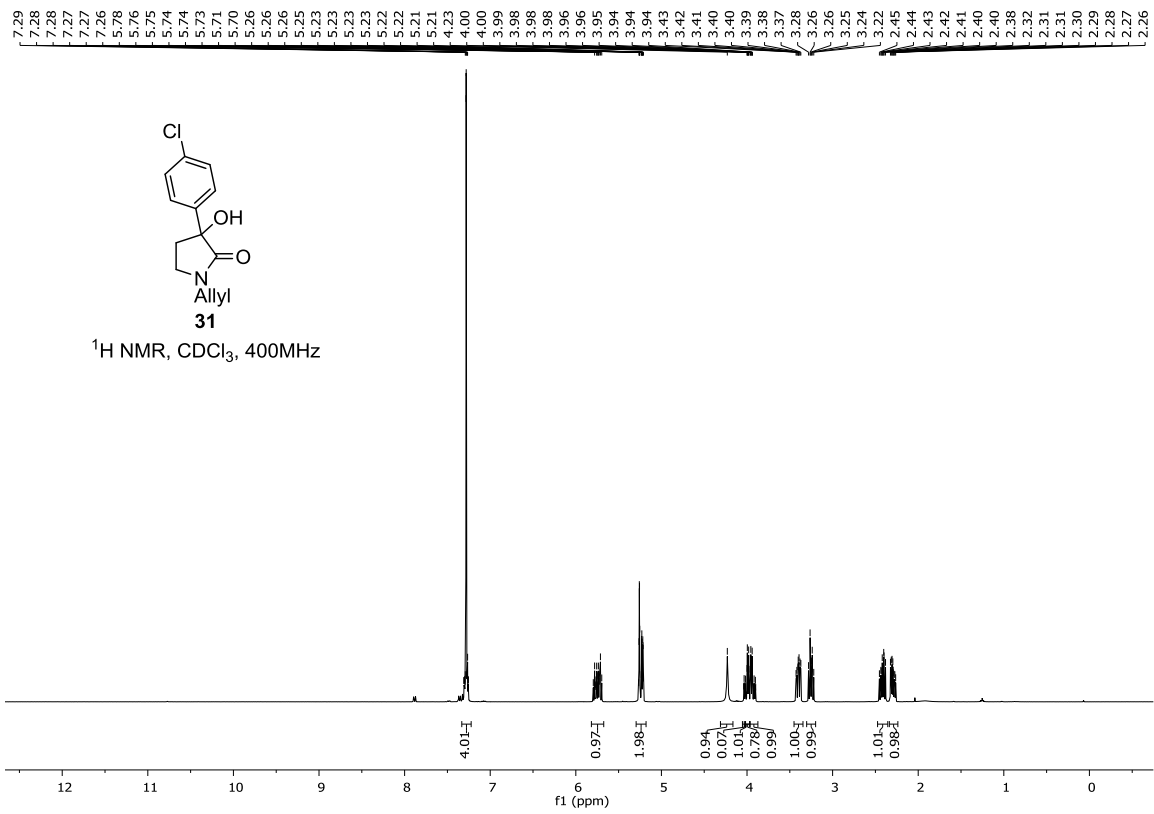
**29**

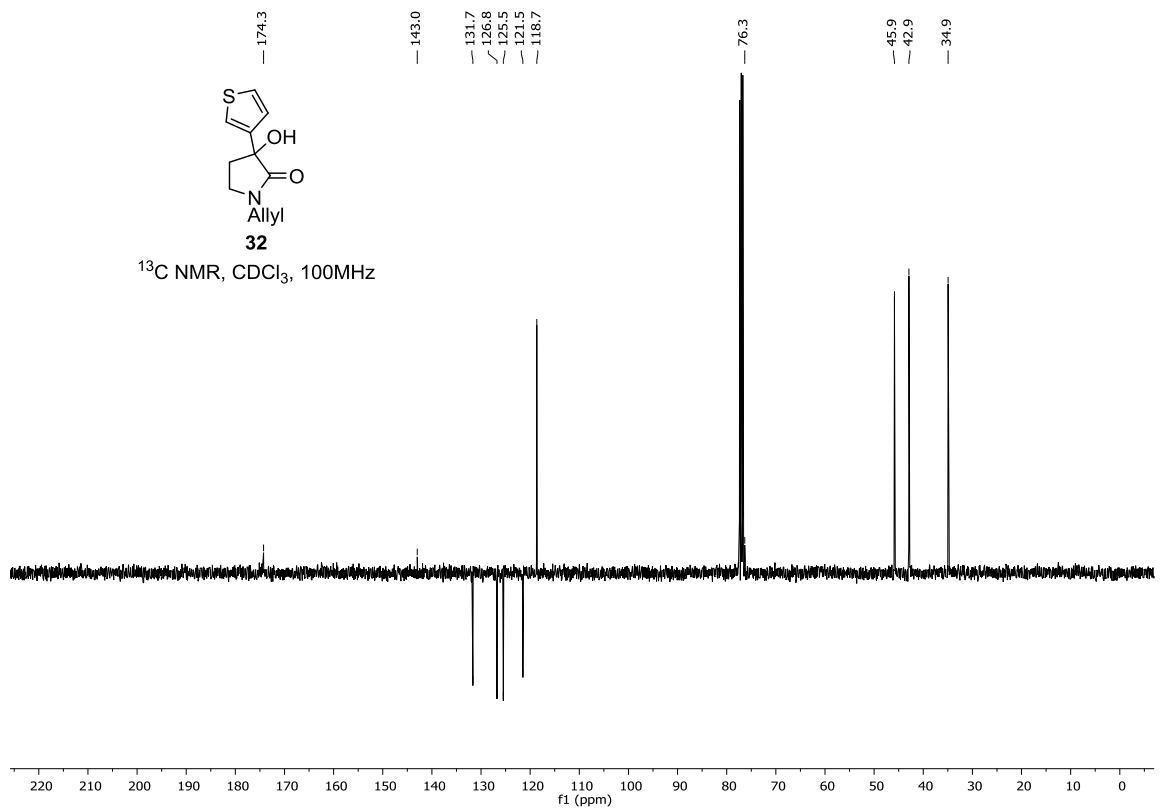
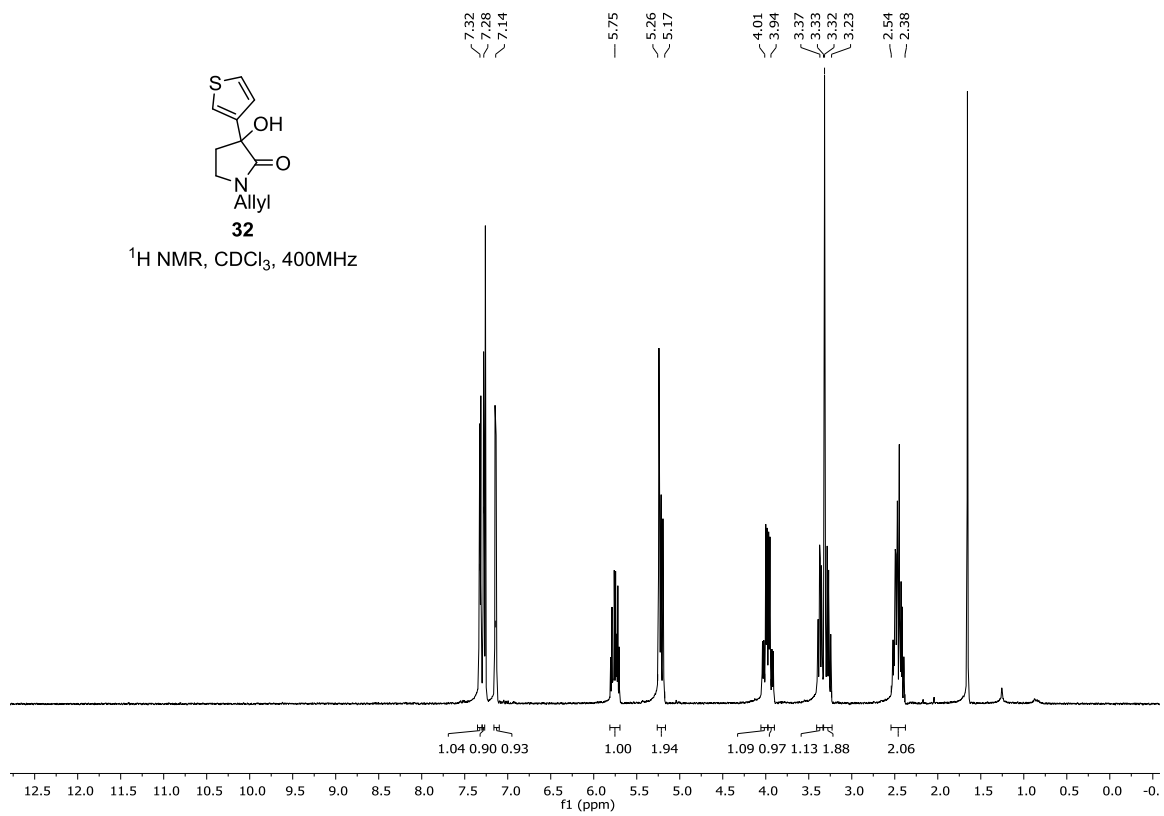
<sup>13</sup>C, 126 MHz, CDCl<sub>3</sub>

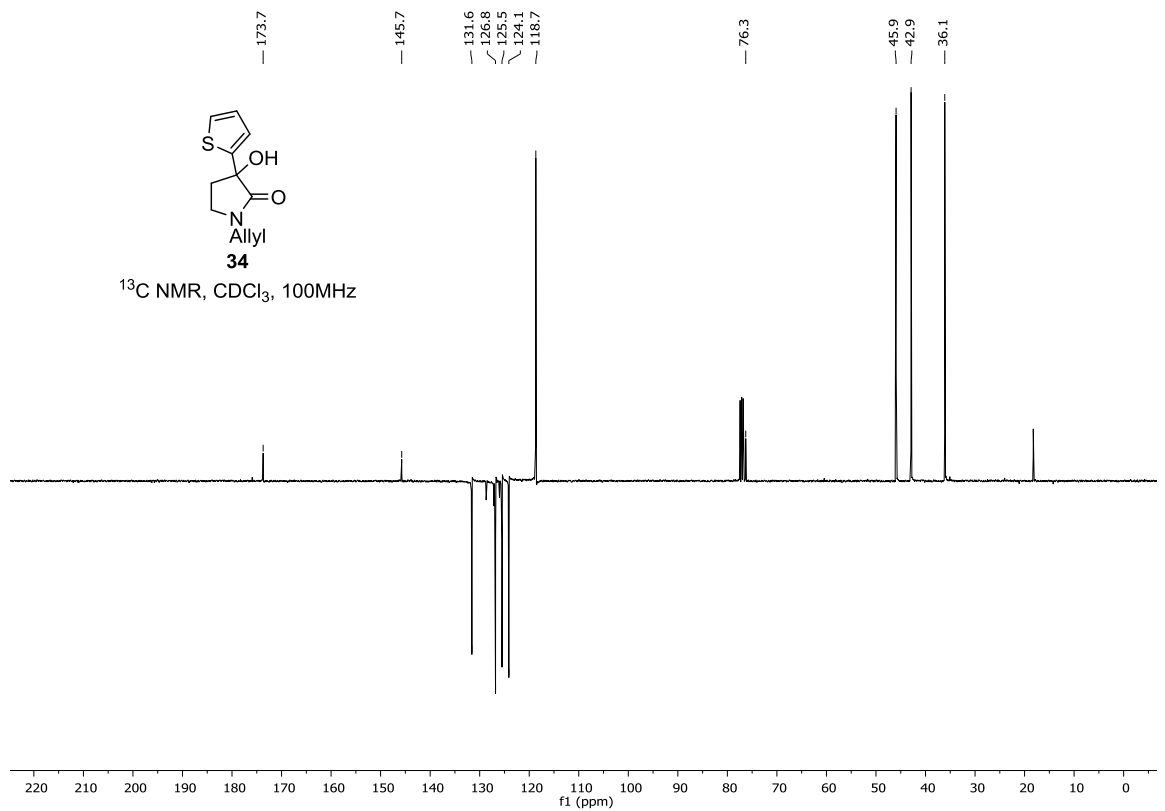
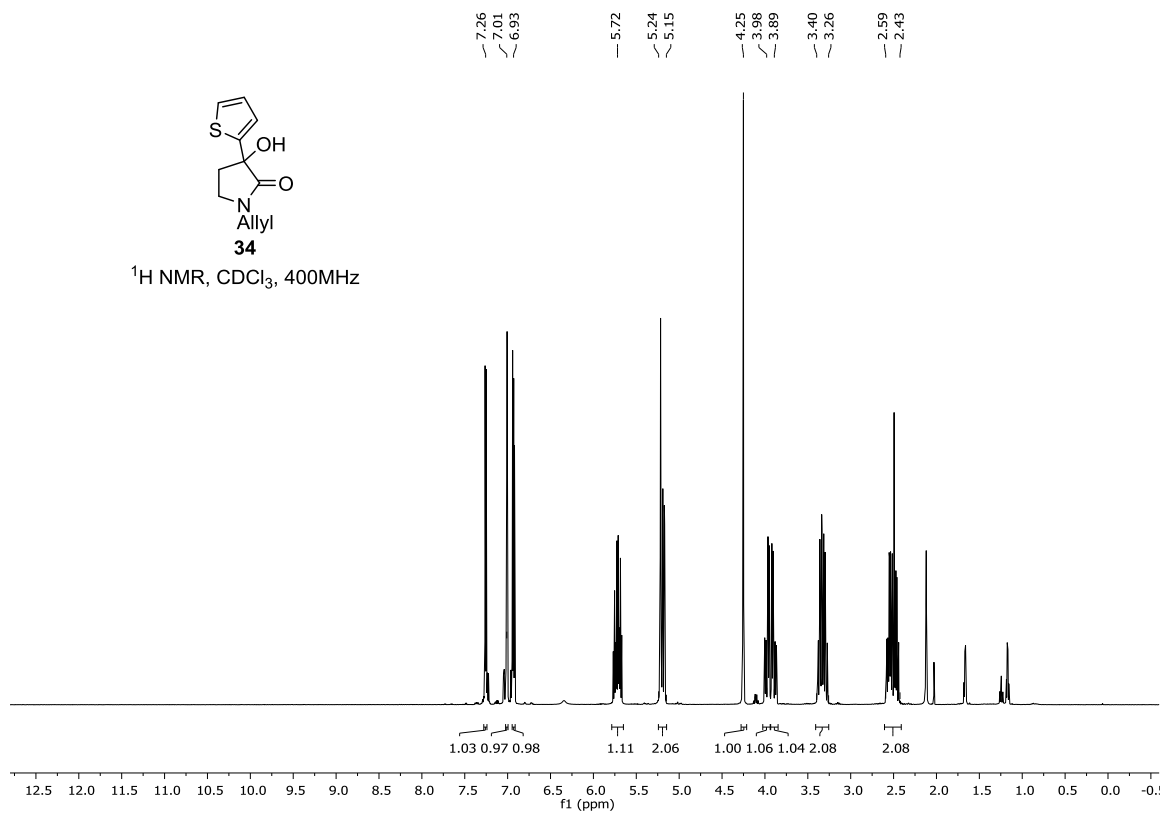


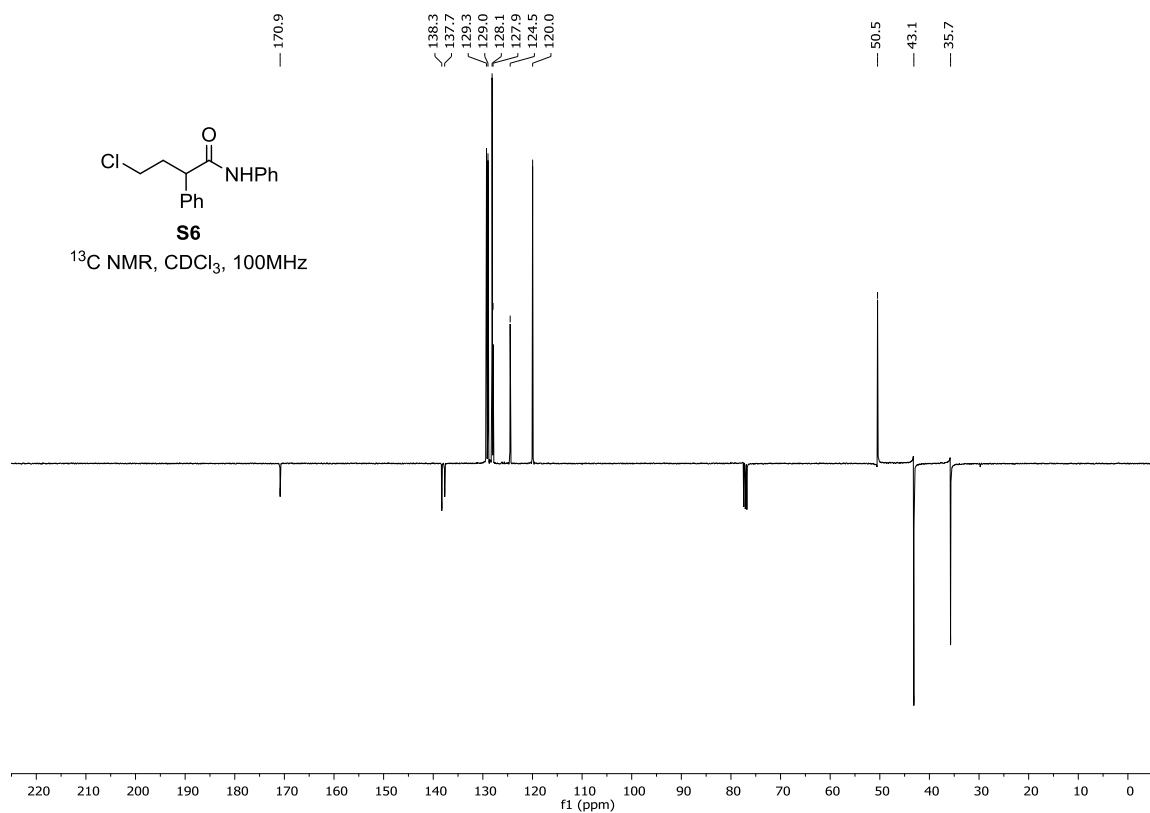
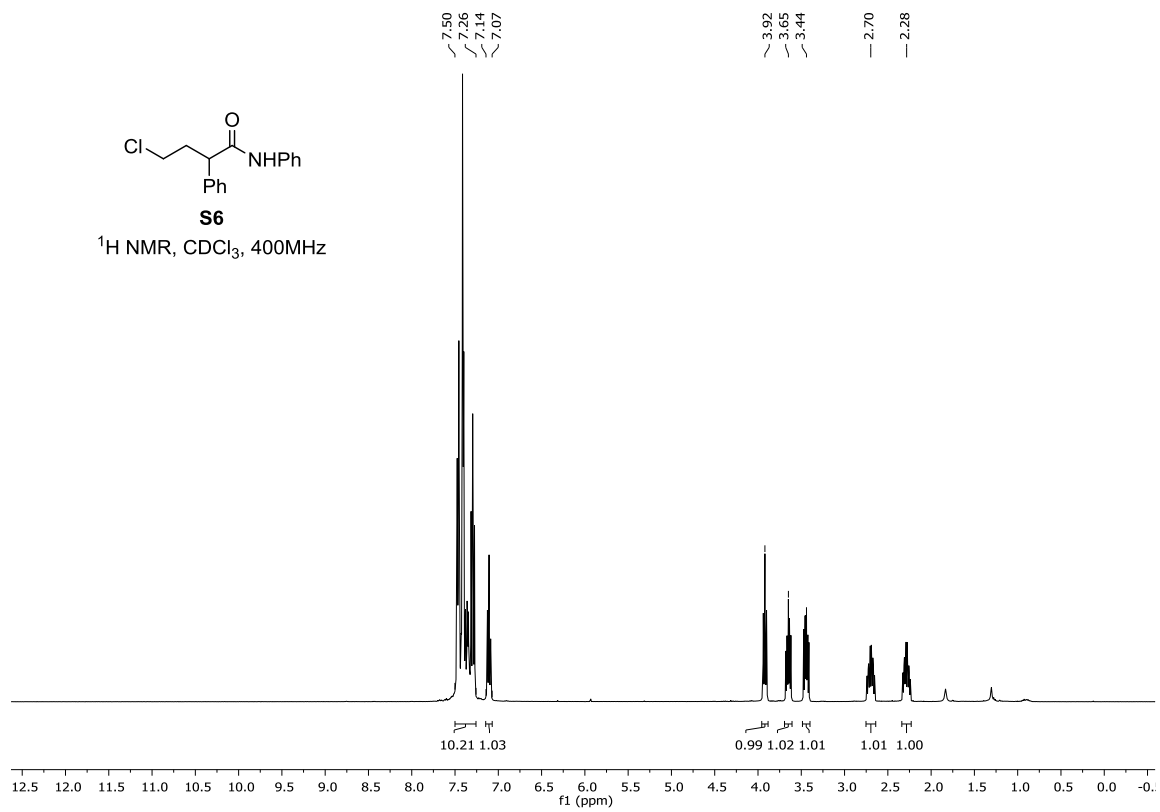


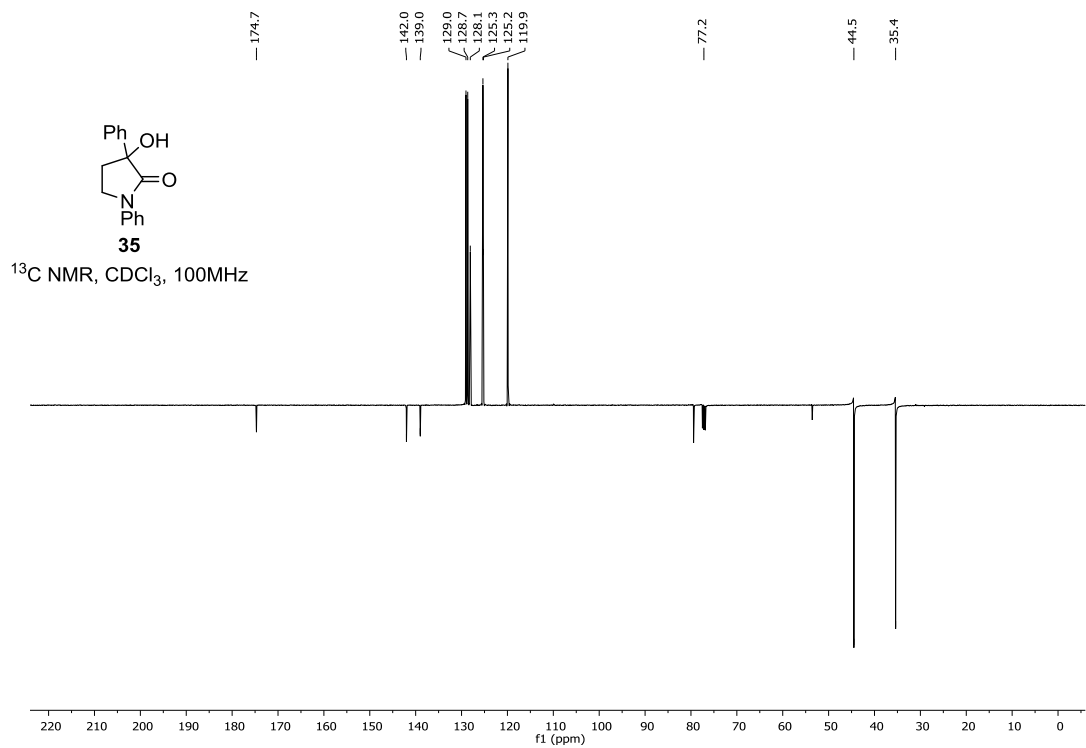
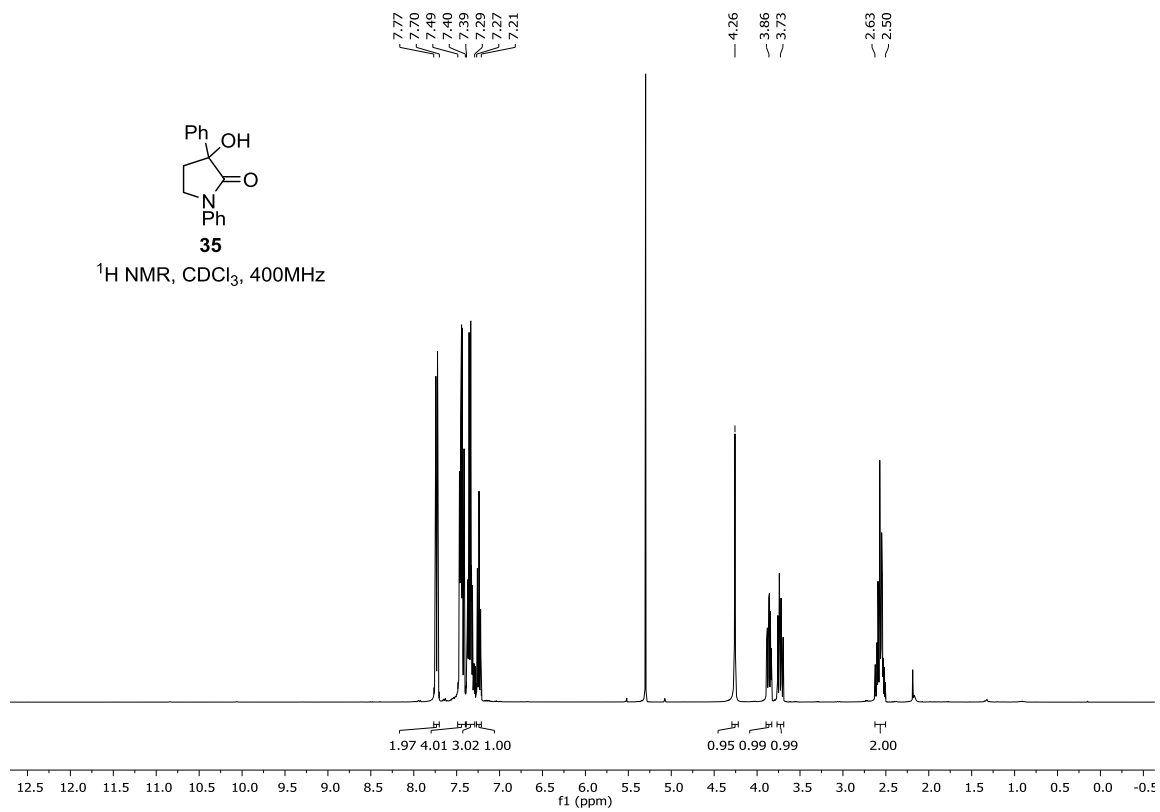


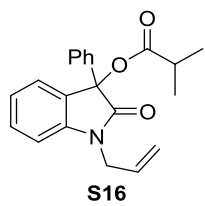




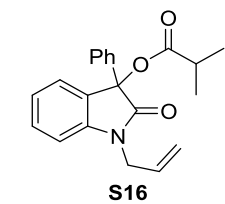
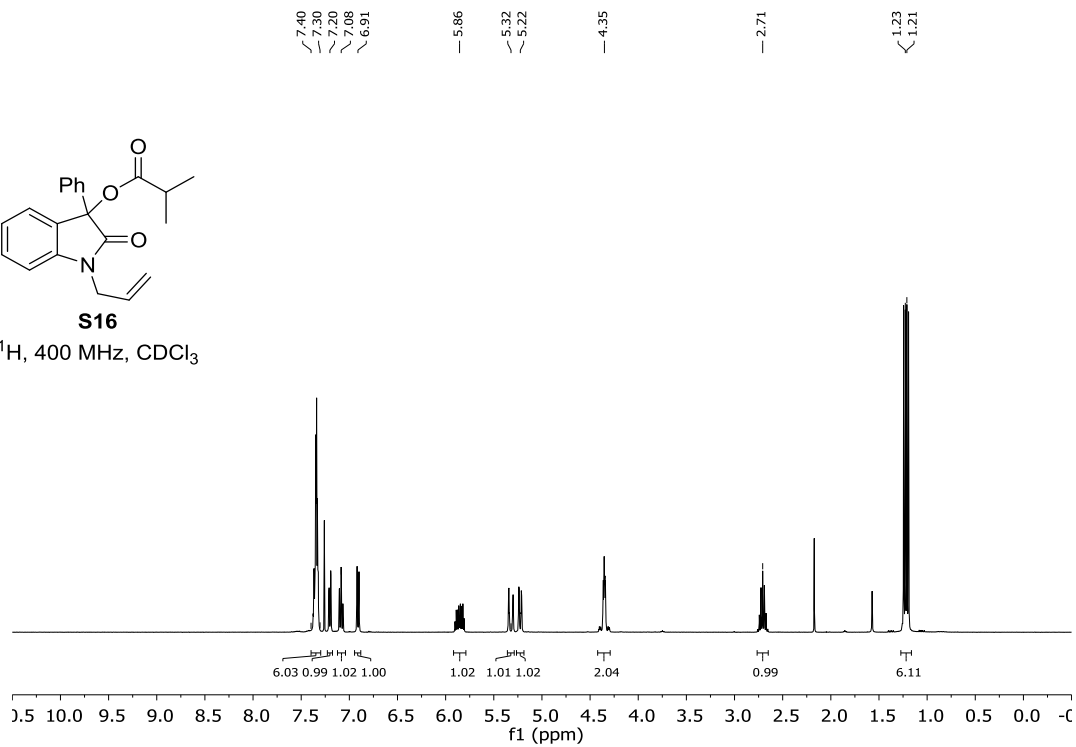




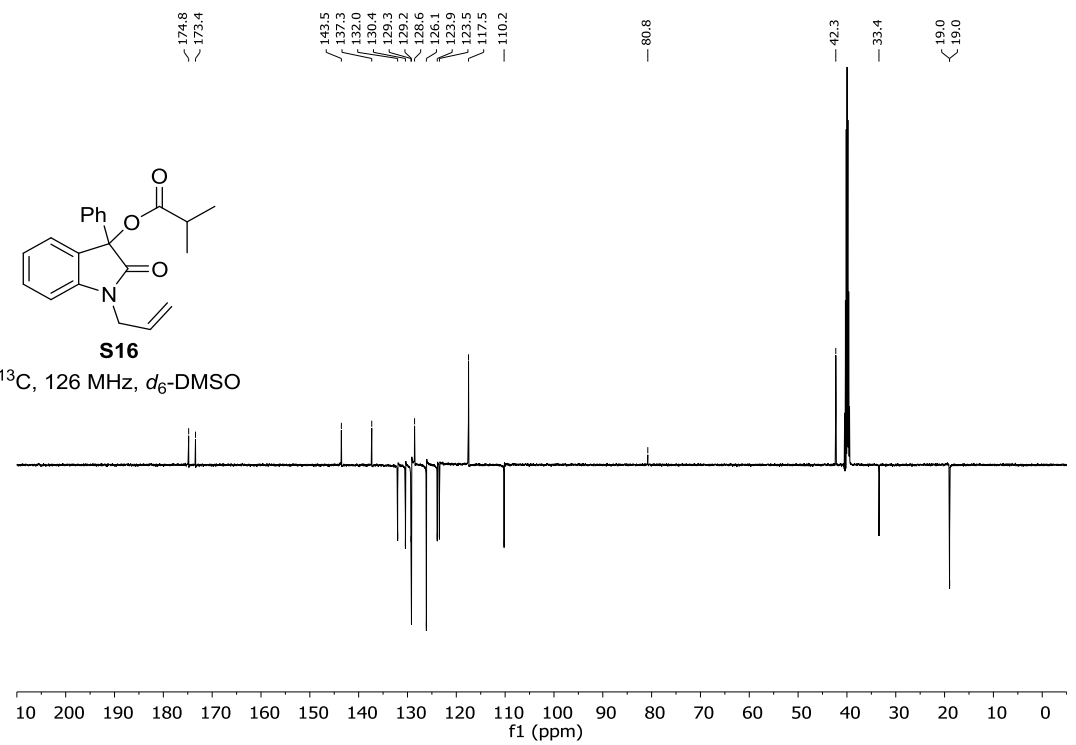


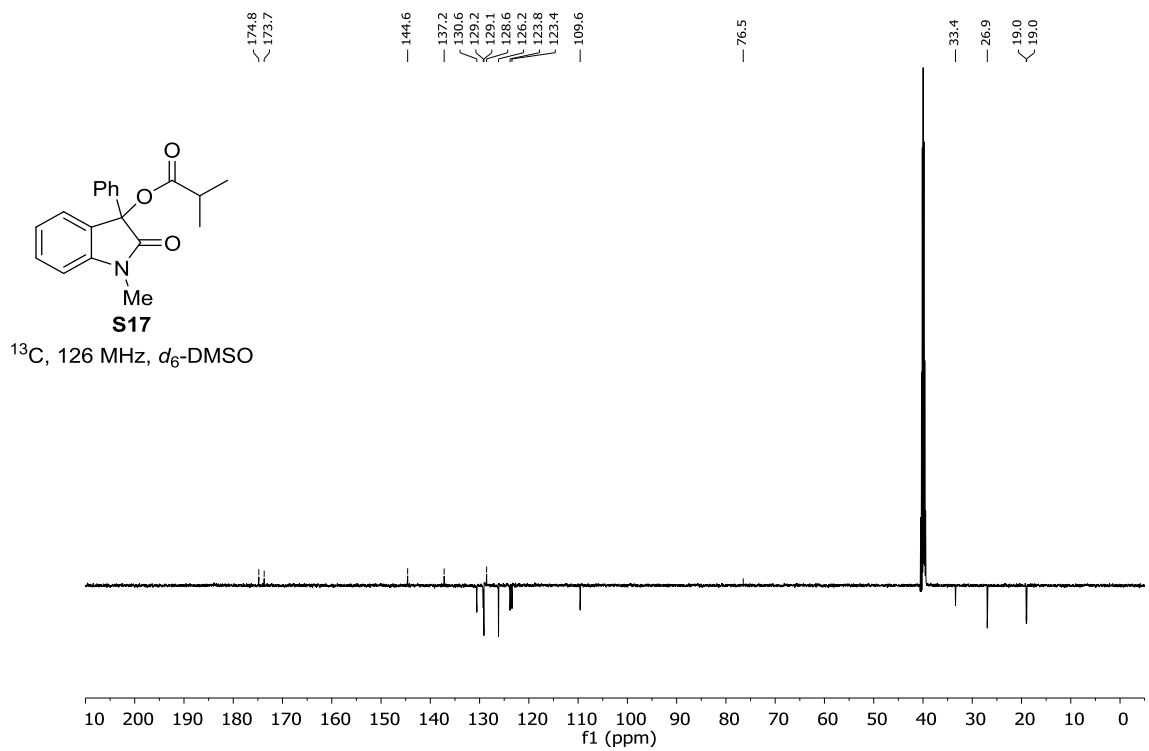
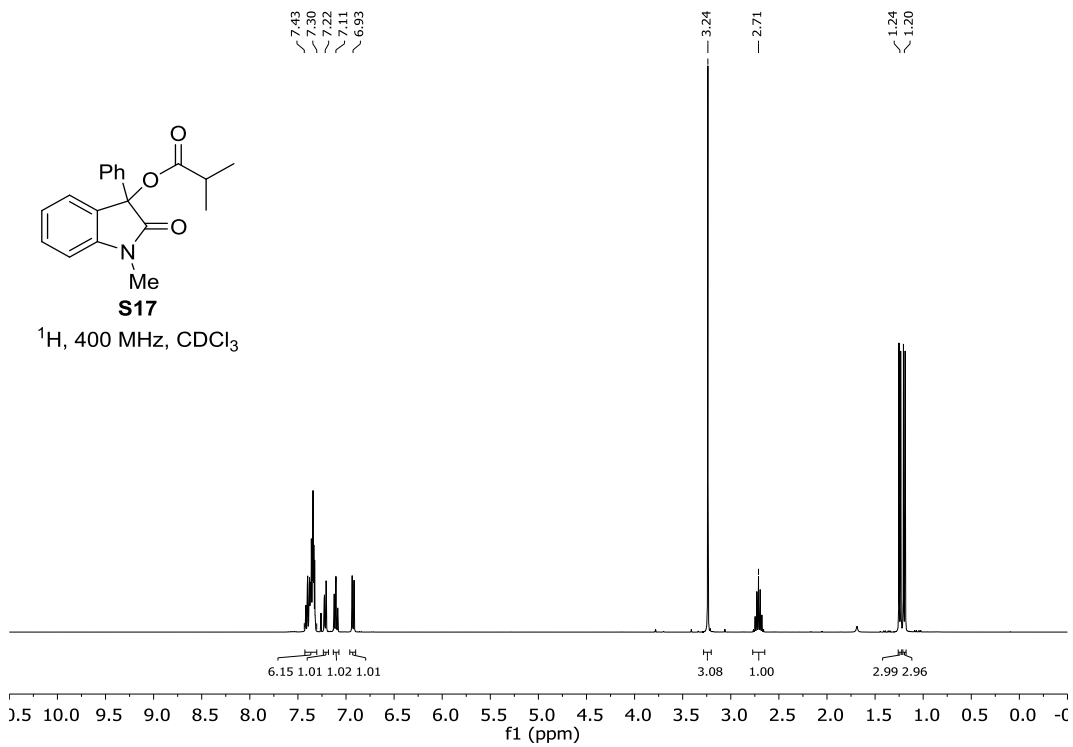


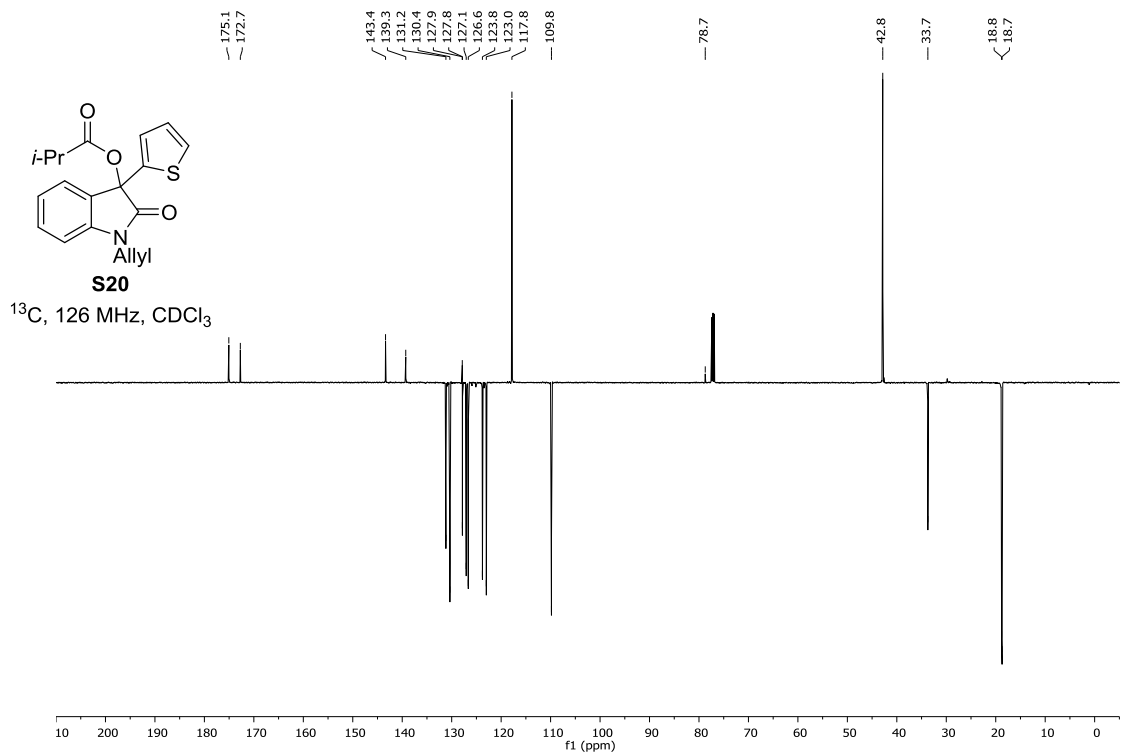
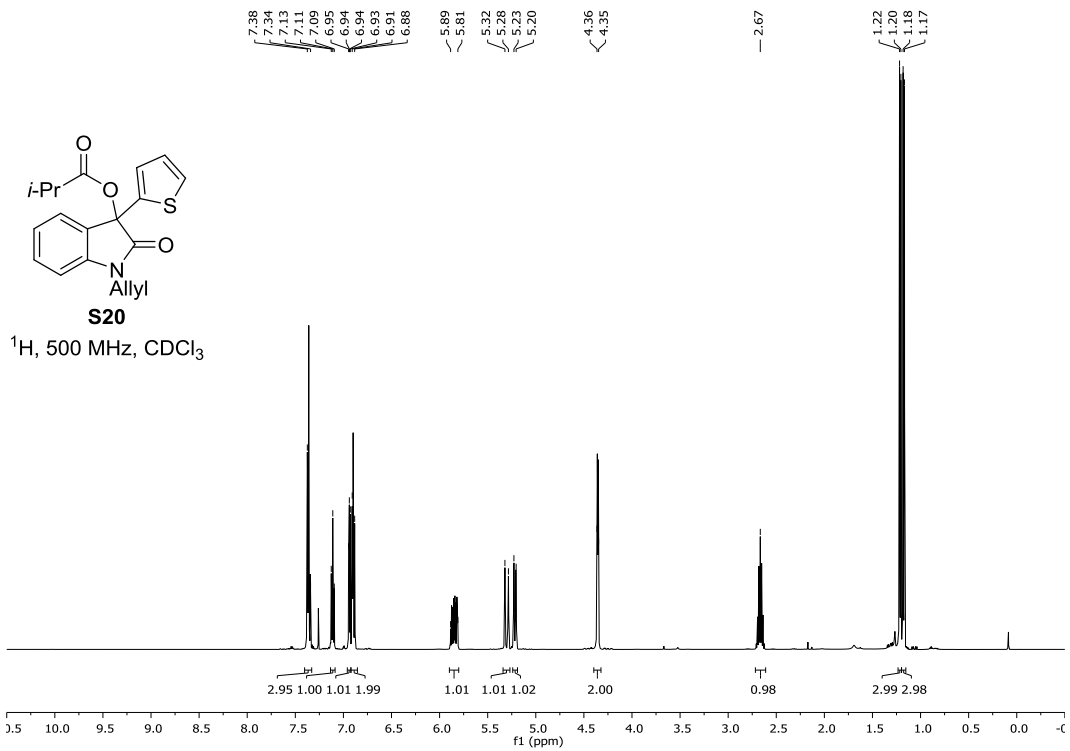
<sup>1</sup>H, 400 MHz, CDCl<sub>3</sub>



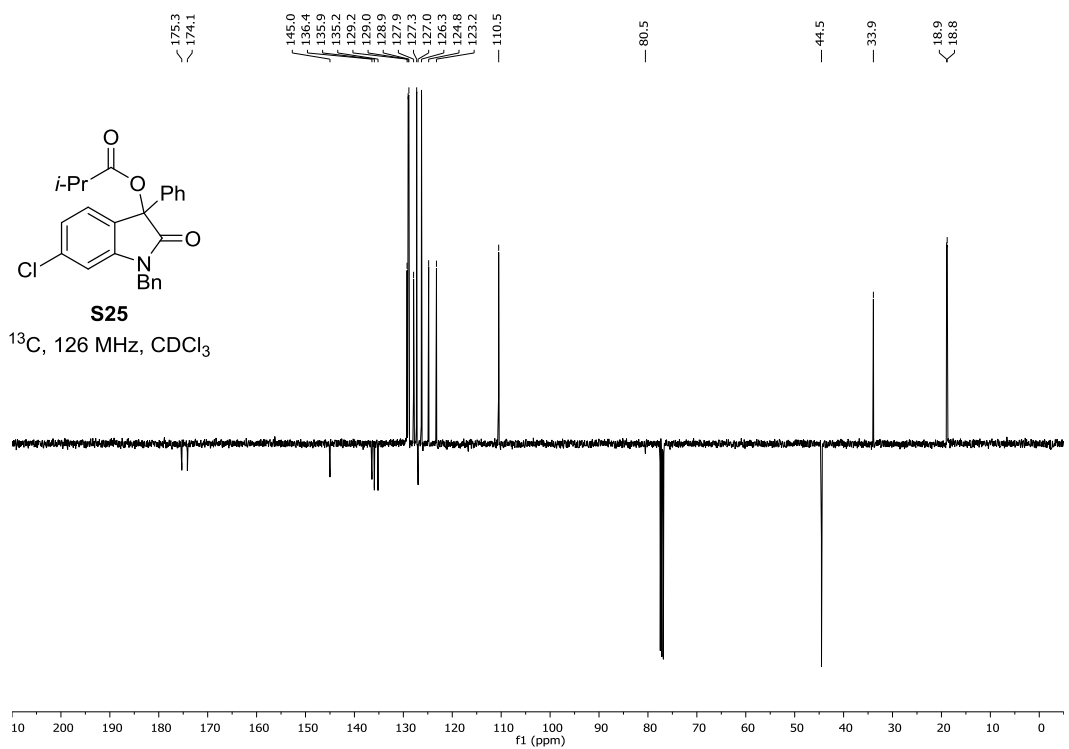
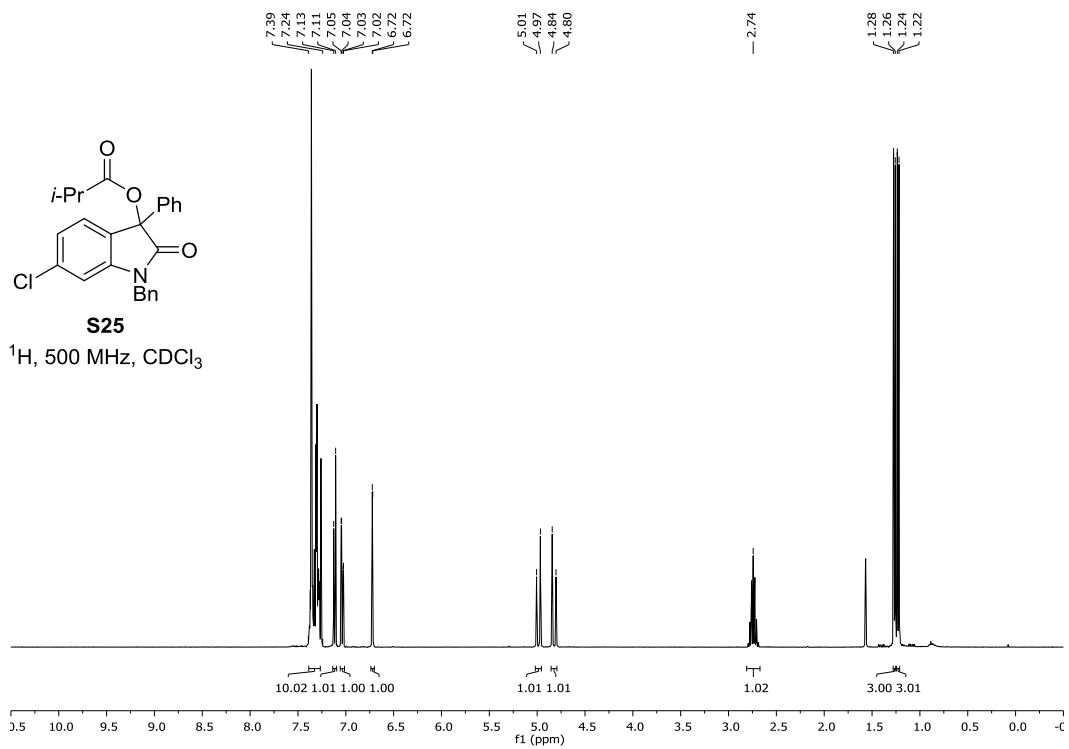
<sup>13</sup>C, 126 MHz, d<sub>6</sub>-DMSO

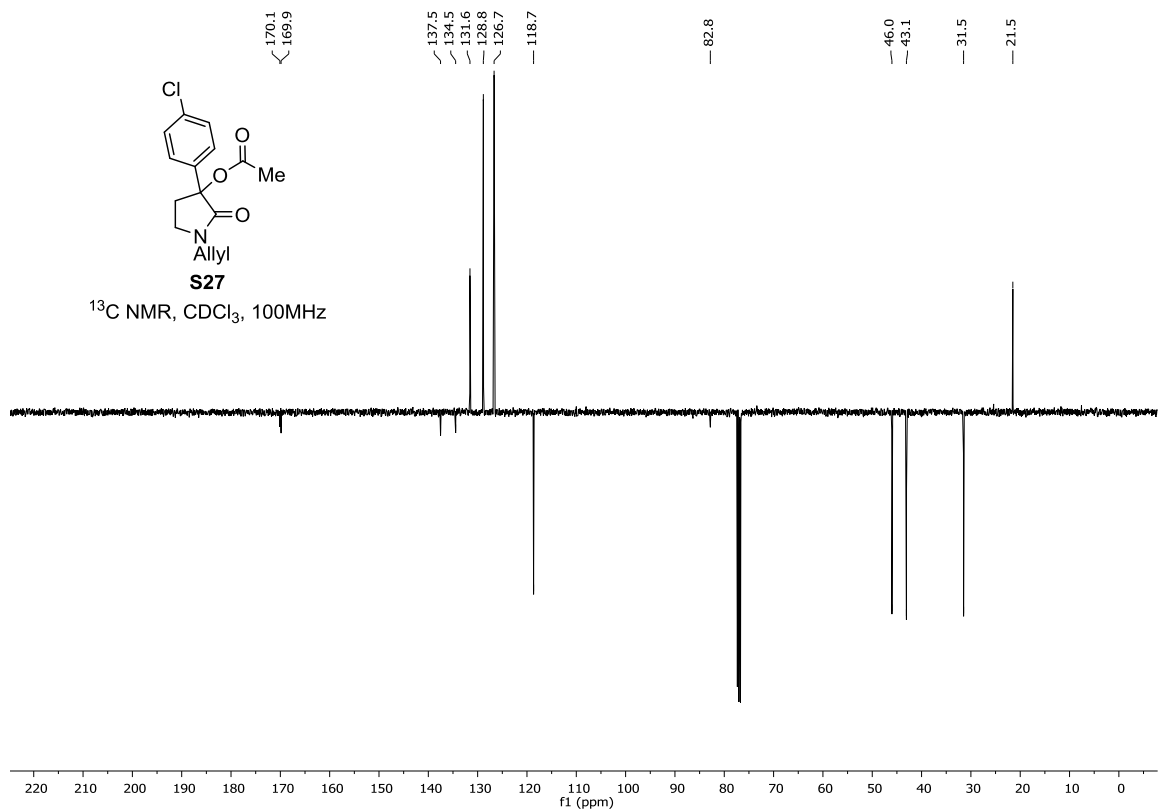
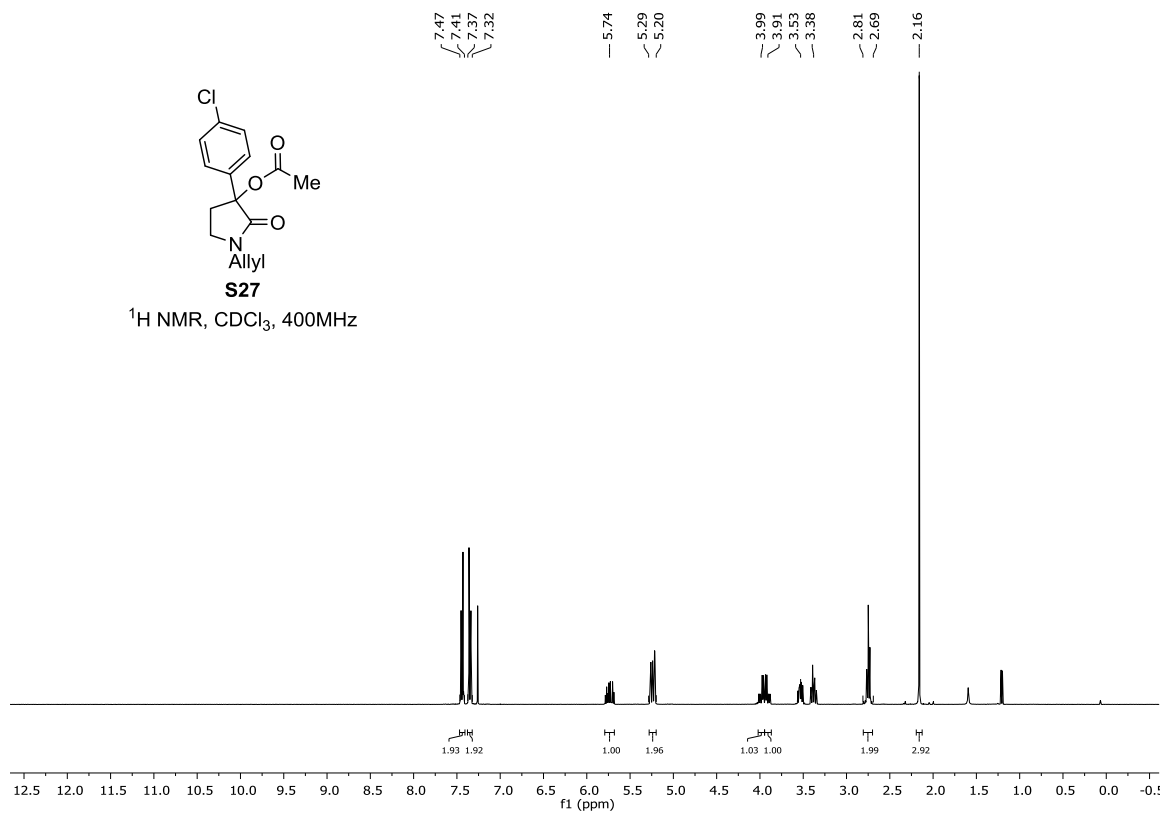


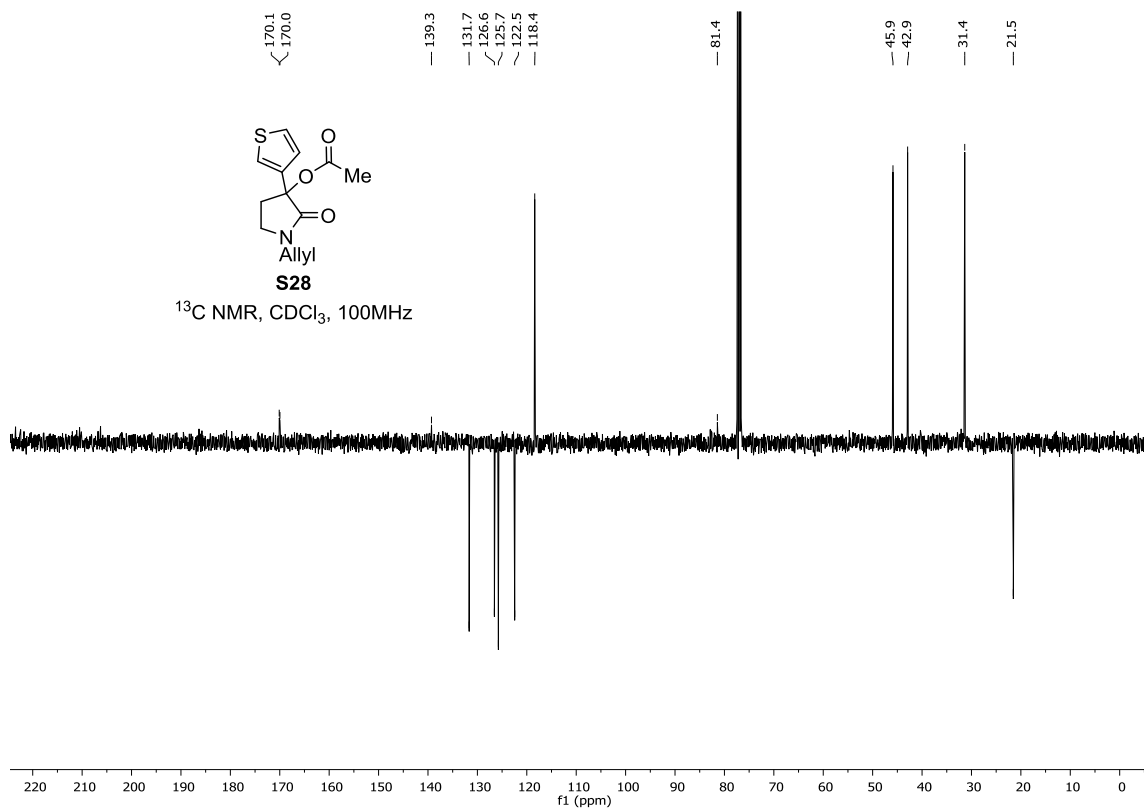
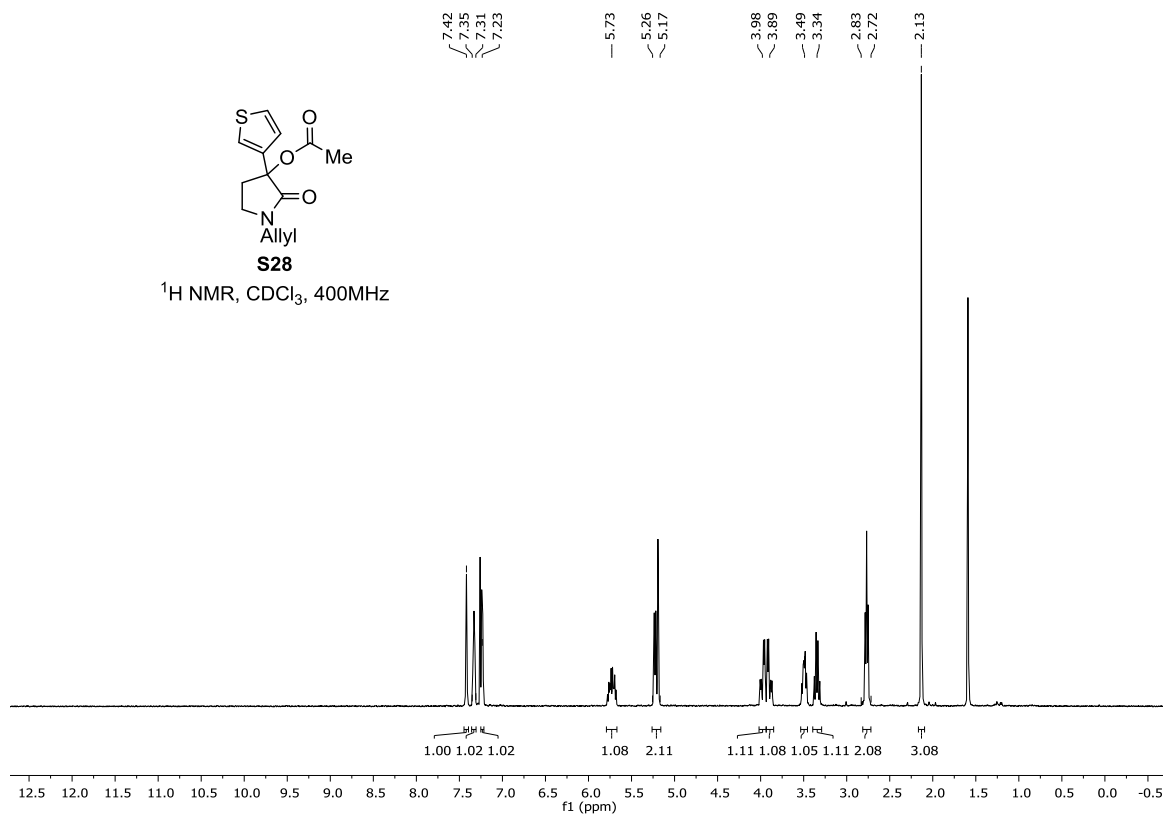


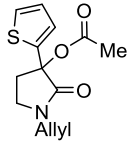






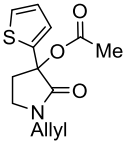
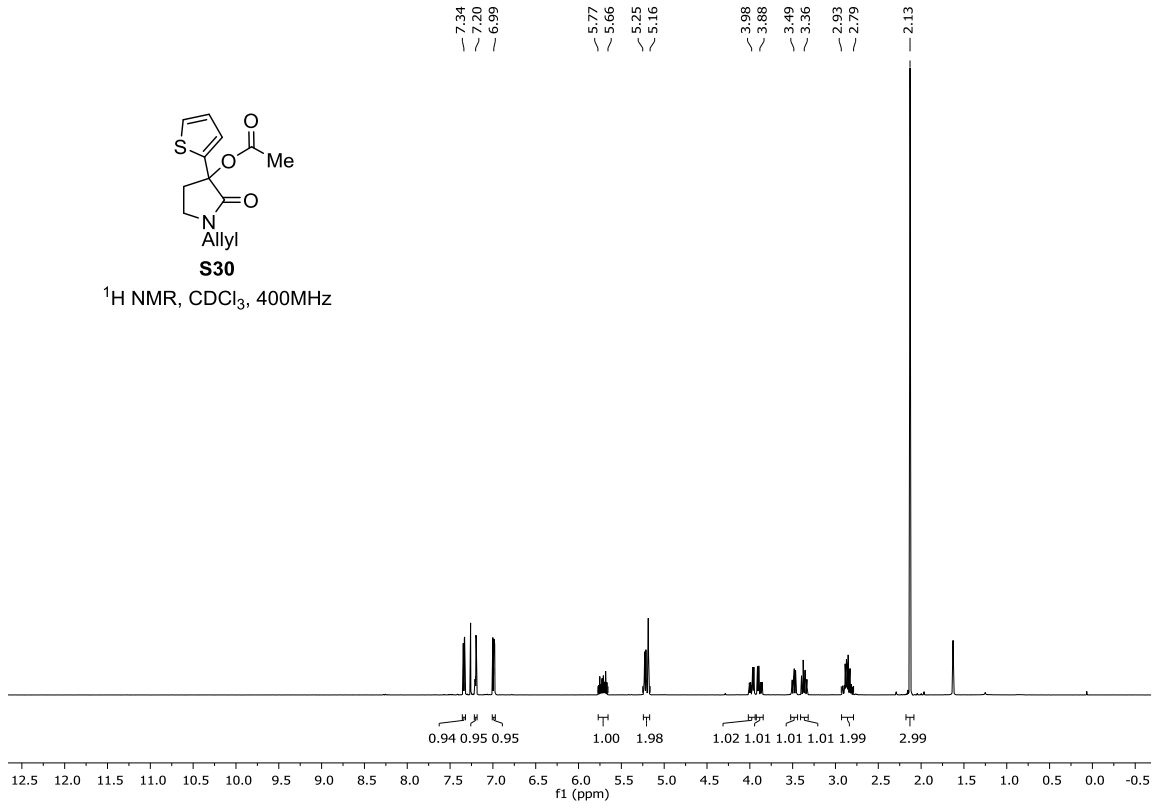






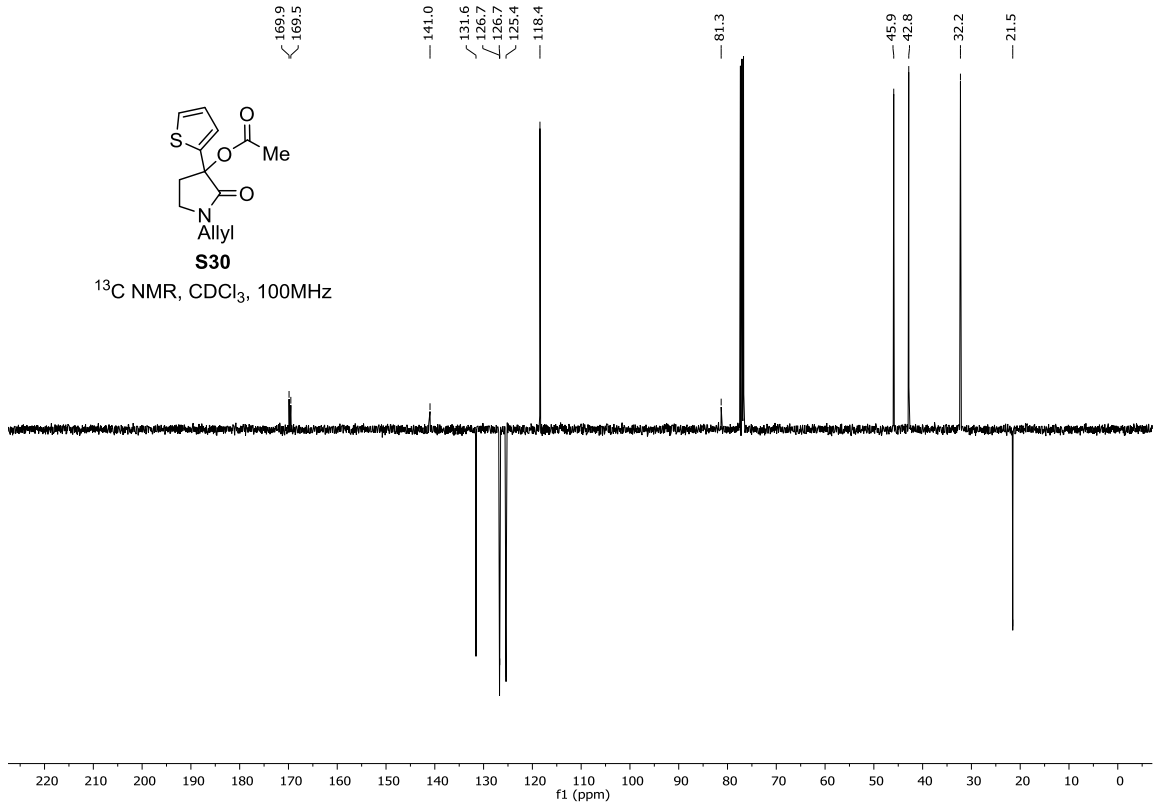
**S30**

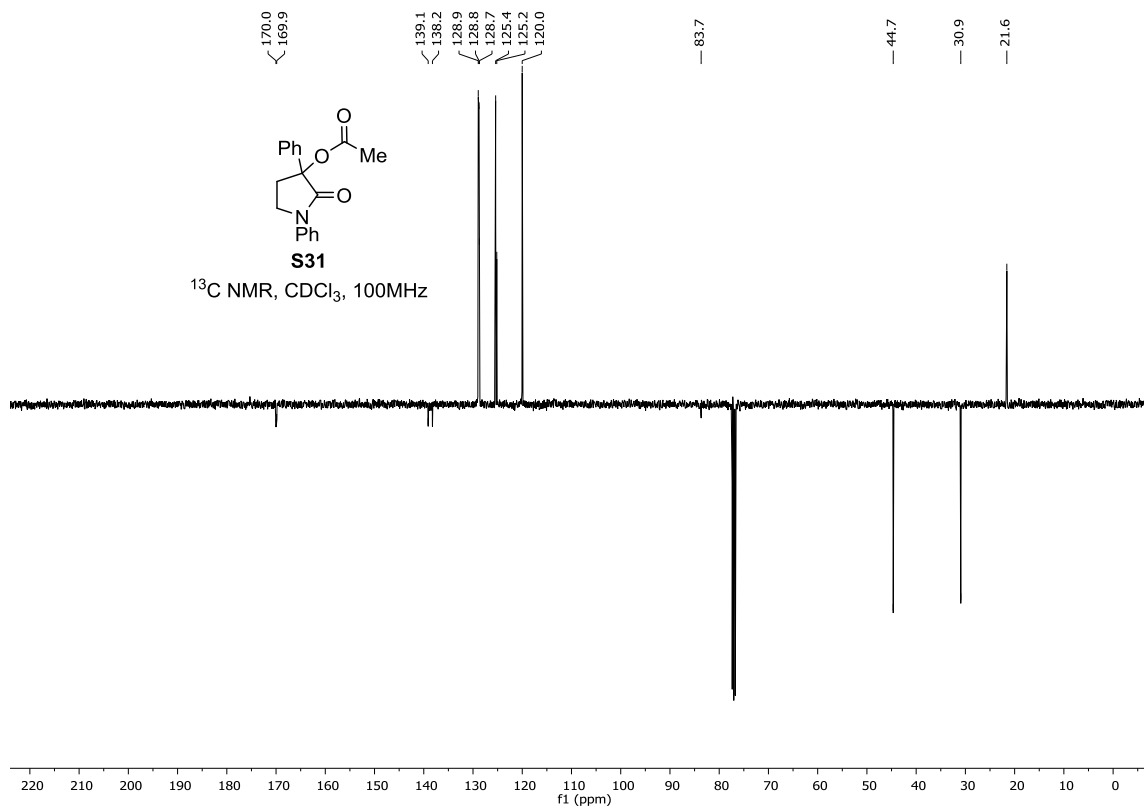
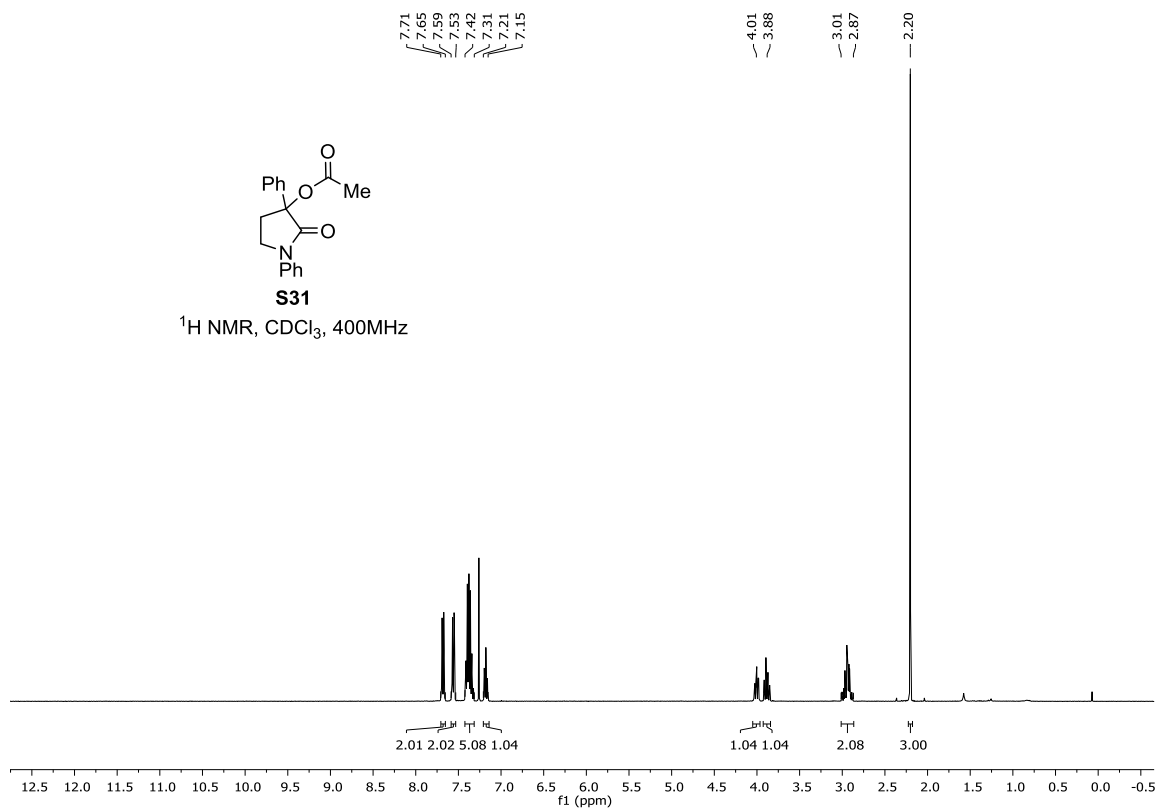
<sup>1</sup>H NMR, CDCl<sub>3</sub>, 400MHz



**S30**

<sup>13</sup>C NMR, CDCl<sub>3</sub>, 100MHz

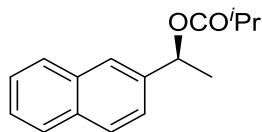




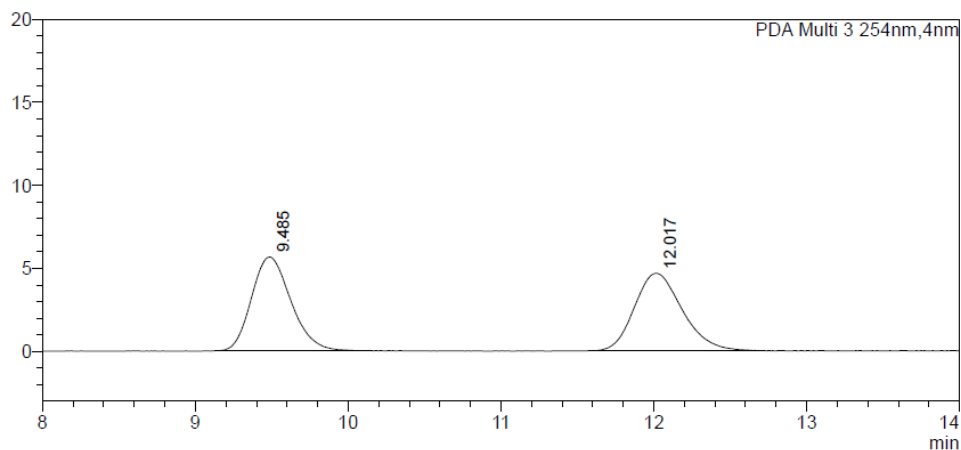
## **HPLC Spectra**

**Reaction Optimisation for Secondary alcohol (Table 1, entry 15):**

1-(Naphthalen-2-yl)ethyl isobutyrate **8**

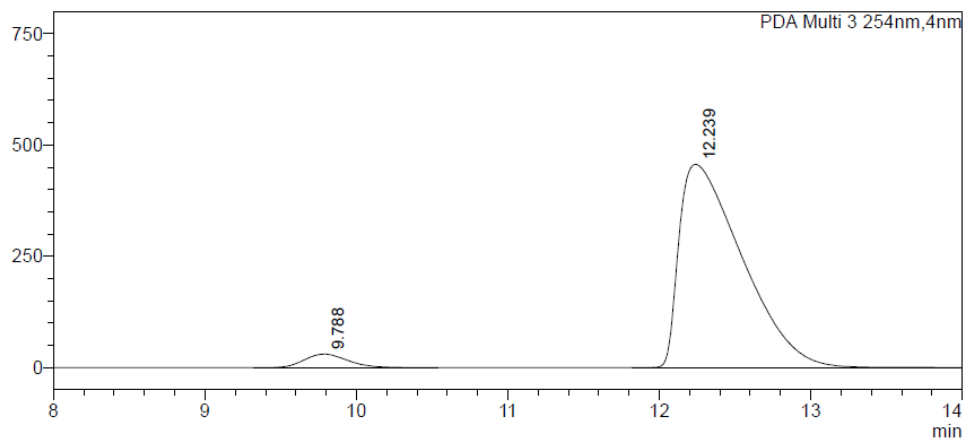


**HPLC data for 8:** Chiralcel OJ-H (98:2 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 254 nm, 30 °C) ) t<sub>R</sub> (R): 9.8 min, t<sub>R</sub> (S): 12.2 min, 4.364:95.636 er.



PDA Ch3 254nm

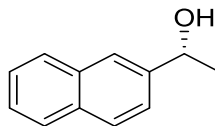
Peak#	Ret. Time	Area%
1	9.485	49.943
2	12.017	50.057
Total		100.000



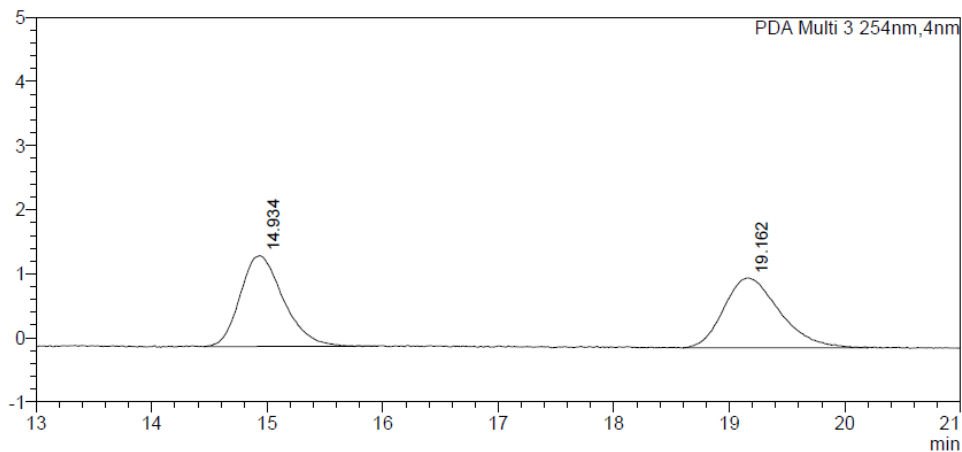
PDA Ch3 254nm

Peak#	Ret. Time	Area%
1	9.788	4.364
2	12.239	95.636
Total		100.000

(*R*)-1-(Naphthalen-2-yl)ethan-1-ol **7**

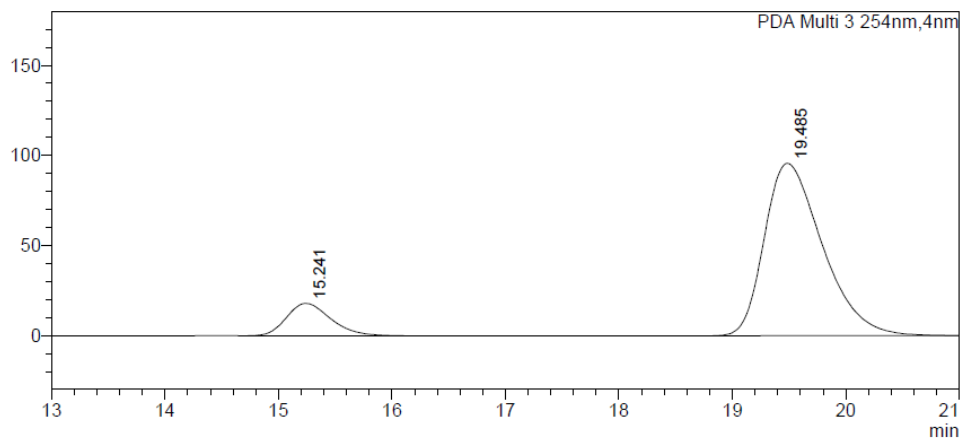


**HPLC data for 7.** Chiralcel OJ-H (90:10 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 254 nm, 30 °C) ) t<sub>R</sub> (*S*): 12.2 min, t<sub>R</sub> (*R*): 19.5 min, 12.474:87.526 er.



PDA Ch3 254nm

Peak#	Ret. Time	Area%
1	14.934	50.298
2	19.162	49.702
Total		100.000



PDA Ch3 254nm

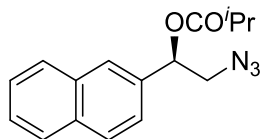
Peak#	Ret. Time	Area%
1	15.241	12.474
2	19.485	87.526
Total		100.000



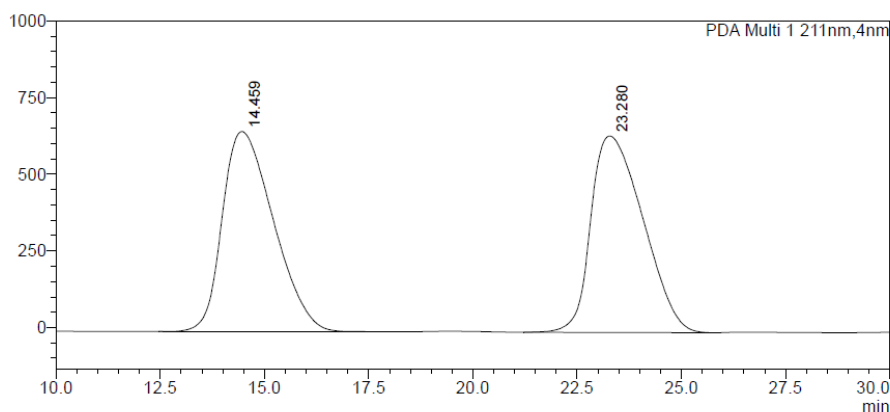
**Recyclability of Merrifield-HBTM (2), TentaGel-HBTM (3), Wang-HBTM (4) and Merrifield-BTM (6) for the KR of 5 selected secondary alcohols:**

**With Merrifield-HBTM (2); cycle 1 to cycle 5:**

2-Azido-1-(naphthalen-2-yl)ethyl isobutyrate **S7**

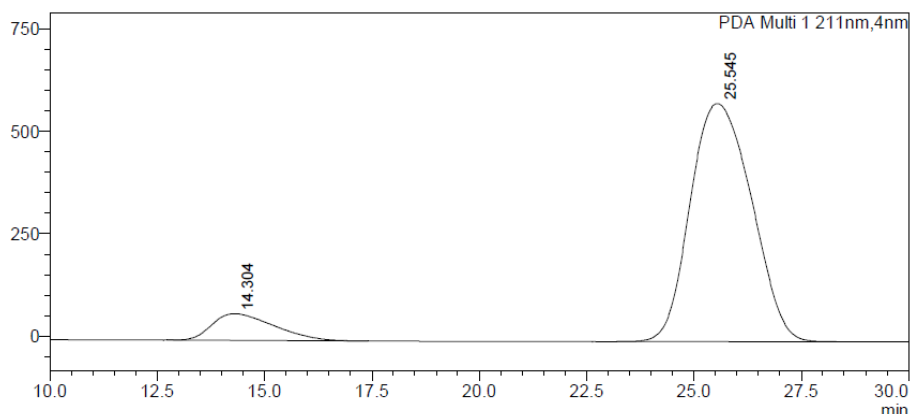


**HPLC data for S7:** Chiralcel AD-H (99.8:0.2 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C)  
t<sub>R</sub> (S): 14.3 min, t<sub>R</sub> (R): 25.5 min, 10.236:89.764 er.



PDA Ch1 211nm

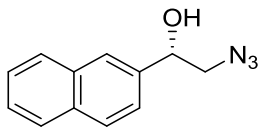
Peak#	Ret. Time	Area%
1	14.459	50.075
2	23.280	49.925
Total		100.000



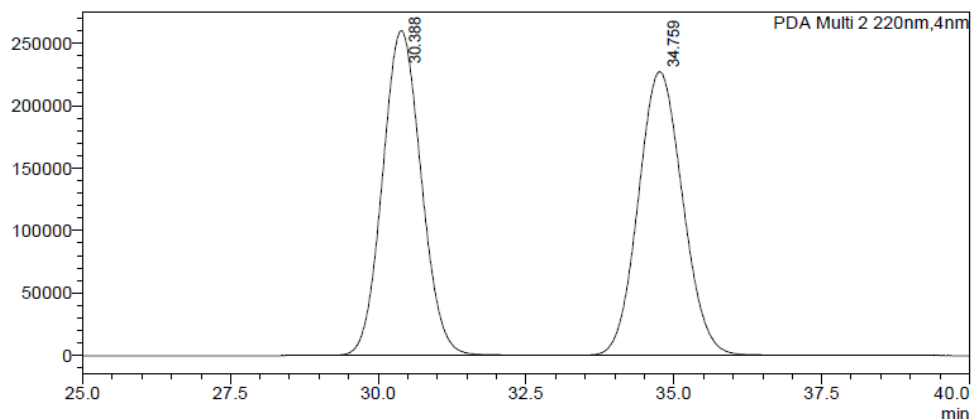
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	14.304	10.236
2	25.545	89.764
Total		100.000

2-Azido-1-(naphthalen-3-yl)ethan-1-ol **9**

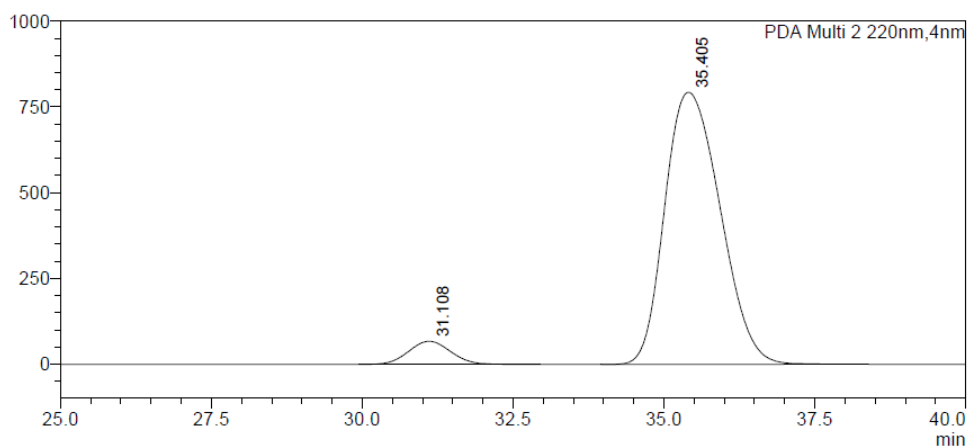


**HPLC data for 9:** Chiralcel OD-H (95:5 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 220 nm, 30 °C) t<sub>R</sub> (R): 31.1 min, t<sub>R</sub> (S): 35.4 min, 6.124:93.876 er.



PDA Ch2 220nm

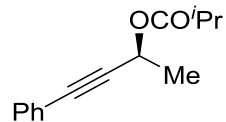
Peak#	Ret. Time	Area%
1	30.388	50.015
2	34.759	49.985
Total		100.000



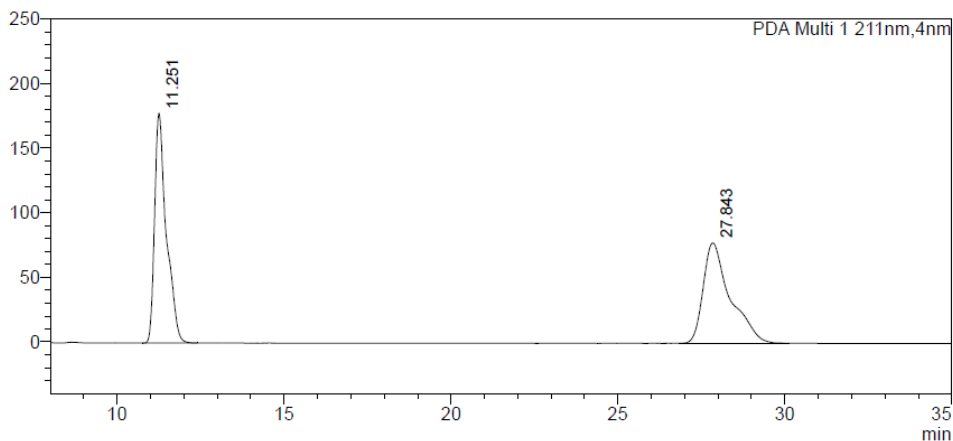
PDA Ch2 220nm

Peak#	Ret. Time	Area%
1	31.108	6.124
2	35.405	93.876
Total		100.000

#### 4-Phenylbut-3-yn-2-yl isobutyrate **S8**

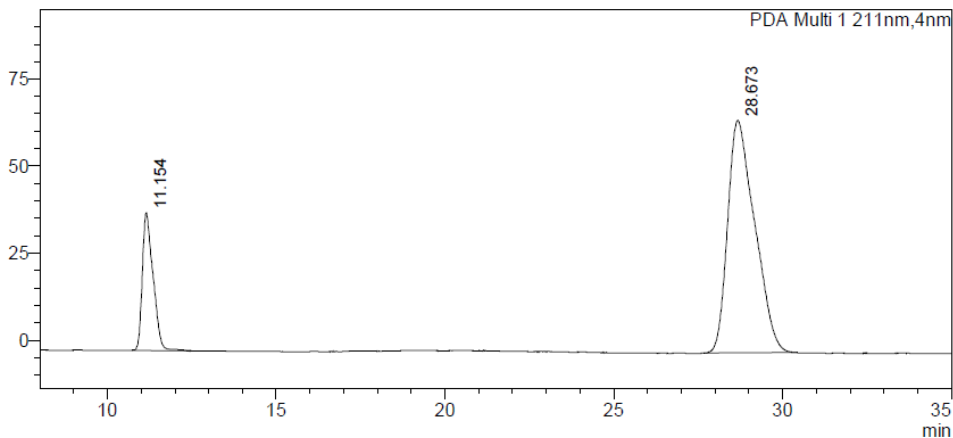


**HPLC data for S8:** Following hydrolysis to alcohol. Chiralcel OD-H (95:5 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C)  $t_R$  (*R*): 11.2 min,  $t_R$  (*S*): 28.7 min, 19.002:80.998 er.



PDA Ch1 211nm

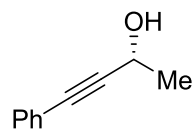
Peak#	Ret. Time	Area%
1	11.251	49.871
2	27.843	50.129
Total		100.000



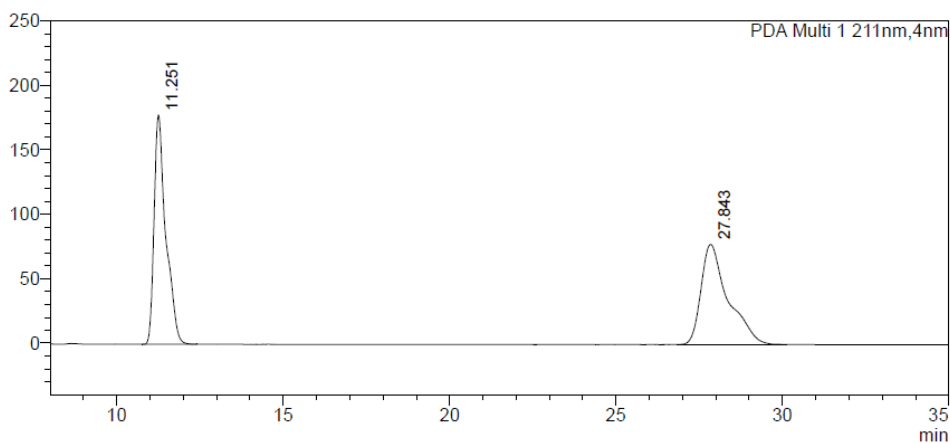
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	11.154	19.002
2	28.673	80.998
Total		100.000

### 4-Phenylbut-3-yn-2-ol **10**

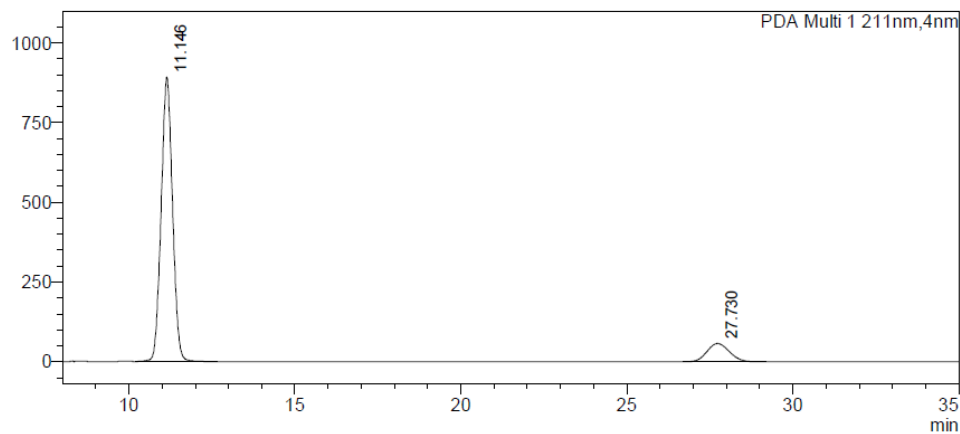


**HPLC data for 10:** Chiralcel OD-H (95:5 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C) *t<sub>R</sub>* (*R*): 11.1 min, *t<sub>R</sub>* (*S*): 27.7 min, 88.823:11.177 er.



PDA Ch1 211nm

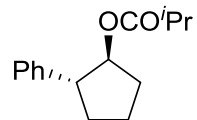
Peak#	Ret. Time	Area%
1	11.251	49.871
2	27.843	50.129
Total		100.000



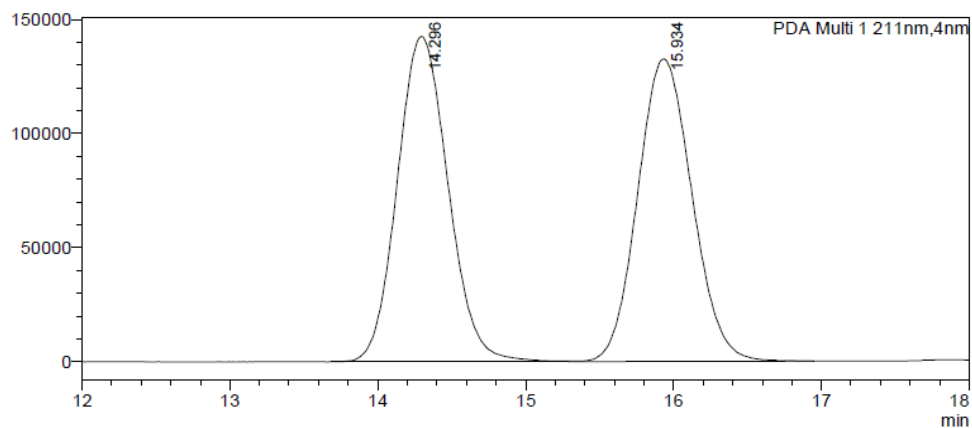
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	11.146	88.823
2	27.730	11.177
Total		100.000

(1*S*,2*R*)-2-Phenylcyclopentyl isobutyrate **S9**

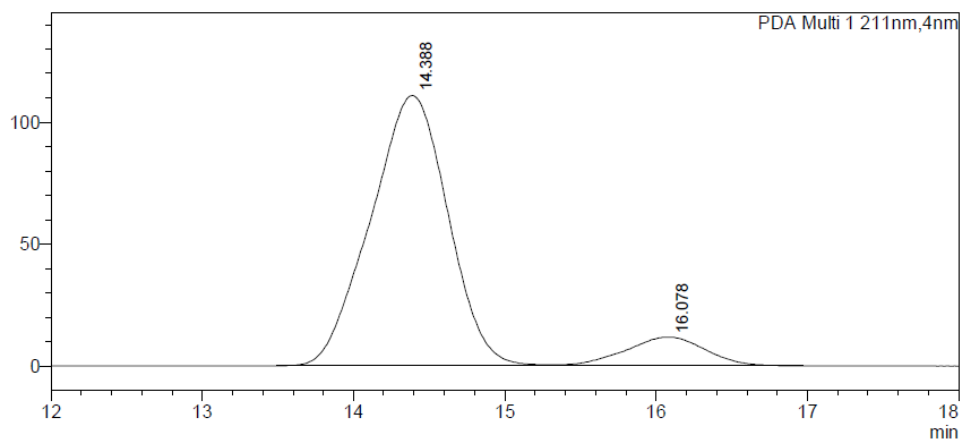


**HPLC data for S9:** Following hydrolysis to alcohol. Chiralcel OD-H (98:2 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C)  $t_R$  (1*S*,2*R*): 14.4 min,  $t_R$  (1*R*,2*S*): 16.1 min, 90.046:9.954 er.



PDA Ch1 211nm

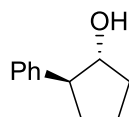
Peak#	Ret. Time	Area%
1	14.296	50.153
2	15.934	49.847
Total		100.000



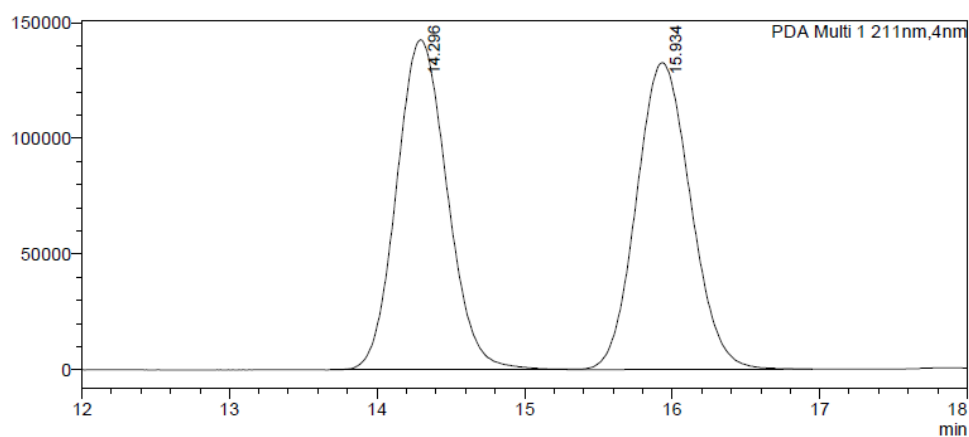
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	14.388	90.046
2	16.078	9.954
Total		100.000

(1*R*,2*S*)-2-Phenylcyclopentan-1-ol **11**

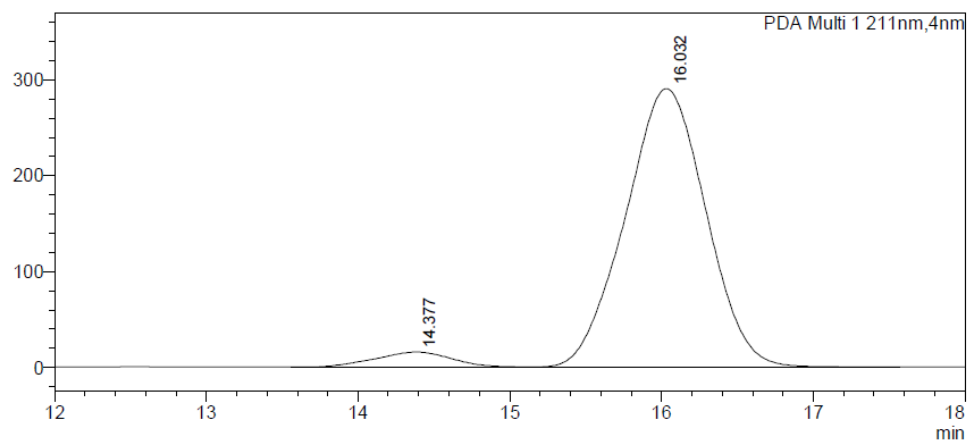


**HPLC data for 11:** Chiralcel OD-H (98:2 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C) *t<sub>R</sub>* (1*S*,2*R*): 14.4 min, *t<sub>R</sub>* (1*R*,2*S*): 16.0 min, 4.997:95.003 er.



PDA Ch1 211nm

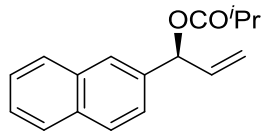
Peak#	Ret. Time	Area%
1	14.296	50.153
2	15.934	49.847
Total		100.000



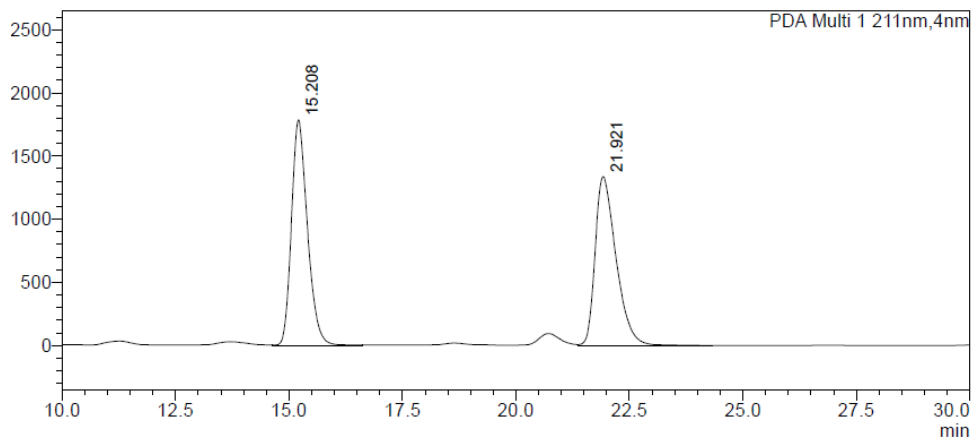
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	14.377	4.997
2	16.032	95.003
Total		100.000

1-(Naphthalen-2-yl)allyl isobutyrate **S10**

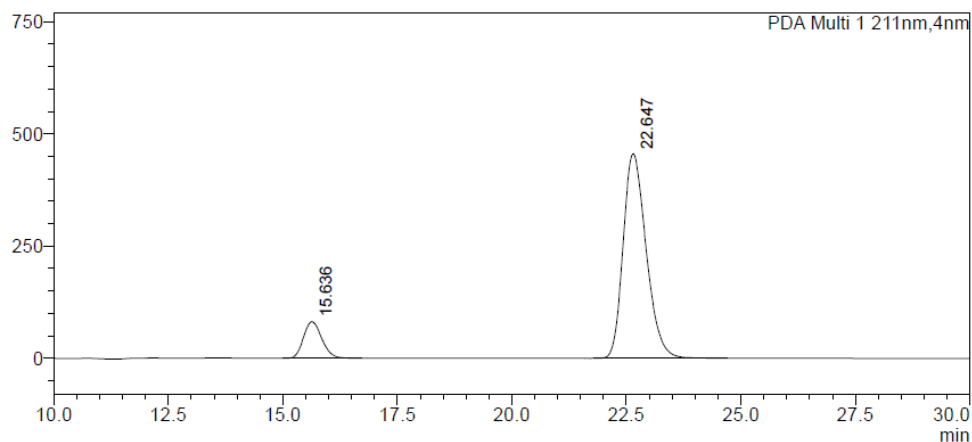


**HPLC data for S10:** Chiralcel OJ-H (95:5 hexane:IPA, flow rate 0.5 mLmin<sup>-1</sup>, 211 nm, 30 °C)  
t<sub>R</sub> (R): 15.6 min, t<sub>R</sub> (S): 22.6 min, 12.460:87.540 er.



PDA Ch1 211nm

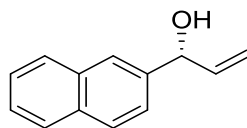
Peak#	Ret. Time	Area%
1	15.208	50.591
2	21.921	49.409
Total		100.000



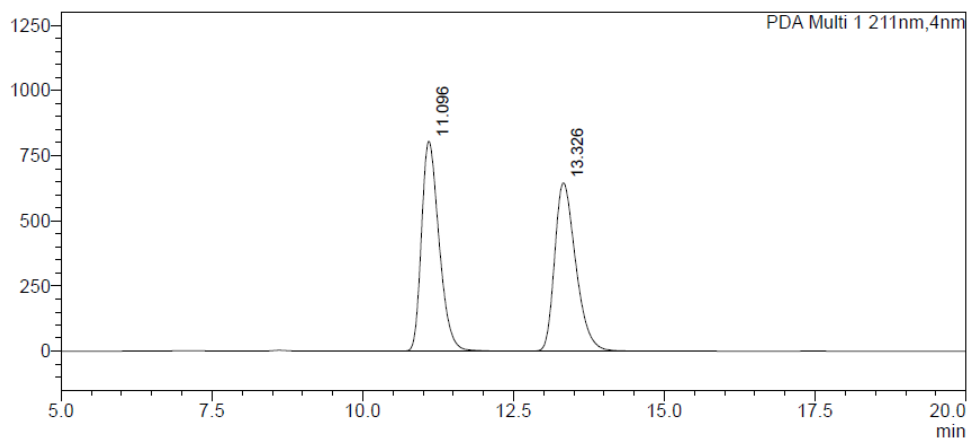
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	15.636	12.460
2	22.647	87.540
Total		100.000

1-(Naphthalen-2-yl)prop-2-en-1-ol **12**

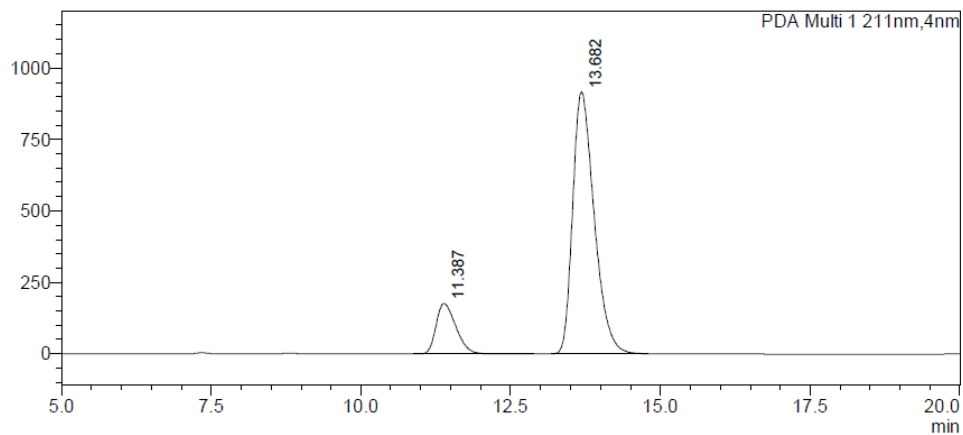


**HPLC data for 12:** Chiralcel OJ-H (80:20 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C) t<sub>R</sub> (S): 11.4 min, t<sub>R</sub> (R): 13.7 min, 15.133:84.867 er.



PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	11.096	50.973
2	13.326	49.027
Total		100.000

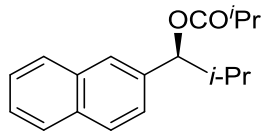


PDA Ch1 211nm

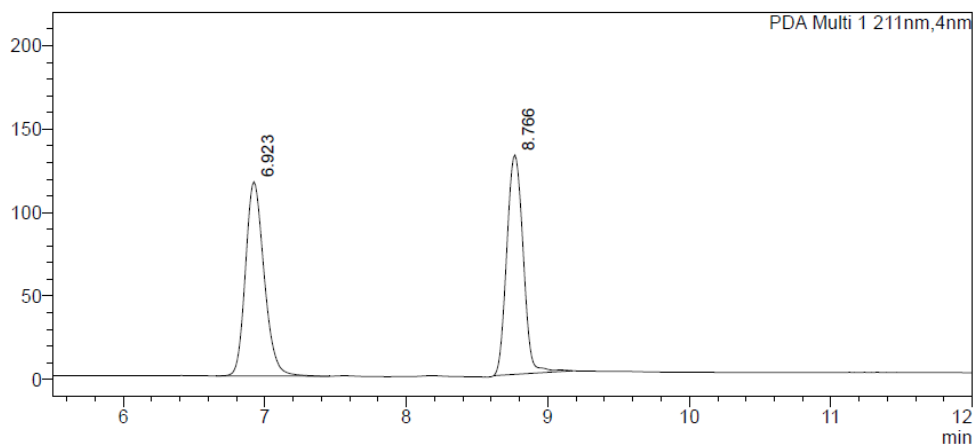
Peak#	Ret. Time	Area%
1	11.387	15.133
2	13.682	84.867
Total		100.000



## 2-Methyl-1-(naphthalen-2-yl)propyl isobutyrate **S11**

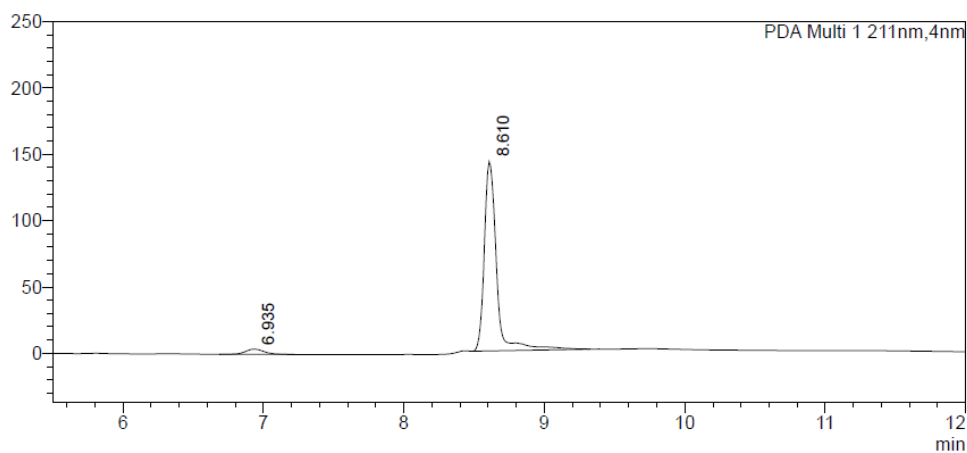


**HPLC data for S11:** Chiralcel AD-H (99.8:0.2 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C)  $t_R$  (*R*): 6.9 min,  $t_R$  (*S*): 8.6 min, 3.935:96.065 er.



PDA Ch1 211nm

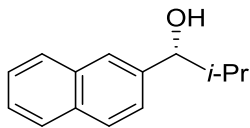
Peak#	Ret. Time	Area%
1	6.923	50.177
2	8.766	49.823
Total		100.000



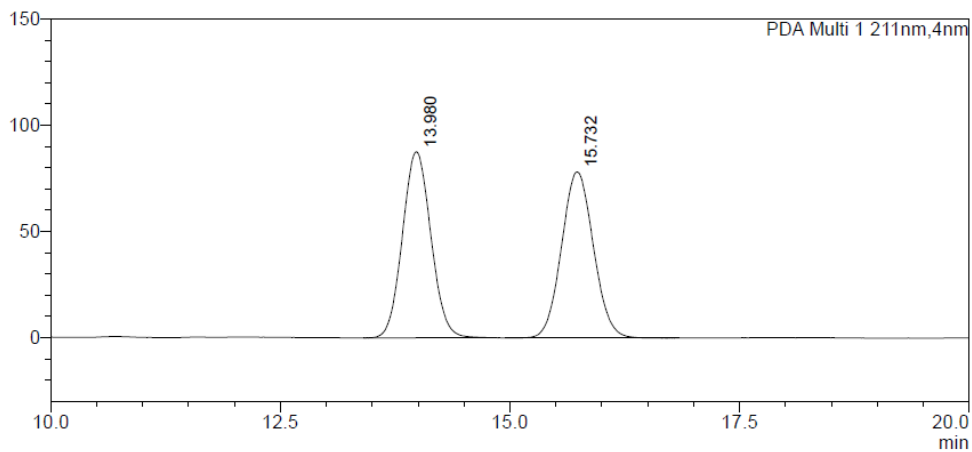
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	6.935	3.935
2	8.610	96.065
Total		100.000

2-Methyl-1-(naphthalen-2-yl)propan-1-ol **13**

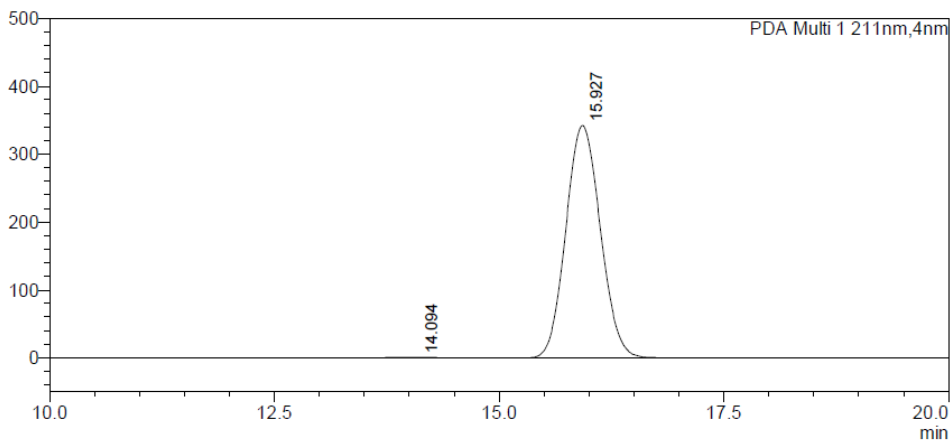


**HPLC data for 13:** Chiralcel OD-H (95:5 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C) t<sub>R</sub> (S): 14.1 min, t<sub>R</sub> (R): 15.9 min, 0.301:99.699 er.



PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	13.980	50.003
2	15.732	49.997
Total		100.000

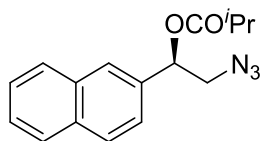


PDA Ch1 211nm

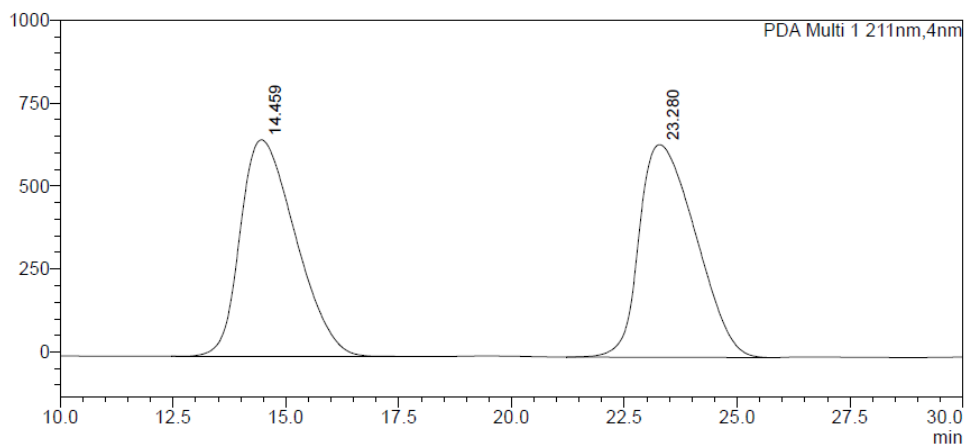
Peak#	Ret. Time	Area%
1	14.094	0.301
2	15.927	99.699
Total		100.000

### With TentaGel-HBTM (3)

2-Azido-1-(naphthalen-2-yl)ethyl isobutyrate **S7**

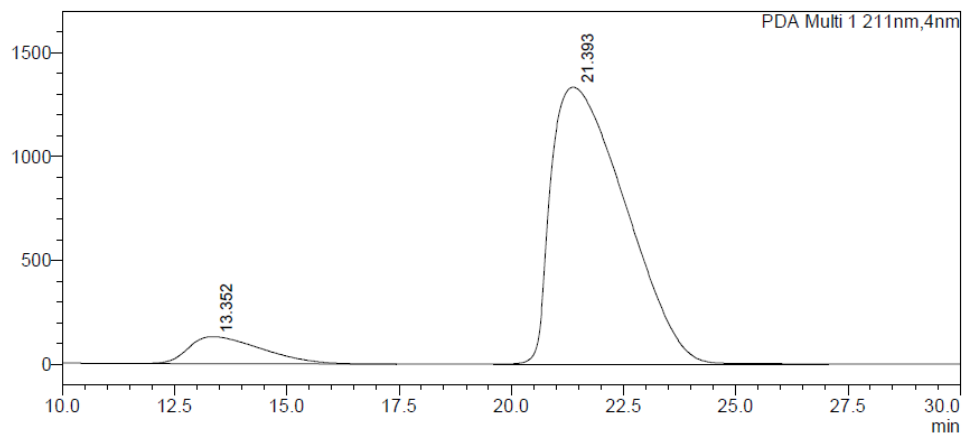


**HPLC data for S7:** Chiralcel AD-H (99.8:0.2 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C)  
 $t_R$  (S): 13.4 min,  $t_R$  (R): 21.4 min, 8.747:91.253 er.



PDA Ch1 211nm

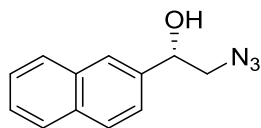
Peak#	Ret. Time	Area%
1	14.459	50.075
2	23.280	49.925
Total		100.000



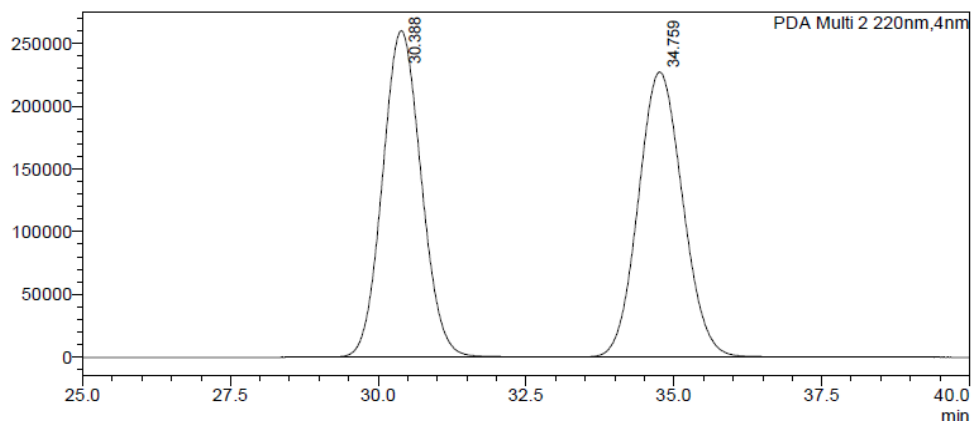
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	13.352	8.747
2	21.393	91.253
Total		100.000

2-Azido-1-(naphthalen-3-yl)ethan-1-ol **9**

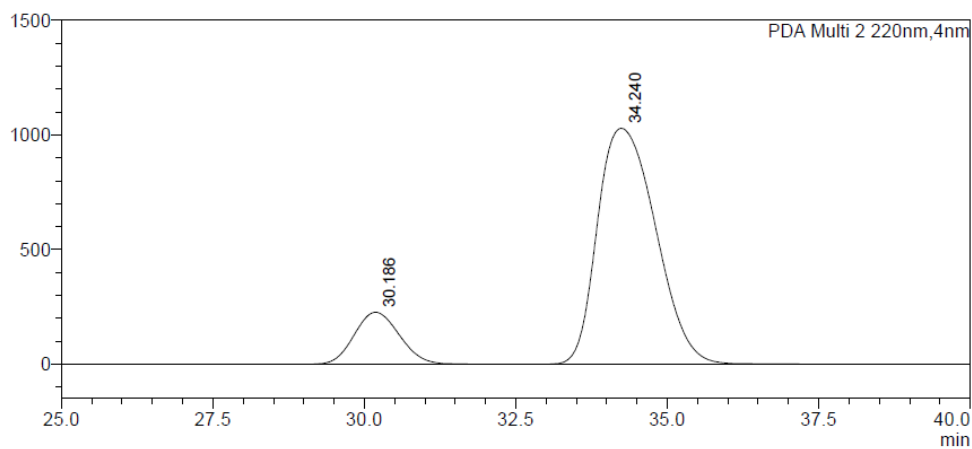


**HPLC data for 9:** Chiralcel OD-H (95:5 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 220 nm, 30 °C) ) t<sub>R</sub> (R): 30.2 min, t<sub>R</sub> (S): 34.2 min, 14.640:85.360 er.



PDA Ch2 220nm

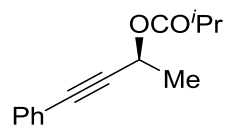
Peak#	Ret. Time	Area%
1	30.388	50.015
2	34.759	49.985
Total		100.000



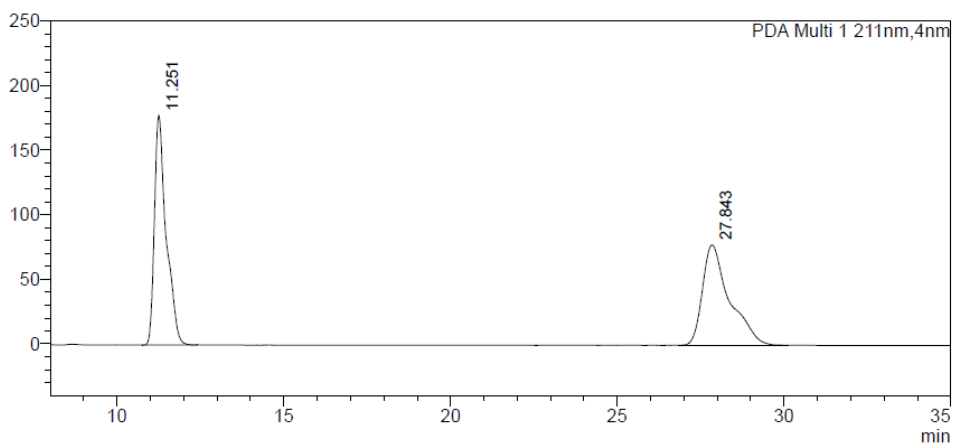
PDA Ch2 220nm

Peak#	Ret. Time	Area%
1	30.186	14.640
2	34.240	85.360
Total		100.000

### 4-Phenylbut-3-yn-2-yl isobutyrate **S8**

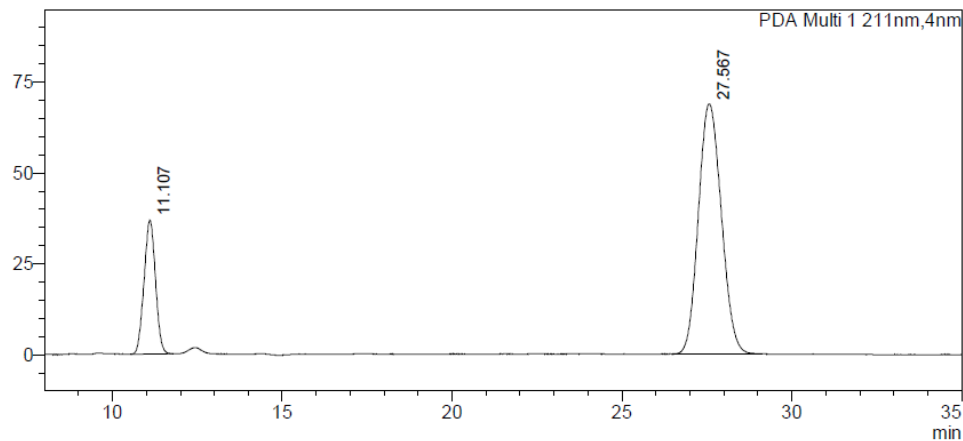


**HPLC data for S8:** Following hydrolysis to ester. Chiralcel OD-H (95:5 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C)  $t_R$  (*R*): 11.1 min,  $t_R$  (*S*): 27.6 min, 21.073:78.9 27 er.



PDA Ch1 211nm

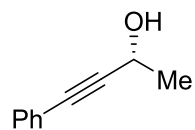
Peak#	Ret. Time	Area%
1	11.251	49.871
2	27.843	50.129
Total		100.000



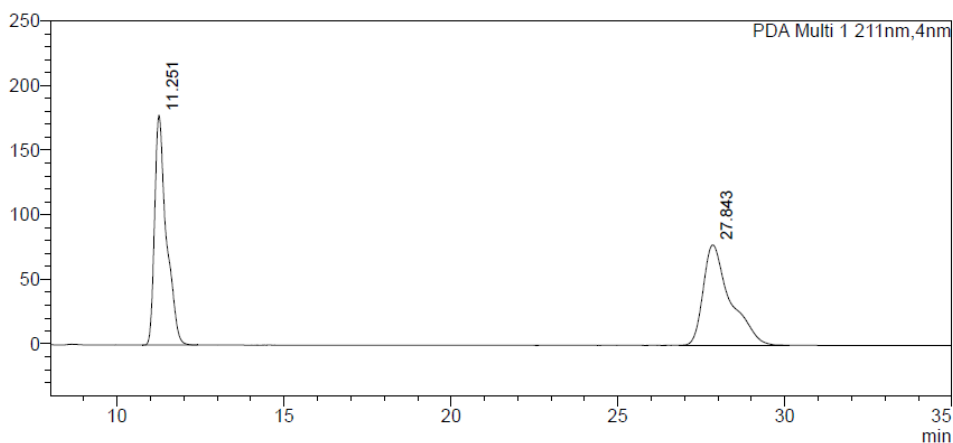
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	11.107	21.073
2	27.567	78.927
Total		100.000

### 4-Phenylbut-3-yn-2-ol **10**

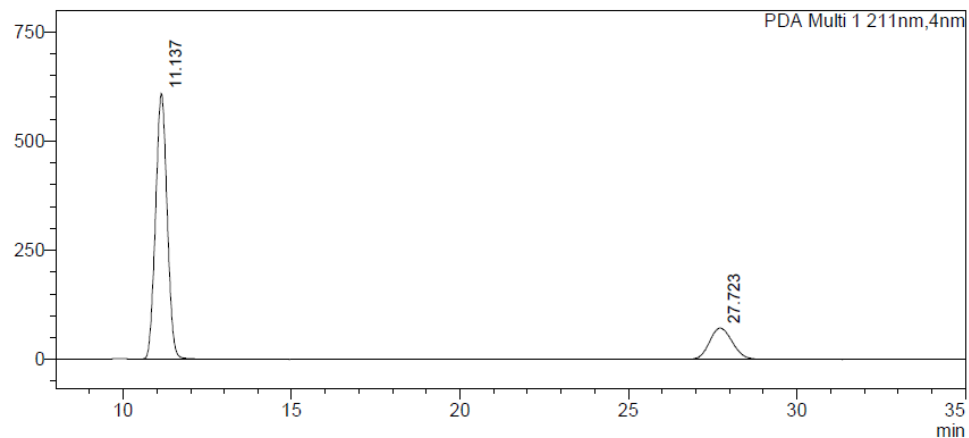


**HPLC data for 10:** Chiralcel OD-H (95:5 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C) *t<sub>R</sub>* (S): 11.1 min, *t<sub>R</sub>* (R): 27.7 min, 81.202:18.798 er.



PDA Ch1 211nm

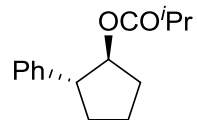
Peak#	Ret. Time	Area%
1	11.251	49.871
2	27.843	50.129
Total		100.000



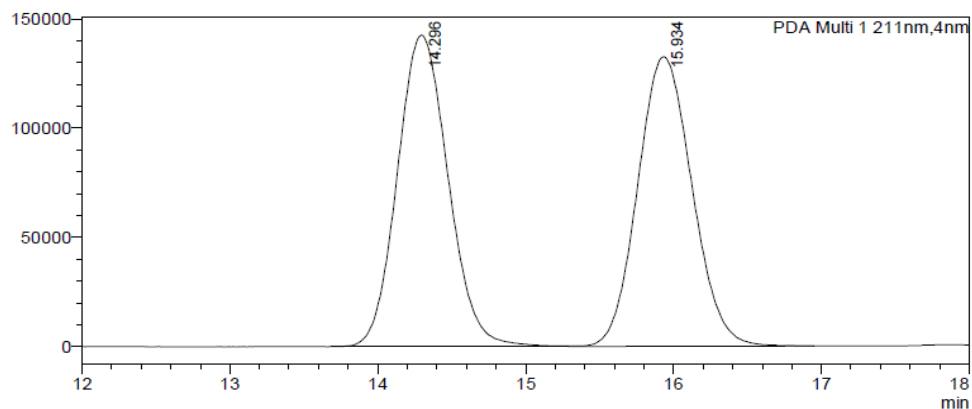
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	11.137	81.202
2	27.723	18.798
Total		100.000

(1*S*,2*R*)-2-Phenylcyclopentyl isobutyrate **S9**

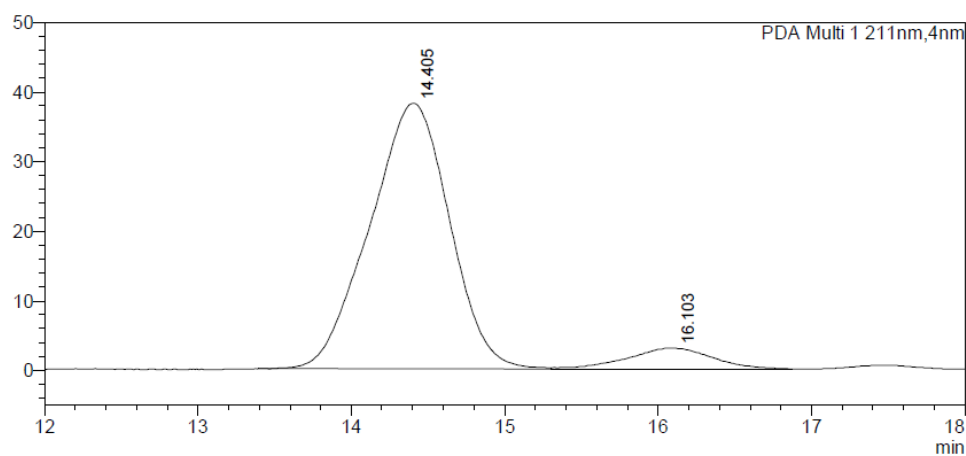


**HPLC data for S9:** Following hydrolysis to ester. Chiralcel OD-H (98:2 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C)  $t_R$  (1*S*,2*R*): 14.4 min,  $t_R$  (1*R*,2*S*): 16.1 min, 92.331:7.7669 er.



PDA Ch1 211nm

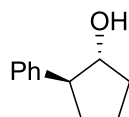
Peak#	Ret. Time	Area%
1	14.296	50.153
2	15.934	49.847
Total		100.000



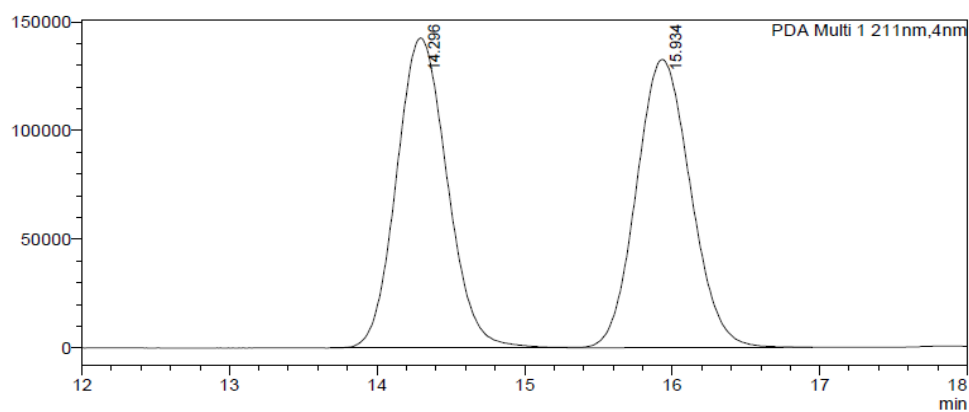
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	14.405	92.331
2	16.103	7.669
Total		100.000

(1*R*,2*S*)-2-Phenylcyclopentan-1-ol **11**

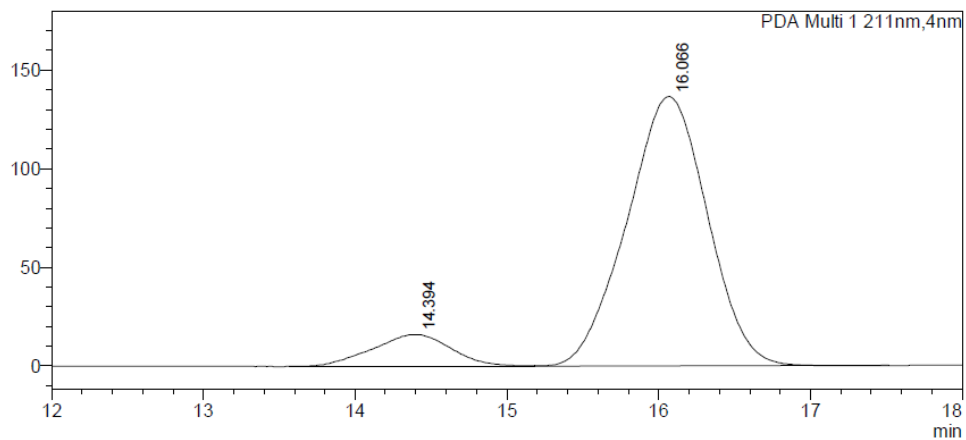


**HPLC data for 11:** Chiralcel OD-H (98:2 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C) *t<sub>R</sub>* (1*S*,2*R*): 14.4 min, *t<sub>R</sub>* (1*R*,2*S*): 16.1 min, 10.359:89.641 er.



PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	14.296	50.153
2	15.934	49.847
Total		100.000

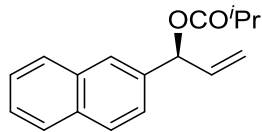


PDA Ch1 211nm

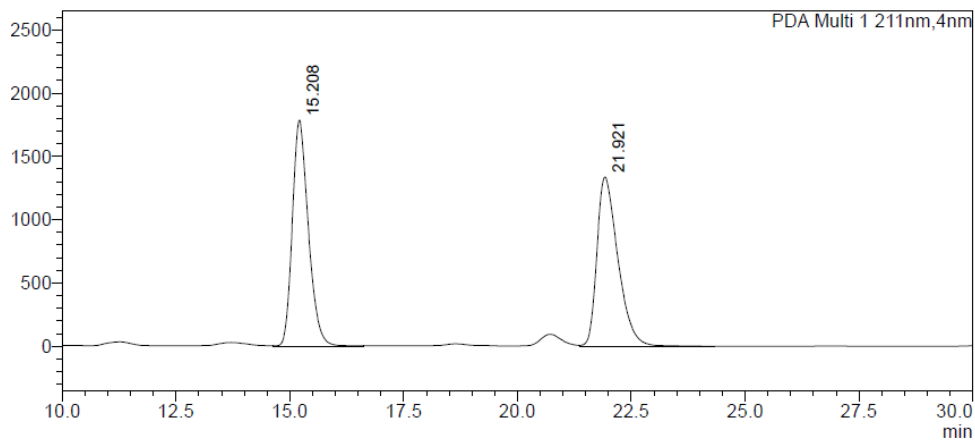
Peak#	Ret. Time	Area%
1	14.394	10.359
2	16.066	89.641
Total		100.000



1-(Naphthalen-2-yl)allyl isobutyrate **S10**

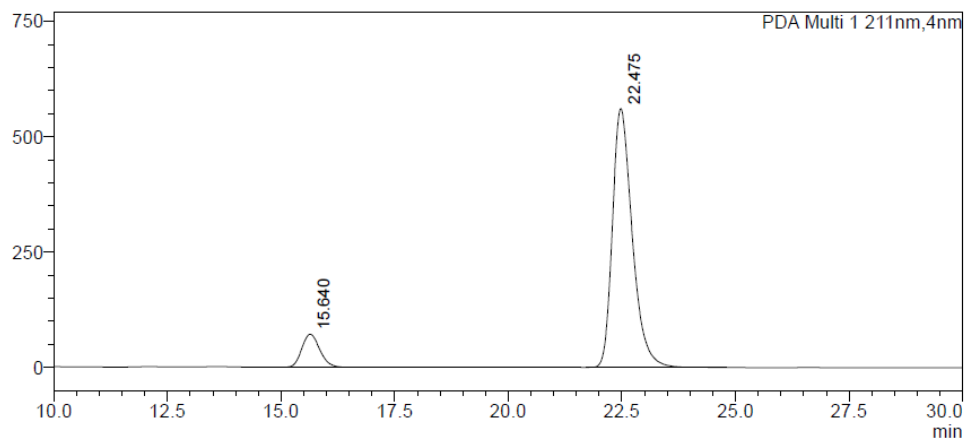


**HPLC data for S10:** Chiralcel OJ-H (95:5 hexane:IPA, flow rate 0.5 mLmin<sup>-1</sup>, 211 nm, 30 °C)  
t<sub>R</sub> (R): 15.6 min, t<sub>R</sub> (S): 22.5 min, 10.258:89.742 er.



PDA Ch1 211nm

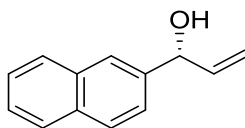
Peak#	Ret. Time	Area%
1	15.208	50.591
2	21.921	49.409
Total		100.000



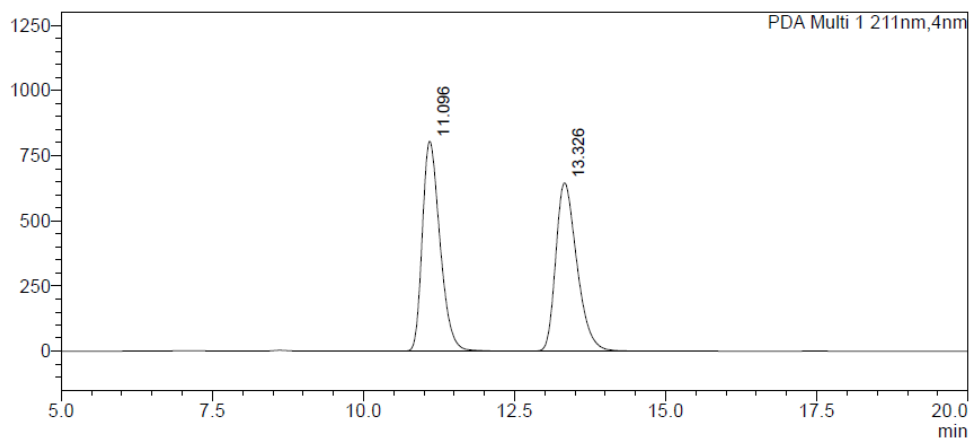
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	15.640	10.258
2	22.475	89.742
Total		100.000

1-(Naphthalen-2-yl)prop-2-en-1-ol **12**

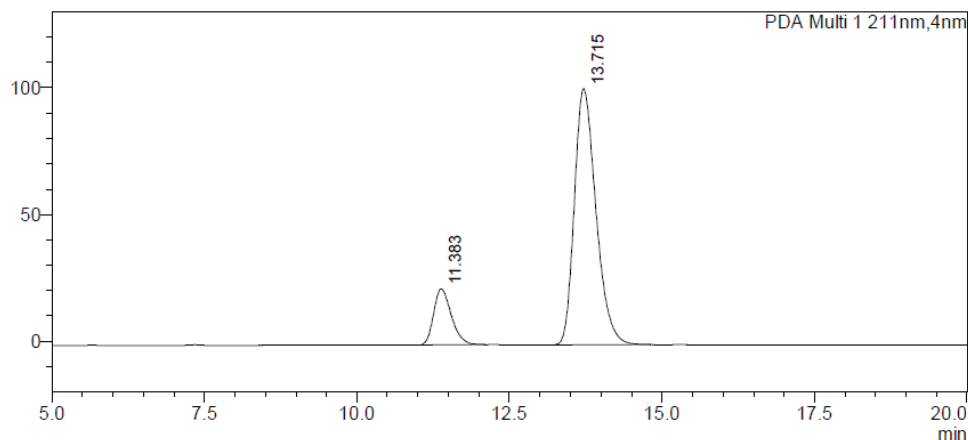


**HPLC data for 12:** Chiralcel OJ-H (80:20 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C) t<sub>R</sub> (S): 11.4 min, t<sub>R</sub> (R): 13.7 min, 15.227:84.773 er.



PDA Ch1 211nm

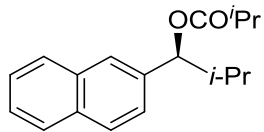
Peak#	Ret. Time	Area%
1	11.096	50.973
2	13.326	49.027
Total		100.000



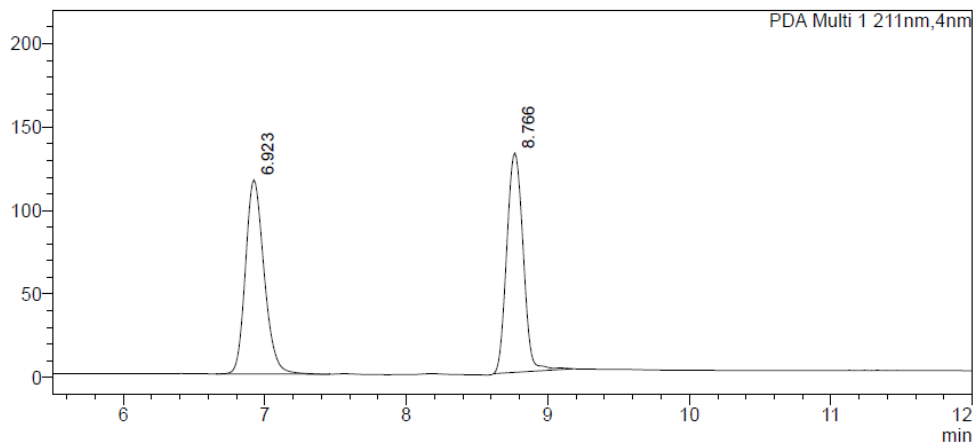
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	11.383	15.227
2	13.715	84.773
Total		100.000

## 2-Methyl-1-(naphthalen-2-yl)propyl isobutyrate **S11**

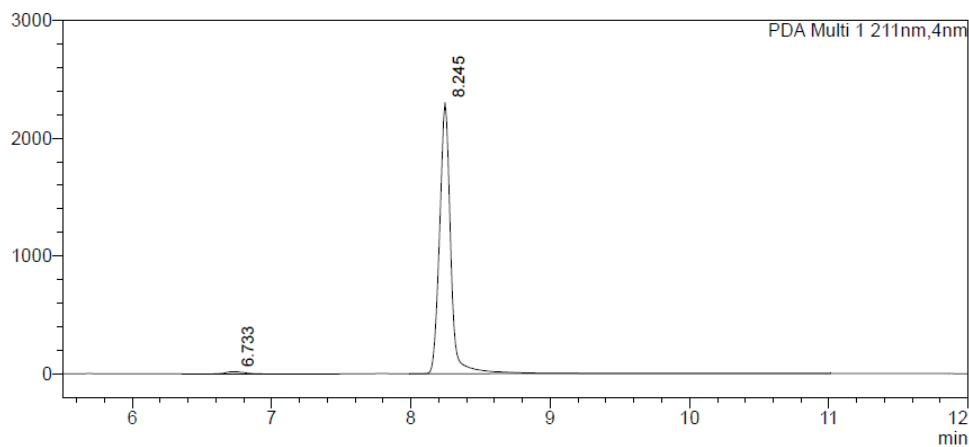


**HPLC data for S11:** Chiralcel AD-H (99.8:0.2 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C)  $t_R$  (R): 6.7 min,  $t_R$  (S): 8.2 min, 1.279:98.721 er.



PDA Ch1 211nm

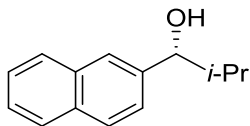
Peak#	Ret. Time	Area%
1	6.923	50.177
2	8.766	49.823
Total		100.000



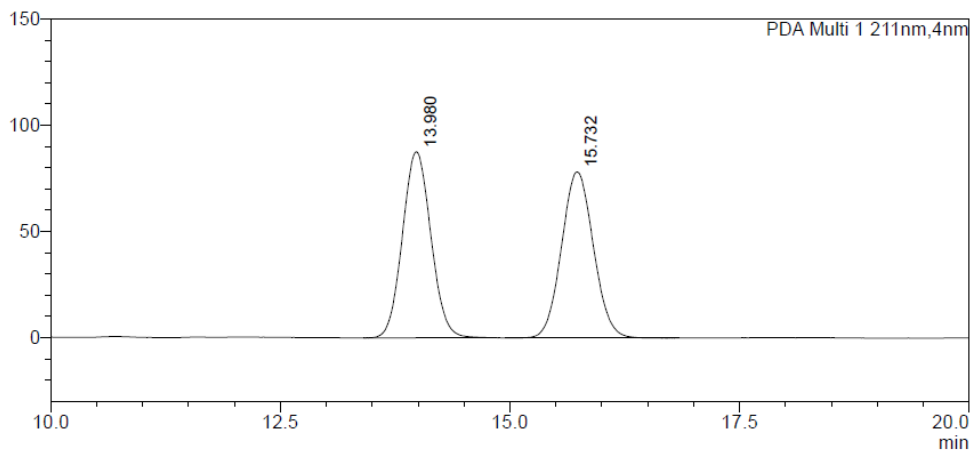
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	6.733	1.279
2	8.245	98.721
Total		100.000

2-Methyl-1-(naphthalen-2-yl)propan-1-ol **13**

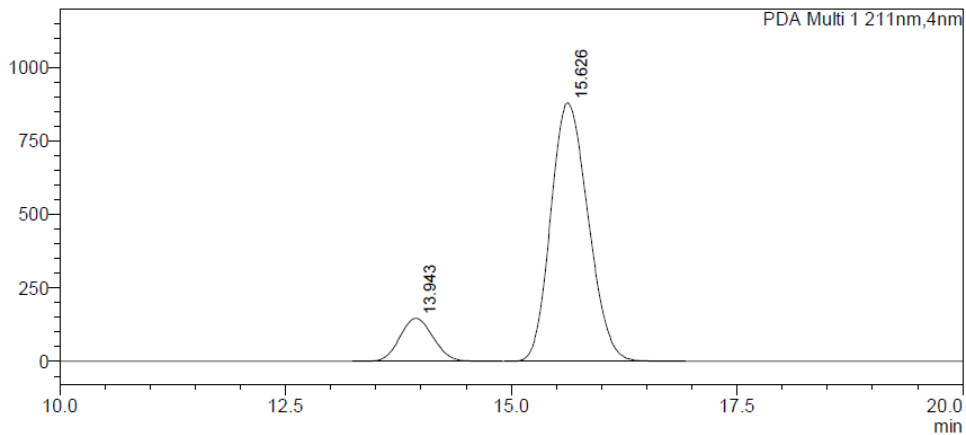


**HPLC data for 13:** Chiralcel OD-H (95:5 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C) t<sub>R</sub> (S): 13.9 min, t<sub>R</sub> (R): 15.6 min, 12.970:87.030 er.



PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	13.980	50.003
2	15.732	49.997
Total		100.000

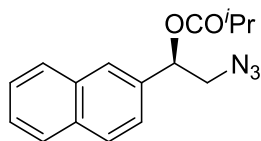


PDA Ch1 211nm

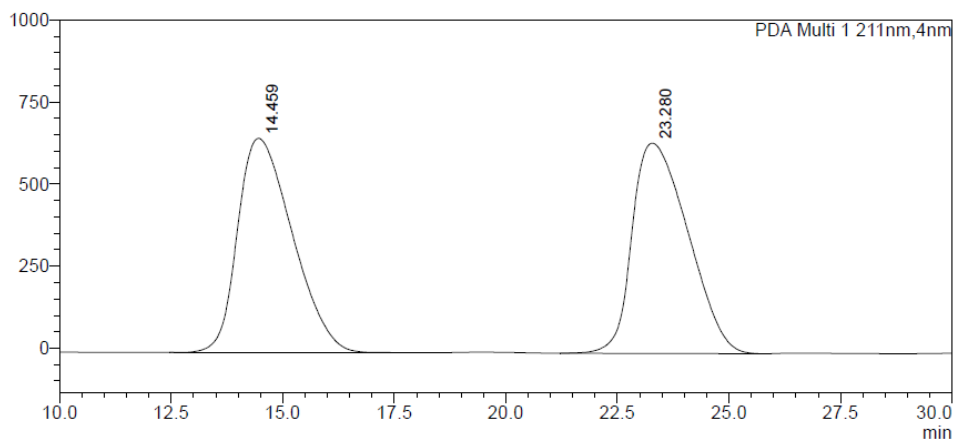
Peak#	Ret. Time	Area%
1	13.943	12.970
2	15.626	87.030
Total		100.000

### With Wang-HBTM (4)

2-Azido-1-(naphthalen-2-yl)ethyl isobutyrate **S7**

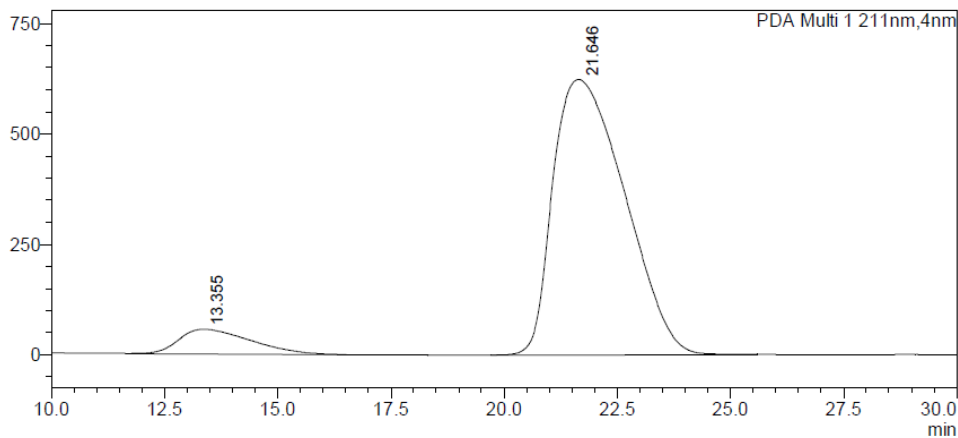


**HPLC data for S7:** Chiralcel AD-H (99.8:0.2 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C)  
 $t_R$  (S): 13.4 min,  $t_R$  (R): 21.6 min, 8.220:91.780 er.



PDA Ch1 211nm

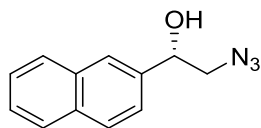
Peak#	Ret. Time	Area%
1	14.459	50.075
2	23.280	49.925
Total		100.000



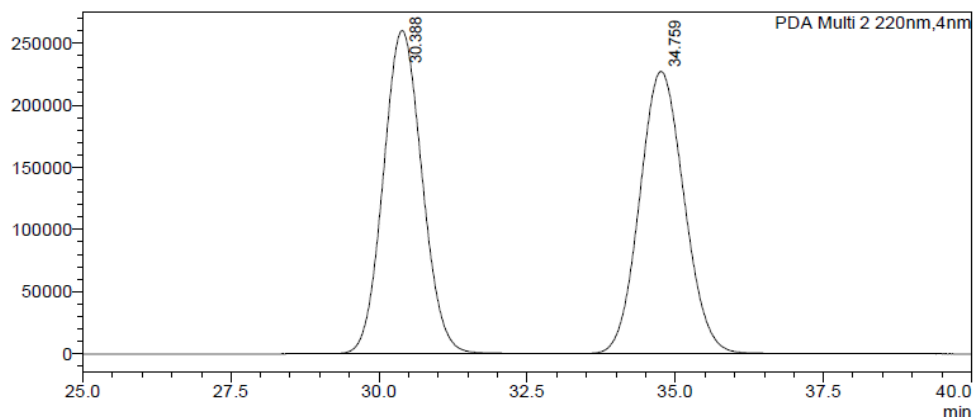
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	13.355	8.220
2	21.646	91.780
Total		100.000

2-Azido-1-(naphthalen-3-yl)ethan-1-ol **9**

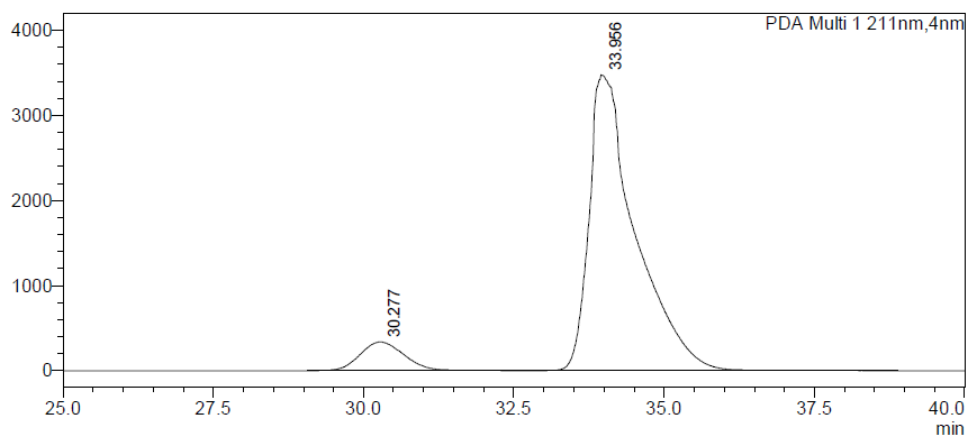


**HPLC data for 9:** Chiralcel OD-H (95:5 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 220 nm, 30 °C) *t<sub>R</sub>* (*R*): 30.3 min, *t<sub>R</sub>* (*S*): 34.0 min, 8.421:91.579 er.



PDA Ch2 220nm

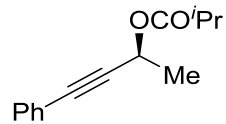
Peak#	Ret. Time	Area%
1	30.388	50.015
2	34.759	49.985
Total		100.000



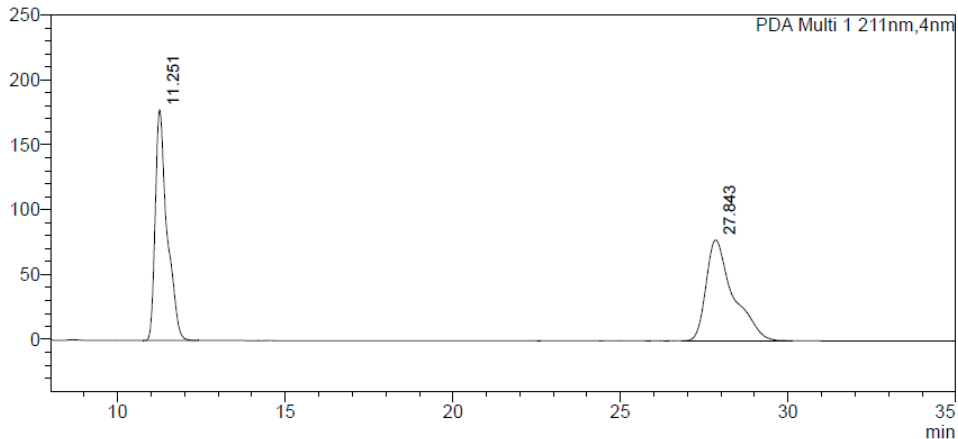
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	30.277	8.421
2	33.956	91.579
Total		100.000

#### 4-Phenylbut-3-yn-2-yl isobutyrate **S8**

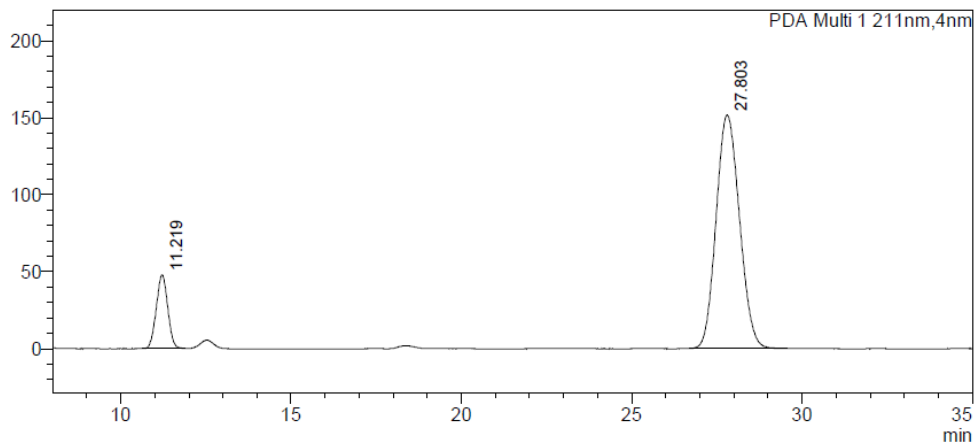


**HPLC data for S8:** Following hydrolysis to alcohol. Chiralcel OD-H (95:5 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C)  $t_R$  (*R*): 11.2 min,  $t_R$  (*S*): 27.8 min, 13.368:86.632 er.



PDA Ch1 211nm

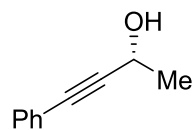
Peak#	Ret. Time	Area%
1	11.251	49.871
2	27.843	50.129
Total		100.000



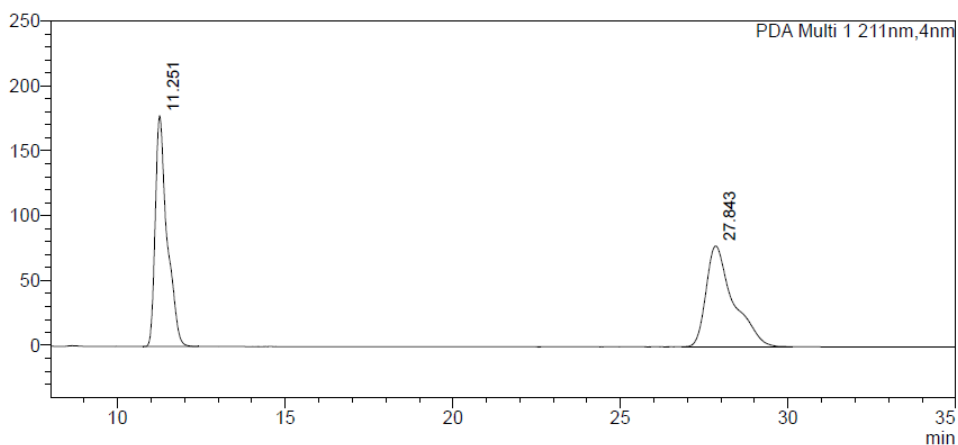
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	11.219	13.368
2	27.803	86.632
Total		100.000

### 4-Phenylbut-3-yn-2-ol **10**

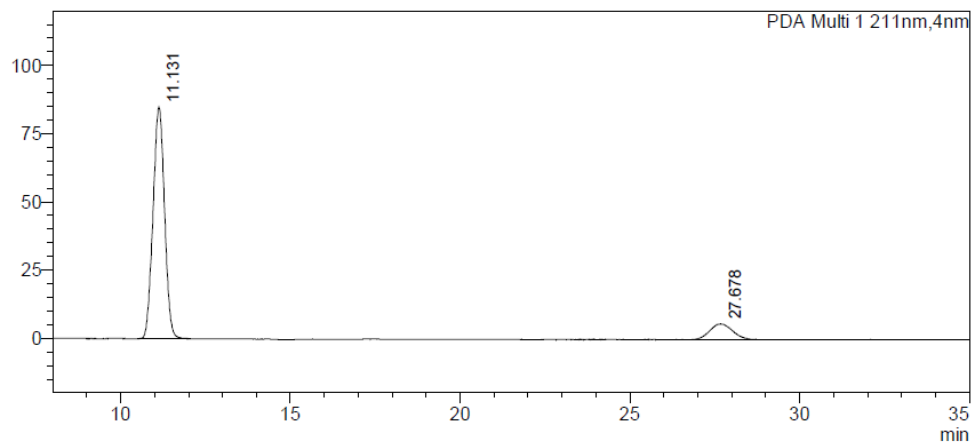


**HPLC data for 10:** Chiralcel OD-H (95:5 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C) t<sub>R</sub> (S): 11.1 min, t<sub>R</sub> (R): 27.7 min, 88.132:11.868 er.



PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	11.251	49.871
2	27.843	50.129
Total		100.000

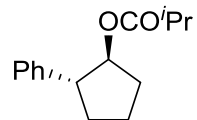


PDA Ch1 211nm

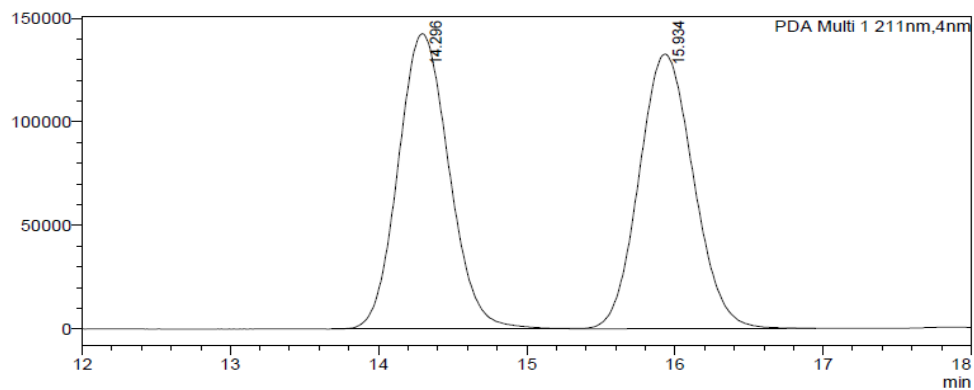
Peak#	Ret. Time	Area%
1	11.131	88.132
2	27.678	11.868
Total		100.000



(1*S*,2*R*)-2-Phenylcyclopentyl isobutyrate **S9**

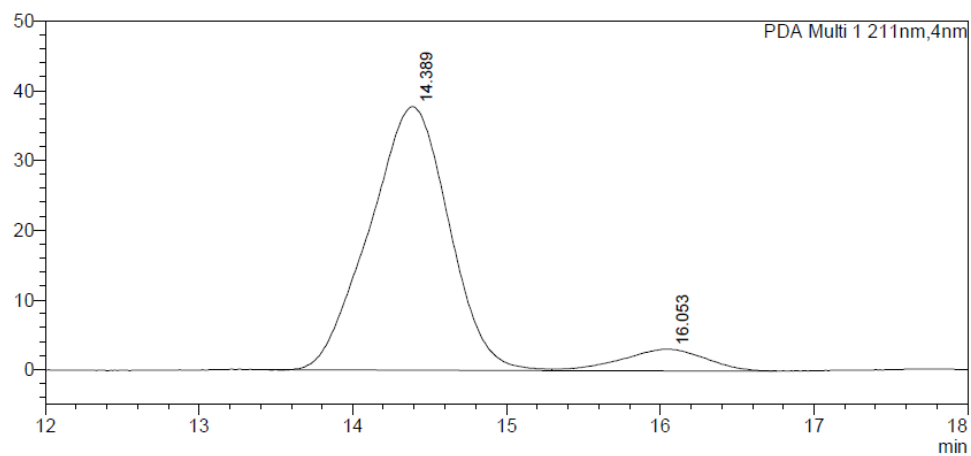


**HPLC data for S9:** Following hydrolysis to alcohol. Chiralcel OD-H (98:2 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C)  $t_R$  (1*S*,2*R*): 14.4 min,  $t_R$  (1*R*,2*S*): 16.1 min, 92.068:7.932 er.



PDA Ch1 211nm

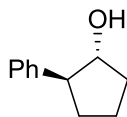
Peak#	Ret. Time	Area%
1	14.296	50.153
2	15.934	49.847
Total		100.000



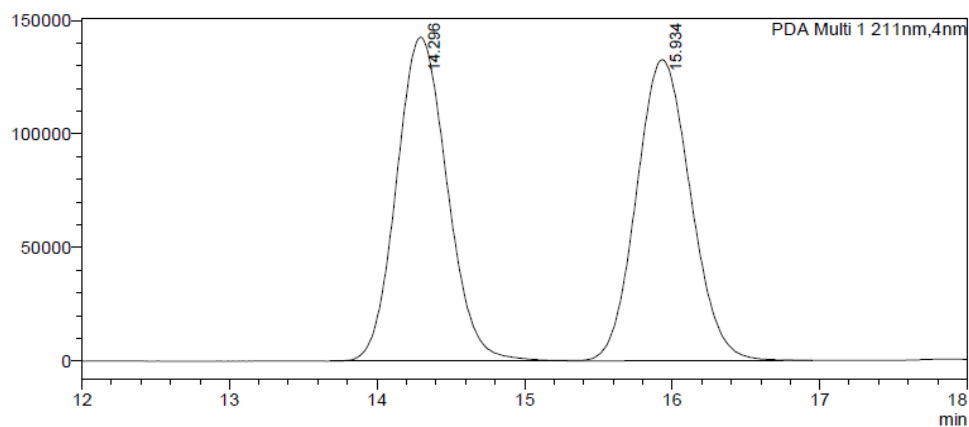
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	14.389	92.068
2	16.053	7.932
Total		100.000

(1*R*,2*S*)-2-Phenylcyclopentan-1-ol **11**

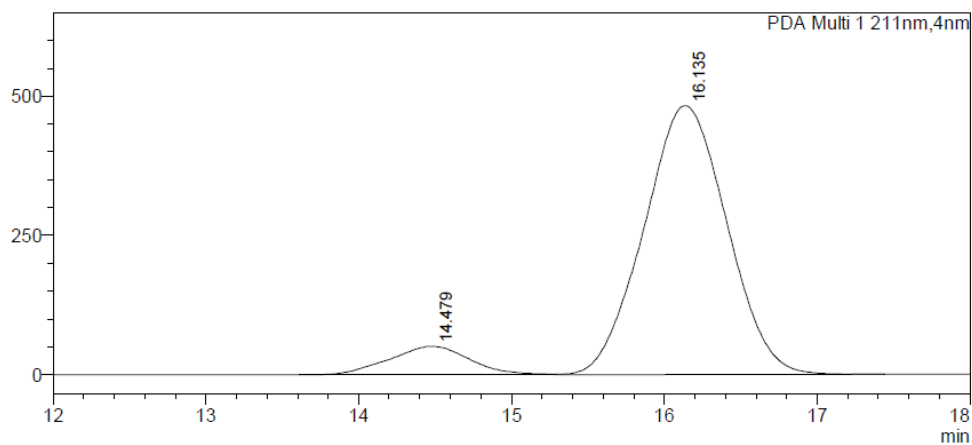


**HPLC data for 11:** Chiralcel OD-H (98:2 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C)  $t_R$  (1*S*,2*R*): 14.5 min,  $t_R$  (1*R*,2*S*): 16.1 min, 9.266:90.734 er.



PDA Ch1 211nm

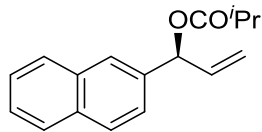
Peak#	Ret. Time	Area%
1	14.296	50.153
2	15.934	49.847
Total		100.000



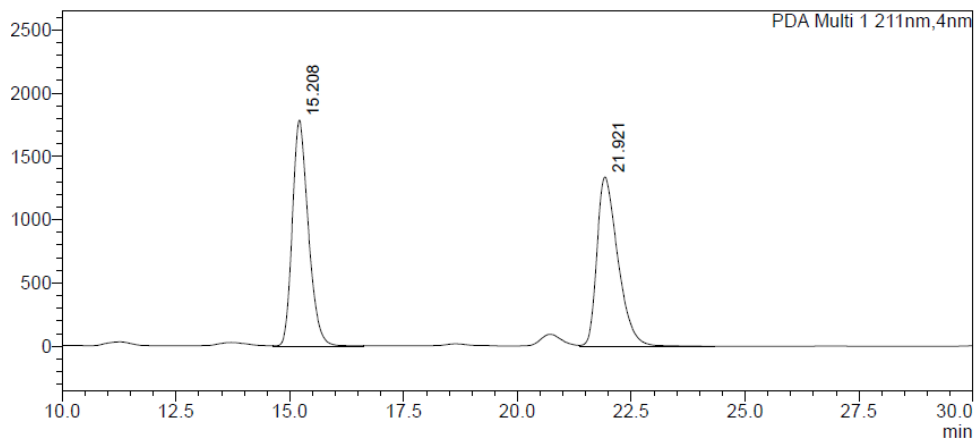
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	14.479	9.266
2	16.135	90.734
Total		100.000

1-(Naphthalen-2-yl)allyl isobutyrate **S10**

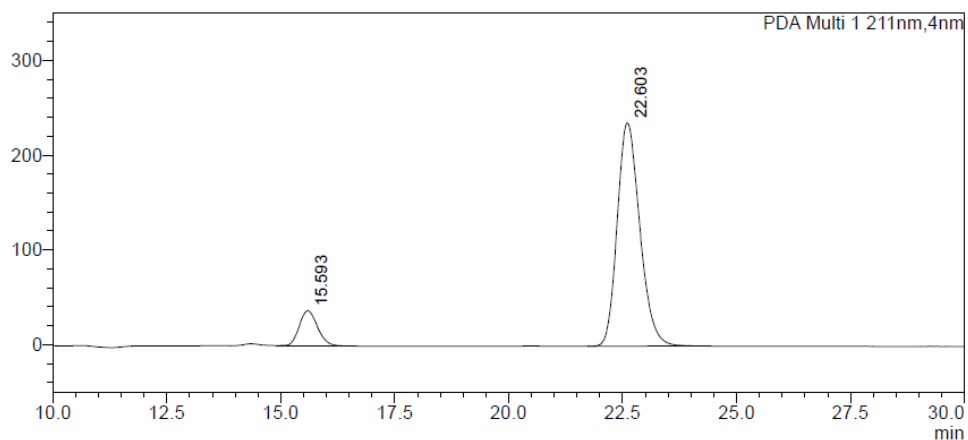


**HPLC data for S10:** Chiralcel OJ-H (95:5 hexane:IPA, flow rate 0.5 mLmin<sup>-1</sup>, 211 nm, 30 °C)  
t<sub>R</sub> (R): 15.6 min, t<sub>R</sub> (S): 22.6 min, 11.374:88.626 er.



PDA Ch1 211nm

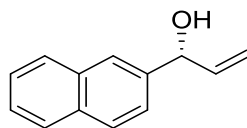
Peak#	Ret. Time	Area%
1	15.208	50.591
2	21.921	49.409
Total		100.000



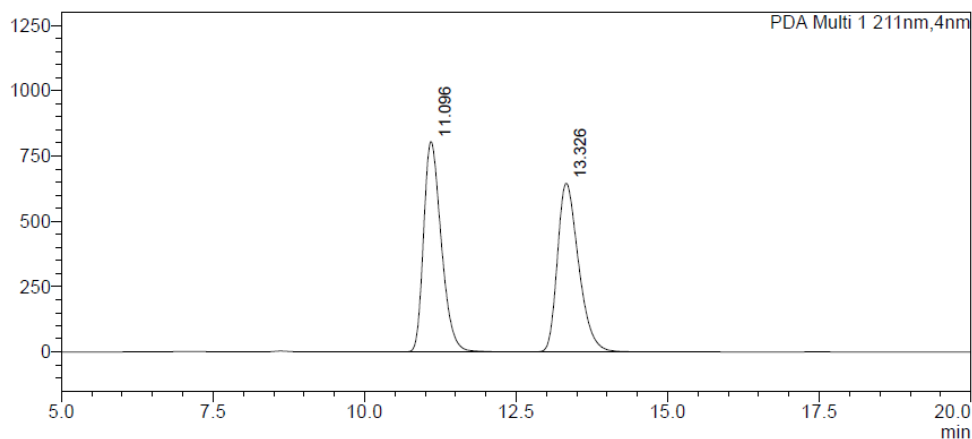
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	15.593	11.374
2	22.603	88.626
Total		100.000

1-(Naphthalen-2-yl)prop-2-en-1-ol **12**

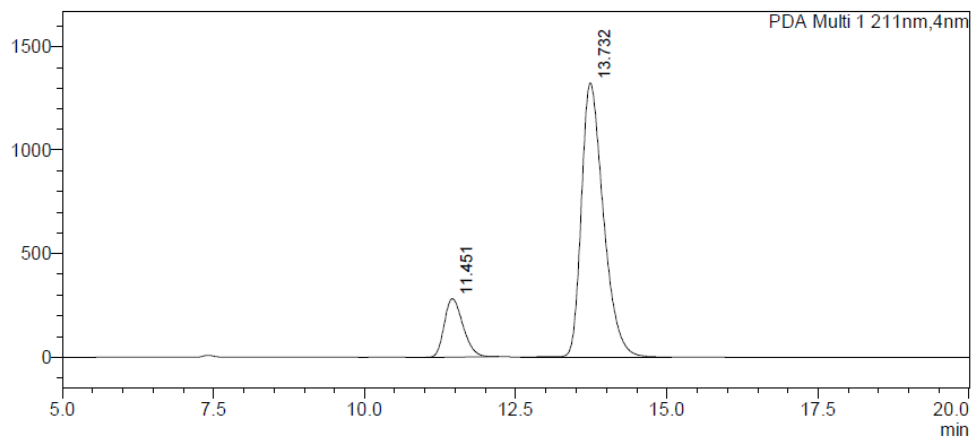


**HPLC data for 12:** Chiralcel OJ-H (80:20 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C) t<sub>R</sub> (S): 11.5 min, t<sub>R</sub> (R): 13.7 min, 15.382:84.618 er.



PDA Ch1 211nm

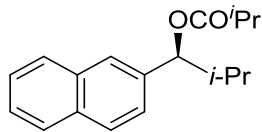
Peak#	Ret. Time	Area%
1	11.096	50.973
2	13.326	49.027
Total		100.000



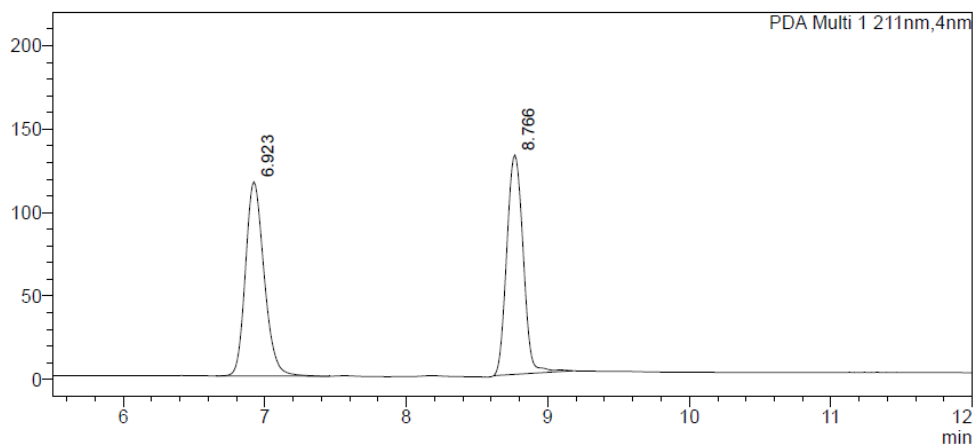
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	11.451	15.382
2	13.732	84.618
Total		100.000

## 2-Methyl-1-(naphthalen-2-yl)propyl isobutyrate **S11**

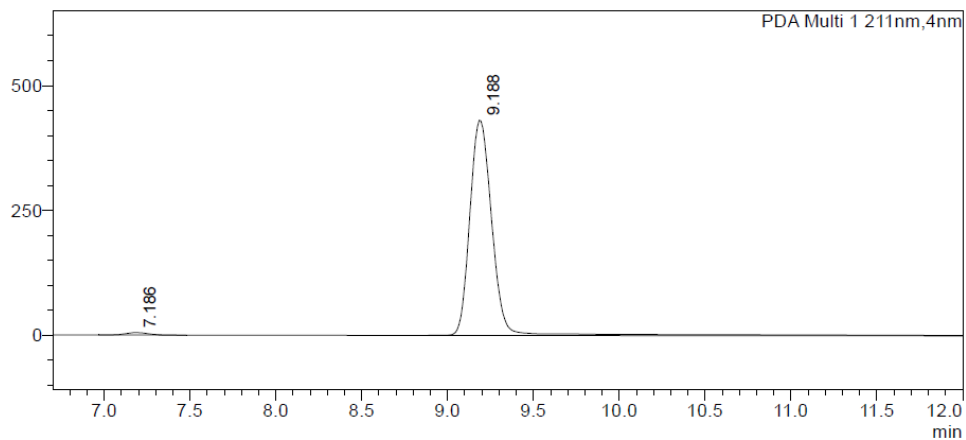


**HPLC data for S11:** Chiralcel AD-H (99.8:0.2 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C)  $t_R$  (R): 7.2 min,  $t_R$  (S): 9.2 min, 1.037:98.963 er.



PDA Ch1 211nm

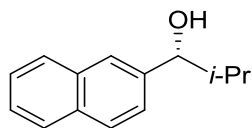
Peak#	Ret. Time	Area%
1	6.923	50.177
2	8.766	49.823
Total		100.000



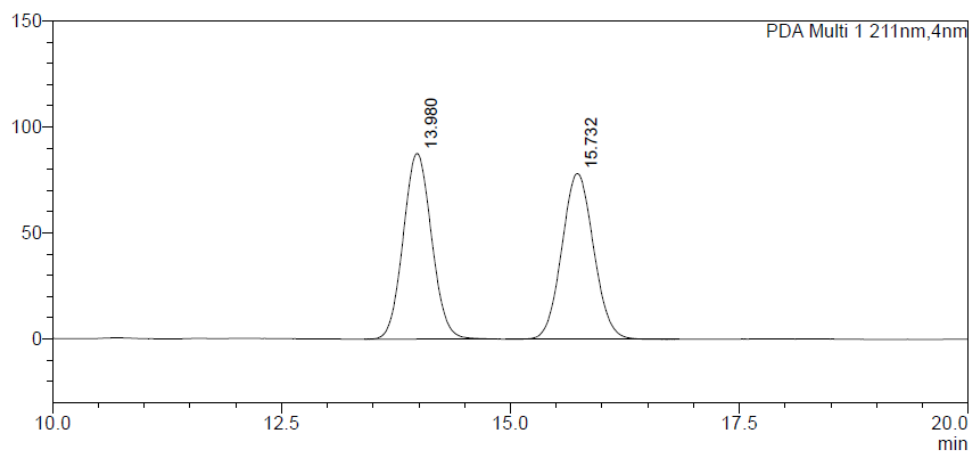
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	7.186	1.037
2	9.188	98.963
Total		100.000

2-Methyl-1-(naphthalen-2-yl)propan-1-ol **13**

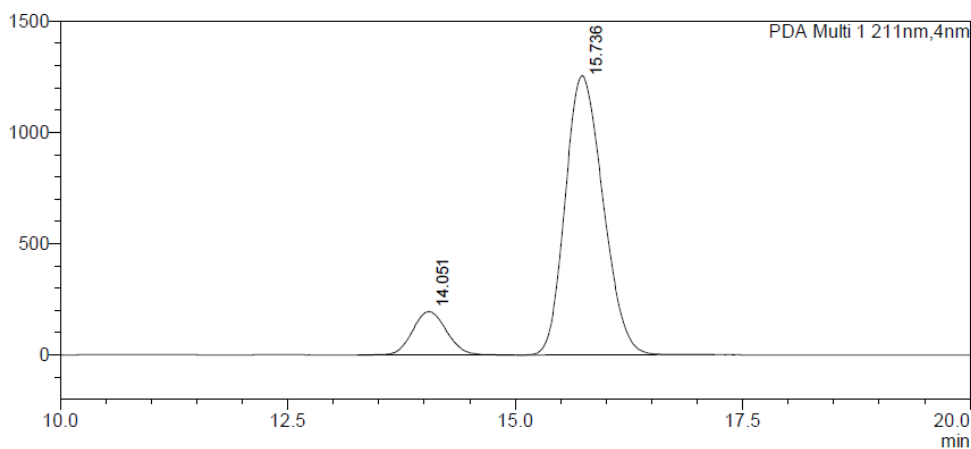


**HPLC data for 13:** Chiralcel OD-H (95:5 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C) t<sub>R</sub> (S): 14.1 min, t<sub>R</sub> (R): 15.7 min, 12.201:87.799 er.



PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	13.980	50.003
2	15.732	49.997
Total		100.000

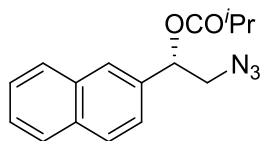


PDA Ch1 211nm

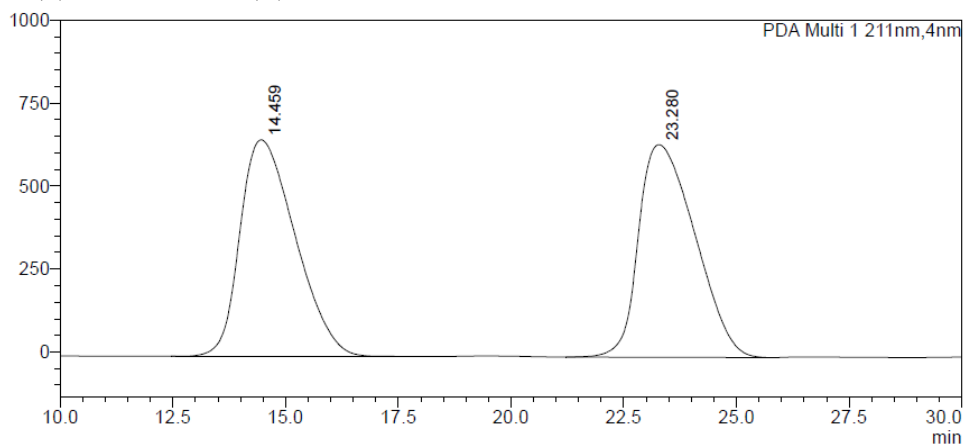
Peak#	Ret. Time	Area%
1	14.051	12.201
2	15.736	87.799
Total		100.000

## With Merrifield-BTM (6)

2-Azido-1-(naphthalen-2-yl)ethyl isobutyrate **S7**

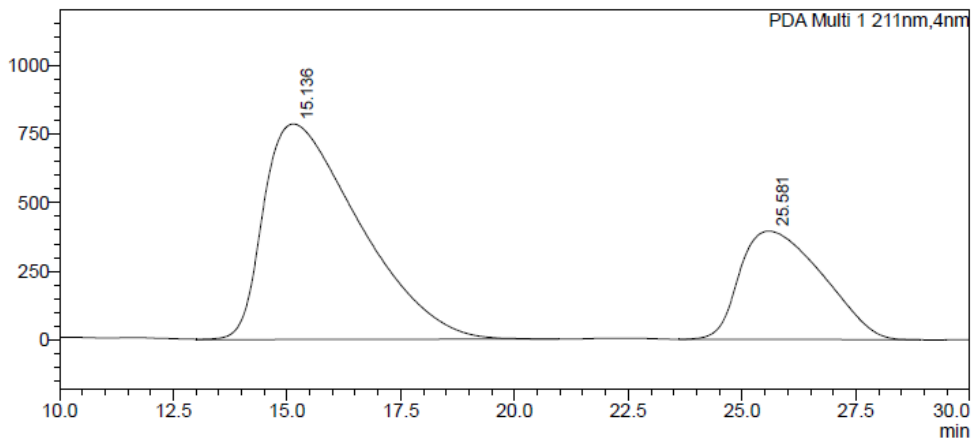


**HPLC data for S7:** Chiralcel AD-H (99.8:0.2 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C)  
 $t_R$  (S): 15.1 min,  $t_R$  (R): 25.6 min, 69.814:30.186 er.



PDA Ch1 211nm

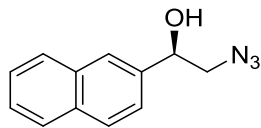
Peak#	Ret. Time	Area%
1	14.459	50.075
2	23.280	49.925
Total		100.000



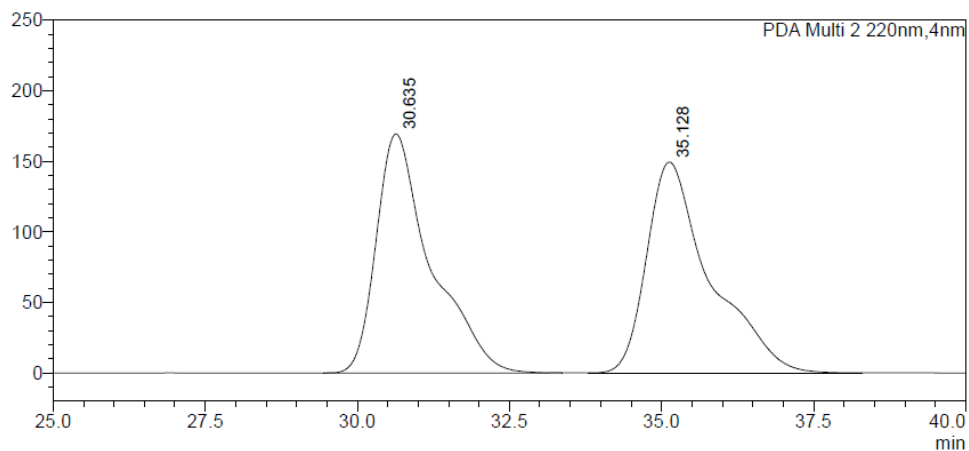
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	15.136	69.814
2	25.581	30.186
Total		100.000

2-Azido-1-(naphthalen-3-yl)ethan-1-ol **9**

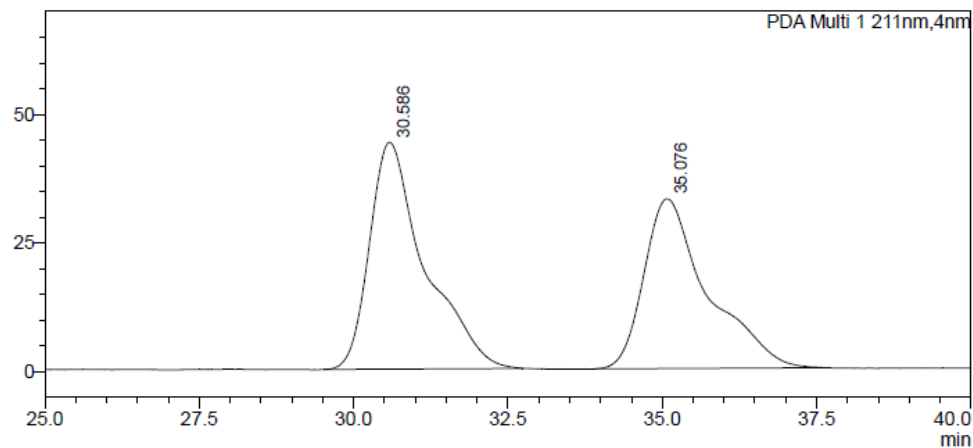


**HPLC data for 9:** Chiralcel OD-H (95:5 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 220 nm, 30 °C) *t<sub>R</sub>* (*R*): 30.6 min, *t<sub>R</sub>* (*S*): 35.1 min, 53.792:46.208 er.



PDA Ch2 220nm

Peak#	Ret. Time	Area%
1	30.635	49.491
2	35.128	50.509
Total		100.000

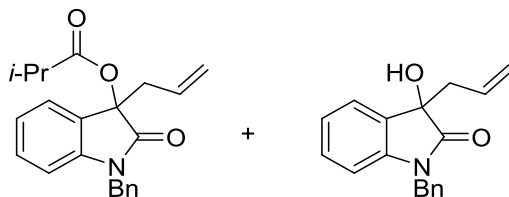


PDA Ch1 211nm

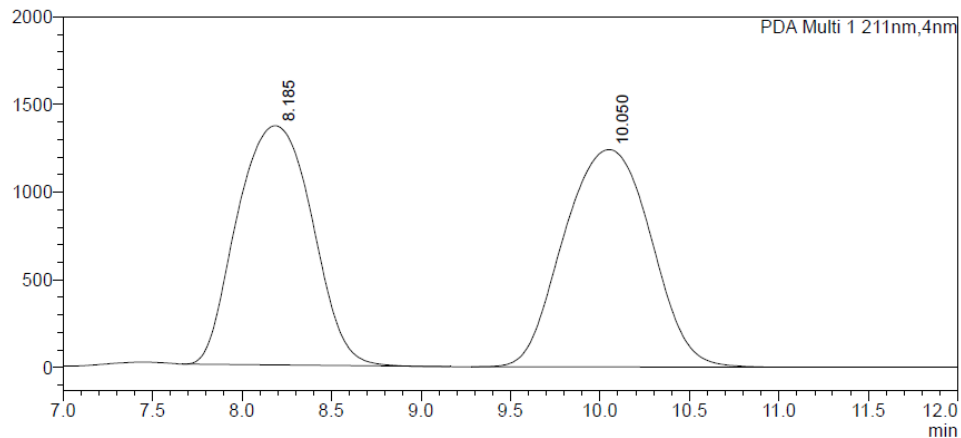
Peak#	Ret. Time	Area%
1	30.586	53.792
2	35.076	46.208
Total		100.000



## Reaction Optimisation for Tertiary heterocyclic alcohol:



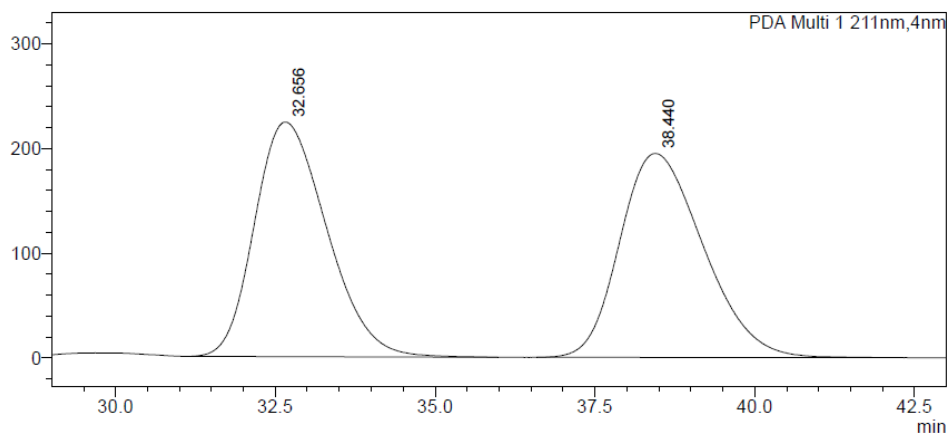
Chiralcel OD-H (98:2 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C) - **Racemic ester:**  $t_R$  (R): 8.2 min,  $t_R$  (S): 10.0 min



PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	8.185	48.695
2	10.050	51.305
Total		100.000

Chiralcel OD-H (98:2 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C) - **Racemic alcohol:**  $t_R$  (R): 32.7 min,  $t_R$  (S): 38.4 min

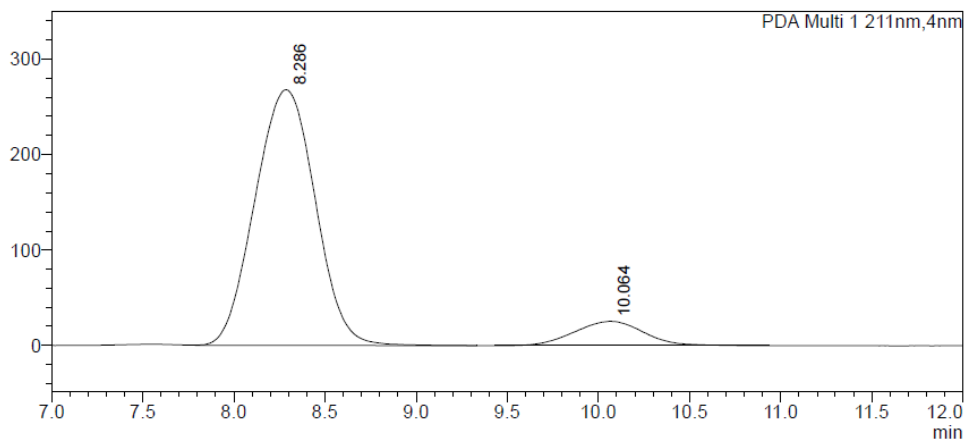


PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	32.656	49.922
2	38.440	50.078
Total		100.000

**Table 3 entry 6:**

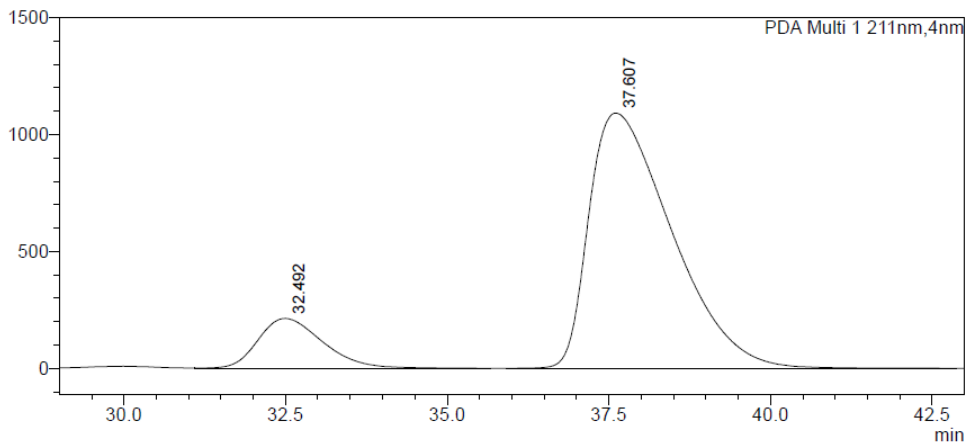
**HPLC data for 15:** Chiralcel OD-H (98:2 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C).  
**ester:**  $t_R$  (*R*): 8.3 min,  $t_R$  (*S*): 10.0 min, 90.188:9.812 (*R*:*S*) er.



PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	8.286	90.188
2	10.064	9.812
Total		100.000

**HPLC data for 14:** Chiralcel OD-H (98:2 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C);  
**alcohol:**  $t_R$  (*R*): 32.5 min,  $t_R$  (*S*): 37.6 min, 13.247:86.753 (*R*:*S*) er

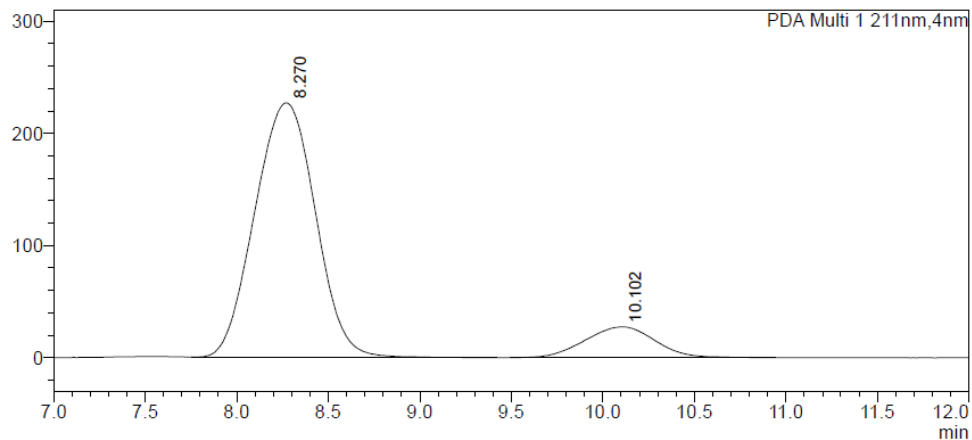


PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	32.492	13.247
2	37.607	86.753
Total		100.000

**Table 3 entry 9:**

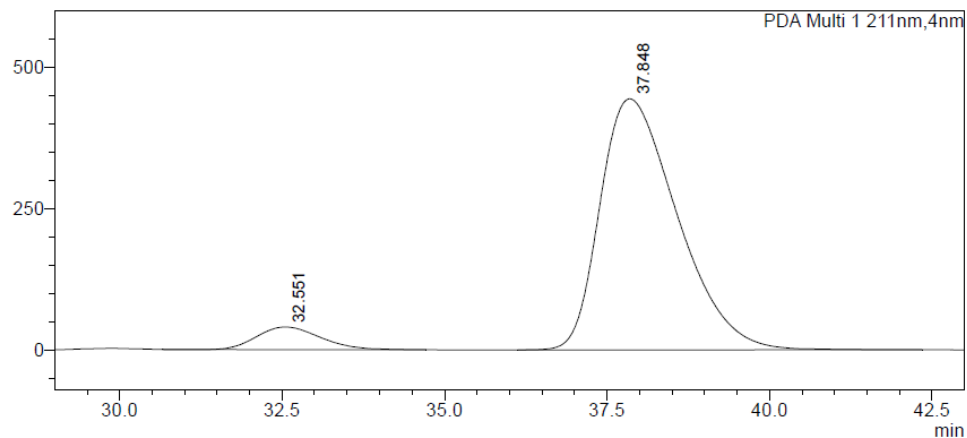
**HPLC data for 15:** Chiralcel OD-H (98:2 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C);  
**ester:** t<sub>R</sub> (*R*): 8.3 min, t<sub>R</sub> (*S*): 10.1 min, 87.773:12.227 (*R*:*S*) er.



PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	8.270	87.773
2	10.102	12.227
Total		100.000

**HPLC data for 14:** Chiralcel OD-H (98:2 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C);  
**alcohol:** t<sub>R</sub> (*R*): 32.6 min, t<sub>R</sub> (*S*): 37.8 min, 6.938:93.062 (*R*:*S*) er

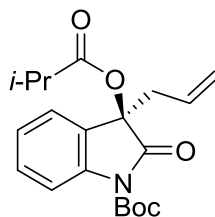


PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	32.551	6.938
2	37.848	93.062
Total		100.000

**Table 4**

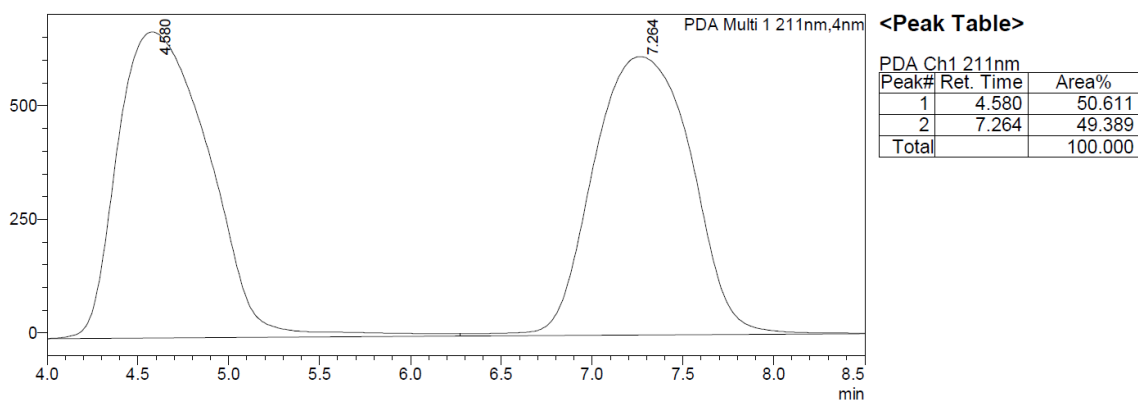
***tert*-butyl 3-allyl-3-(isobutyryloxy)-2-oxindoline-1-carboxylate S12**



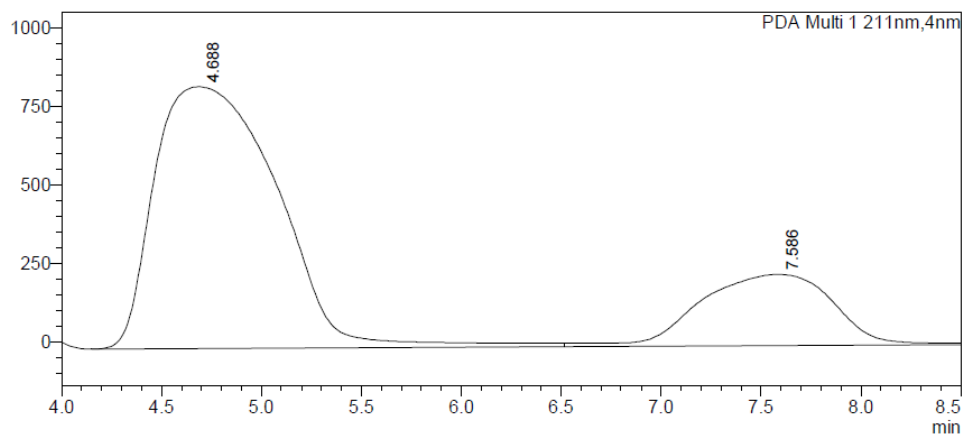
Chiralcel OD-H (99:1 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C)

**Racemic ester:**  $t_R$  (*R*): 4.6 min,  $t_R$  (*S*): 7.3 min

mAU



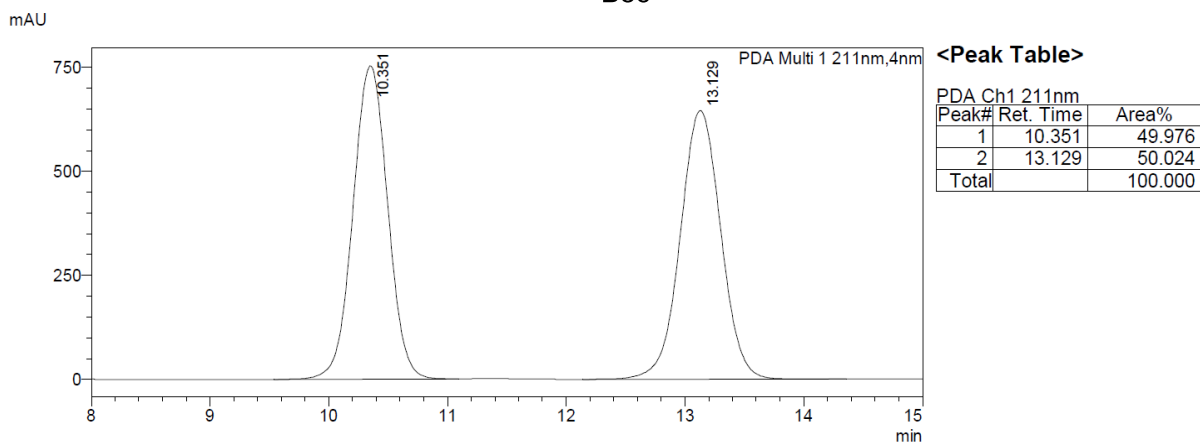
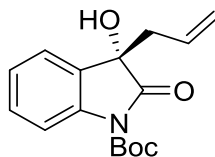
**HPLC data for S12:** Chiralcel OD-H (99:1 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C)  $t_R$  (*R*): 4.7 min,  $t_R$  (*S*): 7.6 min, 77.241:22.759 (*R*:*S*) er.



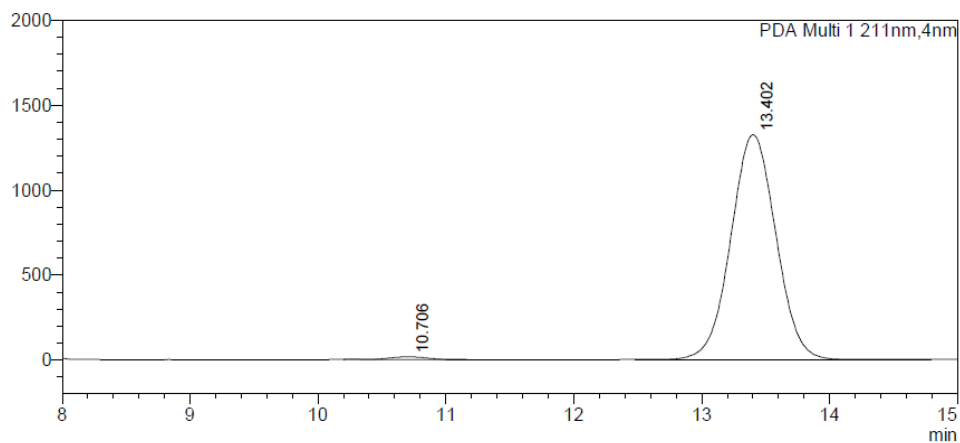
**<Peak Table>**

PDA Ch1 211nm		
Peak#	Ret. Time	Area%
1	4.688	77.241
2	7.586	22.759
Total		100.000

**tert-Butyl 3-allyl-3-hydroxy-2-oxindoline-1-carboxylate 16**



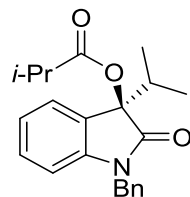
**HPLC data for 16:** Chiralcel AD-H (95:5 hexane:IPA, flow rate 1 mLmin<sup>-1</sup>, 211 nm, 30 °C) ) t<sub>R</sub> (R): 10.7 min, t<sub>R</sub> (S): 13.4 min, 1.048:98.952 (R:S) er.



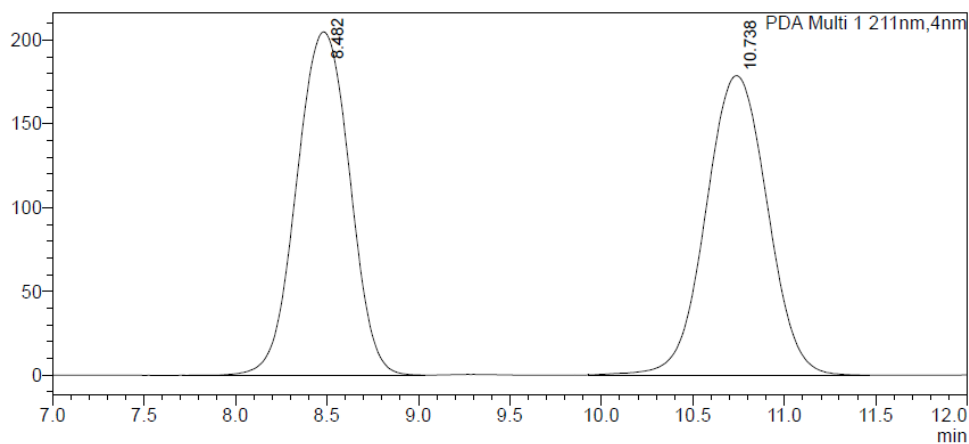
**<Peak Table>**

Peak#	Ret. Time	Area%
1	10.706	1.048
2	13.402	98.952
Total		100.000

### 1-Benzyl-3-isopropyl-2-oxindolin-3-yl isobutyrate S13

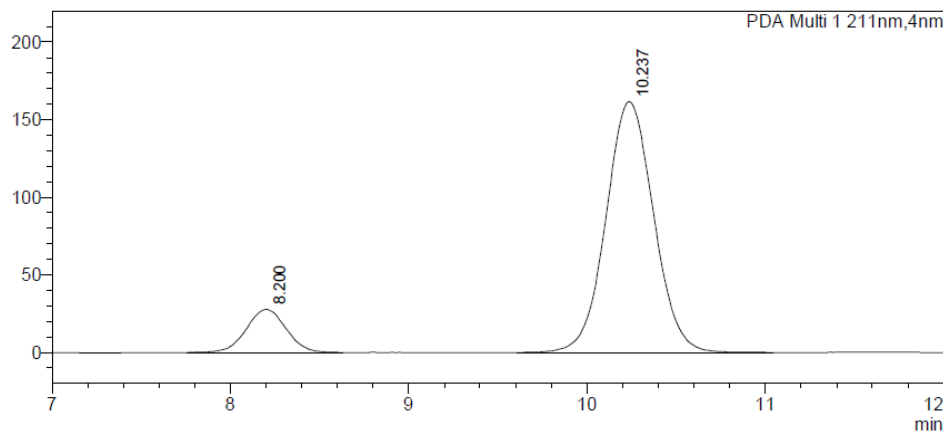


**HPLC data for S13:** Chiralpak AD-H (98:2 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C)  $t_R$  (S): 8.2 min,  $t_R$  (R): 10.2 min, 12.511:87.489 er.



PDA Ch1 211nm

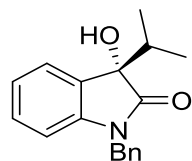
Peak#	Ret. Time	Area%
1	8.482	49.733
2	10.738	50.267
Total		100.000



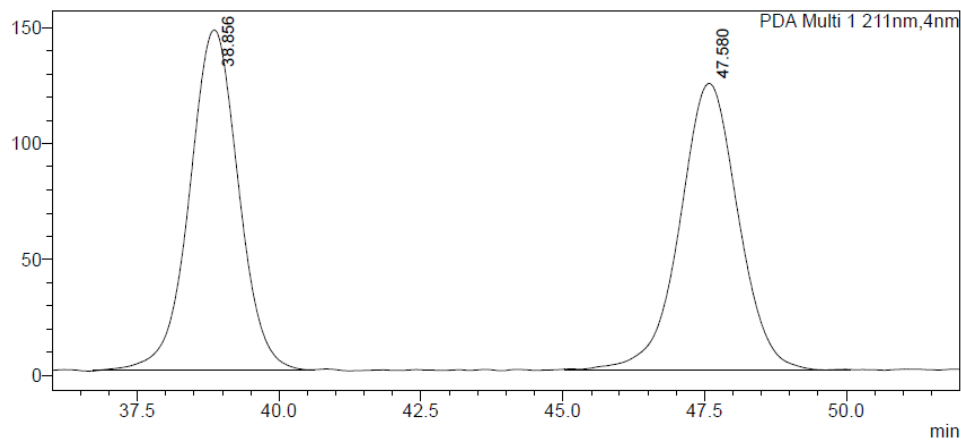
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	8.200	12.511
2	10.237	87.489
Total		100.000

## 1-Benzyl-3-hydroxy-3-isopropyl-indolin-2-one 17

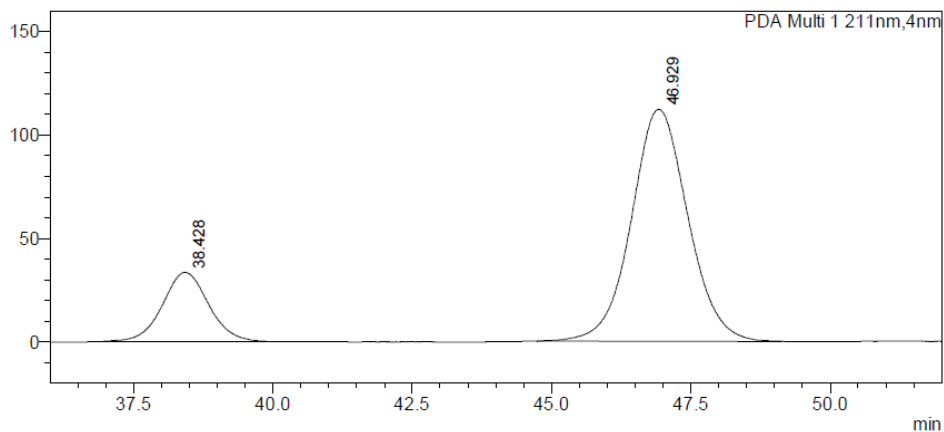


**HPLC data for 17:** Chiralpak AD-H (98:2 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C)  
 $t_R$  (R): 38.4 min,  $t_R$  (S): 46.9 min, 19.578:80.422 (S:R) er.



PDA Ch1 211nm

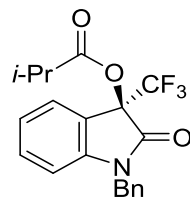
Peak#	Ret. Time	Area%
1	38.856	50.068
2	47.580	49.932
Total		100.000



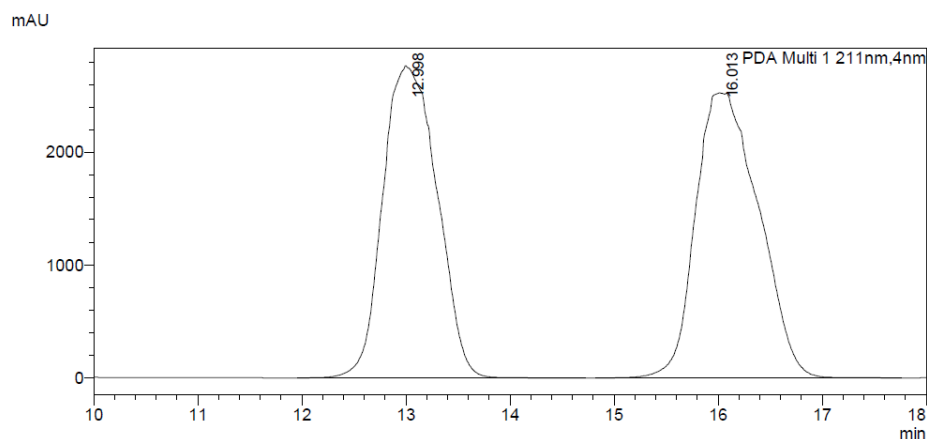
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	38.428	19.578
2	46.929	80.422
Total		100.000

# 1-Benzyl-2-oxo-3-(trifluoromethyl)indolin-3-yl isobutyrate S14

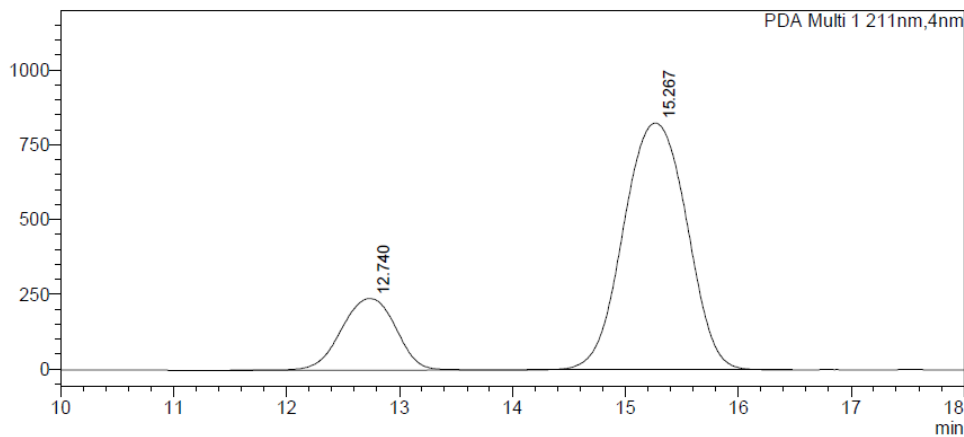


**HPLC data for S14:** Chiralpak AD-H (99:1 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 211 nm, 30 °C) t<sub>R</sub> (S): 12.7 min, t<sub>R</sub> (R): 15.3 min, 19.991:80.009 er.



### <Peak Table>

Peak#	Ret. Time	Area%
1	12.998	48.551
2	16.013	51.449
Total		100.000

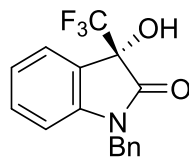


### PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	12.740	19.991
2	15.267	80.009
Total		100.000

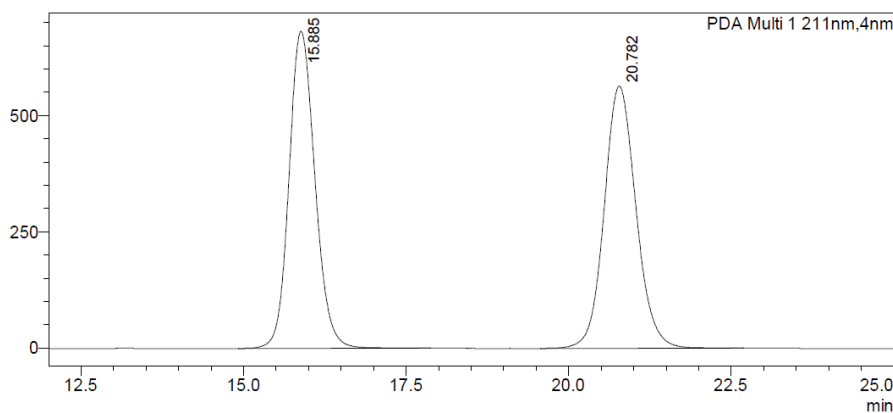


# 1-Benzyl-3-hydroxy-3-(trifluoromethyl)indolin-2-one **18**



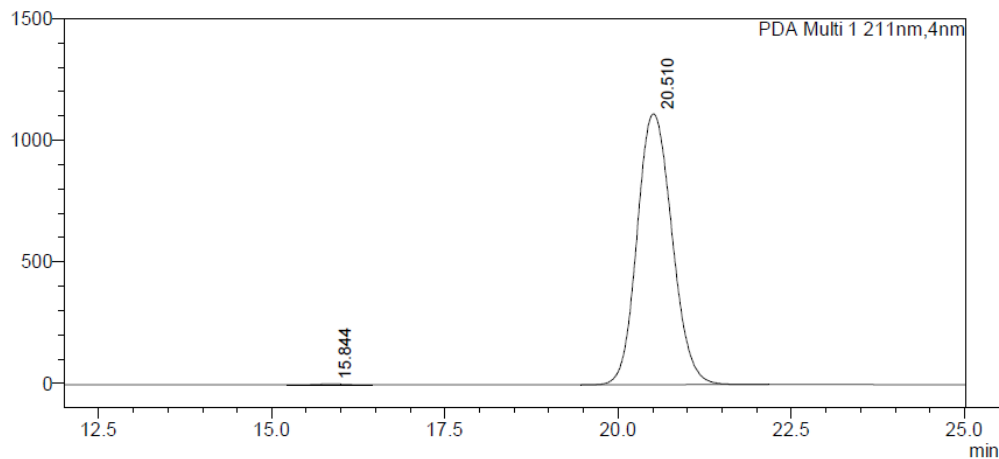
**HPLC data for 18:** Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 211 nm, 30 °C)  
 $t_R$  (*R*): 15.8 min,  $t_R$  (*S*): 20.5 min, 0.305:99.695 er.

mAU



### <Peak Table>

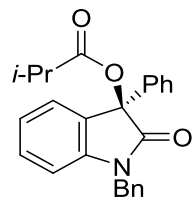
PDA Ch1 211nm		
Peak#	Ret. Time	Area%
1	15.885	49.701
2	20.782	50.299
Total		100.000



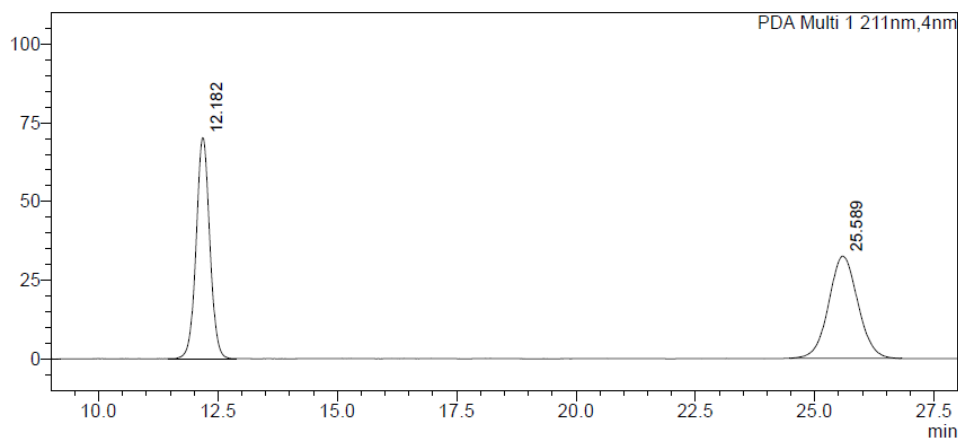
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	15.844	0.305
2	20.510	99.695
Total		100.000

### 1-Benzyl-2-oxo-3-phenylindolin-3-yl isobutyrate S15

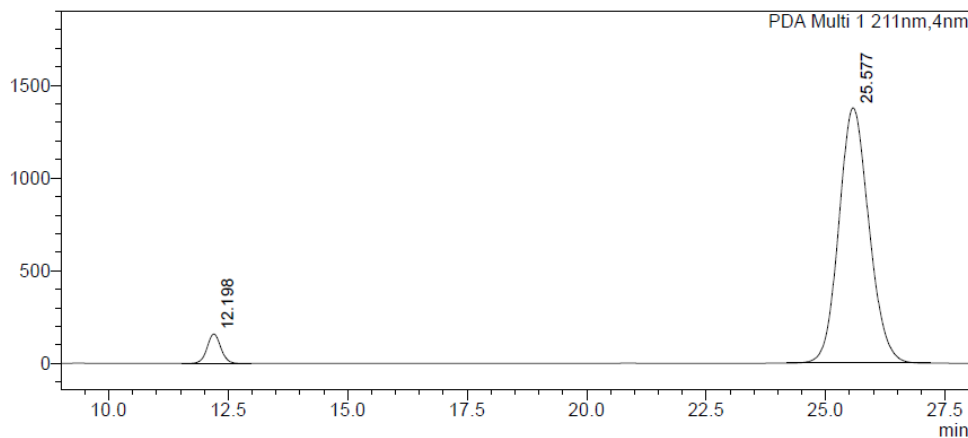


**HPLC data for S15:** Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.25 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (S): 12.2 min, t<sub>R</sub> (R): 25.6 min, 4.968:95.032 (S:R) er.



PDA Ch1 211nm

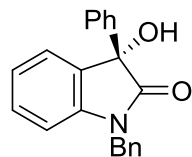
Peak#	Ret. Time	Area%
1	12.182	50.245
2	25.589	49.755
Total		100.000



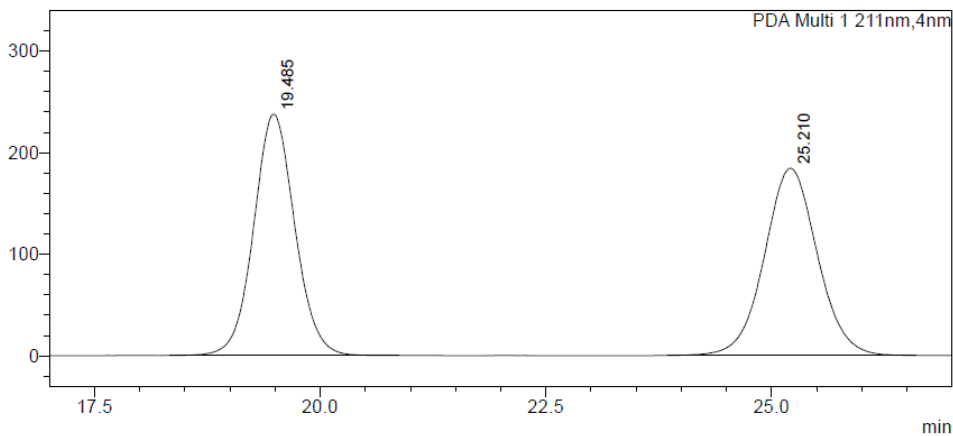
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	12.198	4.968
2	25.577	95.032
Total		100.000

## 1-Benzyl-3-hydroxy-3-phenylindolin-2-one 19

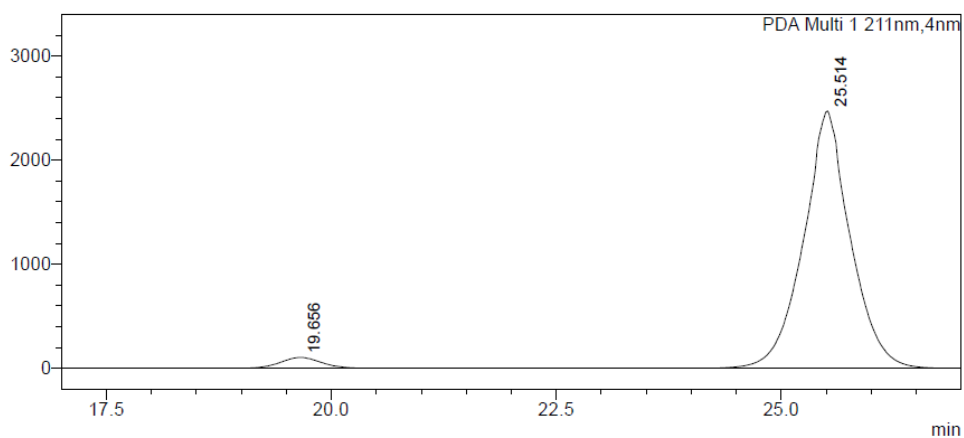


**HPLC data for 19:** Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.25 mL min<sup>-1</sup>, 211 nm, 40 °C)  $t_R$  (R): 19.7 min,  $t_R$  (S): 25.5 min, 3.556:96.444 (R:S) er.



PDA Ch1 211nm

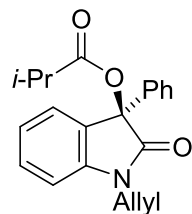
Peak#	Ret. Time	Area%
1	19.485	50.059
2	25.210	49.941
Total		100.000



PDA Ch1 211nm

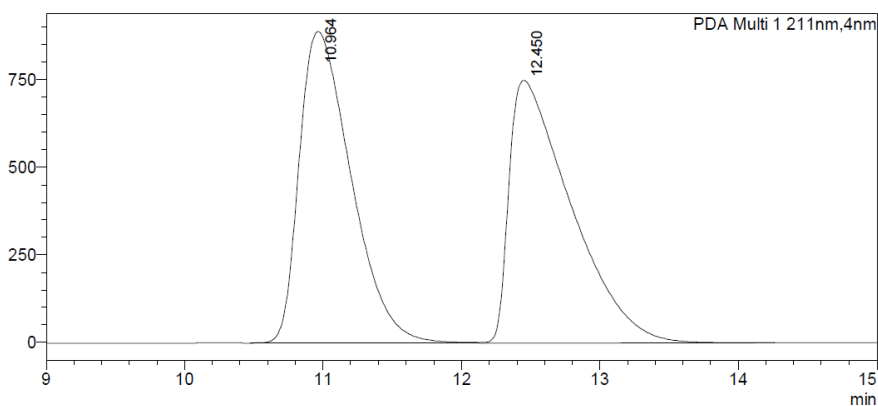
Peak#	Ret. Time	Area%
1	19.656	3.556
2	25.514	96.444
Total		100.000

# 1-Allyl-2-oxo-3-phenylindolin-3-yl isobutyrate **S16**



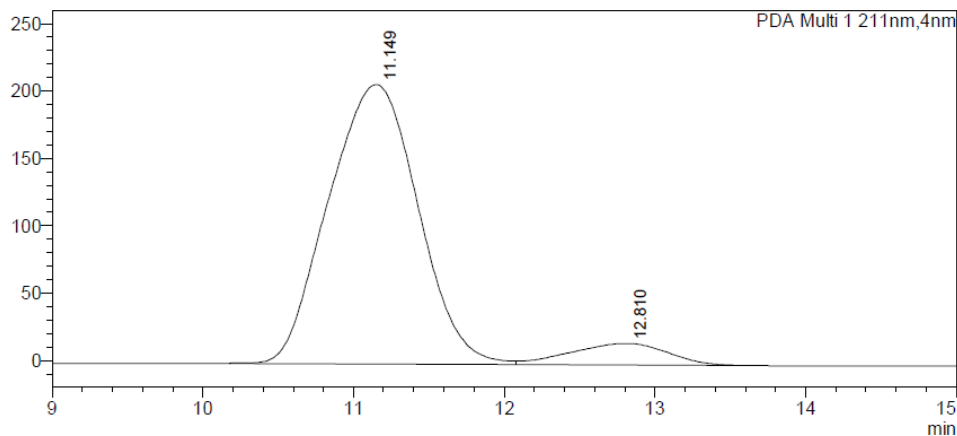
**HPLC data for S16:** Chiralcel OD-H (99:1 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 211 nm, 30 °C)  
t<sub>R</sub> (*R*): 11.1 min, t<sub>R</sub> (*S*): 12.8 min, 92.201:7.799 (*R*:*S*) er.

mAU



<Peak Table>

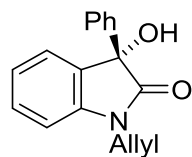
PDA Ch1 211nm		
Peak#	Ret. Time	Area%
1	10.964	49.832
2	12.450	50.168
Total		100.000



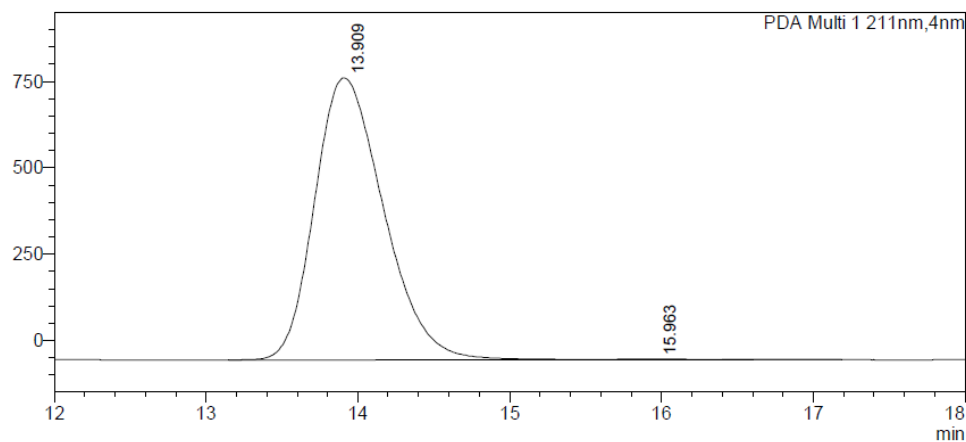
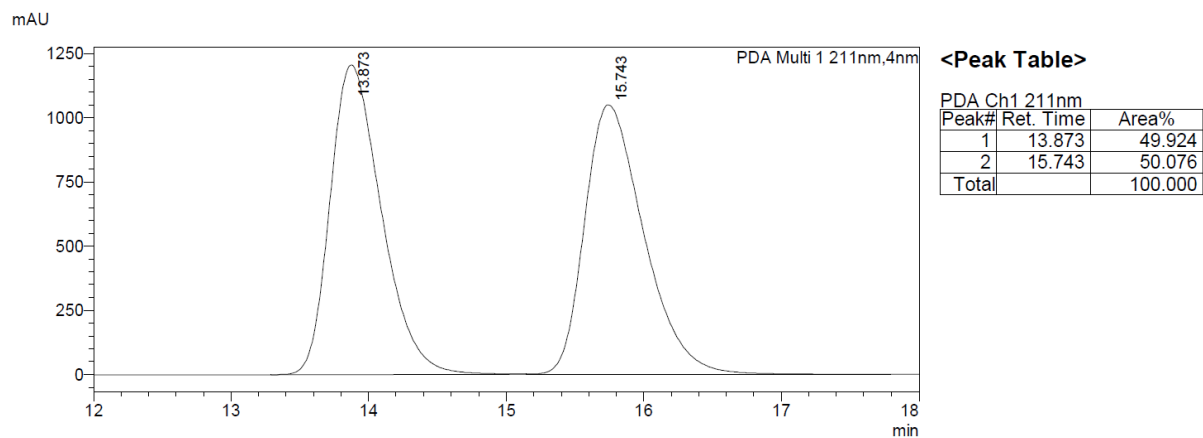
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	11.149	92.201
2	12.810	7.799
Total		100.000

1-Allyl-3-hydroxy-3-phenylindolin-2-one **20**

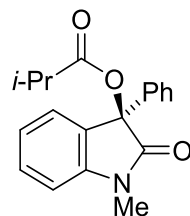


**HPLC data for 20:** Chiralcel OD-H (95:5 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 211 nm, 30 °C)  
 $t_R$  (*S*): 13.9 min,  $t_R$  (*R*): 16.0 min, 99.852:0.148 (*S*:*R*) er.



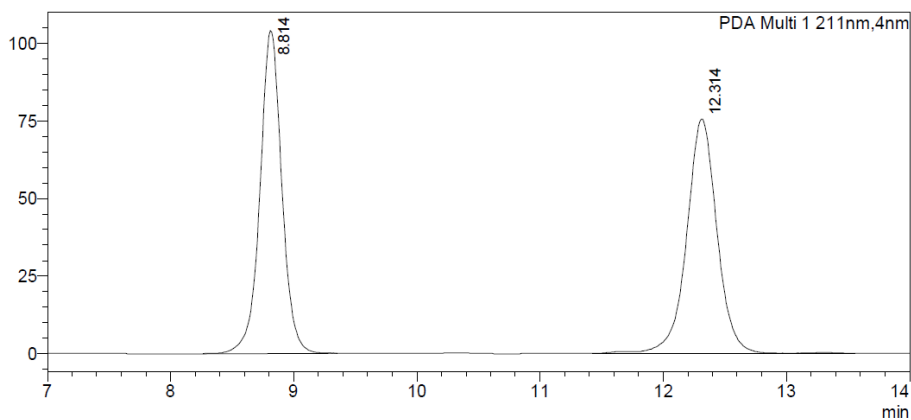
PDA Ch1 211nm		
Peak#	Ret. Time	Area%
1	13.909	99.852
2	15.963	0.148
Total		100.000

1-Methyl-2-oxo-3-phenylindolin-3-yl isobutyrate **S17**



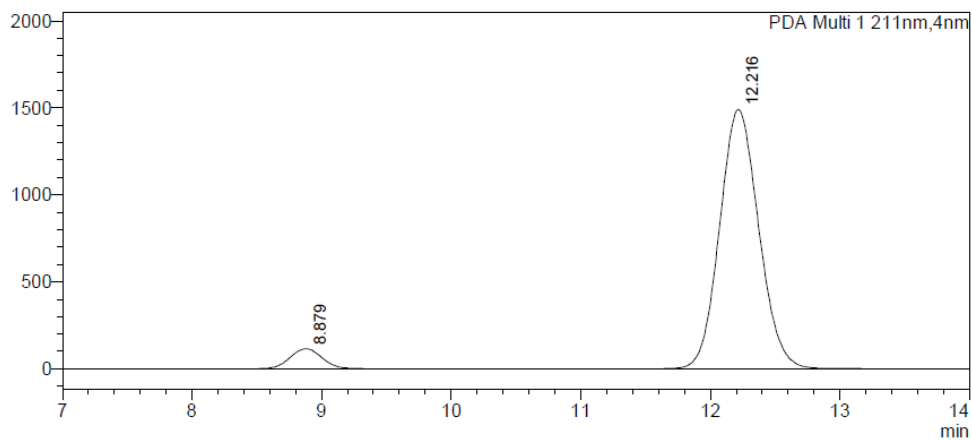
**HPLC data for S17:** Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 211 nm, 30 °C)  $t_R$  (S): 8.9 min,  $t_R$  (R): 12.2 min, 5.919:94.081 er.

mAU



<Peak Table>

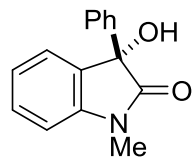
PDA Ch1 211nm		
Peak#	Ret. Time	Area%
1	8.814	49.600
2	12.314	50.400
Total		100.000



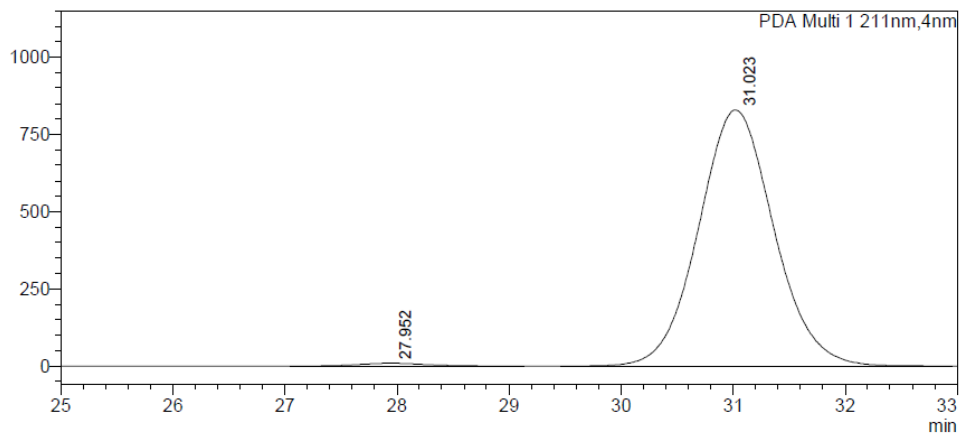
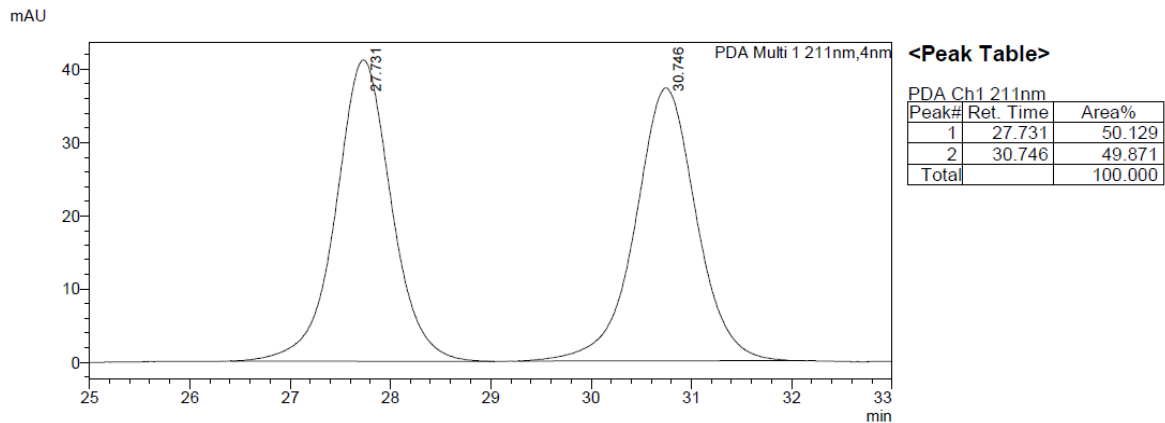
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	8.879	5.919
2	12.216	94.081
Total		100.000

### 3-Hydroxy-1-methyl-3-phenylindolin-2-one **21**

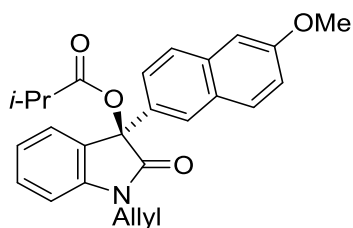


**HPLC data for 21:** Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 211 nm, 30 °C)  
 $t_R$  (*R*): 27.9 min,  $t_R$  (*S*): 31.0 min, 0.994:99.006 er.

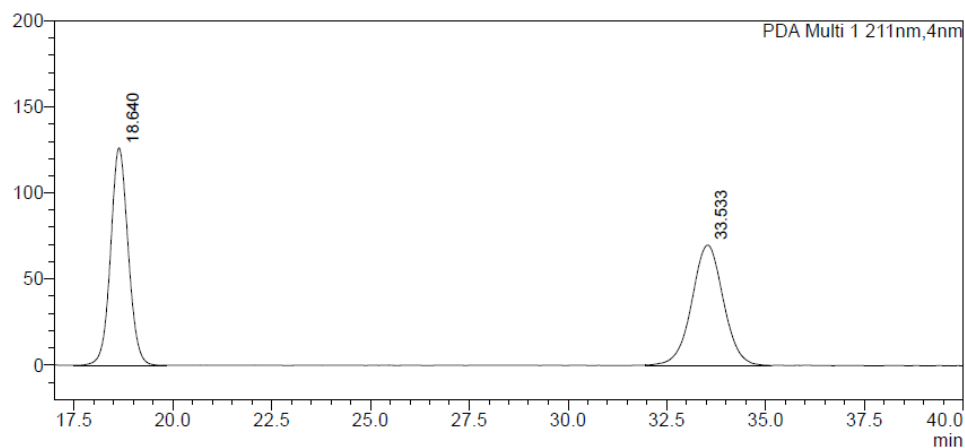


PDA Ch1 211nm		
Peak#	Ret. Time	Area%
1	27.952	0.994
2	31.023	99.006
Total		100.000

1-Allyl-3-(6-methoxynaphthalen-2-yl)-2-oxoindolin-3-yl isobutyrate **S18**

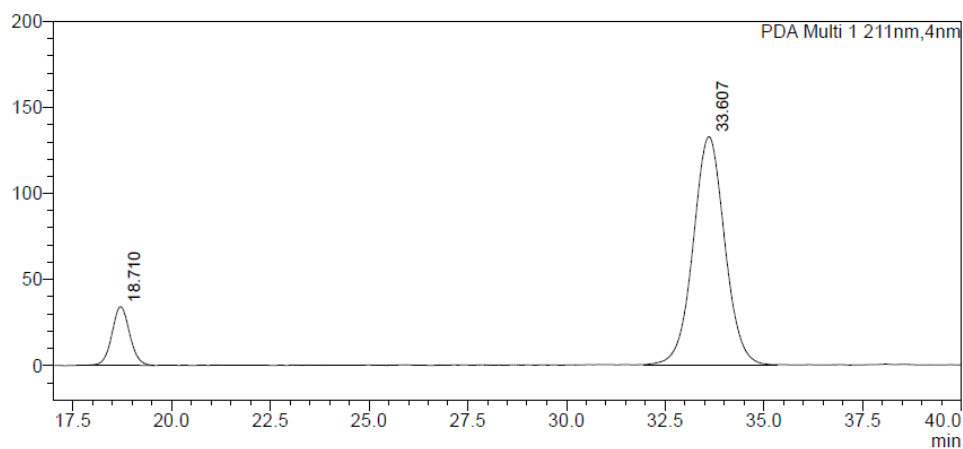


**HPLC data for S18:** Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C)  $t_R$  (S): 18.7 min,  $t_R$  (R): 33.6 min, 12.592:87.408 er.



PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	18.640	50.035
2	33.533	49.965
Total		100.000

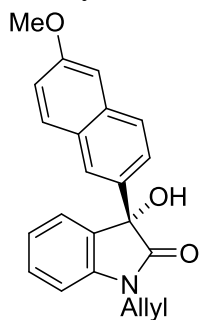


PDA Ch1 211nm

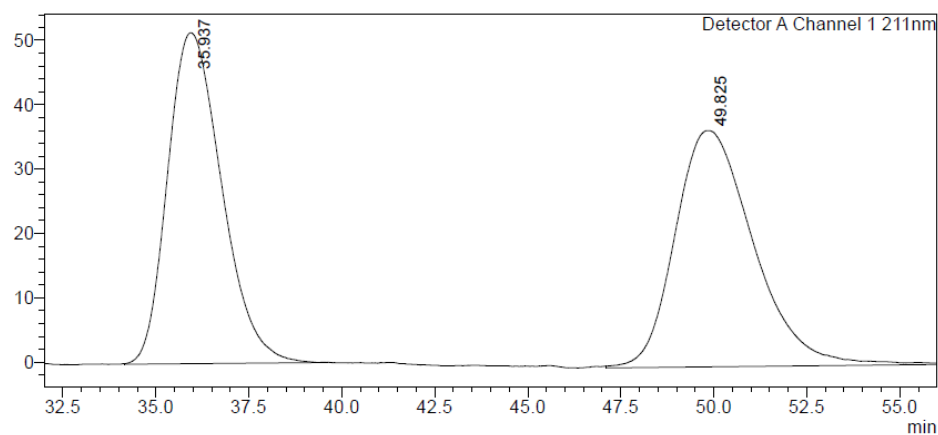
Peak#	Ret. Time	Area%
1	18.710	12.592
2	33.607	87.408
Total		100.000



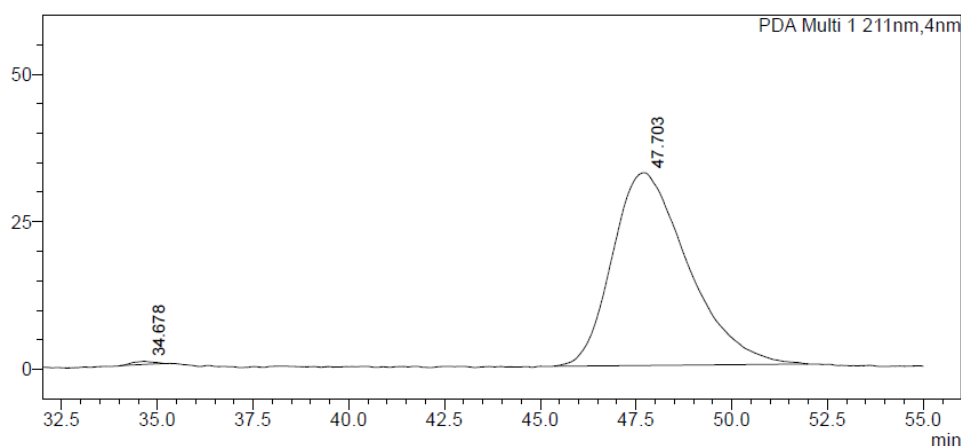
1-Allyl-3-hydroxy-3-(6-methoxynaphthalen-2-yl)indolin-2-one **22**



**HPLC data for 22:** Chiralcel OJ-H (90:10 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C)  
t<sub>R</sub> (R): 34.7 min, t<sub>R</sub> (S): 47.7 min, 0.451:99.549 er.

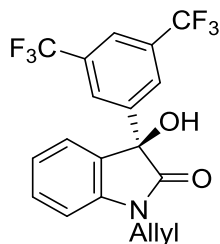


Detector A Channel 1 211nm		
Peak#	Ret. Time	Area%
1	35.937	49.141
2	49.825	50.859
Total		100.000

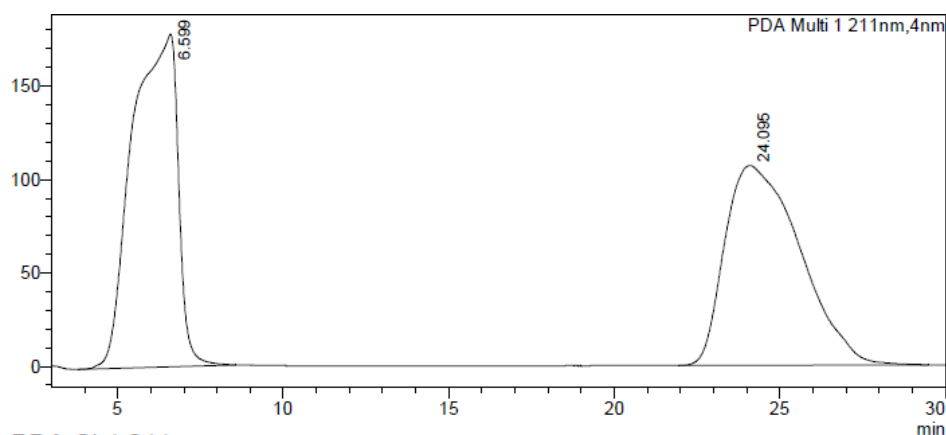


PDA Ch1 211nm		
Peak#	Ret. Time	Area%
1	34.678	0.451
2	47.703	99.549
Total		100.000

1-Allyl-3-(3,5-bis(trifluoromethyl)phenyl)-3-hydroxyindolin-2-one **23**(following hydrolysis of the ester, **1-allyl-3-(3,5-bis(trifluoromethyl)phenyl)-2-oxoindolin-3-yl isobutyrate S19**)

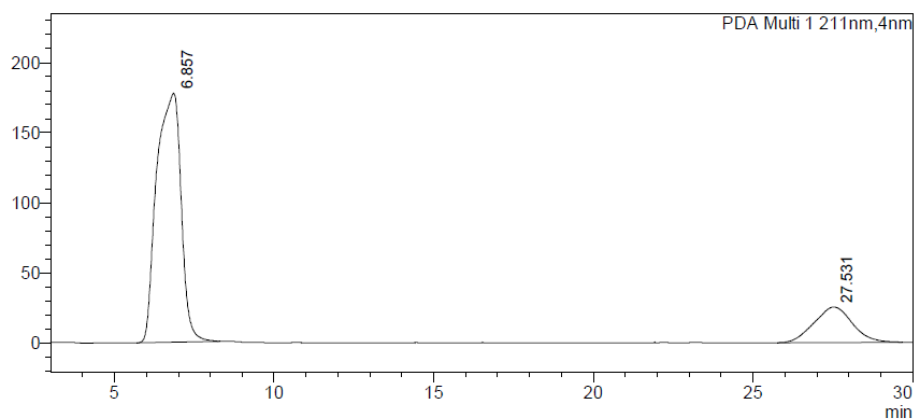


**HPLC data for S19:** Chiralpak AS-H (99:1 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) *t<sub>R</sub>* (R): 6.9 min, *t<sub>R</sub>* (S): 27.5 min, 81.747:18.253 er.



PDA Ch1 211nm

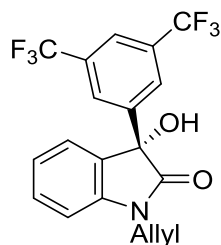
Peak#	Ret. Time	Area%
1	6.599	50.248
2	24.095	49.752
Total		100.000



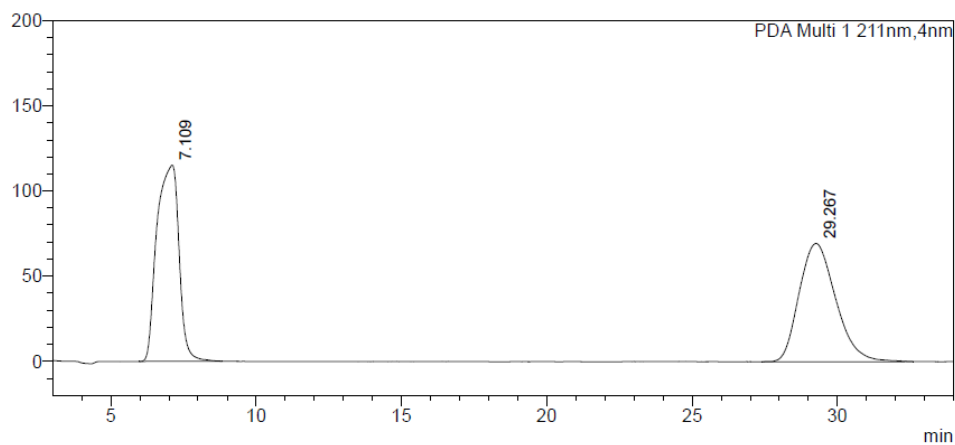
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	6.857	81.747
2	27.531	18.253
Total		100.000

1-Allyl-3-(3,5-bis(trifluoromethyl)phenyl)-3-hydroxyindolin-2-one **23**

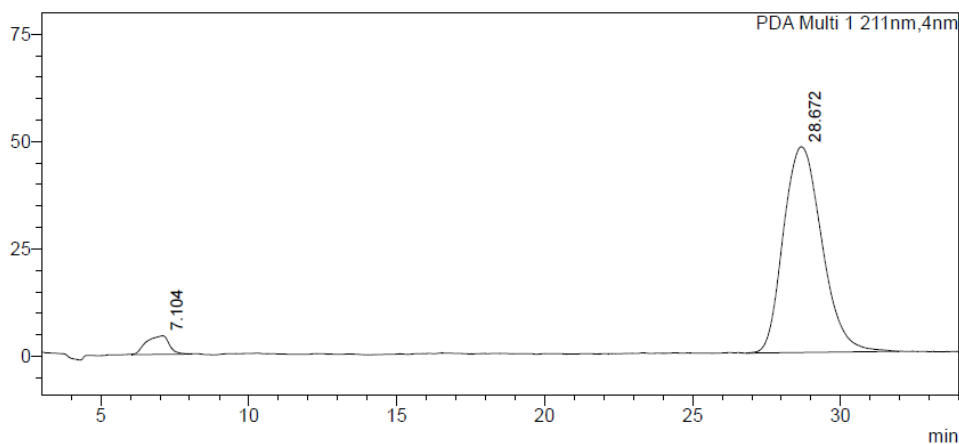


**HPLC data for 23:** Chiralpak AS-H (99:1 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C)  
 $t_R$  (*R*): 7.1 min,  $t_R$  (*S*): 28.7 min, 5.053:94.947 (*R*:*S*) er.



PDA Ch1 211nm

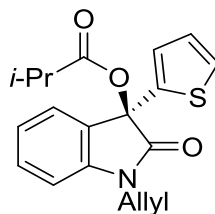
Peak#	Ret. Time	Area%
1	7.109	50.029
2	29.267	49.971
Total		100.000



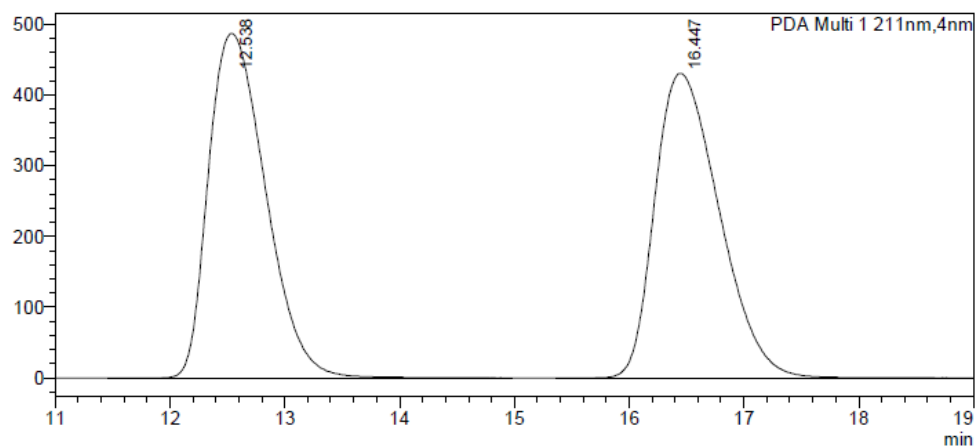
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	7.104	5.053
2	28.672	94.947
Total		100.000

### 1-Allyl-2-oxo-3-(thiophen-2-yl)indolin-3-yl isobutyrate **S20**

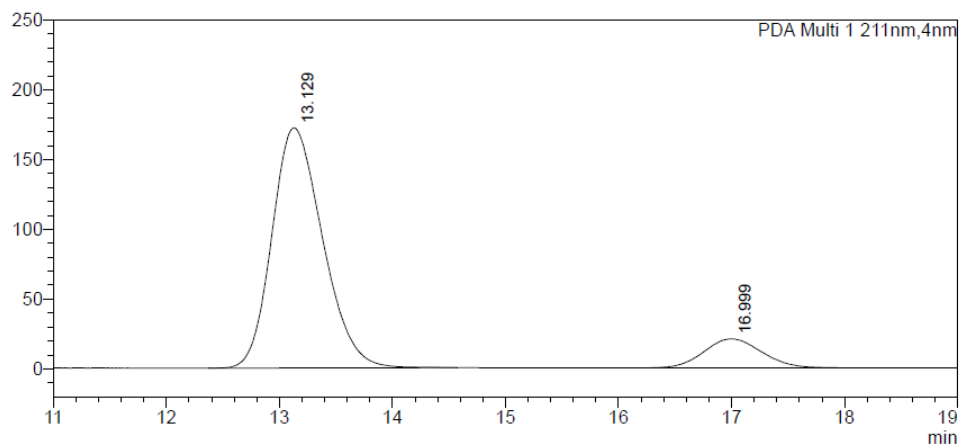


**HPLC data for S20:** Chiralcel OD-H (99:1 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 211 nm, 30 °C)  
t<sub>R</sub> (*R*): 13.1 min, t<sub>R</sub> (*S*): 17.0 min, 87.916:12.084 (*R*:*S*) er.



PDA Ch1 211nm

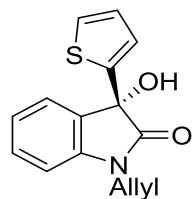
Peak#	Ret. Time	Area%
1	12.538	50.043
2	16.447	49.957
Total		100.000



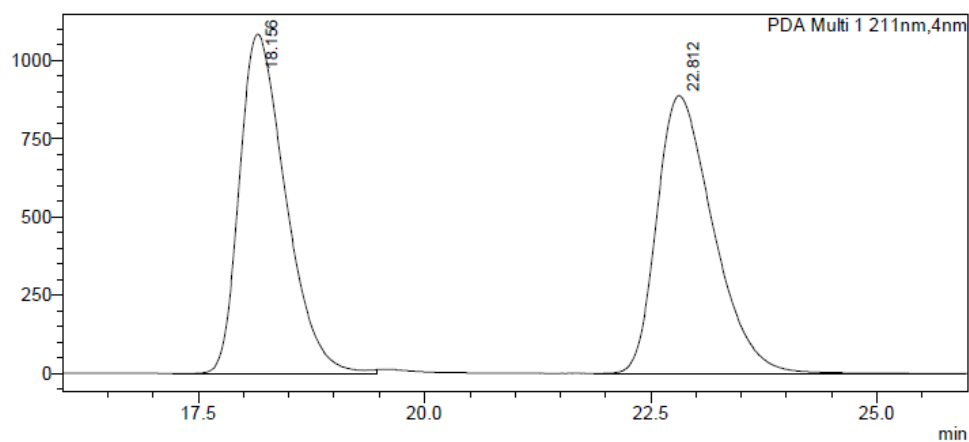
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	13.129	87.916
2	16.999	12.084
Total		100.000

1-Allyl-3-hydroxy-3-(thiophen-2-yl)indolin-2-one **24**

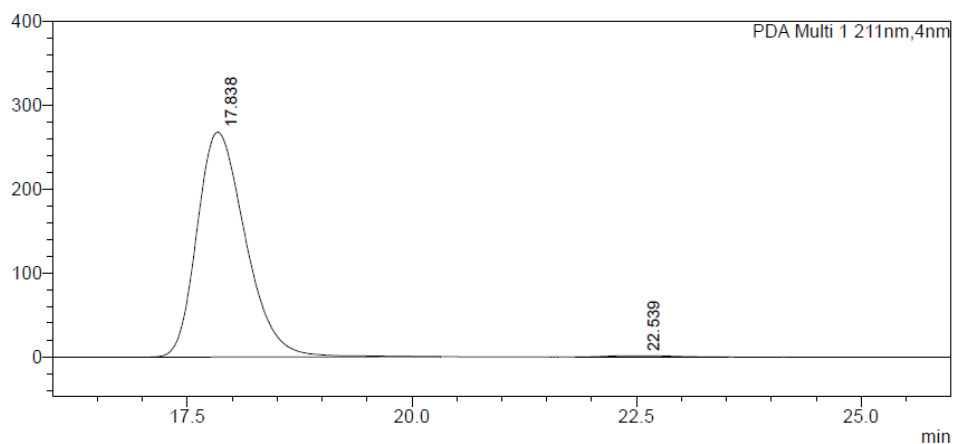


**HPLC data for 24:** Chiralcel OD-H (95:5 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 211 nm, 30 °C)  
 $t_R$  (S): 17.8 min,  $t_R$  (R): 22.5 min, 99.254:0.746 (S:R) er.



PDA Ch1 211nm

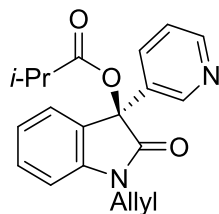
Peak#	Ret. Time	Area%
1	18.156	50.028
2	22.812	49.972
Total		100.000



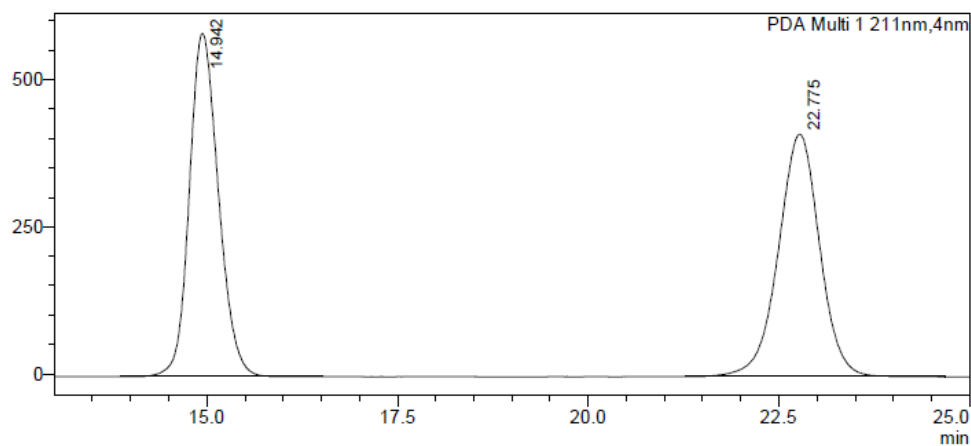
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	17.838	99.254
2	22.539	0.746
Total		100.000

1-Allyl-2-oxo-3-(pyridin-3-yl)indolin-3-yl isobutyrate **S21**

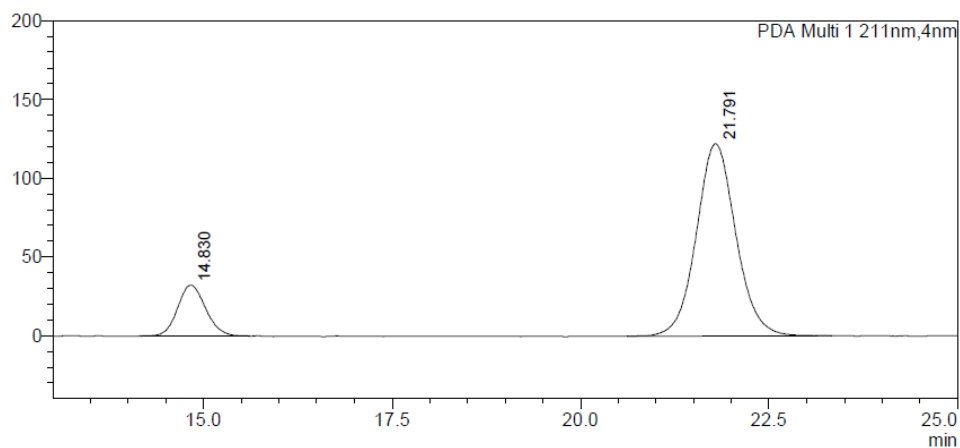


**HPLC data for S21:** Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C)  $t_R$  (R): 14.8 min,  $t_R$  (S): 21.8 min, 15.803:84.197 er.



PDA Ch1 211nm

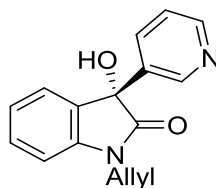
Peak#	Ret. Time	Area%
1	14.942	49.940
2	22.775	50.060
Total		100.000



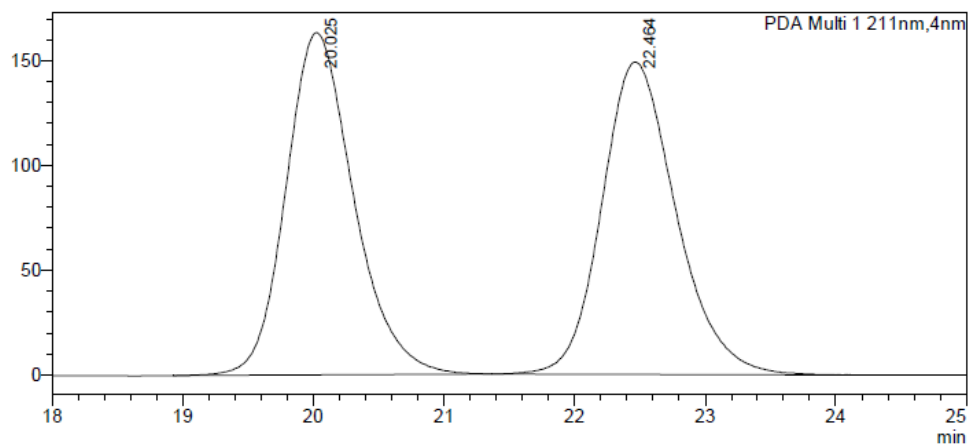
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	14.830	15.803
2	21.791	84.197
Total		100.000

1-Allyl-3-hydroxy-3-(pyridin-3-yl)indolin-2-one **25**

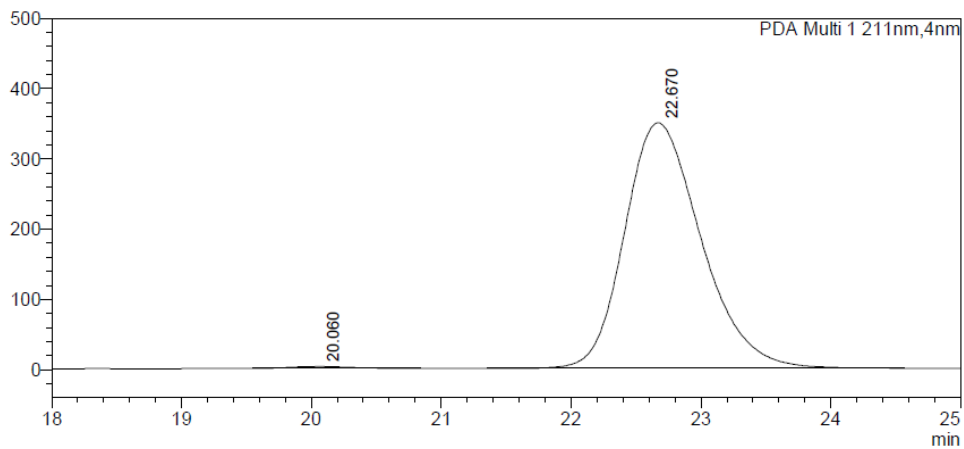


**HPLC data for 25:** Chiralpak AD-H (92:8 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C)  
t<sub>R</sub> (S): 20.1 min, t<sub>R</sub> (R): 22.7 min, 0.586:99.414 er.



PDA Ch1 211nm

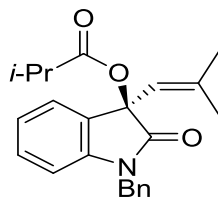
Peak#	Ret. Time	Area%
1	20.025	49.994
2	22.464	50.006
Total		100.000



PDA Ch1 211nm

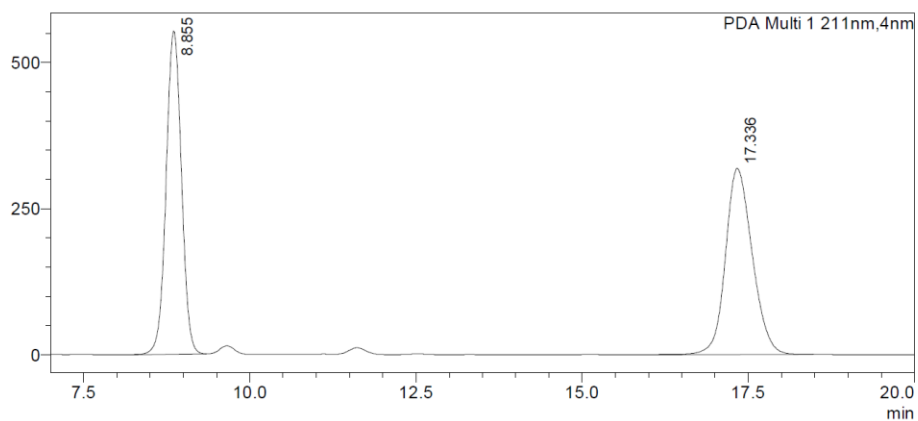
Peak#	Ret. Time	Area%
1	20.060	0.586
2	22.670	99.414
Total		100.000

1-Benzyl-3-(2-methylprop-1-en-1-yl)-2-oxoindolin-3-yl isobutyrate **S22**



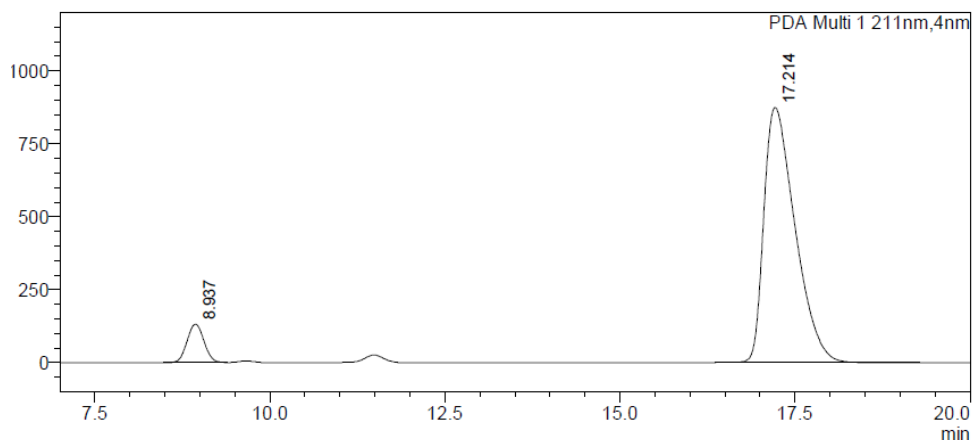
**HPLC data for S22:** Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 211 nm, 30 °C) t<sub>R</sub> (S): 8.9 min, t<sub>R</sub> (R): 17.2 min, 7.530:92.470 er.

mAU



<Peak Table>

Peak#	Ret. Time	Area%
1	8.855	49.837
2	17.336	50.163
Total		100.000

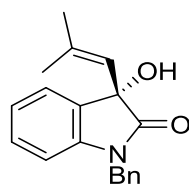


PDA Ch1 211nm

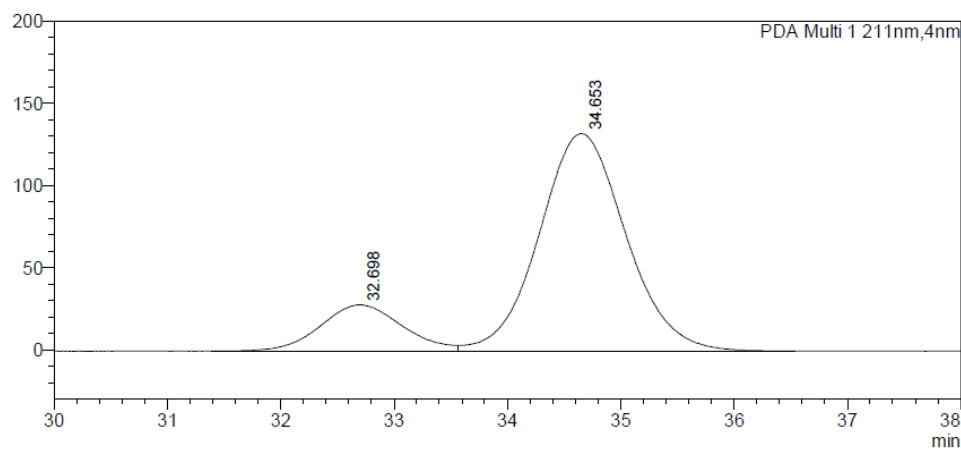
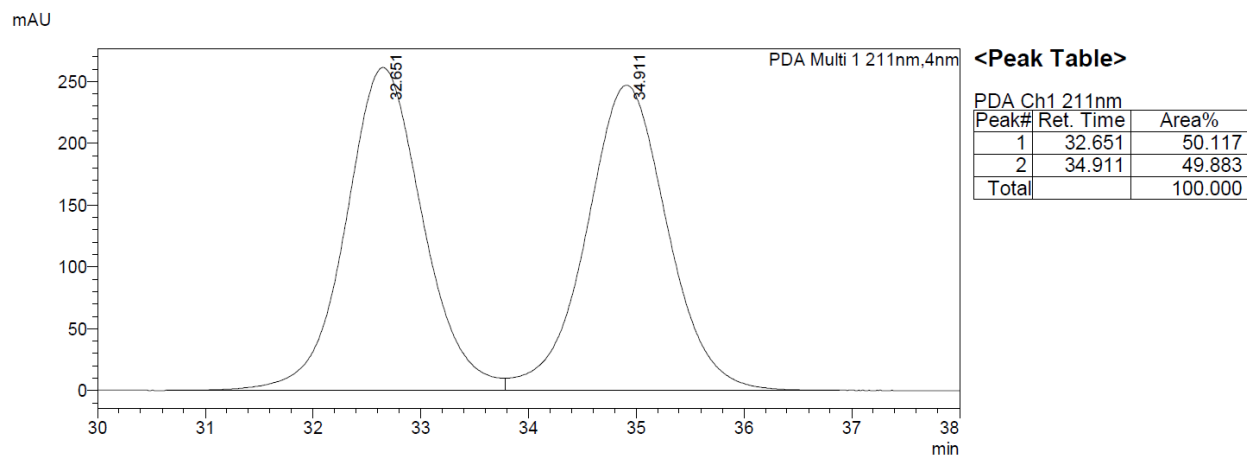
Peak#	Ret. Time	Area%
1	8.937	7.530
2	17.214	92.470
Total		100.000



1-Benzyl-3-hydroxy-3-(2-methylprop-1-en-1-yl)indolin-2-one **26**



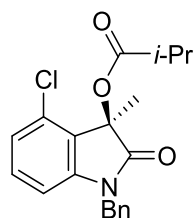
**HPLC data for 26:** Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 211 nm, 30 °C)  
t<sub>R</sub> (R): 32.7 min, t<sub>R</sub> (S): 34.7 min, 16.801:83.199 er.



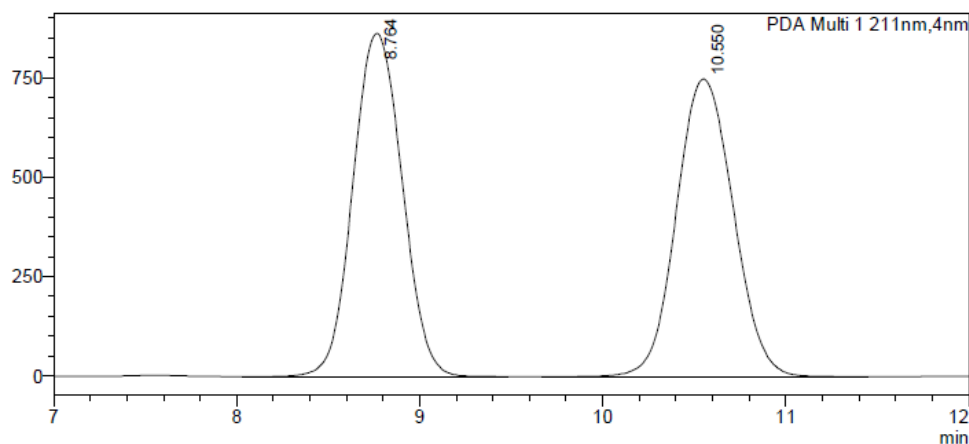
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	32.698	16.801
2	34.653	83.199
Total		100.000

1-Benzyl-4-chloro-3-methyl-2-oxoindolin-3-yl isobutyrate **S23**

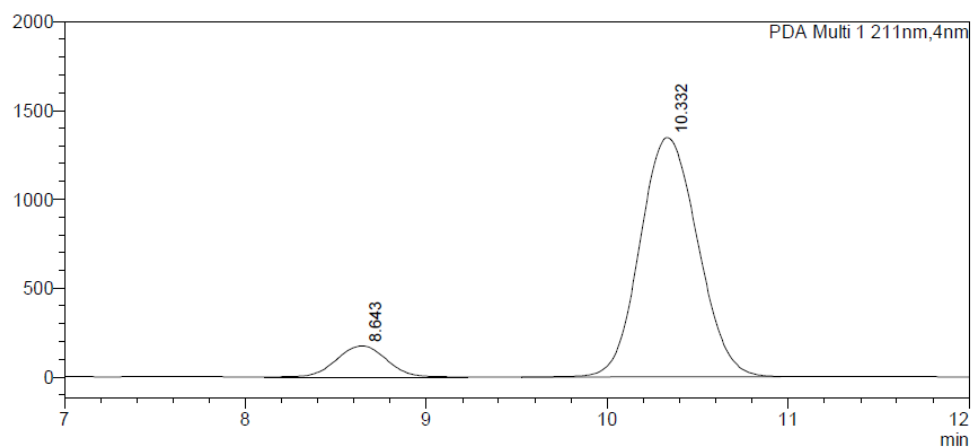


**HPLC data for S23:** Chiralpak AD-H (98:2 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (S): 8.6 min, t<sub>R</sub> (R): 10.3 min, 10.001:89.999 (S:R) er.



PDA Ch1 211nm

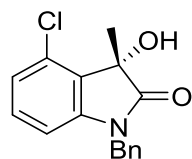
Peak#	Ret. Time	Area%
1	8.764	49.960
2	10.550	50.040
Total		100.000



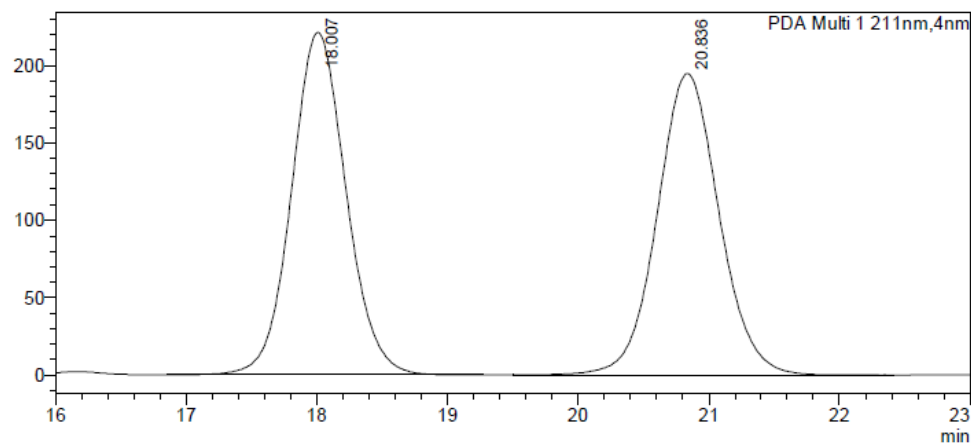
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	8.643	10.001
2	10.332	89.999
Total		100.000

1-Benzyl-4-chloro-3-hydroxy-3-methylindolin-2-one **27**

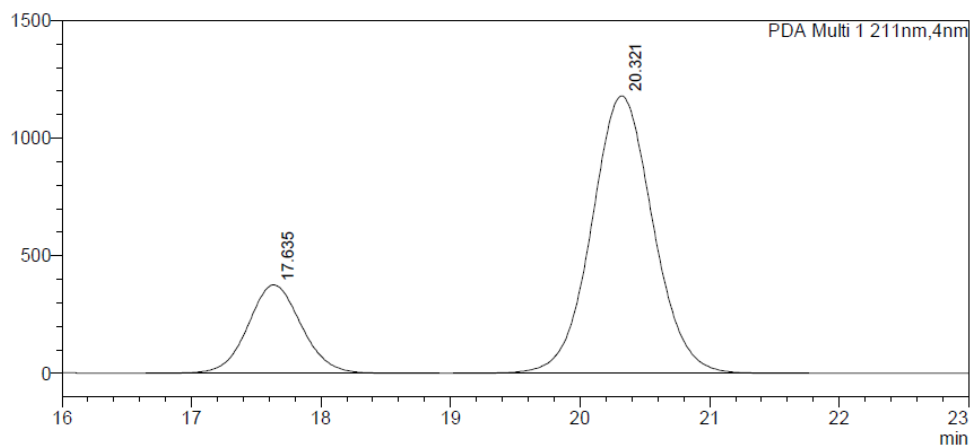


**HPLC data for 27:** Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C)  
t<sub>R</sub> (R): 17.6 min, t<sub>R</sub> (S): 20.3 min, 21.819:78.181 (R:S) er.



PDA Ch1 211nm

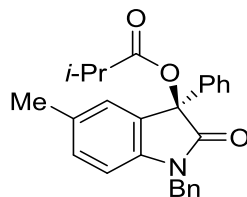
Peak#	Ret. Time	Area%
1	18.007	49.993
2	20.836	50.007
Total		100.000



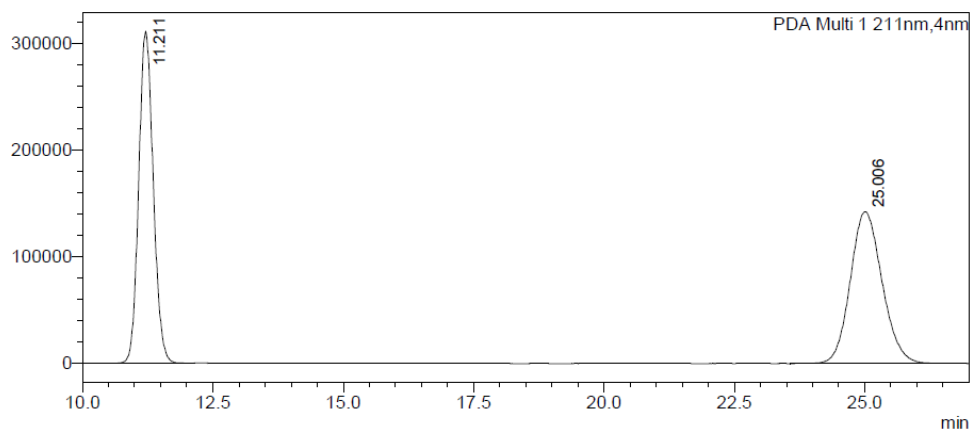
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	17.635	21.819
2	20.321	78.181
Total		100.000

1-Benzyl-5-methyl-2-oxo-3-phenylindolin-3-yl isobutyrate **S24**

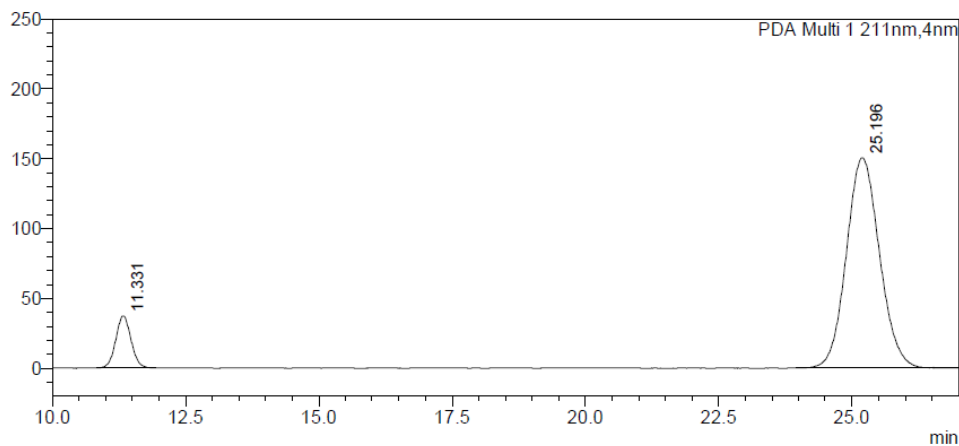


**HPLC data for S24:** Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (S): 11.3 min, t<sub>R</sub> (R): 25.2 min, 10.298:89.702 er.



PDA Ch1 211nm

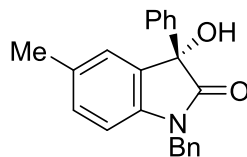
Peak#	Ret. Time	Area%
1	11.211	49.997
2	25.006	50.003
Total		100.000



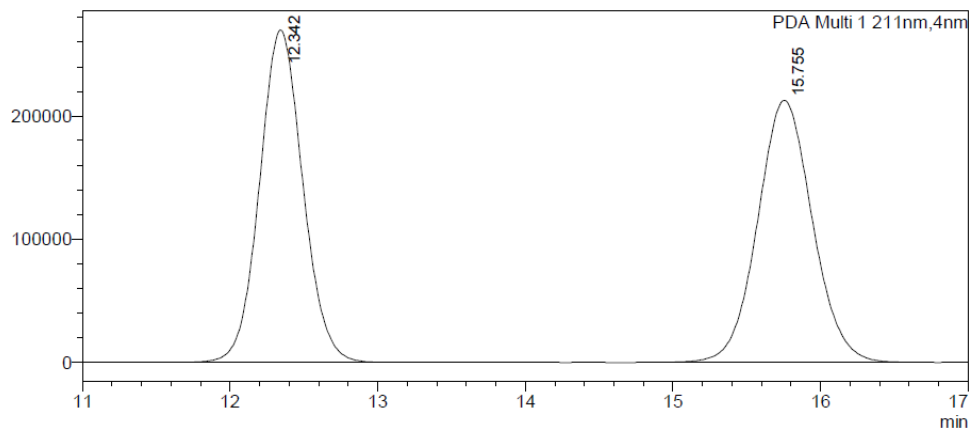
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	11.331	10.298
2	25.196	89.702
Total		100.000

1-Benzyl-3-hydroxy-5-methyl-3-phenylindolin-2-one **28**

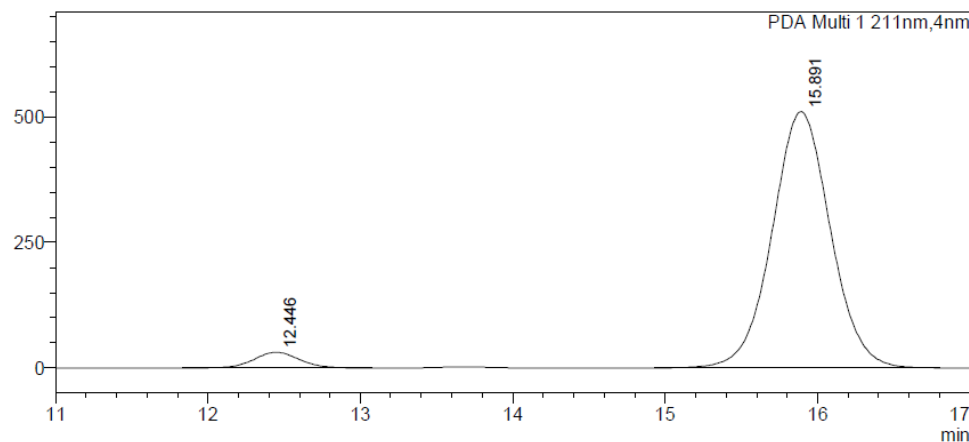


**HPLC data for 28:** Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) *t<sub>R</sub>* (*R*): 12.4 min, *t<sub>R</sub>* (*S*): 15.9 min, 4.610:95.390 (*R*:*S*) er.



PDA Ch1 211nm

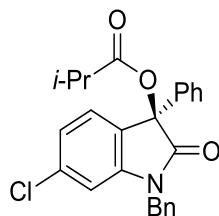
Peak#	Ret. Time	Area%
1	12.342	49.961
2	15.755	50.039
Total		100.000



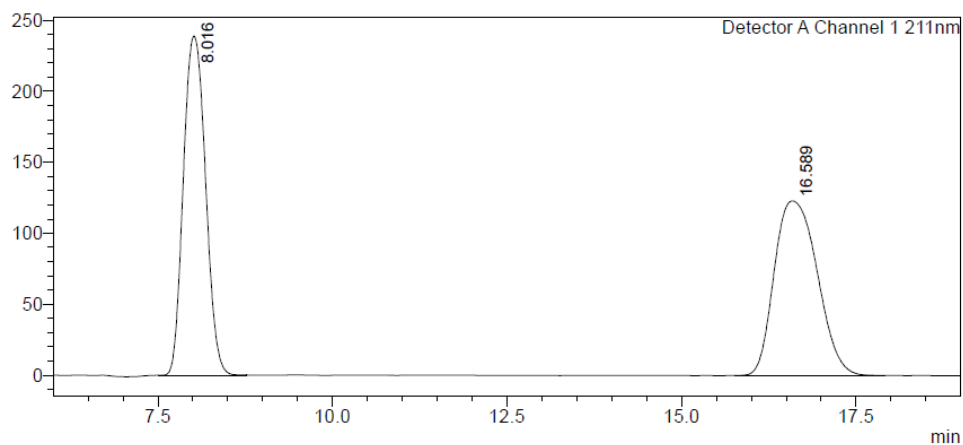
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	12.446	4.610
2	15.891	95.390
Total		100.000

1-Benzyl-6-chloro-2-oxo-3-phenylindolin-3-yl isobutyrate **S25**

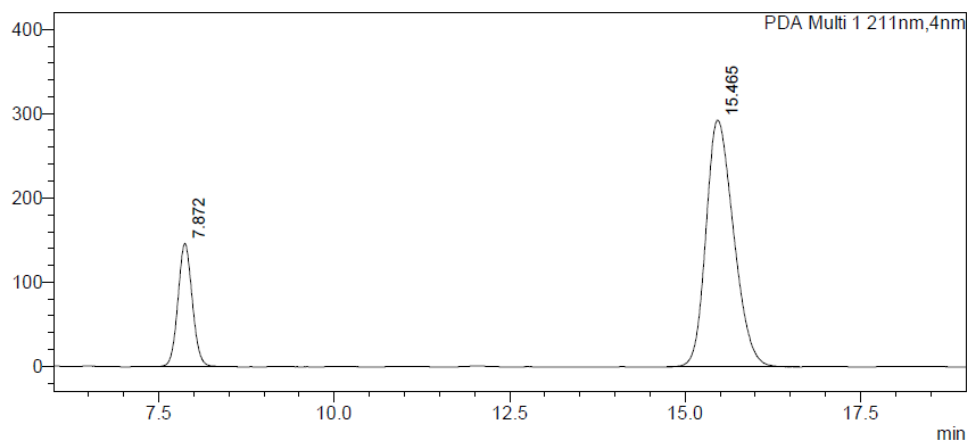


**HPLC data for S25:** Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (S): 7.9 min, t<sub>R</sub> (R): 15.5 min, 20.665:79.335 er.



Detector A Channel 1 211nm

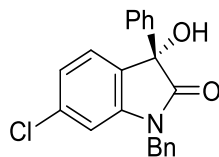
Peak#	Ret. Time	Area%
1	8.016	49.989
2	16.589	50.011
Total		100.000



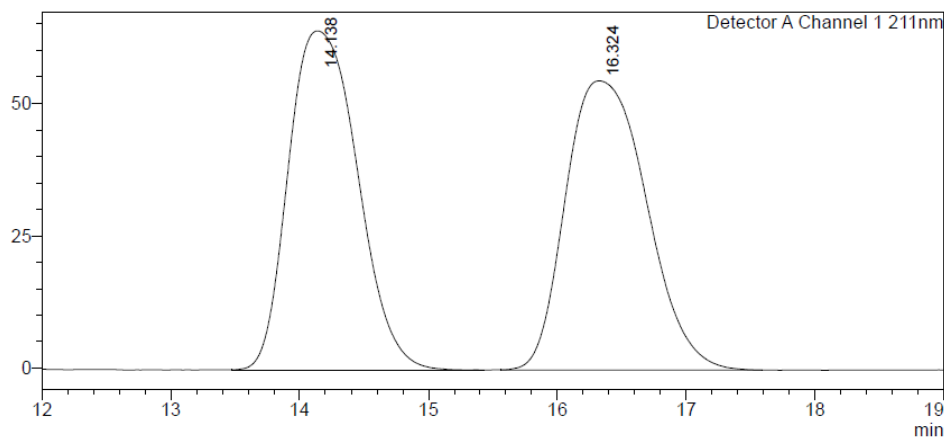
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	7.872	20.665
2	15.465	79.335
Total		100.000

1-Benzyl-6-chloro-3-hydroxy-3-phenylindolin-2-one **29**

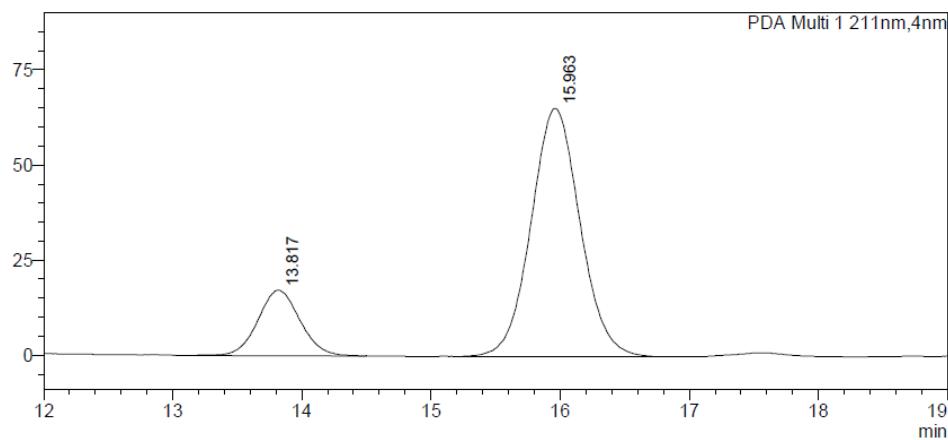


**HPLC data for 29:** Chiralpak AD-H (92:8 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C)  
 $t_R$  (R): 13.8 min,  $t_R$  (S): 15.9 min, 18.545:81.455 er.



Detector A Channel 1 211nm

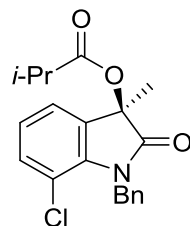
Peak#	Ret. Time	Area%
1	14.138	50.005
2	16.324	49.995
Total		100.000



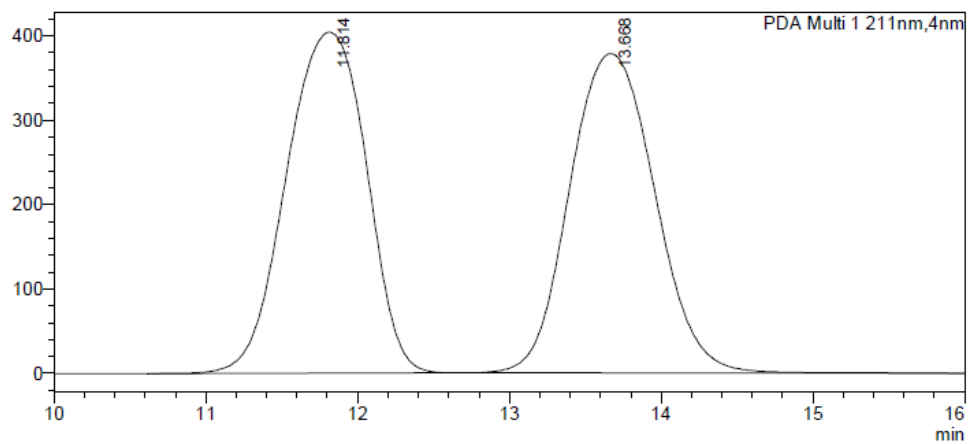
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	13.817	18.545
2	15.963	81.455
Total		100.000

1-Benzyl-7-chloro-3-methyl-2-oxindolin-3-yl isobutyrate **S26**

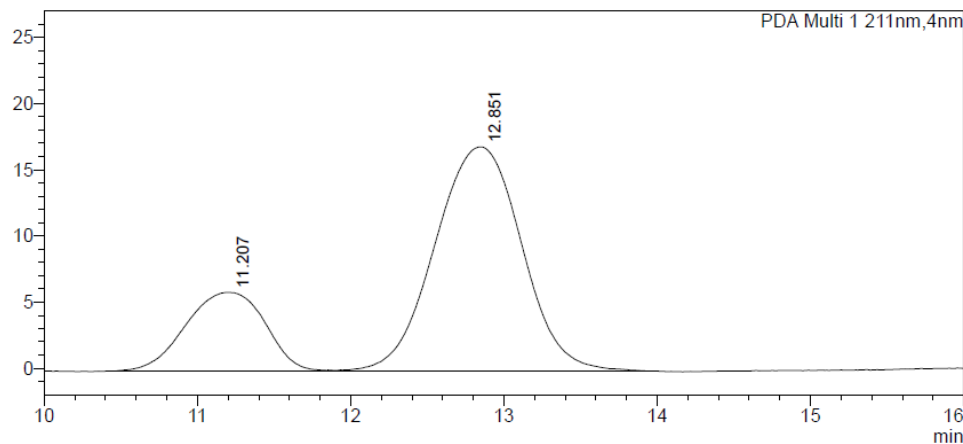


**HPLC data for S26:** Chiralpak AD-H (99:1 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 254 nm, 40 °C)  $t_R$  (S): 11.2 min,  $t_R$  (R): 12.9 min, 24.370:75.630 (S:R) er.



PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	11.814	50.011
2	13.668	49.989
Total		100.000

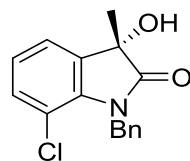


PDA Ch1 211nm

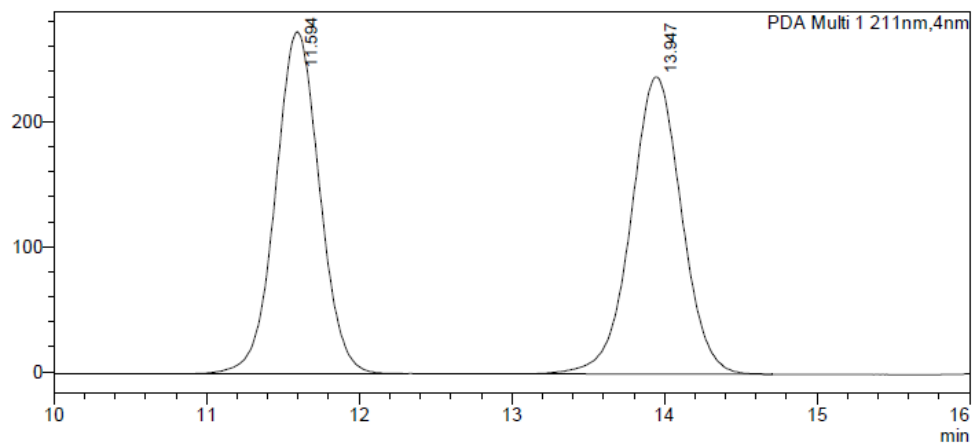
Peak#	Ret. Time	Area%
1	11.207	24.370
2	12.851	75.630
Total		100.000



1-Benzyl-7-chloro-3-hydroxy-3-methylindolin-2-one **30**

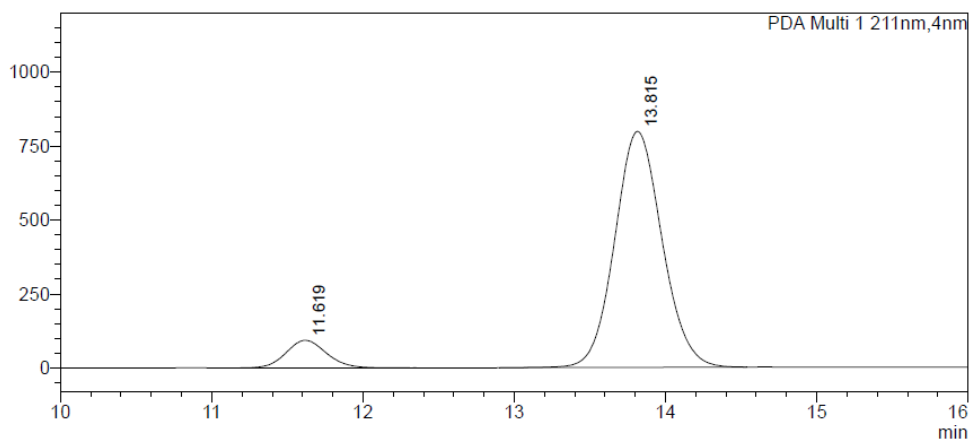


**HPLC data for 30:** Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C)  
t<sub>R</sub> (R): 11.6 min, t<sub>R</sub> (S): 13.8 min, 9.044:90.956 (R:S) er.



PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	11.594	50.003
2	13.947	49.997
Total		100.000

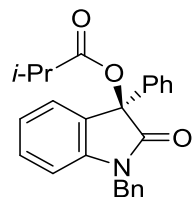


PDA Ch1 211nm

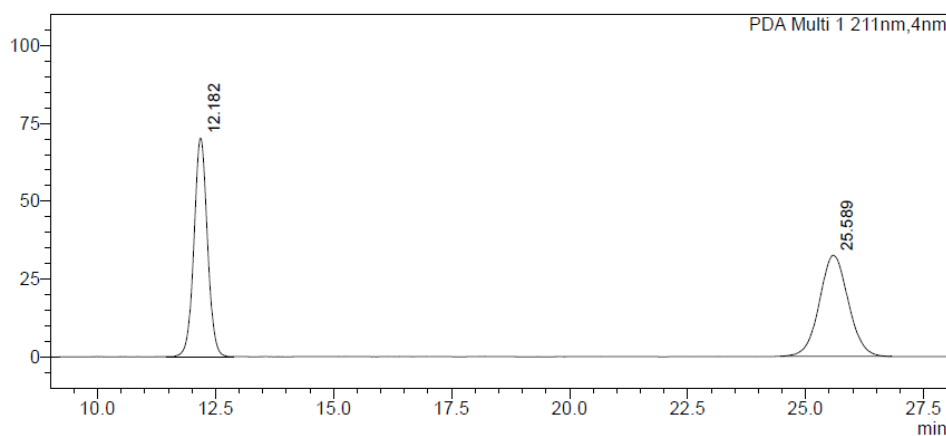
Peak#	Ret. Time	Area%
1	11.619	9.044
2	13.815	90.956
Total		100.000

## Recyclability of catalyst for the KR of tertiary heterocyclic alcohols

Cycle 1: 1-Benzyl-2-oxo-3-phenylindolin-3-yl isobutyrate **S15**

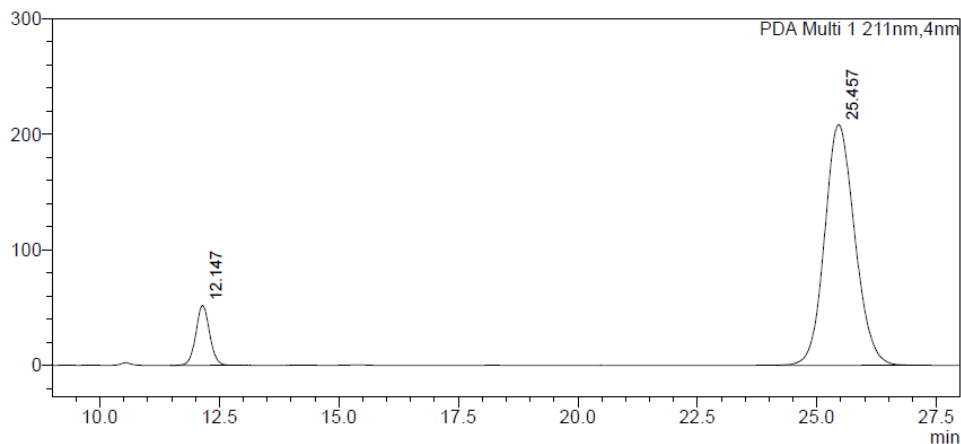


**HPLC data for S15:** Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.25 mL min<sup>-1</sup>, 211 nm, 40 °C)  $t_R$  (S): 12.1 min,  $t_R$  (R): 25.5 min, 10.228:89.772 er.



PDA Ch1 211nm

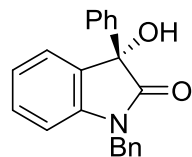
Peak#	Ret. Time	Area%
1	12.182	50.245
2	25.589	49.755
Total		100.000



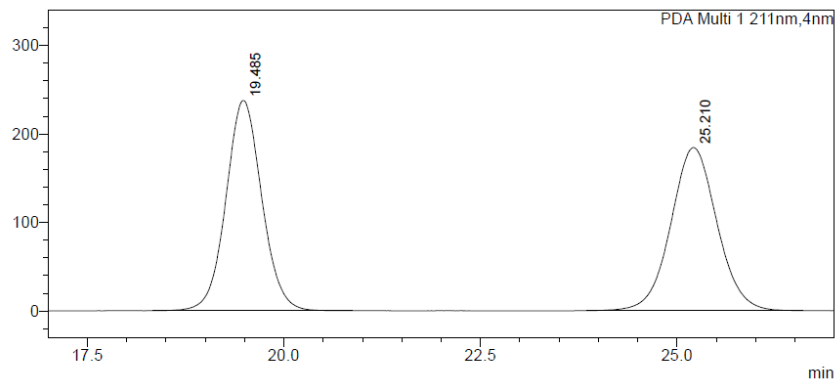
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	12.147	10.228
2	25.457	89.772
Total		100.000

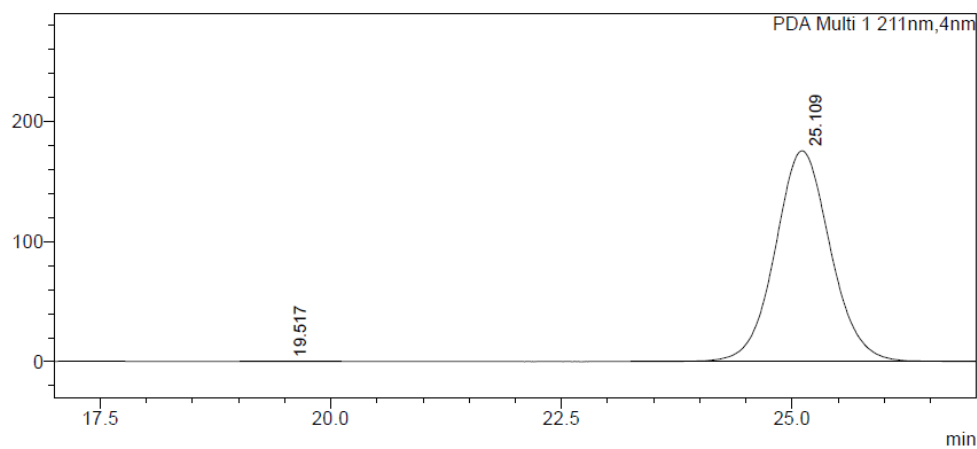
# 1-Benzyl-3-hydroxy-3-phenylindolin-2-one **19**



**HPLC data for 19:** Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.25 mL min<sup>-1</sup>, 211 nm, 40 °C) *t<sub>R</sub>* (*R*): 19.5 min, *t<sub>R</sub>* (*S*): 25.1 min, 0.088:99.912 er.



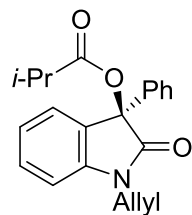
PDA Ch1 211nm		
Peak#	Ret. Time	Area%
1	19.485	50.059
2	25.210	49.941
Total		100.000



PDA Ch1 211nm		
Peak#	Ret. Time	Area%
1	19.517	0.088
2	25.109	99.912
Total		100.000

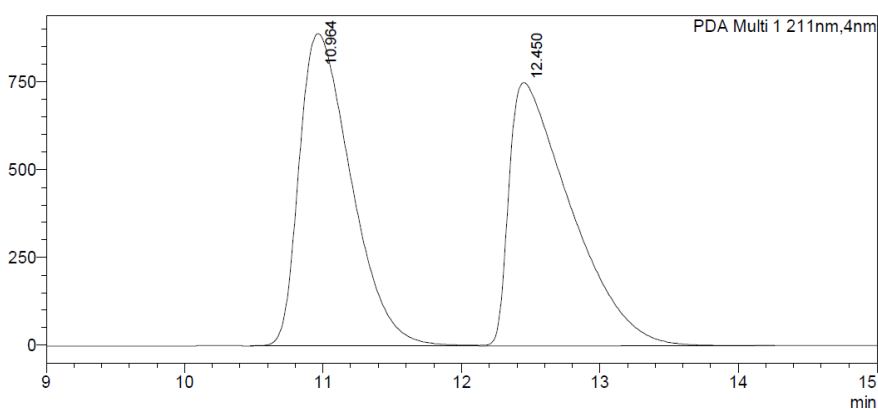
## Cycle 2:

### 1-Allyl-2-oxo-3-phenylindolin-3-yl isobutyrate **S16**



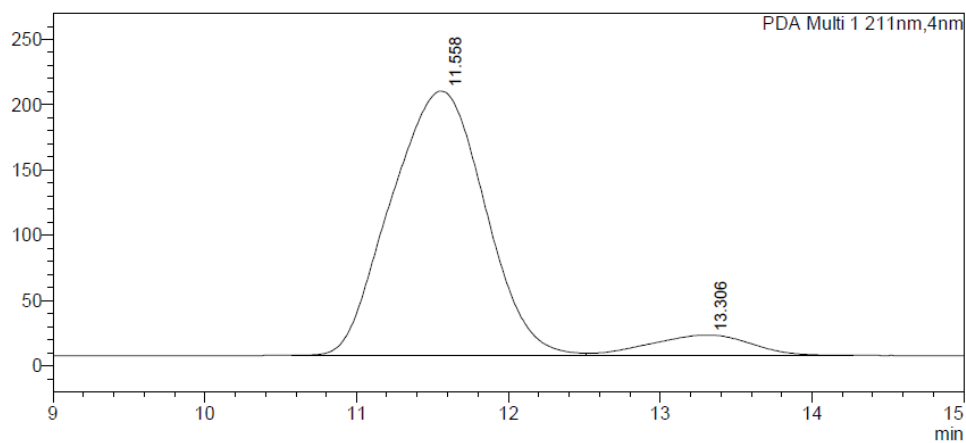
**HPLC data for S16:** Chiralcel OD-H (99:1 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 211 nm, 30 °C)  
 $t_R$  (*R*): 11.6 min,  $t_R$  (*S*): 13.6 min, 92.344:7.656 er.

mAU



<Peak Table>

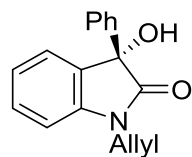
PDA Ch1 211nm		
Peak#	Ret. Time	Area%
1	10.964	49.832
2	12.450	50.168
Total		100.000



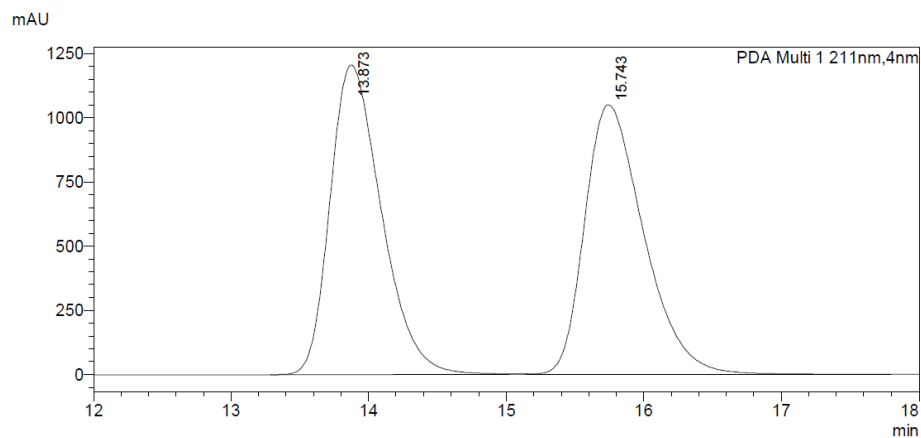
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	11.558	92.344
2	13.306	7.656
Total		100.000

1-Allyl-3-hydroxy-3-phenylindolin-2-one **20**

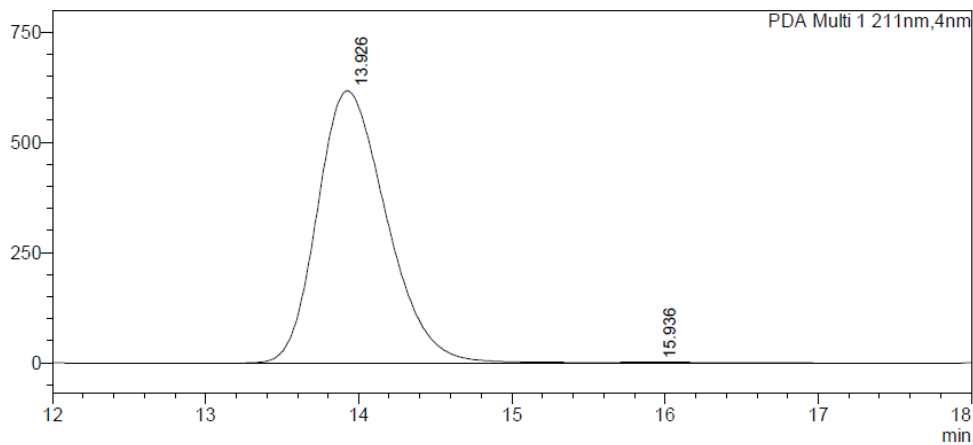


**HPLC data for 20:** Chiralcel OD-H (95:5 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 211 nm, 30 °C)  
 $t_R$  (S): 13.9 min,  $t_R$  (R): 15.9 min, 99.852:0.148 er.



<Peak Table>

Peak#	Ret. Time	Area%
1	13.873	49.924
2	15.743	50.076
Total		100.000

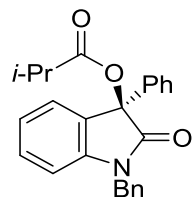


PDA Ch1 211nm

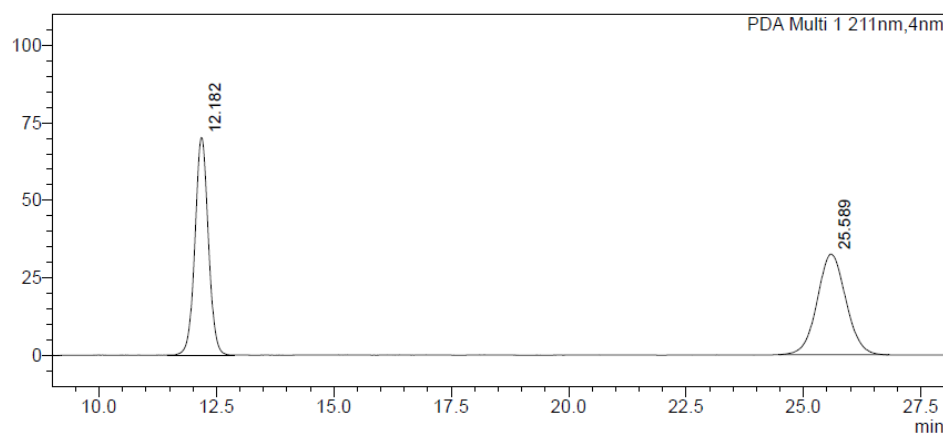
Peak#	Ret. Time	Area%
1	13.926	99.852
2	15.936	0.148
Total		100.000

### Cycle 3:

#### 1-Benzyl-2-oxo-3-phenylindolin-3-yl isobutyrate **S15**

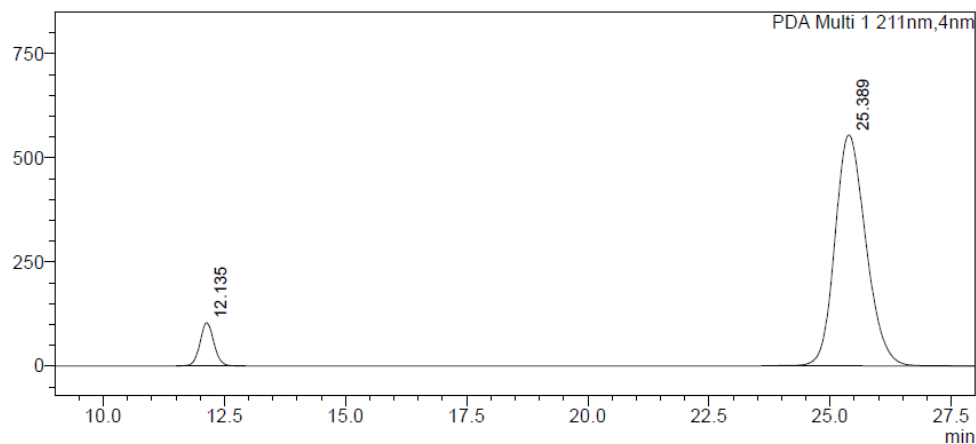


**HPLC data for S15:** Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.25 mL min<sup>-1</sup>, 211 nm, 40 °C)  $t_R$  (S): 12.1 min,  $t_R$  (R): 25.4 min, 7.797:92.203 (S:R) er.



PDA Ch1 211nm

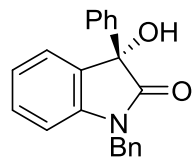
Peak#	Ret. Time	Area%
1	12.182	50.245
2	25.589	49.755
Total		100.000



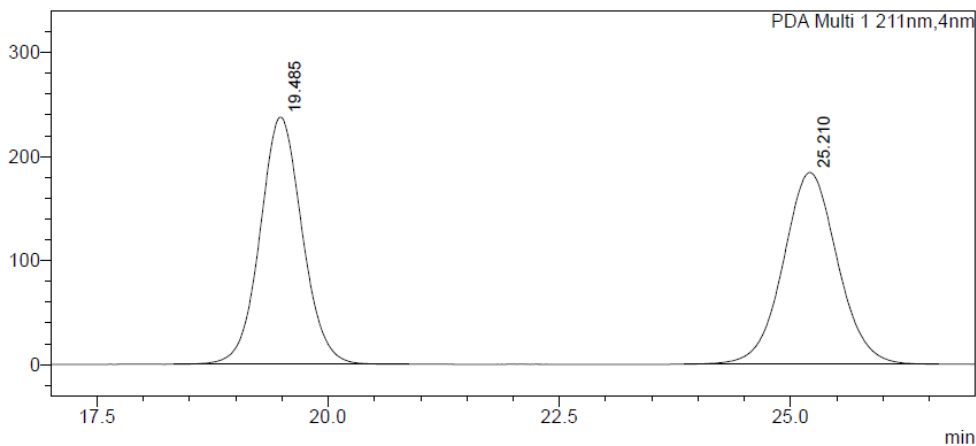
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	12.135	7.797
2	25.389	92.203
Total		100.000

1-Benzyl-3-hydroxy-3-phenylindolin-2-one **19**

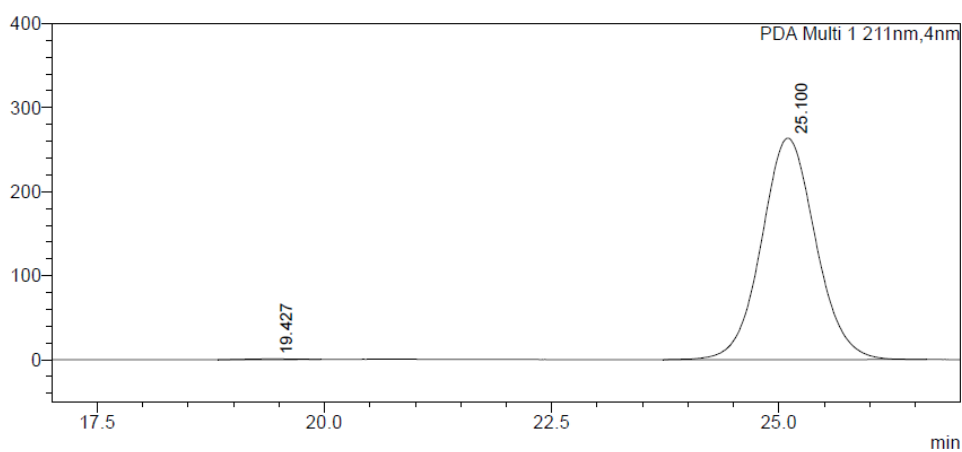


**HPLC data for 19:** Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.25 mL min<sup>-1</sup>, 211 nm, 40 °C) *t<sub>R</sub>* (*R*): 19.4 min, *t<sub>R</sub>* (*S*): 25.1 min, 0.276:99.724 er.



PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	19.485	50.059
2	25.210	49.941
Total		100.000

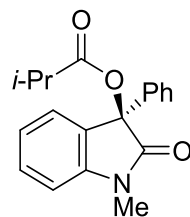


PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	19.427	0.276
2	25.100	99.724
Total		100.000

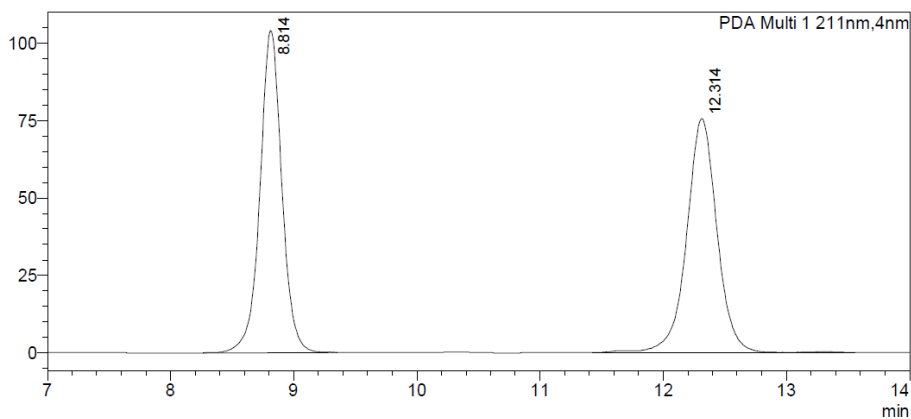
### Cycle 4:

### 1-Methyl-2-oxo-3-phenylindolin-3-yl isobutyrate **S17**



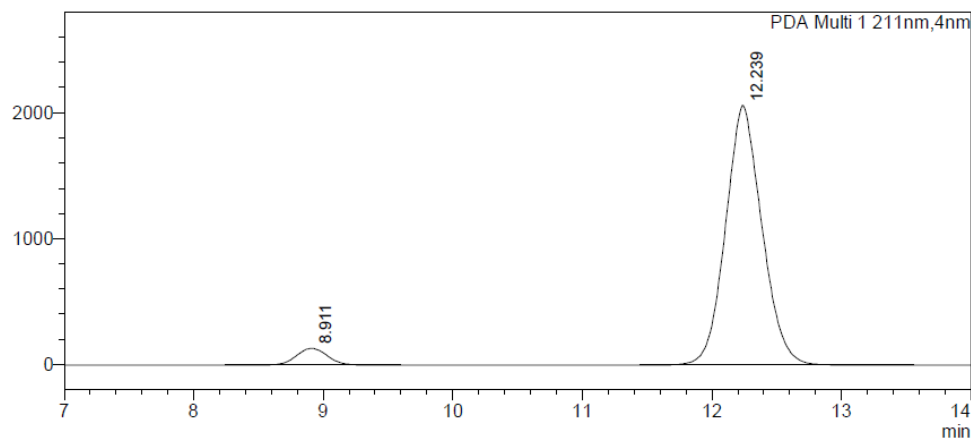
**HPLC data for S17:** Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 211 nm, 30 °C) *t<sub>R</sub>* (S): 8.9 min, *t<sub>R</sub>* (R): 12.2 min, 5.178:94.822 er.

mAU



#### <Peak Table>

Peak#	Ret. Time	Area%
1	8.814	49.600
2	12.314	50.400
Total		100.000

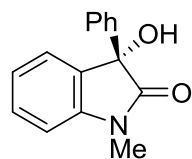


PDA Ch1 211nm

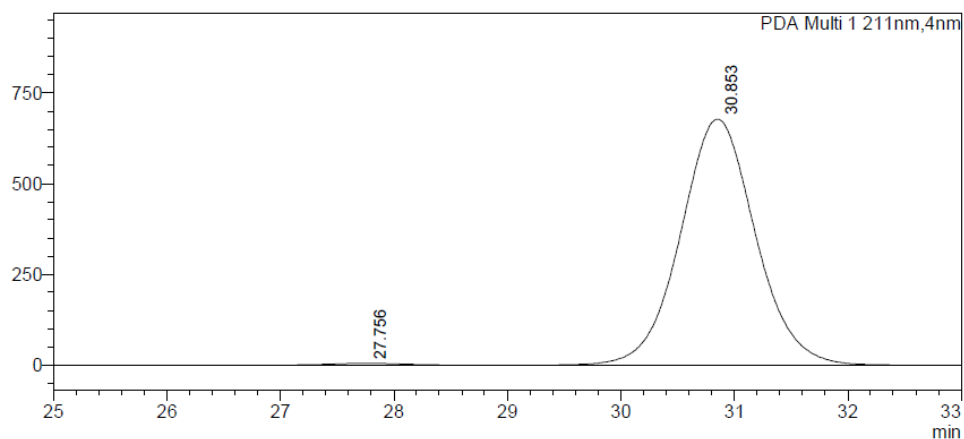
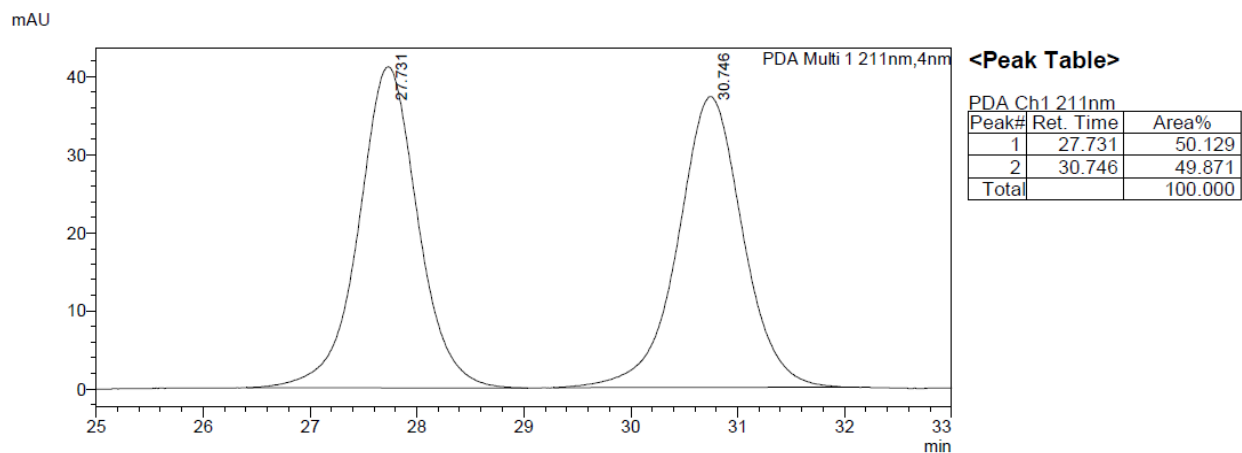
Peak#	Ret. Time	Area%
1	8.911	5.178
2	12.239	94.822
Total		100.000



### 3-Hydroxy-1-methyl-3-phenylindolin-2-one **21**



**HPLC data for 21:** Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 211 nm, 30 °C)  
 $t_R$  (*R*): 27.8 min,  $t_R$  (*S*): 30.9 min, 0.718:99.282 er.

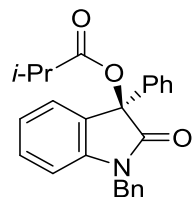


PDA Ch1 211nm

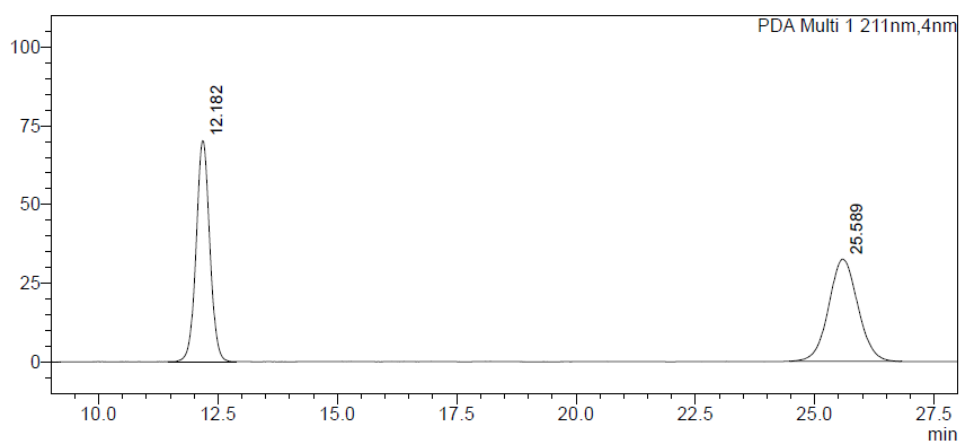
Peak#	Ret. Time	Area%
1	27.756	0.718
2	30.853	99.282
Total		100.000

### Cycle 5:

#### 1-Benzyl-2-oxo-3-phenylindolin-3-yl isobutyrate **S15**

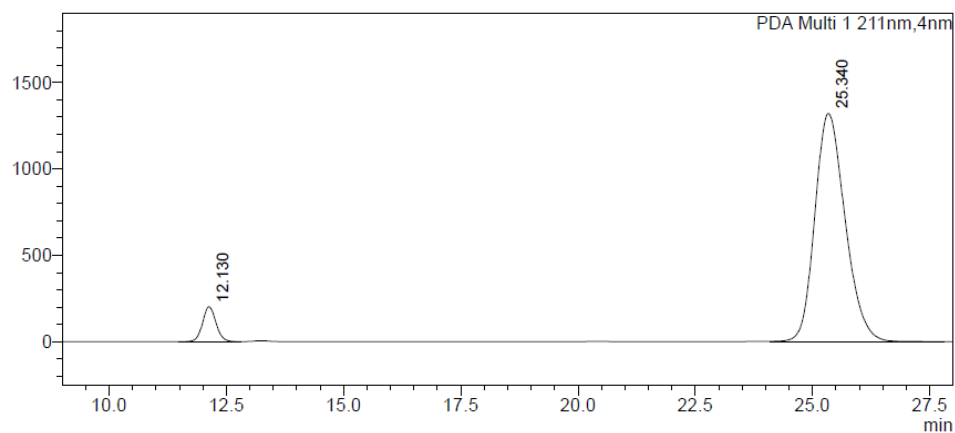


**HPLC data for S15:** Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.25 mL min<sup>-1</sup>, 211 nm, 40 °C)  $t_R$  (S): 12.1 min,  $t_R$  (R): 25.3 min, 6.376:93.624 er.



PDA Ch1 211nm

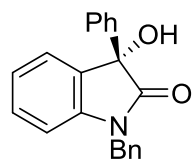
Peak#	Ret. Time	Area%
1	12.182	50.245
2	25.589	49.755
Total		100.000



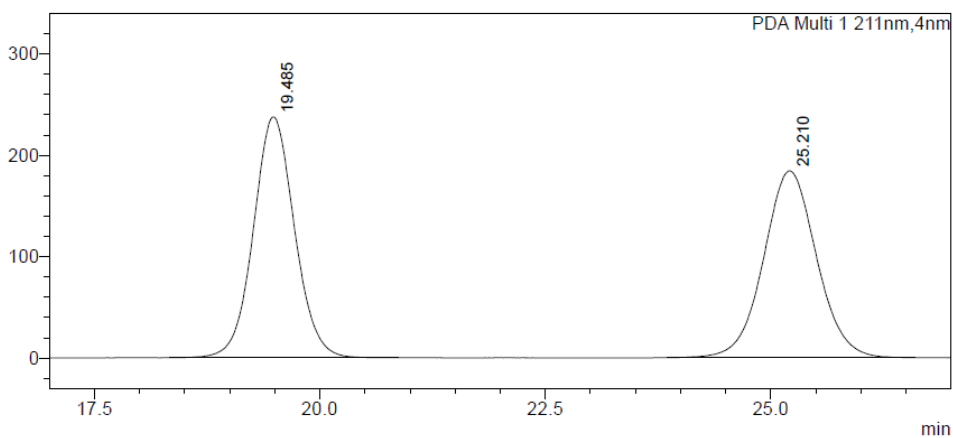
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	12.130	6.376
2	25.340	93.624
Total		100.000

### 1-Benzyl-3-hydroxy-3-phenylindolin-2-one **19**

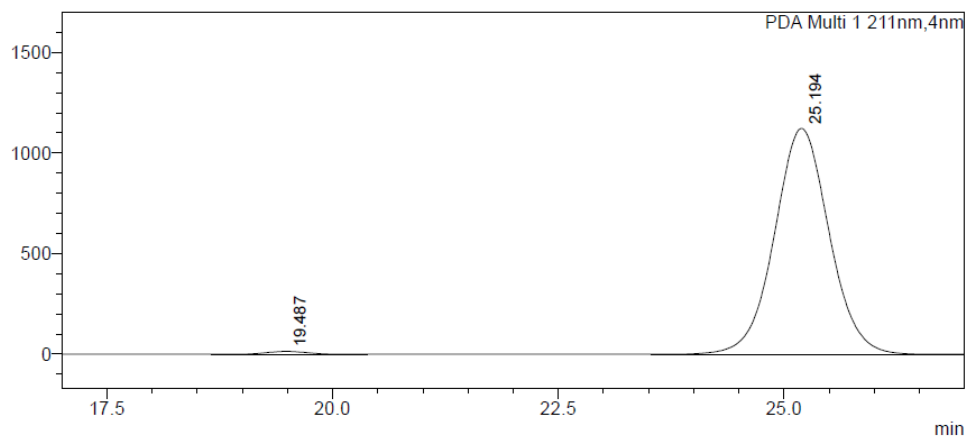


**HPLC data for 19:** Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.25 mL min<sup>-1</sup>, 211 nm, 40 °C)  $t_R$  (*R*): 19.5 min,  $t_R$  (*S*): 25.2 min, 0.983:99.017 (*R*:*S*) er.



PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	19.485	50.059
2	25.210	49.941
Total		100.000

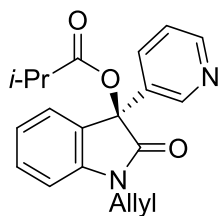


PDA Ch1 211nm

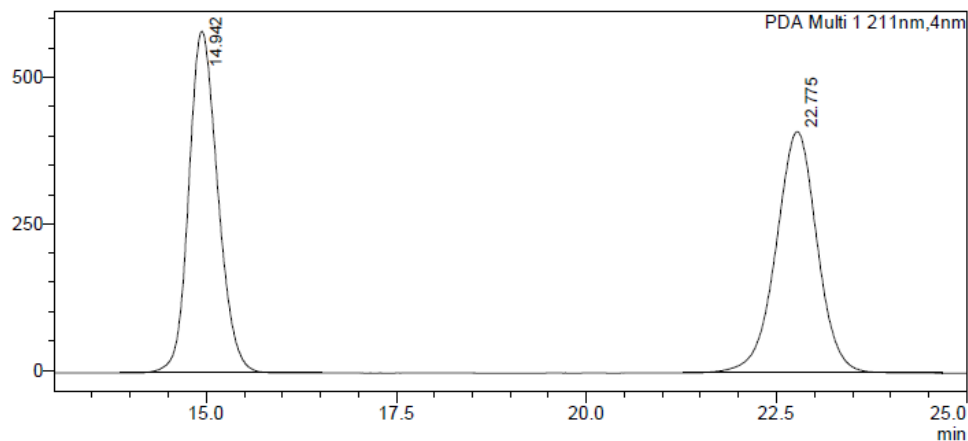
Peak#	Ret. Time	Area%
1	19.487	0.983
2	25.194	99.017
Total		100.000

### Cycle 6:

1-Allyl-2-oxo-3-(pyridin-3-yl)indolin-3-yl isobutyrate **S21**

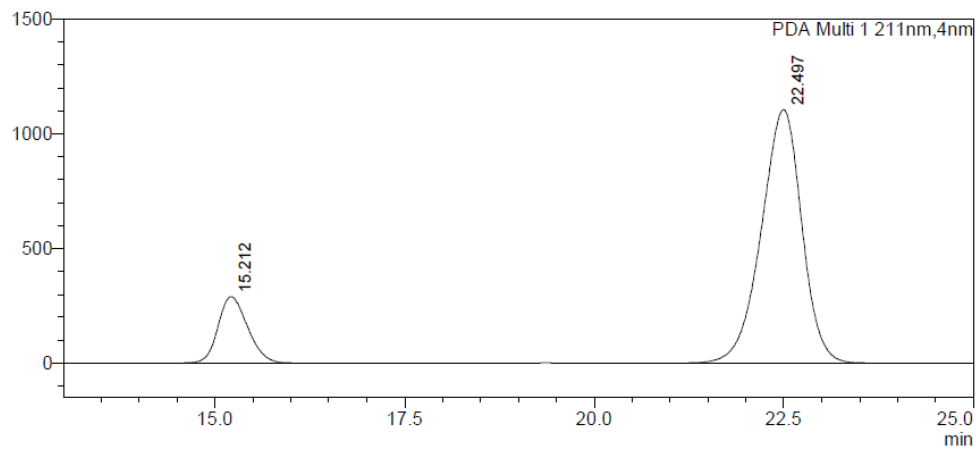


**HPLC data for S21:** Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C)  $t_R$  (R): 15.2 min,  $t_R$  (S): 22.5 min, 16.134:83.866 er.



PDA Ch1 211nm

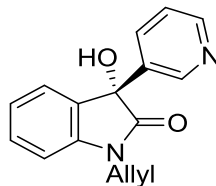
Peak#	Ret. Time	Area%
1	14.942	49.940
2	22.775	50.060
Total		100.000



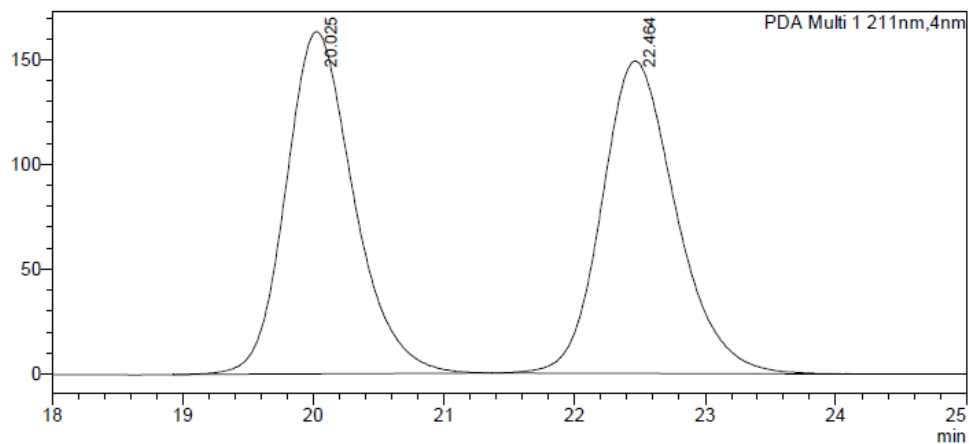
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	15.212	16.134
2	22.497	83.866
Total		100.000

1-Allyl-3-hydroxy-3-(pyridin-3-yl)indolin-2-one **25**

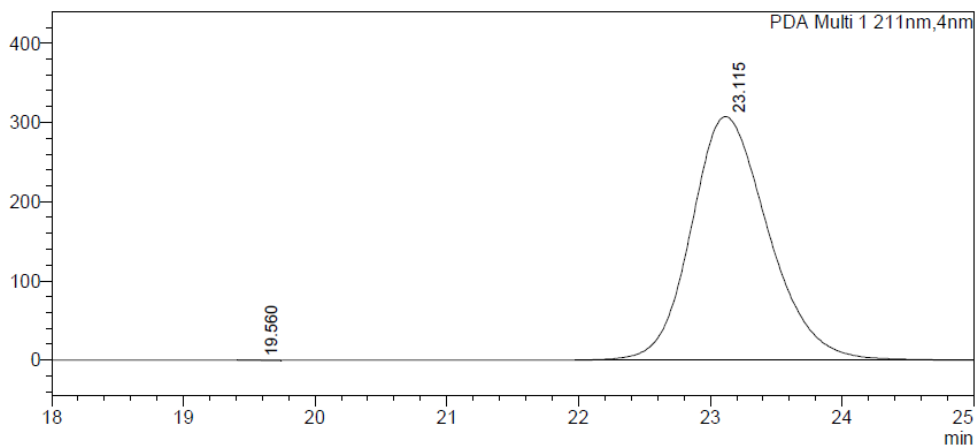


**HPLC data for 25:** Chiralpak AD-H (92:8 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C)  
t<sub>R</sub> (S): 20.1 min, t<sub>R</sub> (R): 22.7 min, 0.010:99.990 er.



PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	20.025	49.994
2	22.464	50.006
Total		100.000

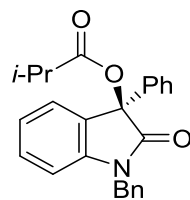


PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	19.560	0.010
2	23.115	99.990
Total		100.000

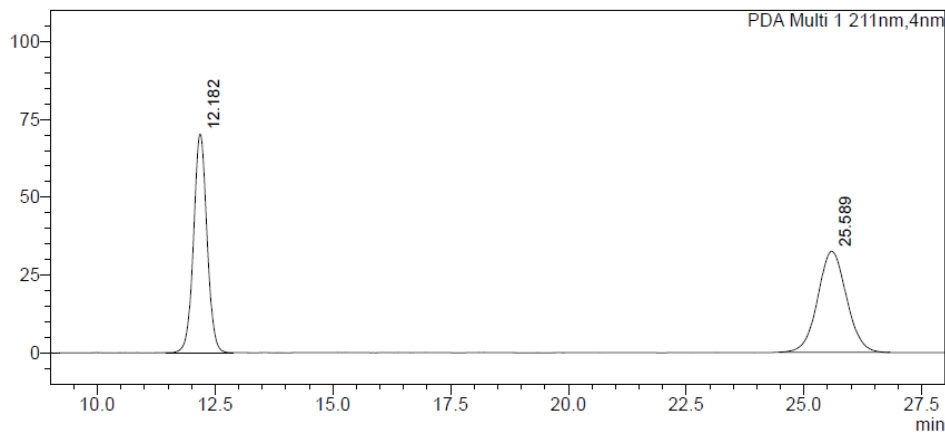
### Cycle 7:

1-Benzyl-2-oxo-3-phenylindolin-3-yl isobutyrate **S15**



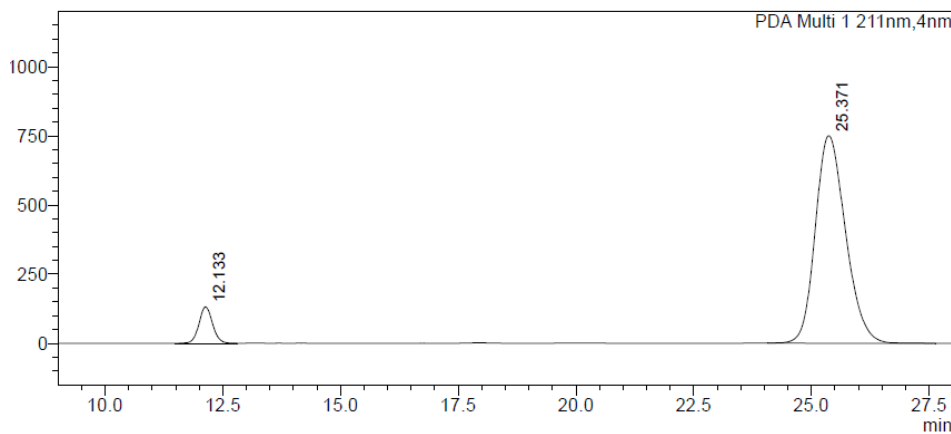
S182

**HPLC data for S15:** Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.25 mL min<sup>-1</sup>, 211 nm, 40 °C) *t<sub>R</sub>* (S): 12.1 min, *t<sub>R</sub>* (R): 25.4 min, 7.315:92.685 er.



PDA Ch1 211nm

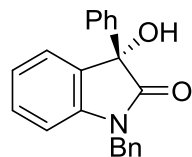
Peak#	Ret. Time	Area%
1	12.182	50.245
2	25.589	49.755
Total		100.000



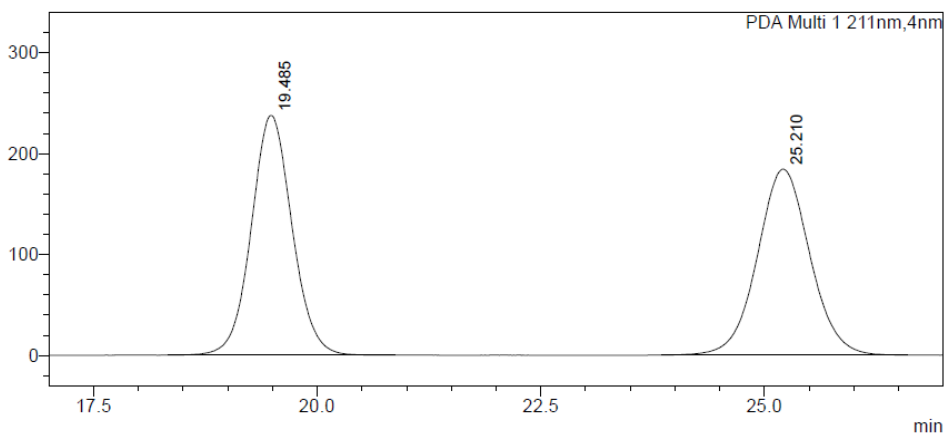
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	12.133	7.315
2	25.371	92.685
Total		100.000

1-Benzyl-3-hydroxy-3-phenylindolin-2-one **19**

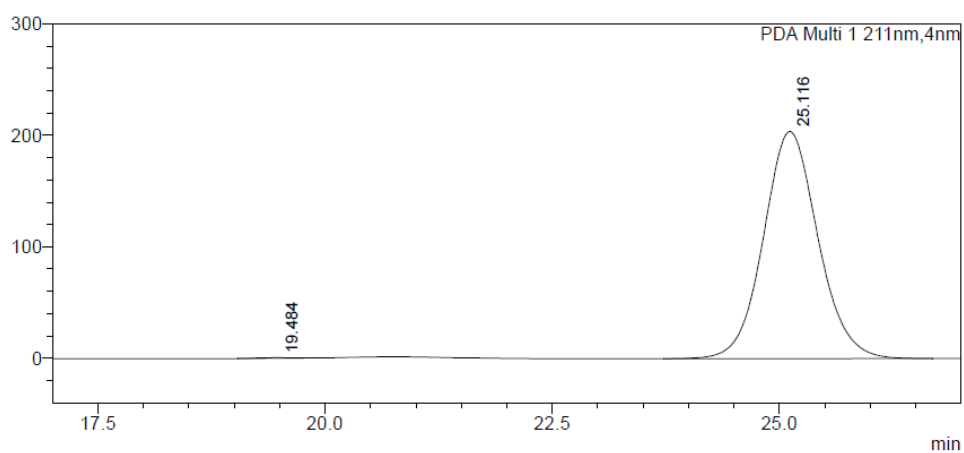


**HPLC data for 19:** Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.25 mL min<sup>-1</sup>, 211 nm, 40 °C) *t<sub>R</sub>* (R): 19.5 min, *t<sub>R</sub>* (S): 25.1 min, 0.151:99.849 er.



PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	19.485	50.059
2	25.210	49.941
Total		100.000

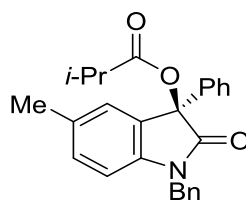


PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	19.484	0.151
2	25.116	99.849
Total		100.000

### Cycle 8:

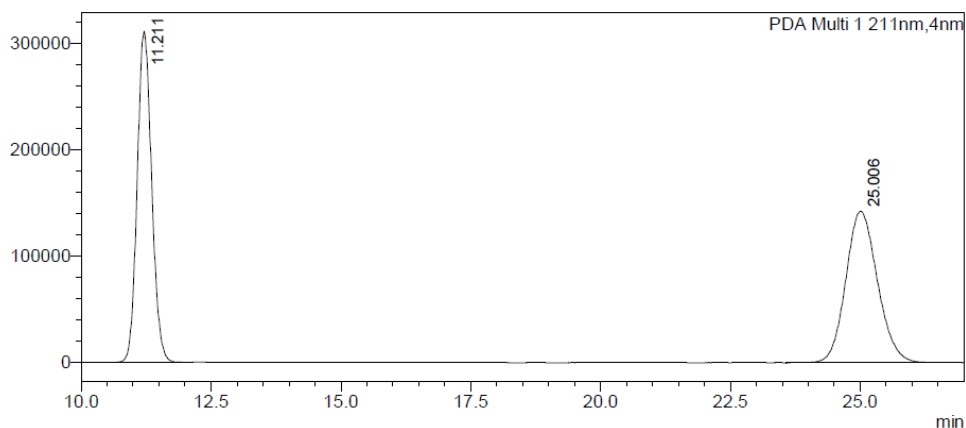
1-Benzyl-5-methyl-2-oxo-3-phenylindolin-3-yl isobutyrate **S24**



S184

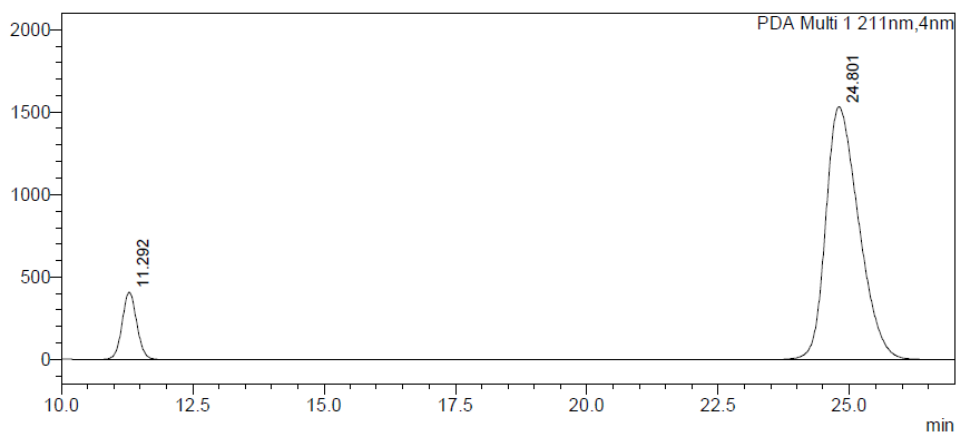


**HPLC data for S24:** Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) *t<sub>R</sub>* (S): 11.3 min, *t<sub>R</sub>* (R): 24.8 min, 10.583:89.417 er.



PDA Ch1 211nm

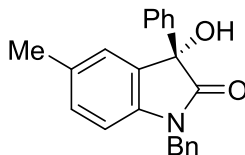
Peak#	Ret. Time	Area%
1	11.211	49.997
2	25.006	50.003
Total		100.000



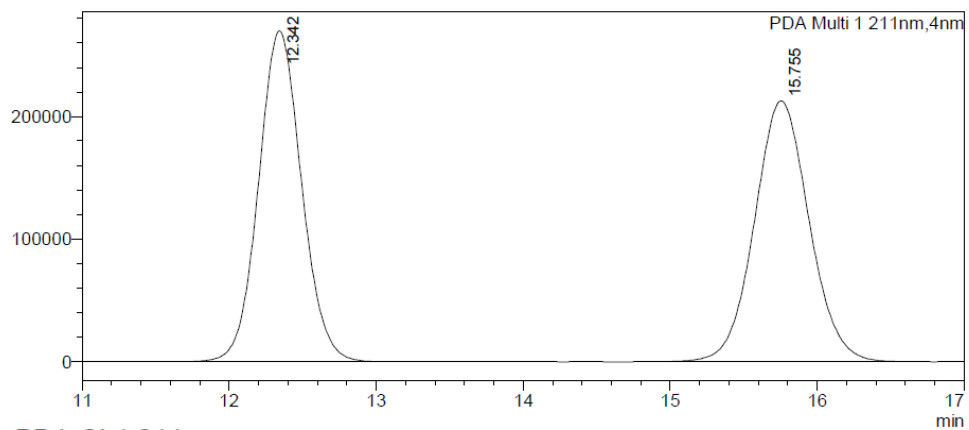
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	11.292	10.583
2	24.801	89.417
Total		100.000

1-Benzyl-3-hydroxy-5-methyl-3-phenylindolin-2-one **28**

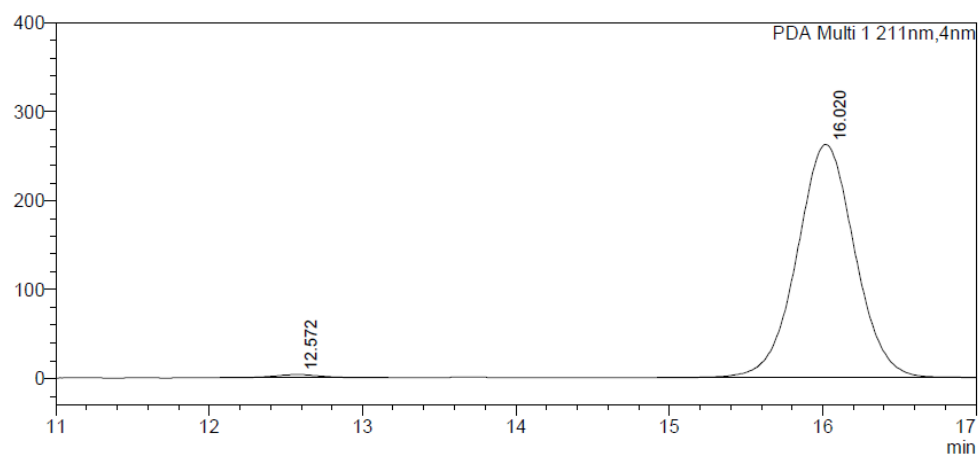


**HPLC data for 28:** Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) *t<sub>R</sub>* (R): 12.4 min, *t<sub>R</sub>* (S): 15.9 min, 1.127:98.873 er.



PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	12.342	49.961
2	15.755	50.039
Total		100.000

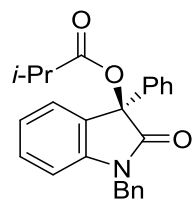


PDA Ch1 211nm

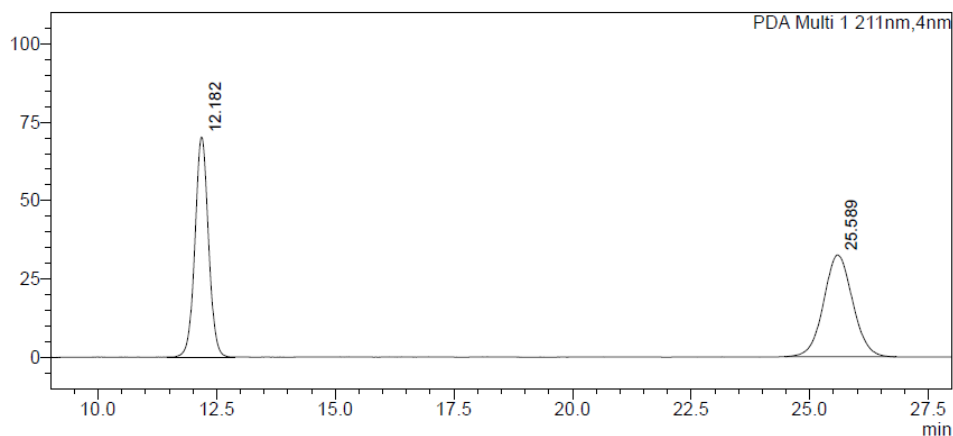
Peak#	Ret. Time	Area%
1	12.572	1.127
2	16.020	98.873
Total		100.000

**Cycle 9:**

1-Benzyl-2-oxo-3-phenylindolin-3-yl isobutyrate **S15**

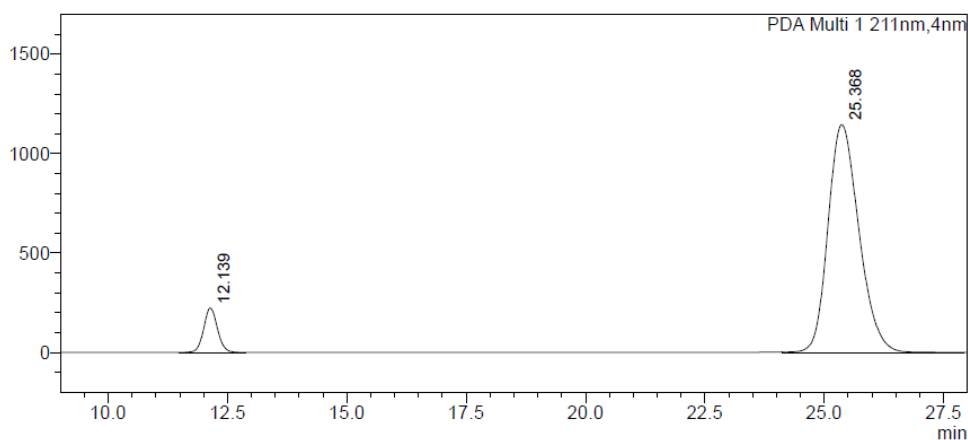


**HPLC data for S15:** Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.25 mL min<sup>-1</sup>, 211 nm, 40 °C)  $t_R$  (S): 12.1 min,  $t_R$  (R): 25.4 min, 7.964:92.036 er.



PDA Ch1 211nm

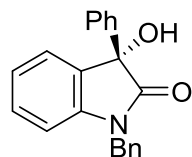
Peak#	Ret. Time	Area%
1	12.182	50.245
2	25.589	49.755
Total		100.000



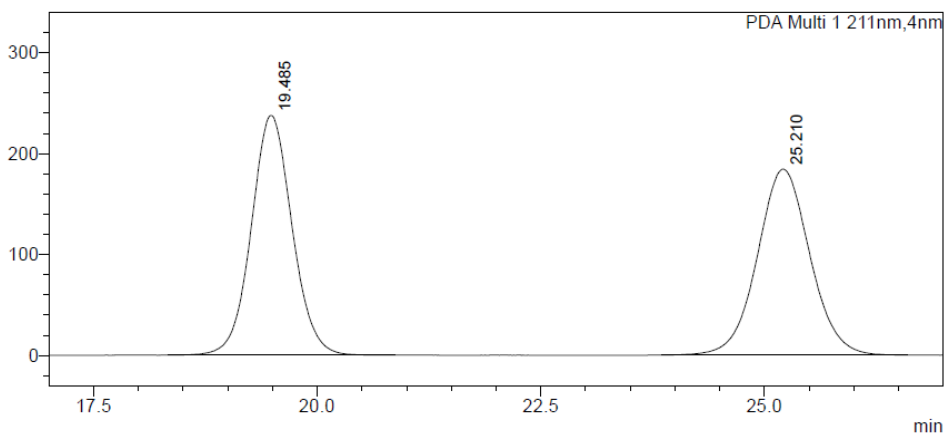
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	12.139	7.964
2	25.368	92.036
Total		100.000

1-Benzyl-3-hydroxy-3-phenylindolin-2-one **19**

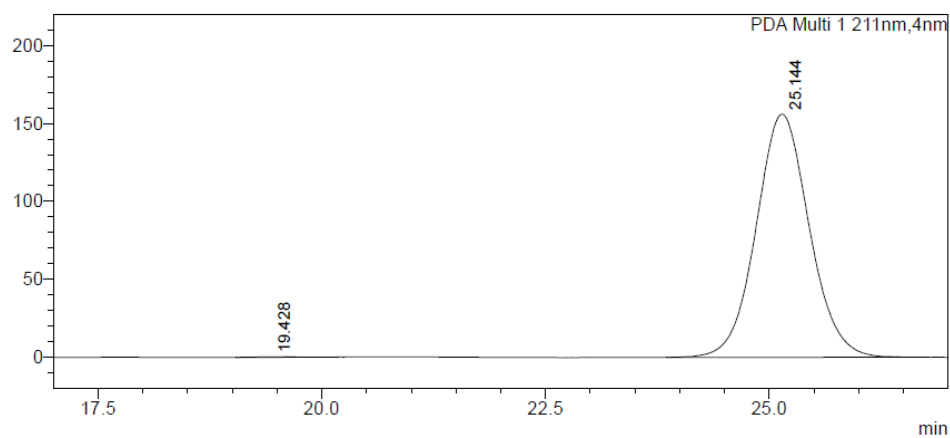


**HPLC data for 19:** Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.25 mL min<sup>-1</sup>, 211 nm, 40 °C)  $t_R$  (R): 19.4 min,  $t_R$  (S): 25.1 min, 0.112:99.888 er.



PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	19.485	50.059
2	25.210	49.941
Total		100.000

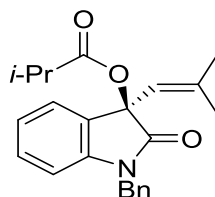


PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	19.428	0.112
2	25.144	99.888
Total		100.000

**Cycle 10:**

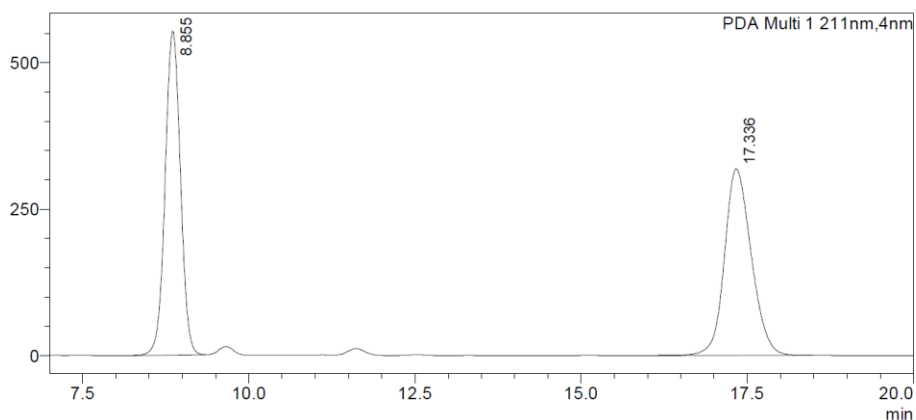
1-Benzyl-3-(2-methylprop-1-en-1-yl)-2-oxindolin-3-yl isobutyrate **S22**



S188

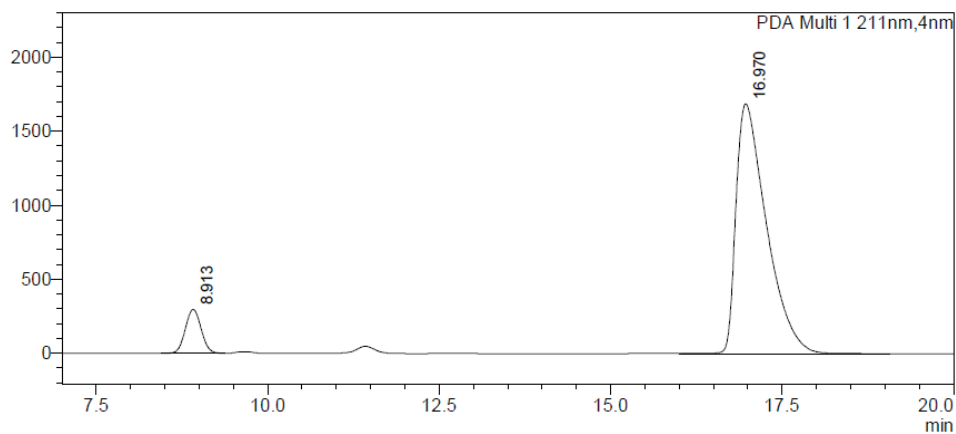
**HPLC data for S22:** Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 211 nm, 30 °C)  $t_R$  (S): 8.9 min,  $t_R$  (R): 17.4 min, 8.365:91.635 er.

mAU



<Peak Table>

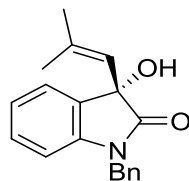
PDA Ch1 211nm		
Peak#	Ret. Time	Area%
1	8.855	49.837
2	17.336	50.163
Total		100.000



PDA Ch1 211nm

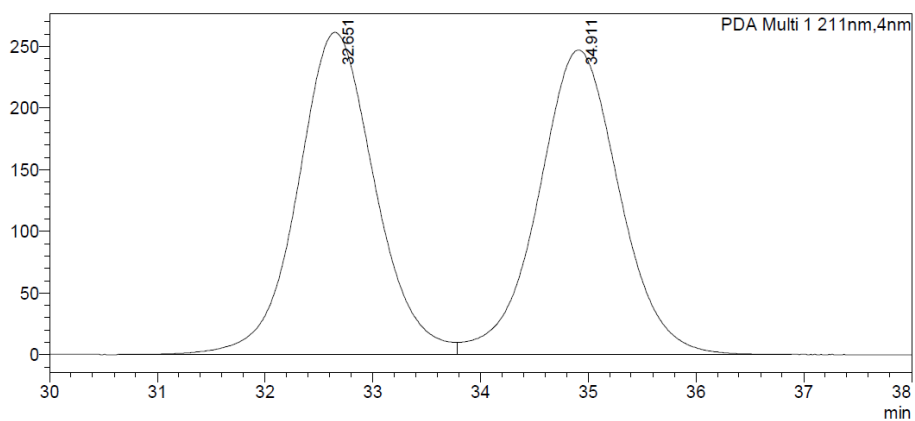
Peak#	Ret. Time	Area%
1	8.913	8.365
2	16.970	91.635
Total		100.000

1-Benzyl-3-hydroxy-3-(2-methylprop-1-en-1-yl)indolin-2-one **26**



**HPLC data for 26:** Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 211 nm, 30 °C)  $t_R$  (R): 32.9 min,  $t_R$  (S): 34.6 min, 10.526:89.474 er.

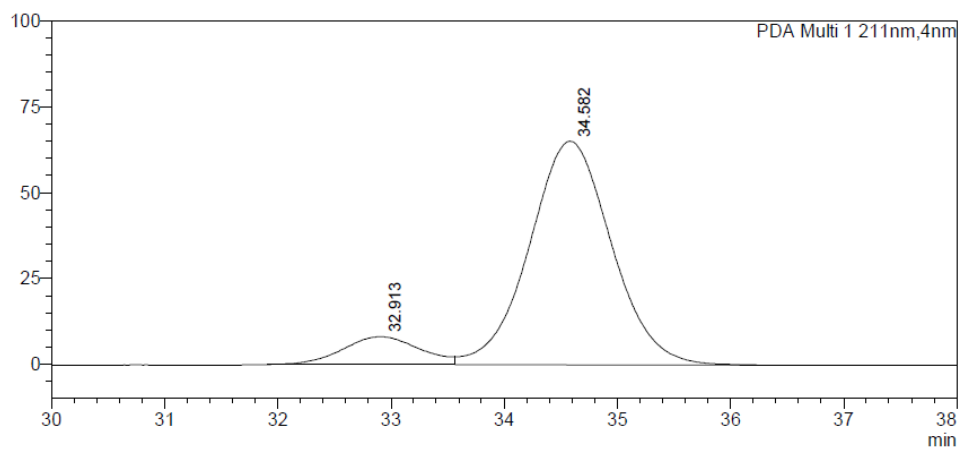
mAU



<Peak Table>

PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	32.651	50.117
2	34.911	49.883
Total		100.000

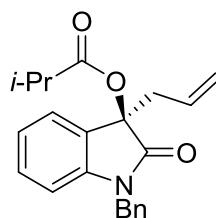


PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	32.913	10.526
2	34.582	89.474
Total		100.000

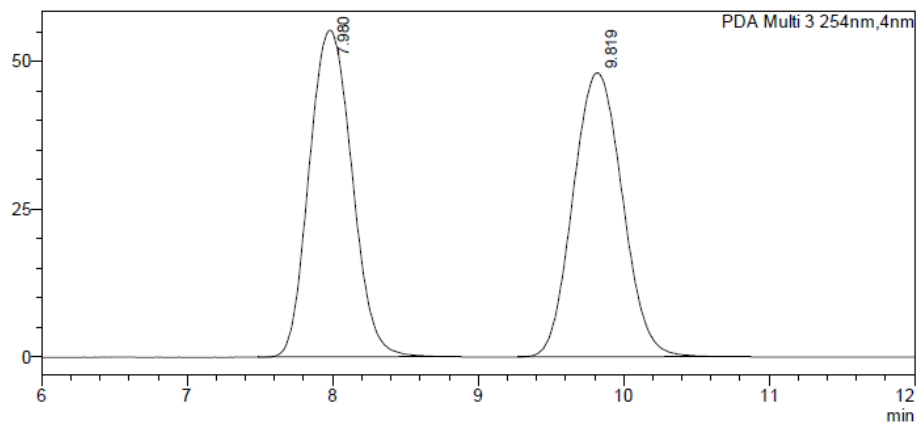
### Flow HPLCs - KR<sub>s</sub> in CHCl<sub>3</sub>

3-Allyl-1-benzyl-2-oxoindolin-3-yl isobutyrate **15**



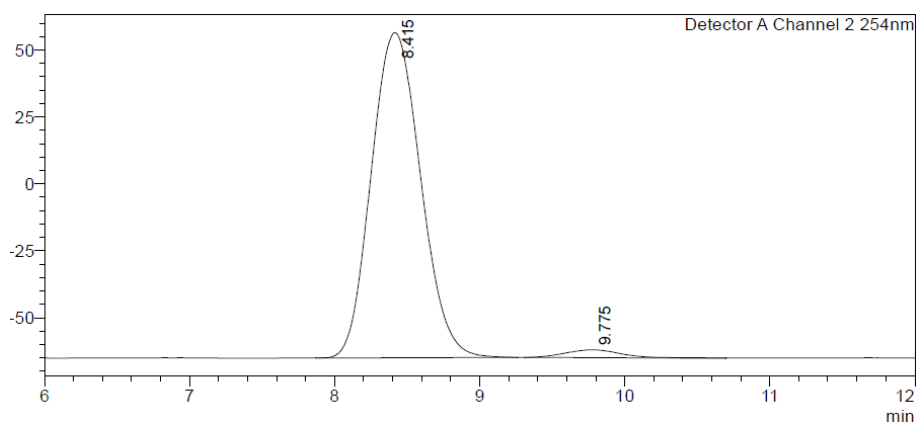
S190

Chiralpak OD-H (98:2 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 254 nm, 30 °C) t<sub>R</sub> (R): 8.4 min, t<sub>R</sub> (S): 9.8 min, 97.369:2.631 er.



PDA Ch3 254nm

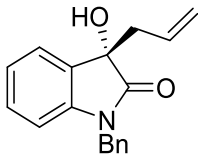
Peak#	Ret. Time	Area%
1	7.980	49.984
2	9.819	50.016
Total		100.000



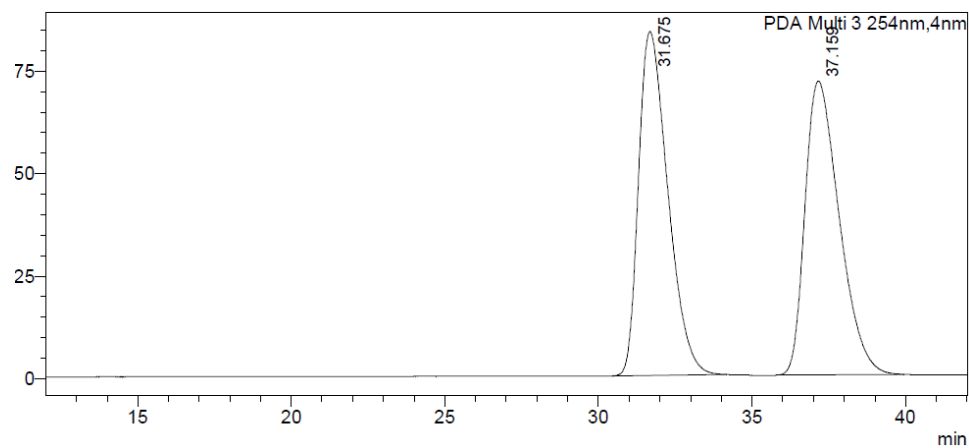
Detector A Channel 2 254nm

Peak#	Ret. Time	Area%
1	8.415	97.369
2	9.775	2.631
Total		100.000

### 3-Allyl-1-benzyl-3-hydroxyindolin-2-one **14**

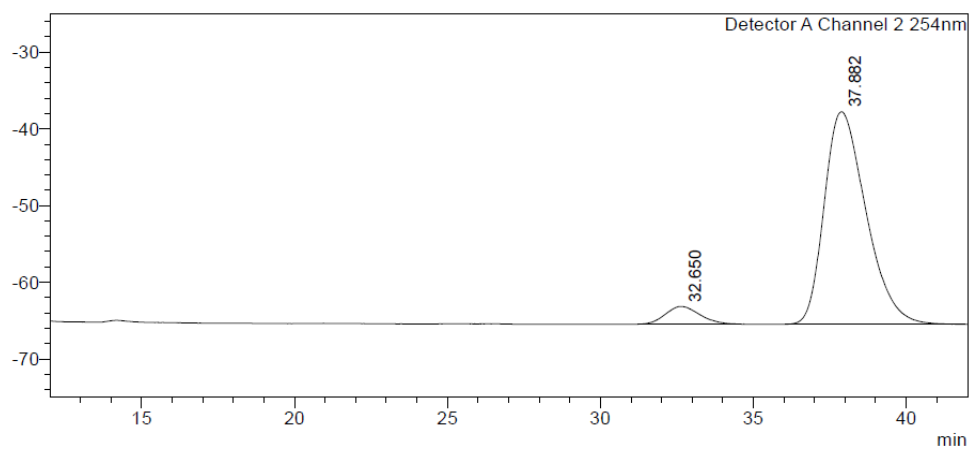


Chiralpak OD-H (98:2 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 254 nm, 30 °C) t<sub>R</sub> (R): 32.7 min, t<sub>R</sub> (S): 37.9 min, 6.296:93.704 er.



PDA Ch3 254nm

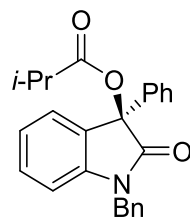
Peak#	Ret. Time	Area%
1	31.675	50.008
2	37.159	49.992
Total		100.000



Detector A Channel 2 254nm

Peak#	Ret. Time	Area%
1	32.650	6.296
2	37.882	93.704
Total		100.000

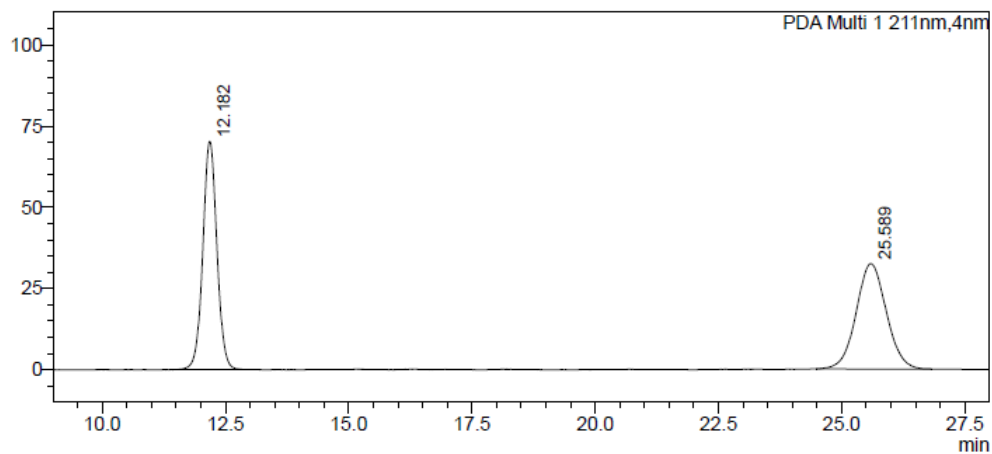
1-Benzyl-2-oxo-3-phenylindolin-3-yl isobutyrate **S15**



S192

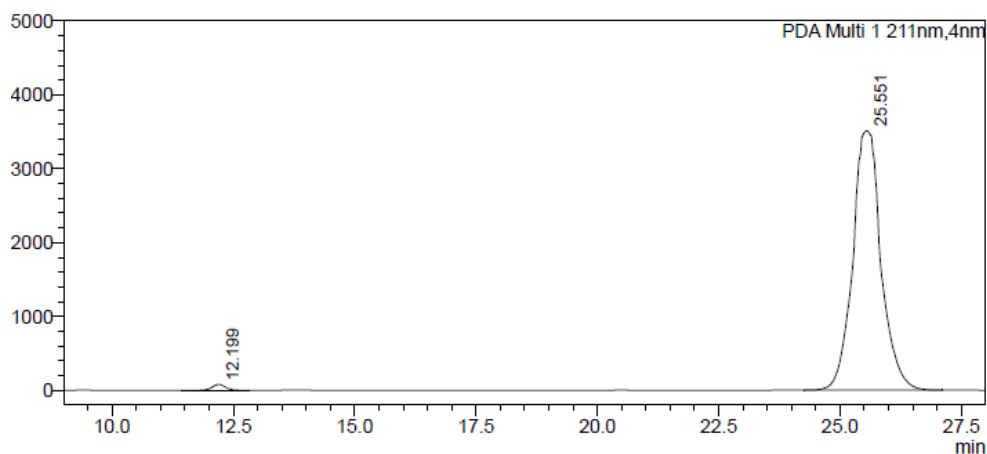


Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.25 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (S): 12.2 min, t<sub>R</sub> (R): 25.6 min, 1.094:98.906 er.



PDA Ch1 211nm

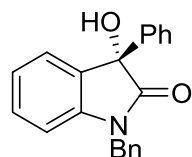
Peak#	Ret. Time	Area%
1	12.182	50.245
2	25.589	49.755
Total		100.000



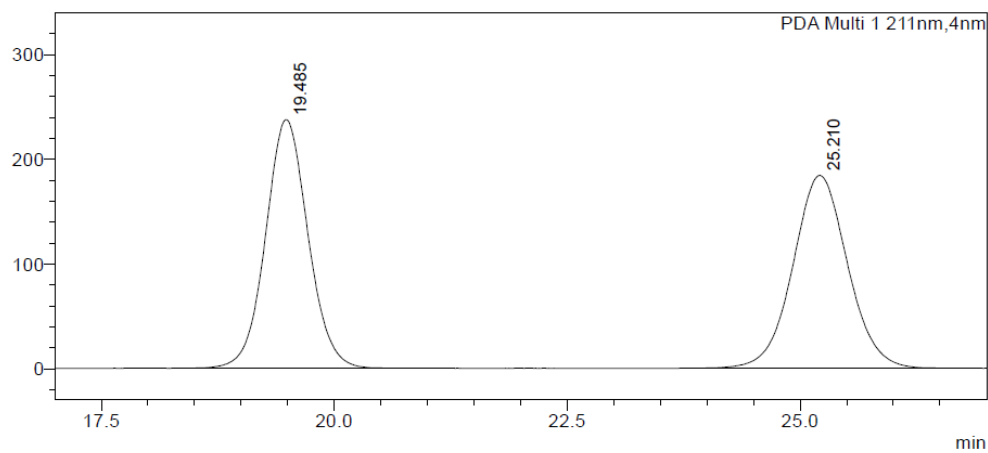
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	12.199	1.094
2	25.551	98.906
Total		100.000

1-Benzyl-3-hydroxy-3-phenylindolin-2-one **19**

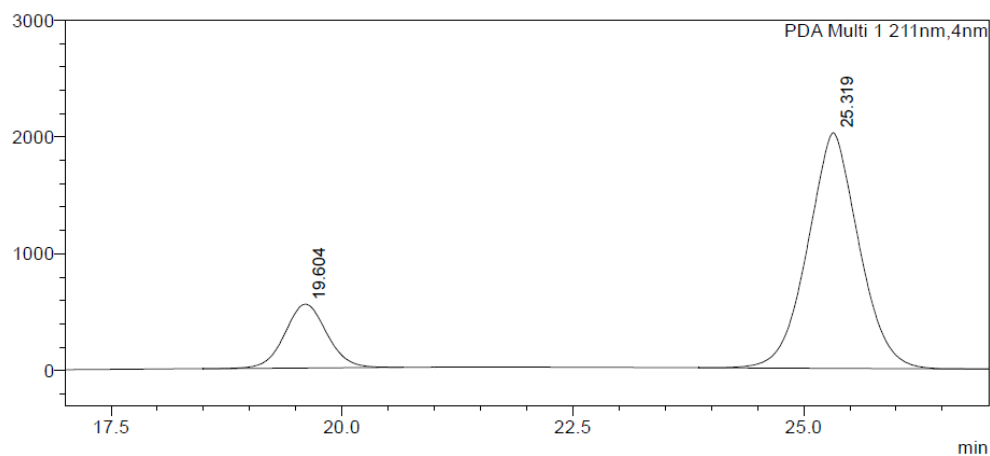


Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.25 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (R): 19.6 min, t<sub>R</sub> (S): 25.319 min, 18.301:81.699 er.



PDA Ch1 211nm

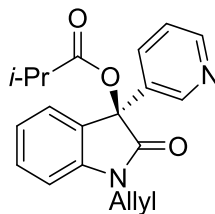
Peak#	Ret. Time	Area%
1	19.485	50.059
2	25.210	49.941
Total		100.000



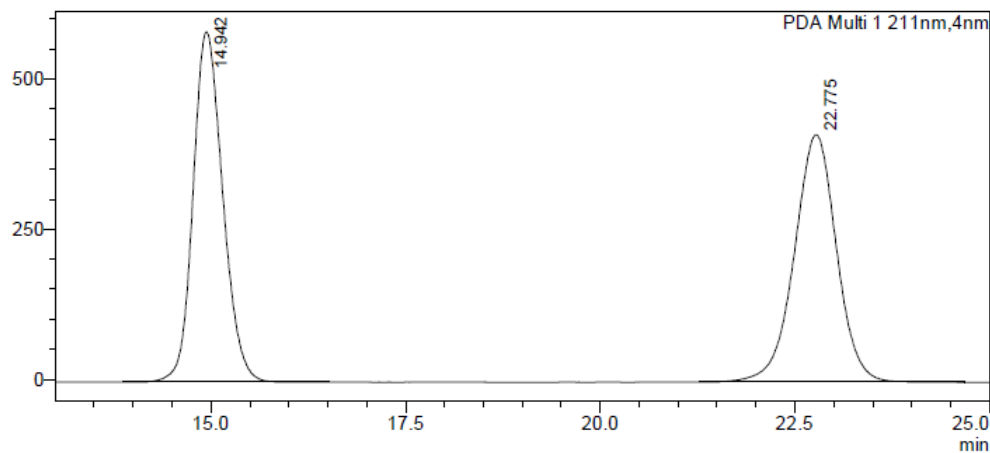
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	19.604	18.301
2	25.319	81.699
Total		100.000

1-Allyl-2-oxo-3-(pyridin-3-yl)indolin-3-yl isobutyrate **S21**

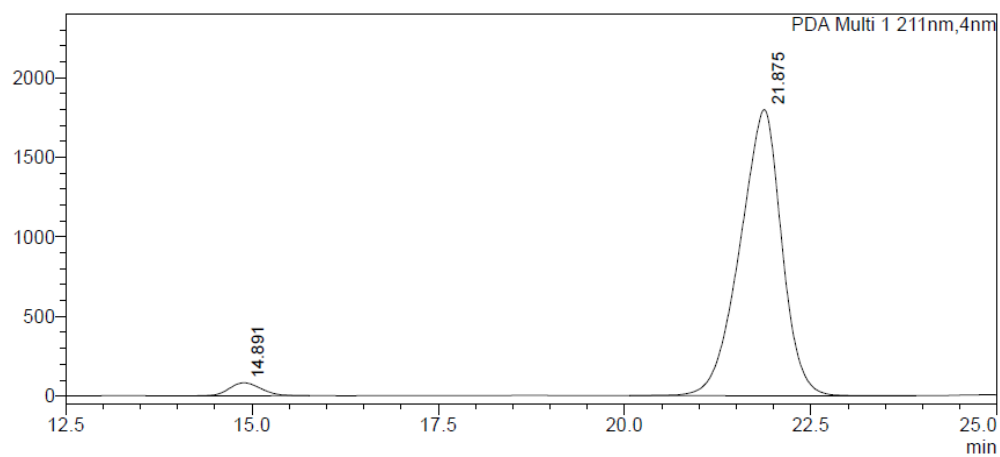


Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (R): 14.8 min, t<sub>R</sub> (S): 21.6 min, 3.342:96.658 er.



PDA Ch1 211nm

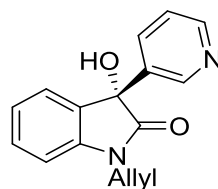
Peak#	Ret. Time	Area%
1	14.942	49.940
2	22.775	50.060
Total		100.000



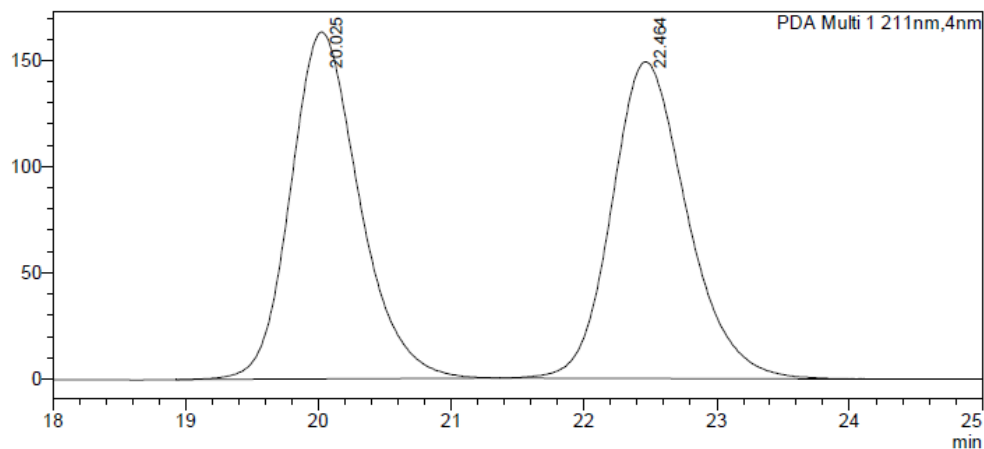
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	14.891	3.342
2	21.875	96.658
Total		100.000

1-Allyl-3-hydroxy-3-(pyridin-3-yl)indolin-2-one **25**

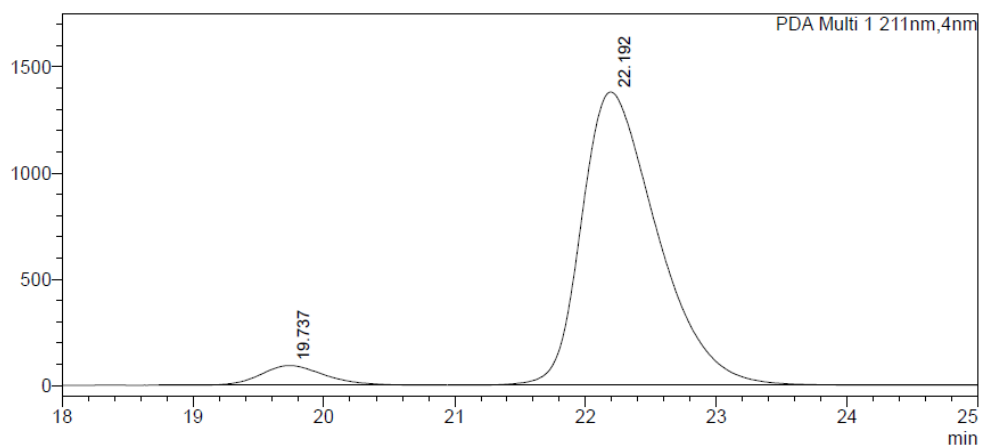


Chiralpak AD-H (92:8 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (S): 20.1 min, t<sub>R</sub> (R): 22.7 min, 5.429:94.571 er.



PDA Ch1 211nm

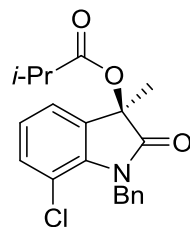
Peak#	Ret. Time	Area%
1	20.025	49.994
2	22.464	50.006
Total		100.000



PDA Ch1 211nm

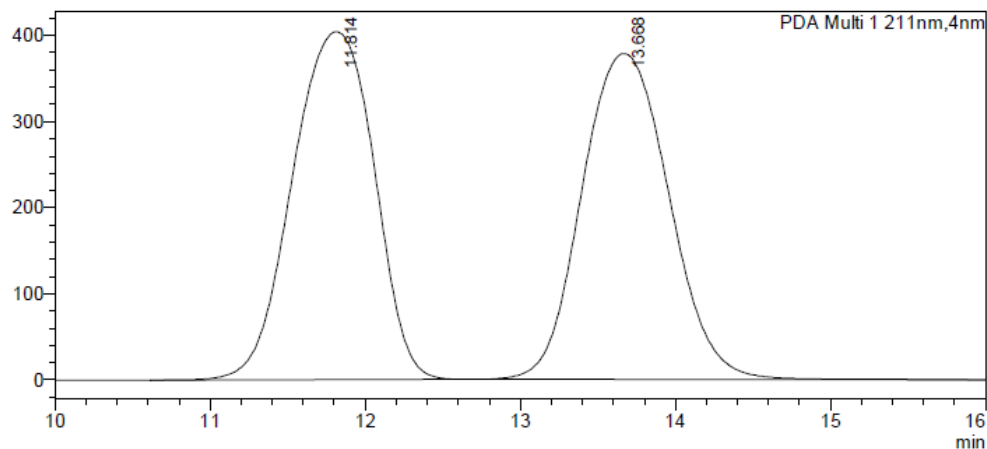
Peak#	Ret. Time	Area%
1	19.737	5.429
2	22.192	94.571
Total		100.000

1-Benzyl-7-chloro-3-methyl-2-oxindolin-3-yl isobutyrate **S26**



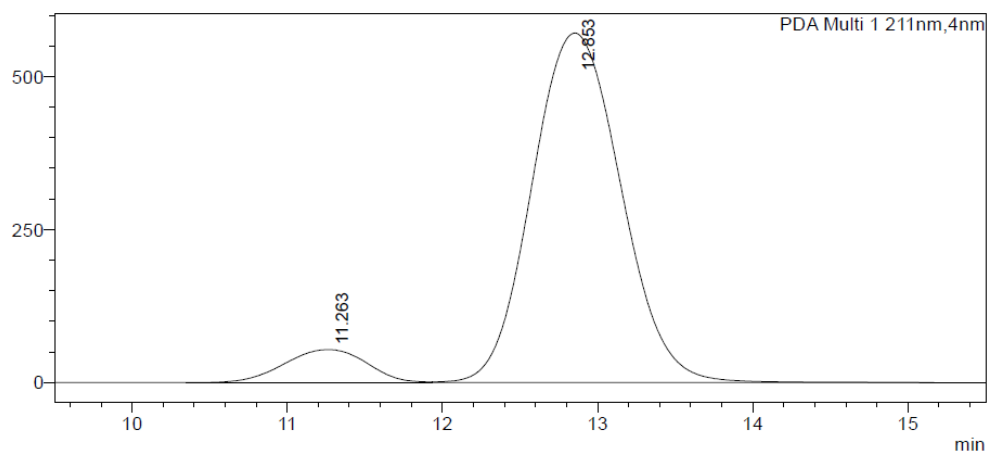
S196

Chiralpak AD-H (99:1 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (S): 11.3 min, t<sub>R</sub> (R): 12.9 min, 8.003:91.997 er.



PDA Ch1 211nm

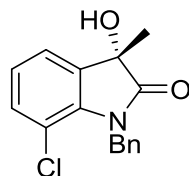
Peak#	Ret. Time	Area%
1	11.814	50.011
2	13.668	49.989
Total		100.000



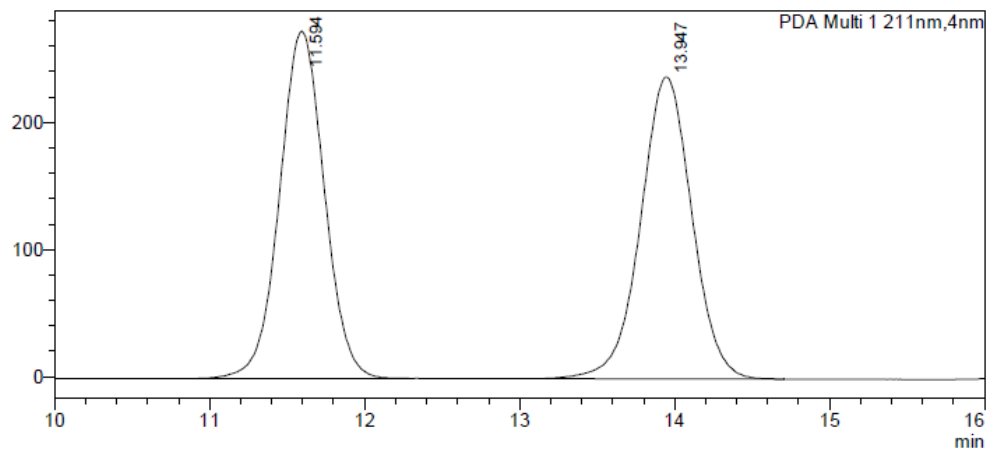
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	11.263	8.003
2	12.853	91.997
Total		100.000

1-Benzyl-7-chloro-3-hydroxy-3-methylindolin-2-one **30**

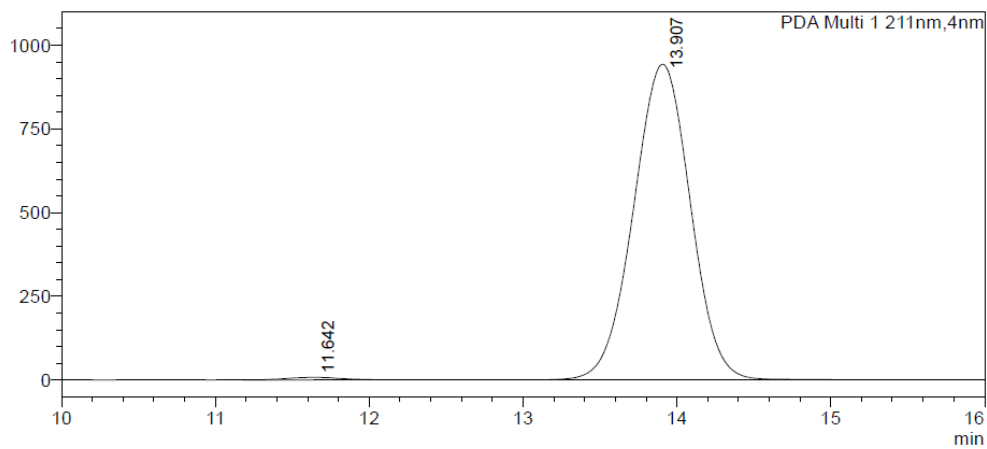


Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (R): 11.6 min, t<sub>R</sub> (S): 13.9 min, 0.784:99.216 er.



PDA Ch1 211nm

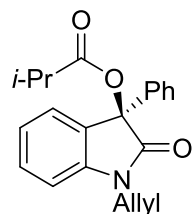
Peak#	Ret. Time	Area%
1	11.594	50.003
2	13.947	49.997
Total		100.000



PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	11.642	0.784
2	13.907	99.216
Total		100.000

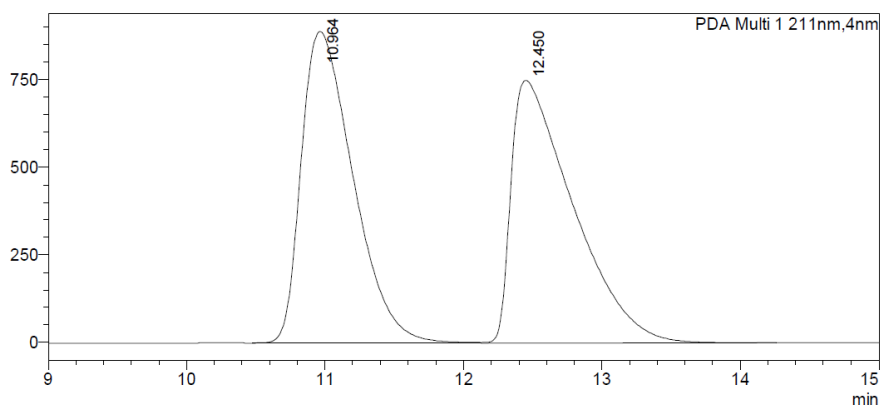
1-Allyl-2-oxo-3-phenylindolin-3-yl isobutyrate **S16**



S198

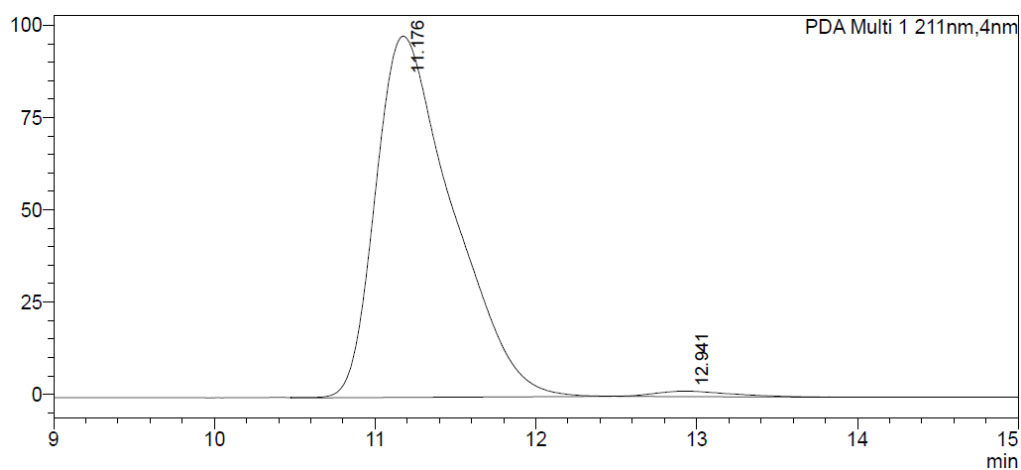
Chiralcel OD-H (99:1 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 211 nm, 30 °C) t<sub>R</sub> (R): 11.0 min, t<sub>R</sub> (S): 12.8 min, 98.093:1.907 er.

mAU



<Peak Table>

PDA Ch1 211nm		
Peak#	Ret. Time	Area%
1	10.964	49.832
2	12.450	50.168
Total		100.000

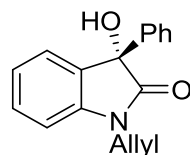


65

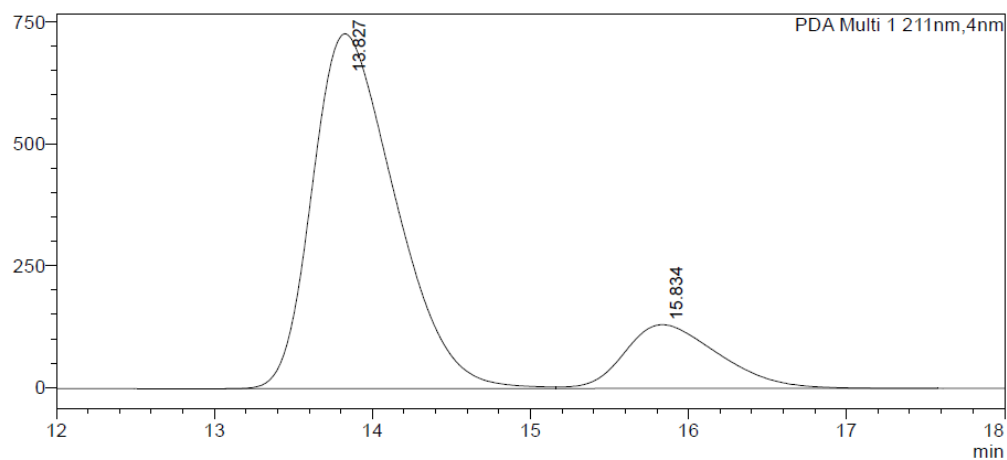
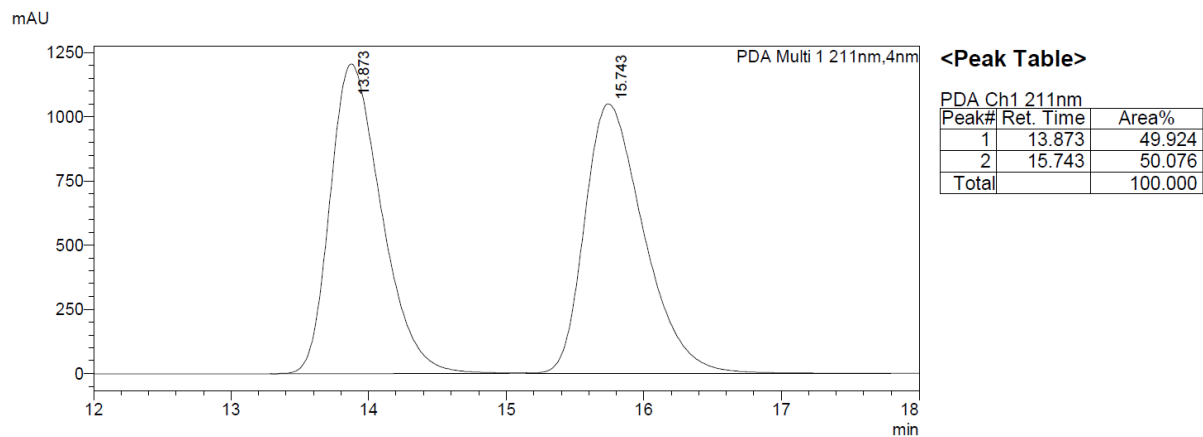
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	11.176	98.516
2	12.941	1.484
Total		100.000

1-Allyl-3-hydroxy-3-phenylindolin-2-one **20**



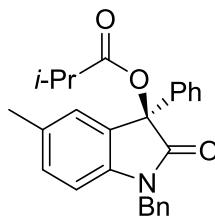
Chiralcel OD-H (95:5 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 211 nm, 30 °C) t<sub>R</sub> (S): 13.8 min, t<sub>R</sub> (R): 15.8 min, 82.999:17.001 er.



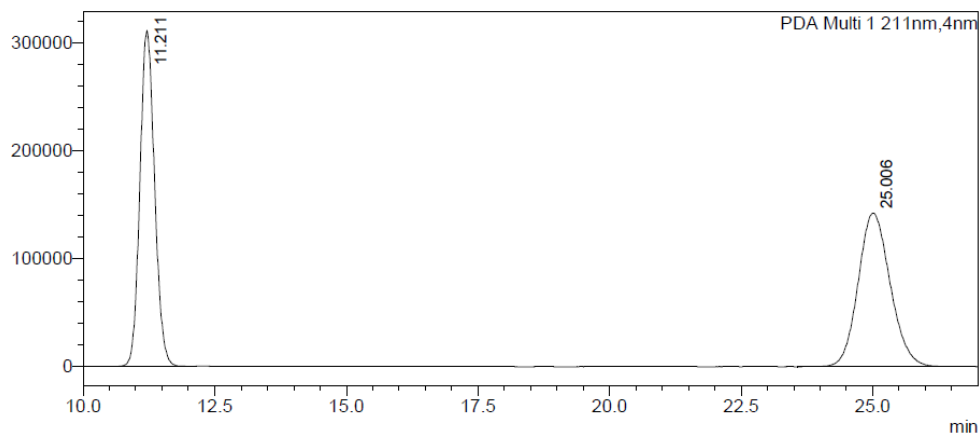
PDA Ch1 211nm		
Peak#	Ret. Time	Area%
1	13.827	82.999
2	15.834	17.001
Total		100.000

1-Benzyl-5-methyl-2-oxo-3-phenylindolin-3-yl isobutyrate **S24**



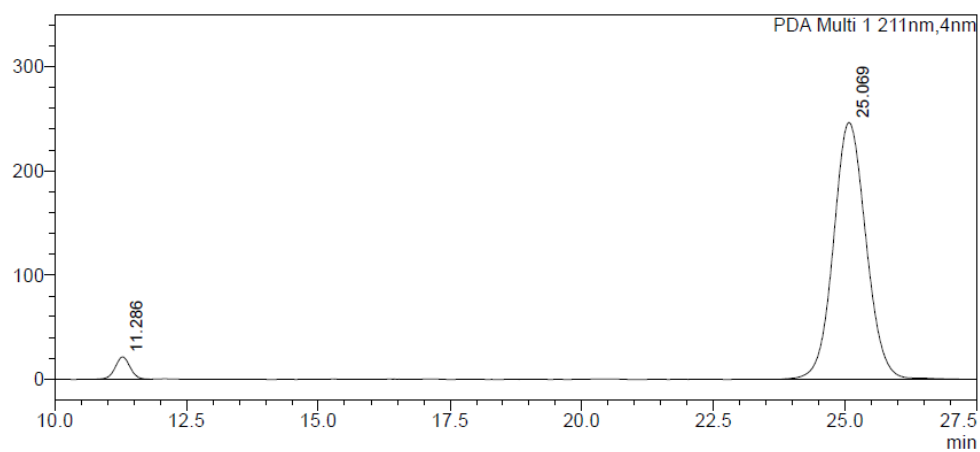


Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (S): 11.3 min, t<sub>R</sub> (R): 25.1 min, 3.832:96.168 er.



PDA Ch1 211nm

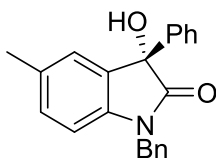
Peak#	Ret. Time	Area%
1	11.211	49.997
2	25.006	50.003
Total		100.000



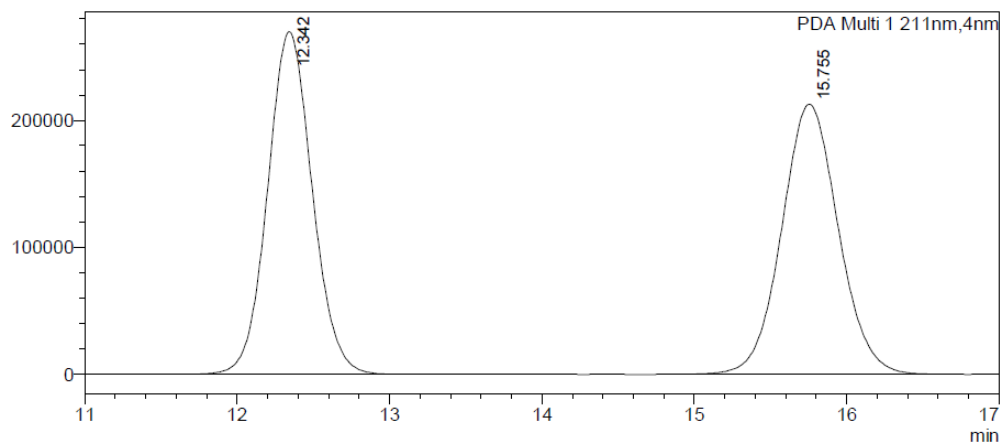
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	11.286	3.832
2	25.069	96.168
Total		100.000

1-Benzyl-3-hydroxy-5-methyl-3-phenylindolin-2-one **28**

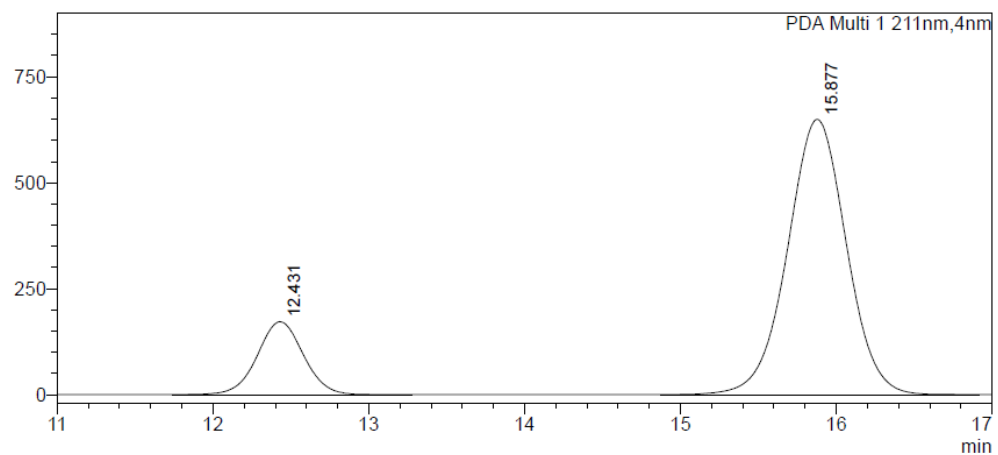


Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (R): 12.4 min, t<sub>R</sub> (S): 15.9 min, 17.3:82.686 er.



PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	12.342	49.961
2	15.755	50.039
Total		100.000

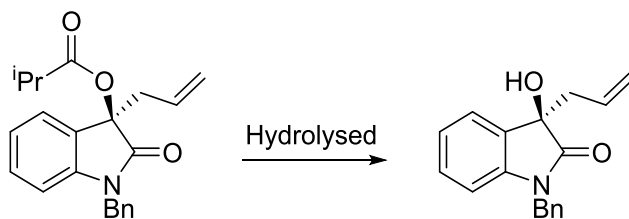


PDA Ch1 211nm

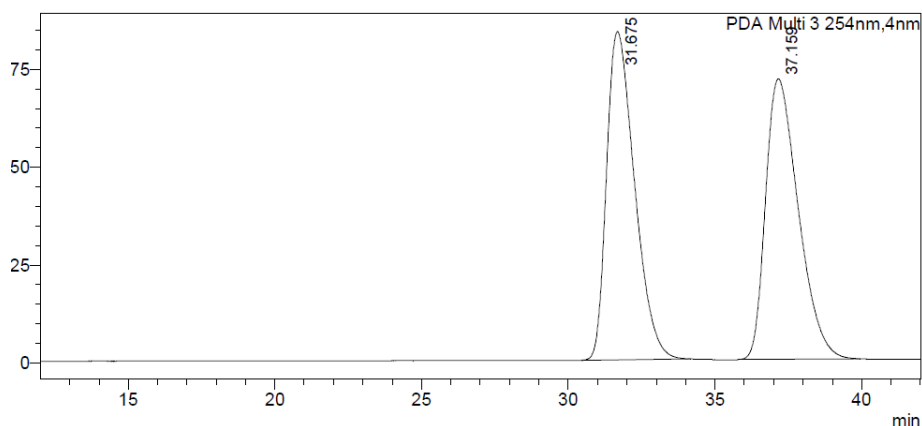
Peak#	Ret. Time	Area%
1	12.431	17.311
2	15.877	82.689
Total		100.000

Flow HPLCs - KR in EtOAc

3-Allyl-1-benzyl-2-oxindolin-3-yl isobutyrate **S15** (Ester hydrolyzed to alcohol for HPLC analysis)

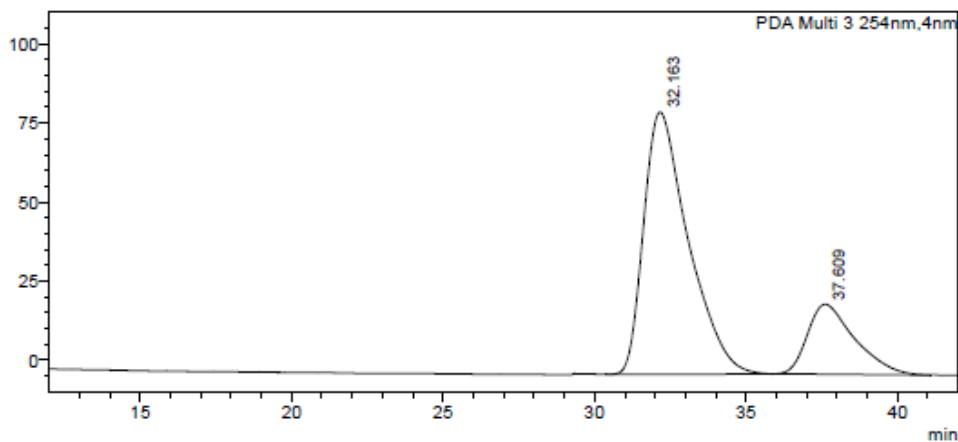


Chiralpak OD-H (98:2 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 254 nm, 30 °C) t<sub>R</sub> (R): 32.2 min, t<sub>R</sub> (S): 37.6 min, 77.959:22.041 er.



PDA Ch3 254nm

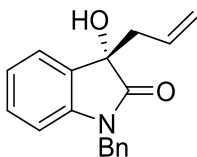
Peak#	Ret. Time	Area%
1	31.675	50.008
2	37.159	49.992
Total		100.000



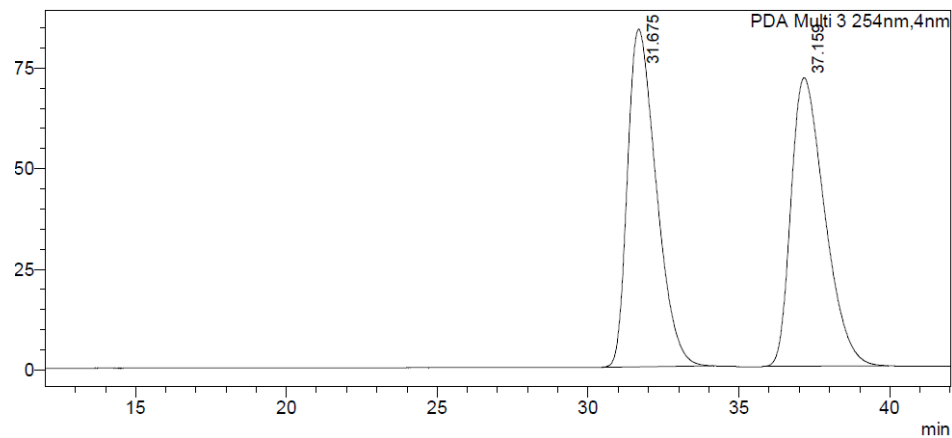
PDA Ch3 254nm

Peak#	Ret. Time	Area%
1	32.163	77.959
2	37.609	22.041
Total		100.000

### 3-Allyl-1-benzyl-3-hydroxyindolin-2-one **16**

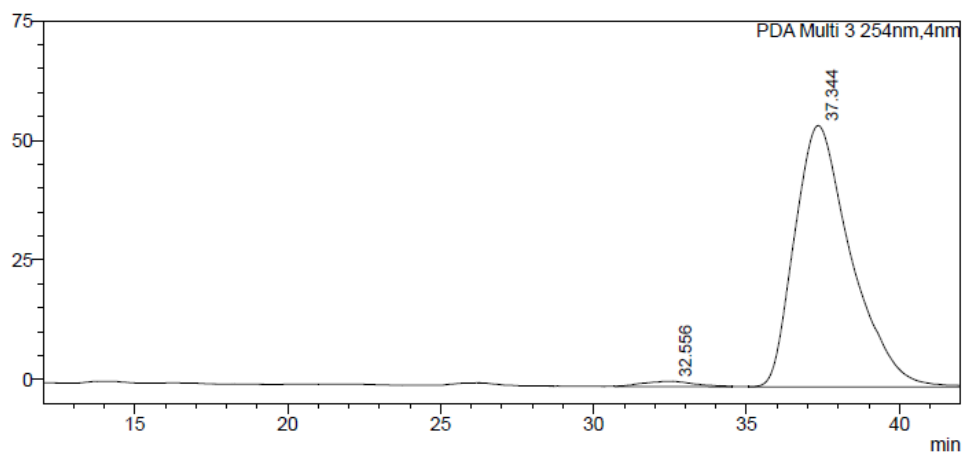


Chiralpak OD-H (98:2 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 254 nm, 30 °C) t<sub>R</sub> (R): 32.6 min, t<sub>R</sub> (S): 37.3 min, 1.796:98.204 er.



PDA Ch3 254nm

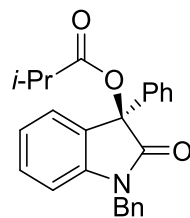
Peak#	Ret. Time	Area%
1	31.675	50.008
2	37.159	49.992
Total		100.000



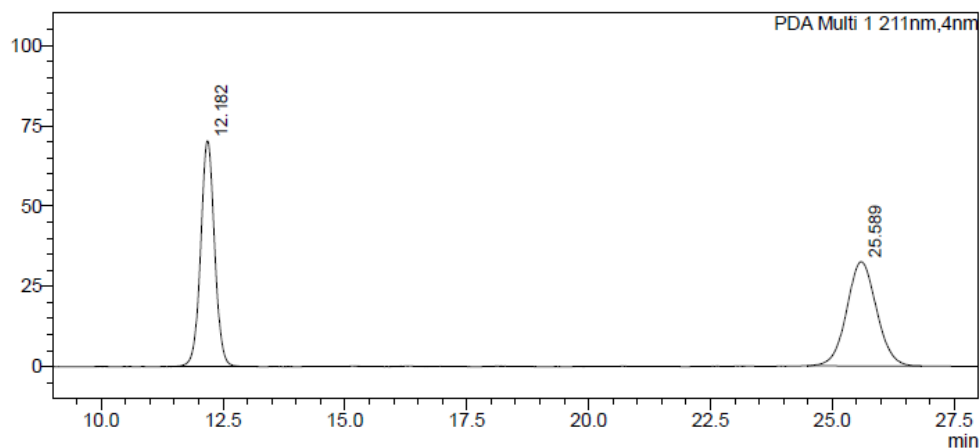
PDA Ch3 254nm

Peak#	Ret. Time	Area%
1	32.556	1.796
2	37.344	98.204
Total		100.000

1-Benzyl-2-oxo-3-phenylindolin-3-yl isobutyrate **S15**

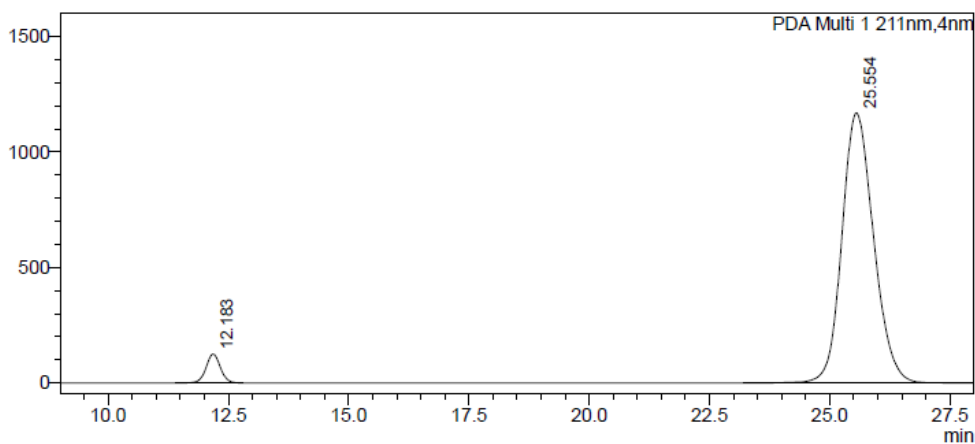


Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.25 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (S): 12.2 min, t<sub>R</sub> (R): 25.6 min, 4.626:95.374 er.



PDA Ch1 211nm

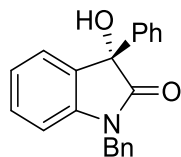
Peak#	Ret. Time	Area%
1	12.182	50.245
2	25.589	49.755
Total		100.000



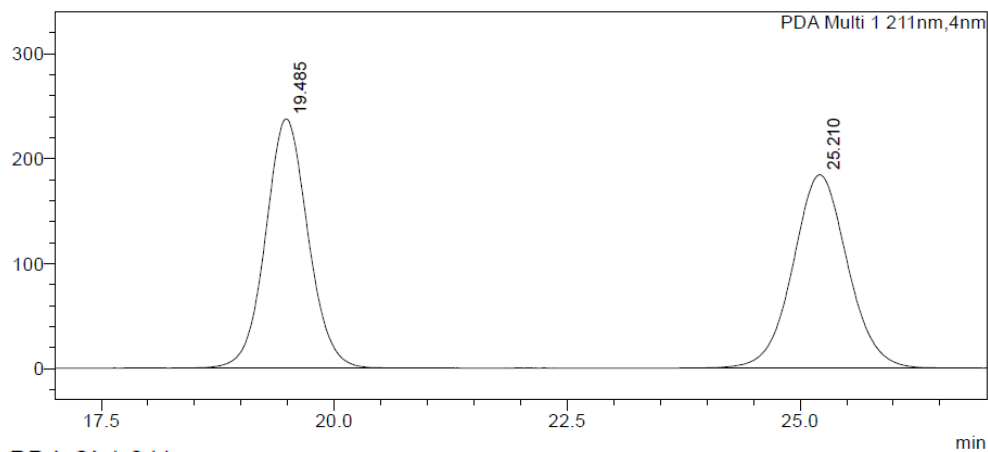
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	12.183	4.626
2	25.554	95.374
Total		100.000

1-Benzyl-3-hydroxy-3-phenylindolin-2-one **19**

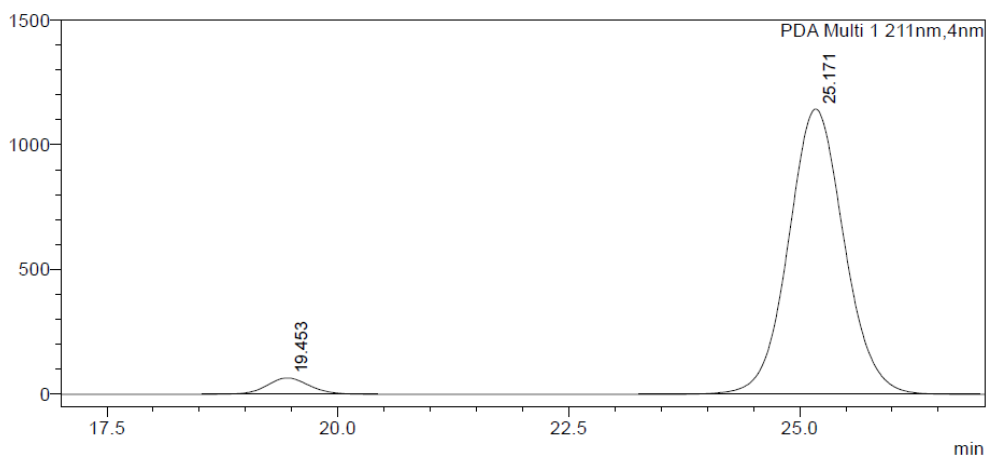


Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.25 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (R): 19.5 min, t<sub>R</sub> (S): 25.2 min, 4.192:95.808 er.



PDA Ch1 211nm

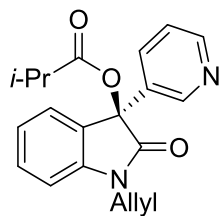
Peak#	Ret. Time	Area%
1	19.485	50.059
2	25.210	49.941
Total		100.000



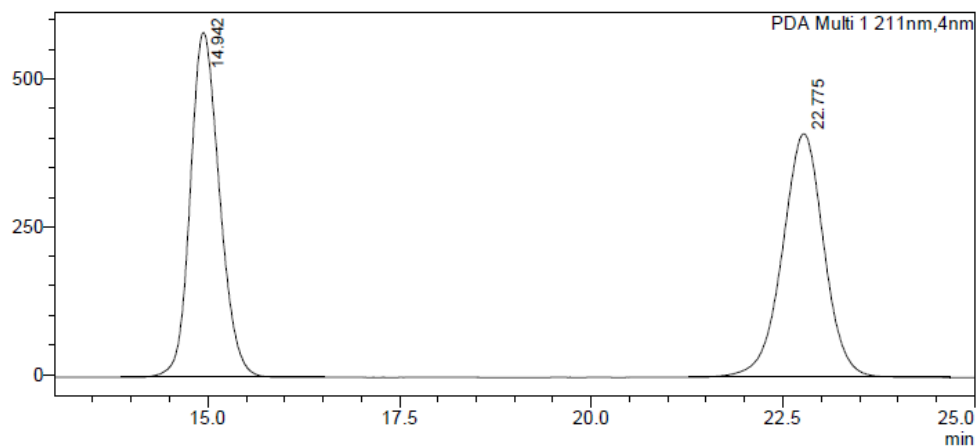
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	19.453	4.192
2	25.171	95.808
Total		100.000

1-Allyl-2-oxo-3-(pyridin-3-yl)indolin-3-yl isobutyrate **S21**

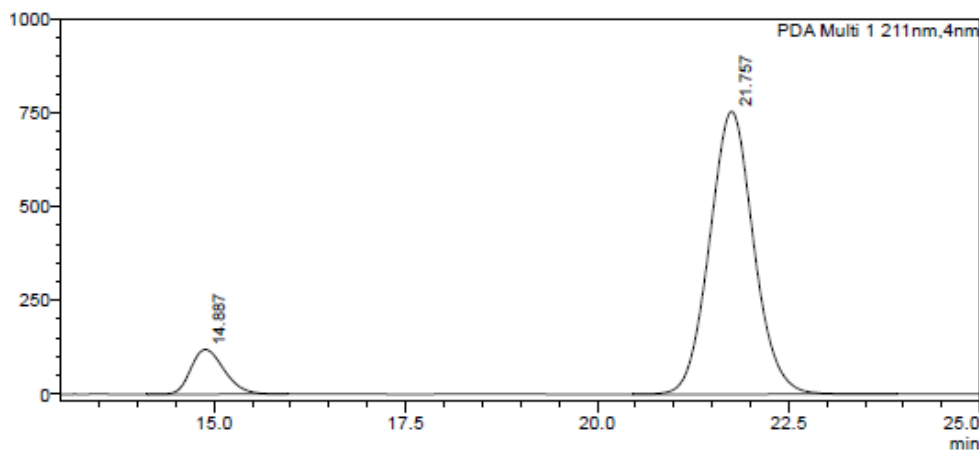


Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (R): 14.9 min, t<sub>R</sub> (S): 21.8 min, 10.729:89.271 er.



PDA Ch1 211nm

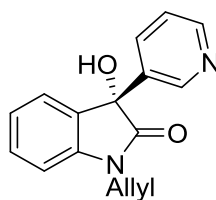
Peak#	Ret. Time	Area%
1	14.942	49.940
2	22.775	50.060
Total		100.000



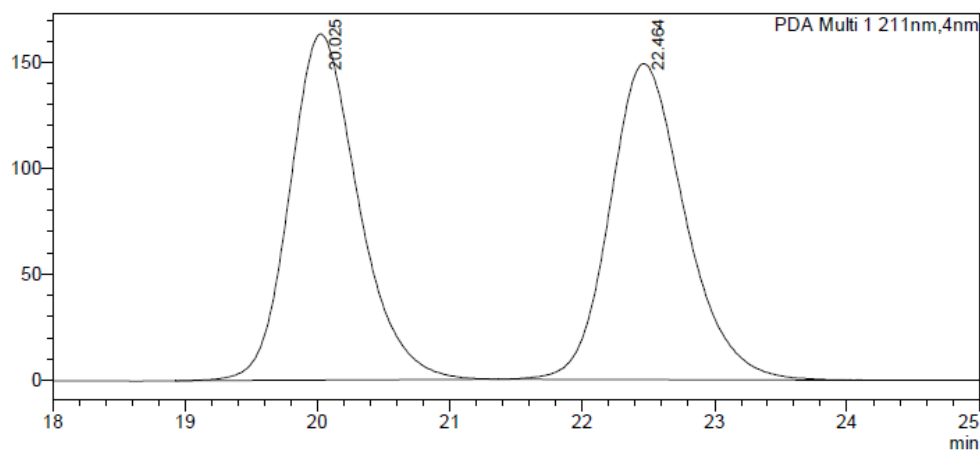
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	14.887	10.729
2	21.757	89.271
Total		100.000

1-Allyl-3-hydroxy-3-(pyridin-3-yl)indolin-2-one **25**

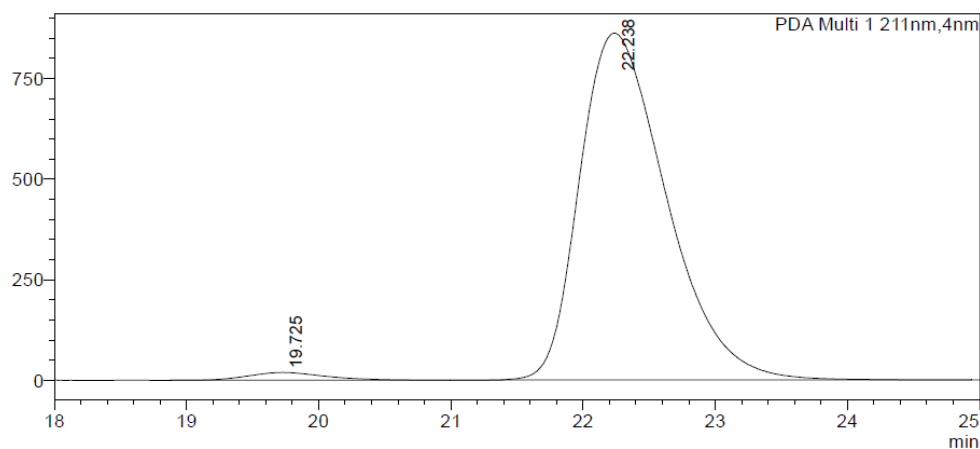


Chiralpak AD-H (92:8 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (S): 19.7 min, t<sub>R</sub> (R): 22.2 min, 1.906:98.094 er.



PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	20.025	49.994
2	22.464	50.006
Total		100.000

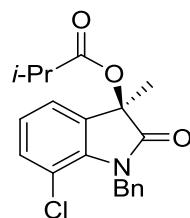


PDA Ch1 211nm

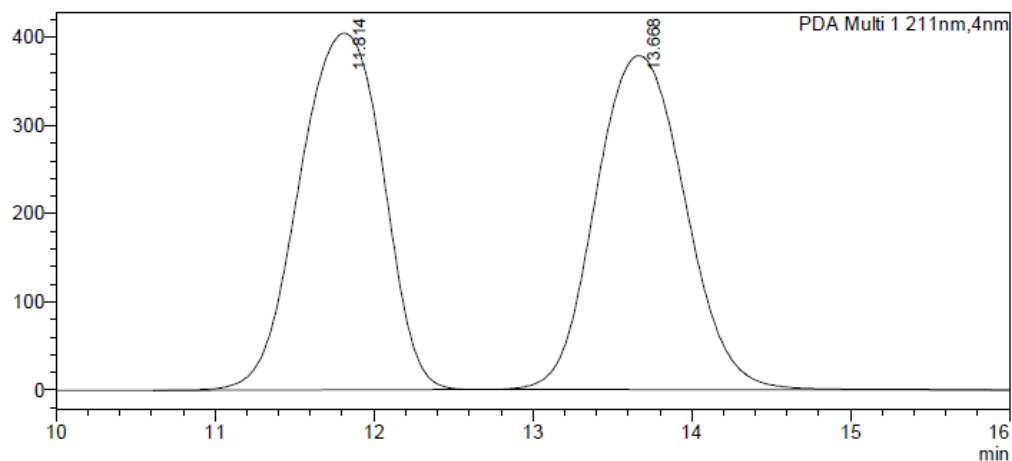
Peak#	Ret. Time	Area%
1	19.725	1.906
2	22.238	98.094
Total		100.000



1-Benzyl-7-chloro-3-methyl-2-oxindolin-3-yl isobutyrate **S26**

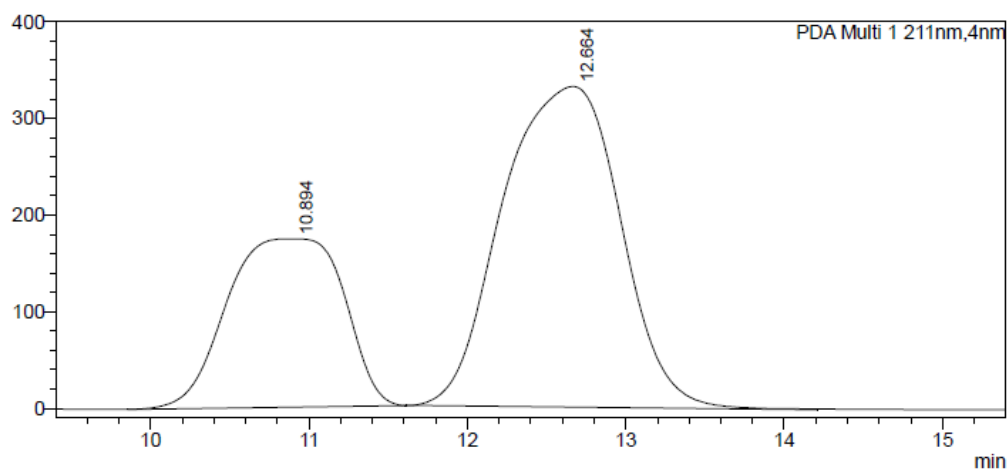


Chiralpak AD-H (99:1 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (S): 10.9 min, t<sub>R</sub> (R): 12.7 min, 34.005:65.995 er.



PDA Ch1 211nm

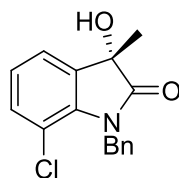
Peak#	Ret. Time	Area%
1	11.814	50.011
2	13.668	49.989
Total		100.000



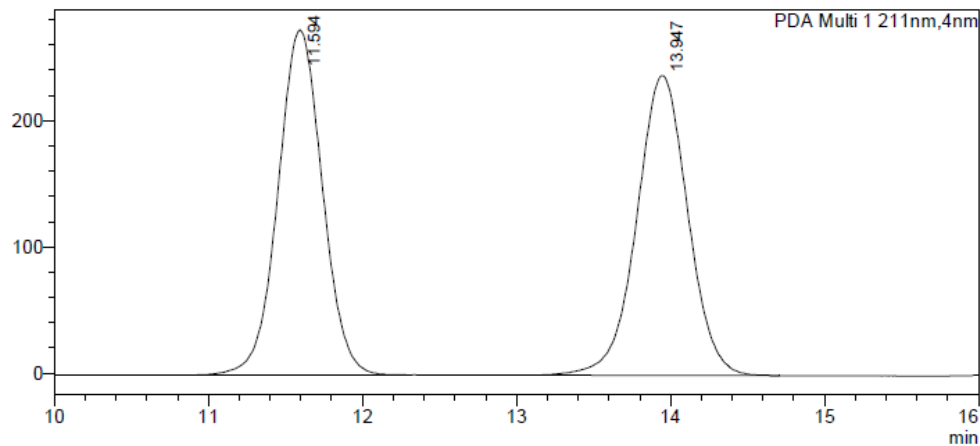
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	10.894	34.005
2	12.664	65.995
Total		100.000

1-Benzyl-7-chloro-3-hydroxy-3-methylindolin-2-one **30**

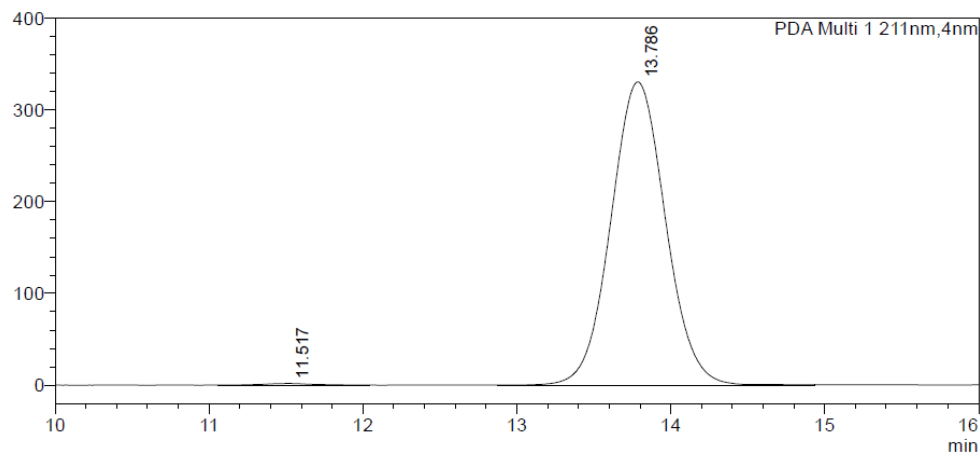


Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (*R*): 11.5 min, t<sub>R</sub> (*S*): 13.8 min, 0.544:99.456 er.



PDA Ch1 211nm

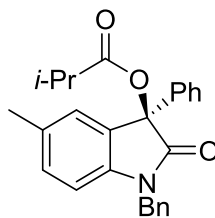
Peak#	Ret. Time	Area%
1	11.594	50.003
2	13.947	49.997
Total		100.000



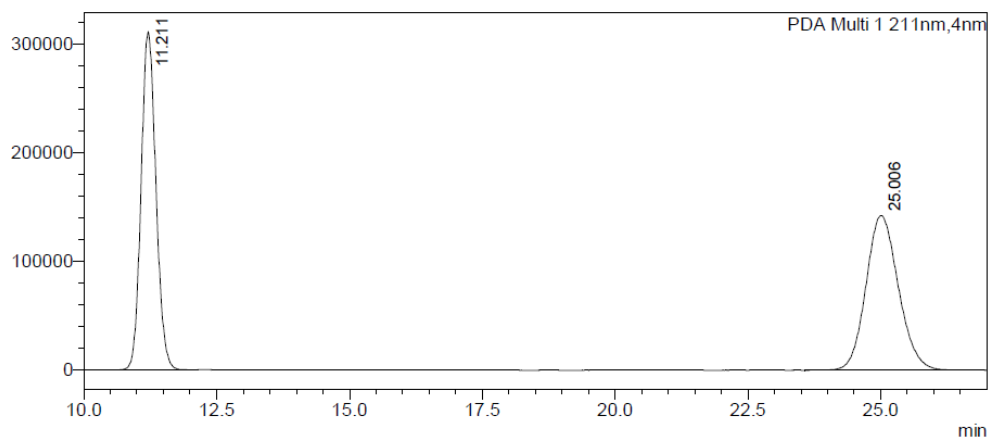
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	11.517	0.544
2	13.786	99.456
Total		100.000

1-Benzyl-5-methyl-2-oxo-3-phenylindolin-3-yl isobutyrate **S24**

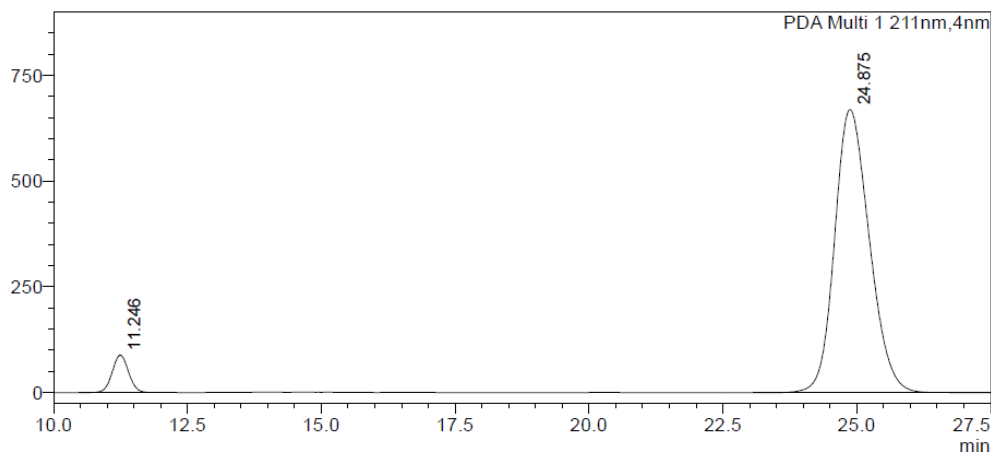


Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (S): 11.2 min, t<sub>R</sub> (R): 24.9 min, 5.851:94.149 er.



PDA Ch1 211nm

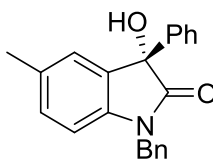
Peak#	Ret. Time	Area%
1	11.211	49.997
2	25.006	50.003
Total		100.000



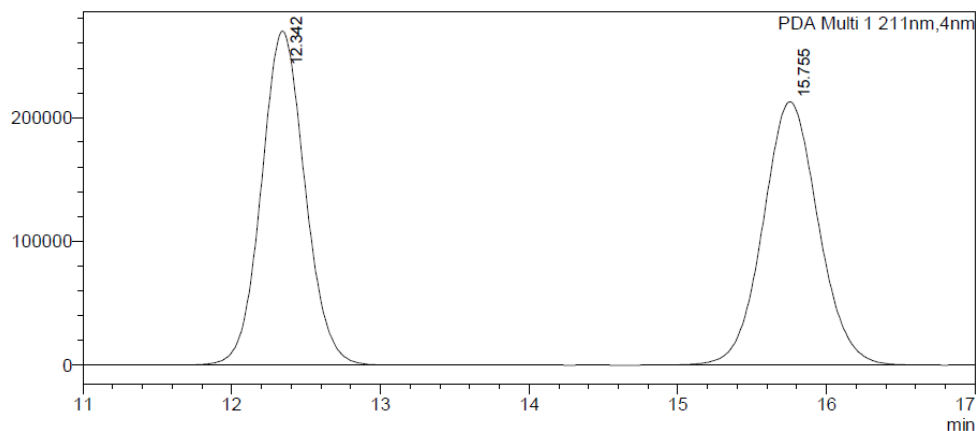
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	11.246	5.851
2	24.875	94.149
Total		100.000

1-Benzyl-3-hydroxy-5-methyl-3-phenylindolin-2-one **28**

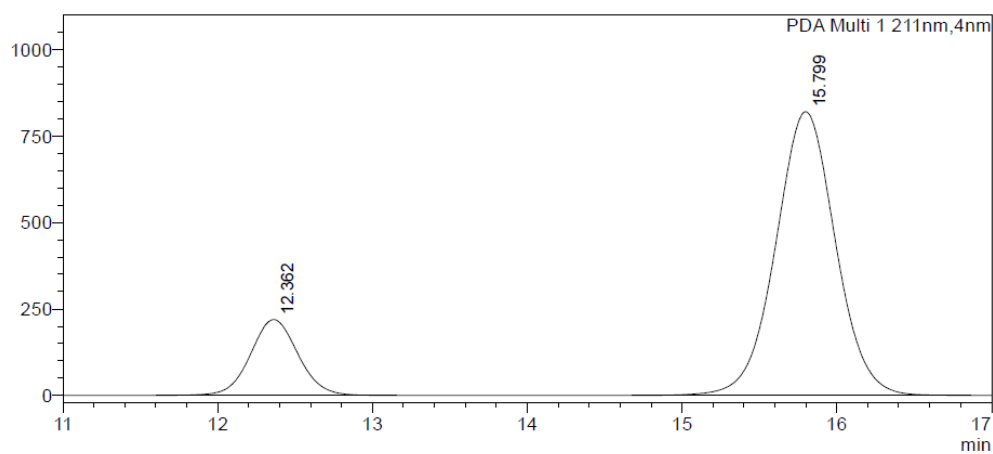


Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (R): 12.4 min, t<sub>R</sub> (S): 15.8 min, 17.547:82.453 er.



PDA Ch1 211nm

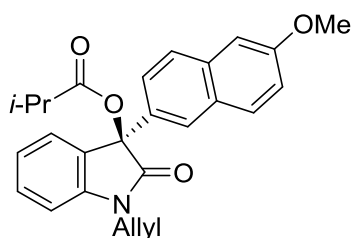
Peak#	Ret. Time	Area%
1	12.342	49.961
2	15.755	50.039
Total		100.000



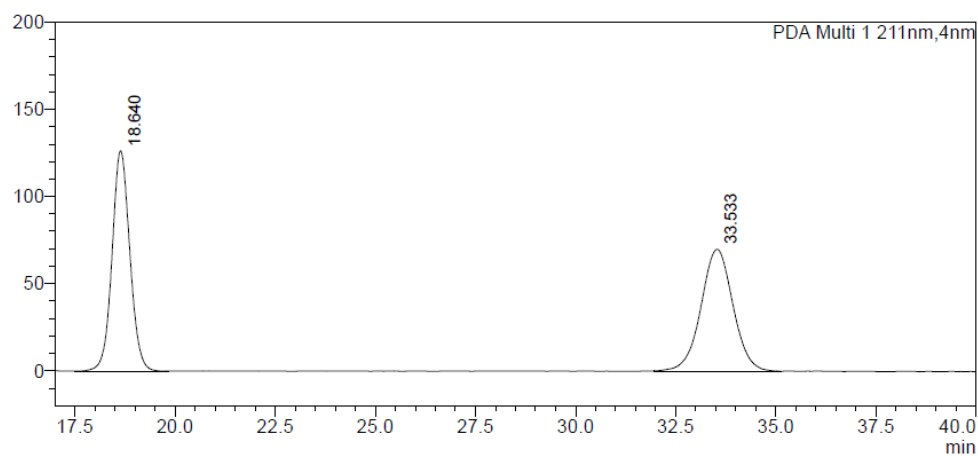
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	12.362	17.547
2	15.799	82.453
Total		100.000

1-Allyl-3-(6-methoxynaphthalen-2-yl)-2-oxoindolin-3-yl isobutyrate **S18**

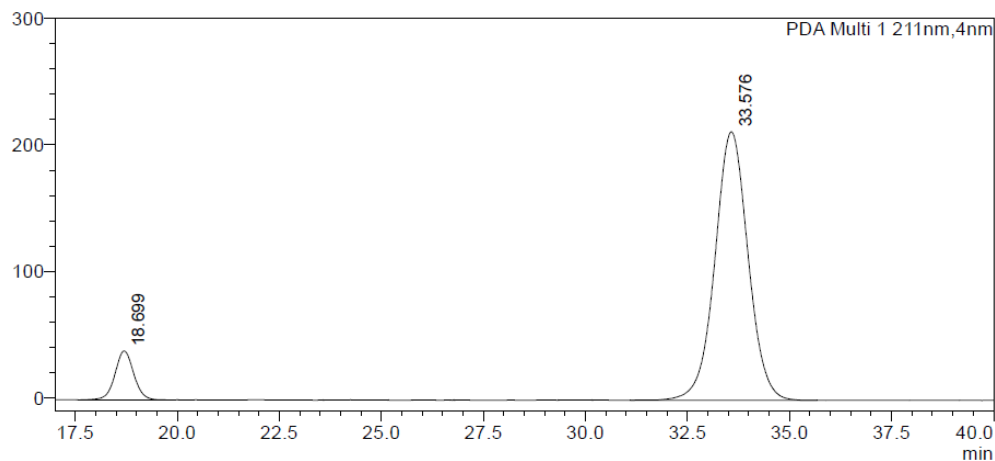


Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (S): 18.7 min, t<sub>R</sub> (R): 33.6 min, 9.315:90.685 er.



PDA Ch1 211nm

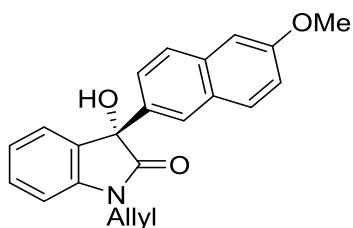
Peak#	Ret. Time	Area%
1	18.640	50.035
2	33.533	49.965
Total		100.000



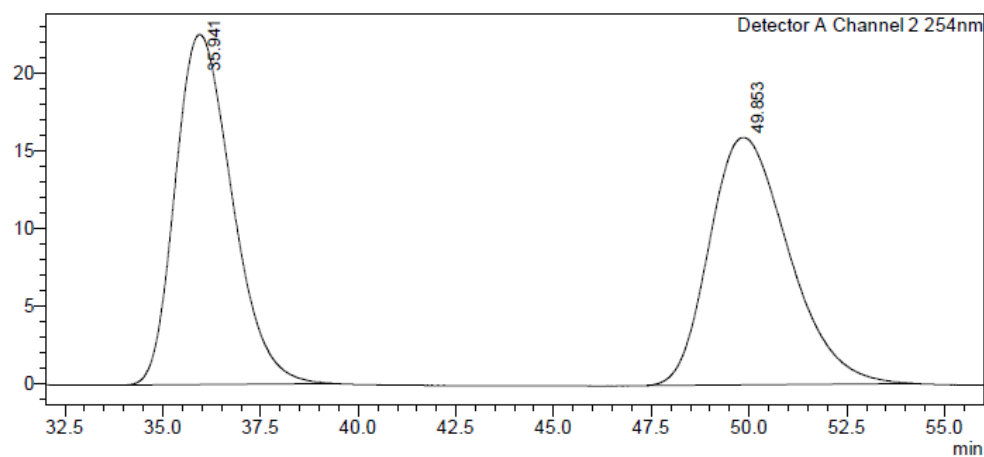
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	18.699	9.315
2	33.576	90.685
Total		100.000

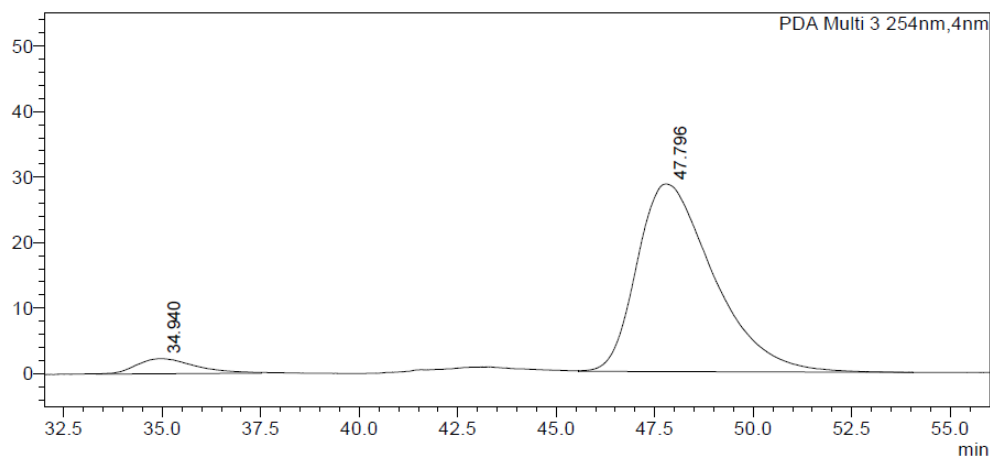
1-Allyl-3-hydroxy-3-(6-methoxynaphthalen-2-yl)indolin-2-one **22**



Chiralcel OJ-H (90:10 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 254 nm, 40 °C) t<sub>R</sub> (R): 35.0 min, t<sub>R</sub> (S): 47.8 min, 5.178:94.822 er.



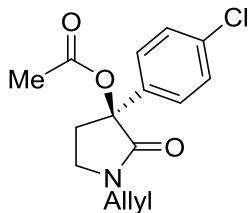
Peak#	Ret. Time	Area%
1	35.941	50.316
2	49.853	49.684
Total		100.000



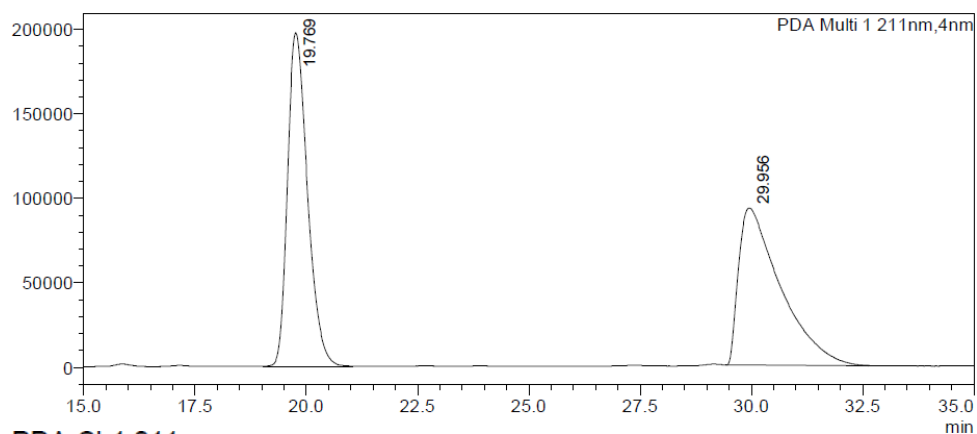
Peak#	Ret. Time	Area%
1	35.005	5.178
2	47.793	94.822
Total		100.000

## Flow HPLCs - KR in PhMe

### 1-Allyl-3-(4-chlorophenyl)-2-oxopyrrolidin-3-yl acetate **S27**

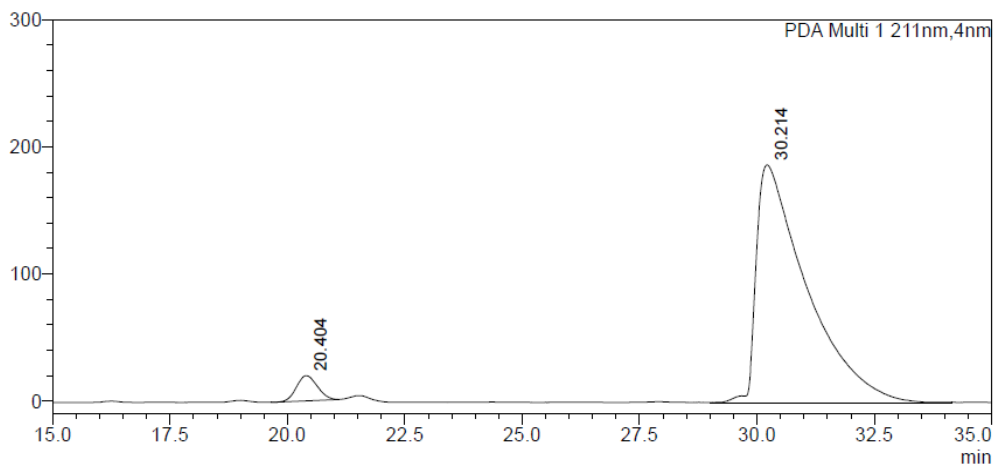


Chiralpak AD-H (95:5 hexane:IPA, flow rate 1.0 mL min<sup>-1</sup>, 211 nm, 30 °C) t<sub>R</sub> (*R*): 20.4 min, t<sub>R</sub> (*S*): 30.2 min, 4.205:95.795 er.



PDA Ch1 211nm

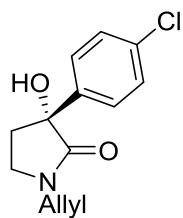
Peak#	Ret. Time	Area%
1	19.769	50.256
2	29.956	49.744
Total		100.000



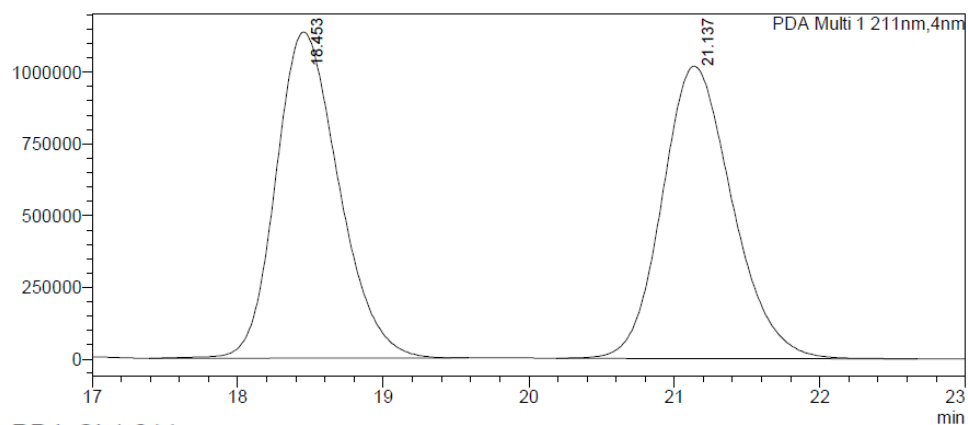
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	20.404	4.205
2	30.214	95.795
Total		100.000

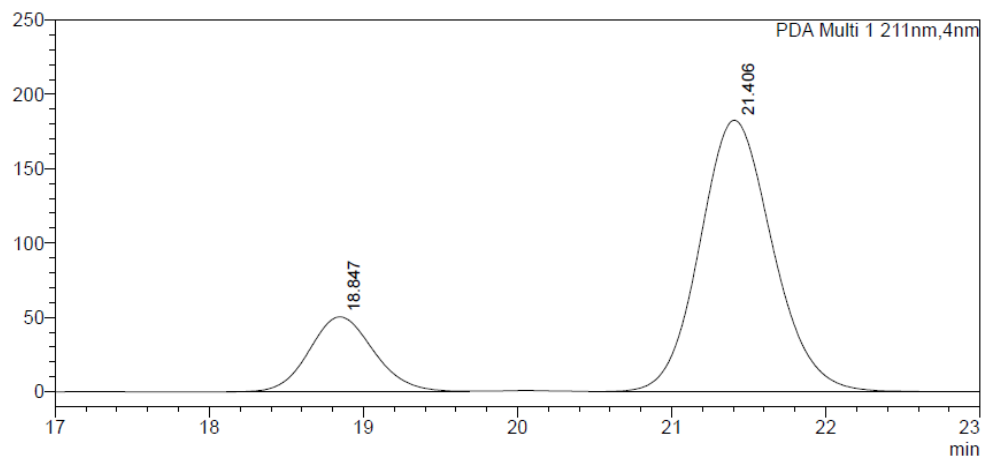
1-Allyl-3-(4-chlorophenyl)-3-hydroxypyrrolidin-2-one **31**



Chiralpak AD-H (95:5 hexane:IPA, flow rate 1 mL min<sup>-1</sup>, 211 nm, 30 °C) t<sub>R</sub> (S): 18.8 min, t<sub>R</sub> (R): 21.4 min, 19.811:80.189 er.



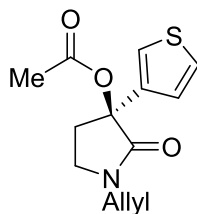
Peak#	Ret. Time	Area%
1	18.453	50.052
2	21.137	49.948
Total		100.000



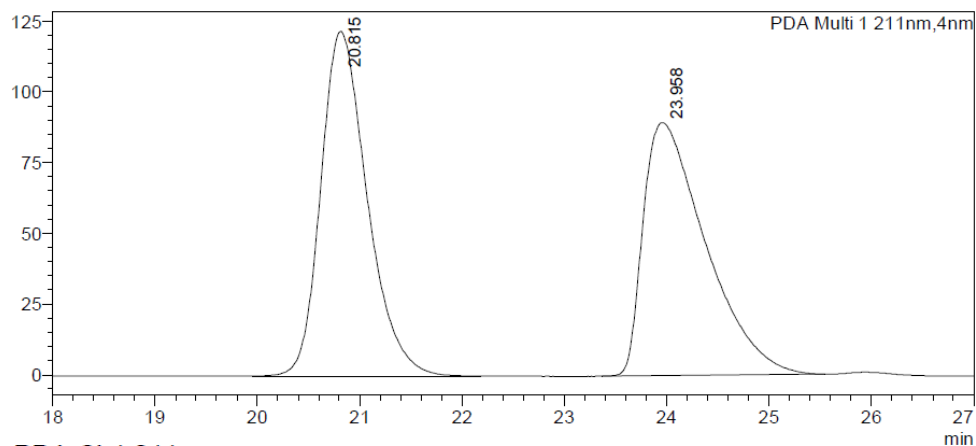
Peak#	Ret. Time	Area%
1	18.847	19.811
2	21.406	80.189
Total		100.000



1-Allyl-2-oxo-3-(thiophen-3-yl)pyrrolidin-3-yl acetate **S28**

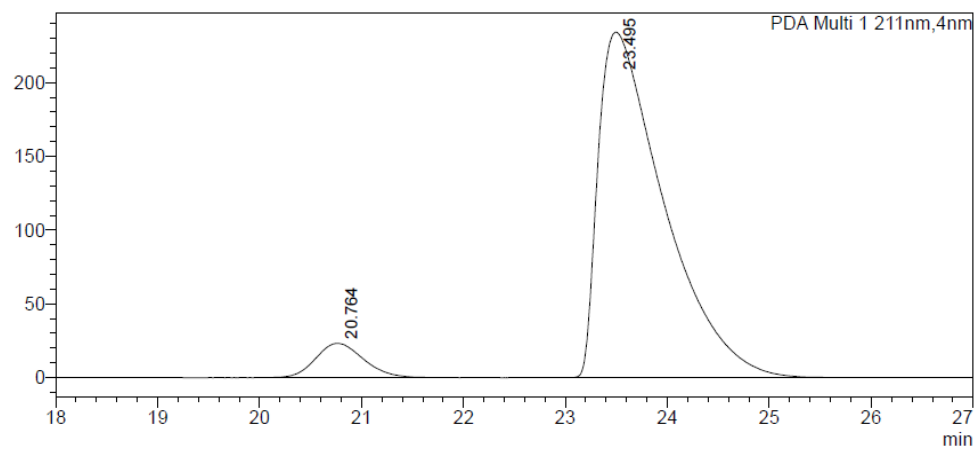


Chiralpak AD-H (95:5 hexane:IPA, flow rate 1 mL min<sup>-1</sup>, 211 nm, 30 °C) t<sub>R</sub> (R): 20.8 min, t<sub>R</sub> (S): 23.5 min, 6.793:93.207 er.



PDA Ch1 211nm

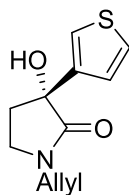
Peak#	Ret. Time	Area%
1	20.815	50.317
2	23.958	49.683
Total		100.000



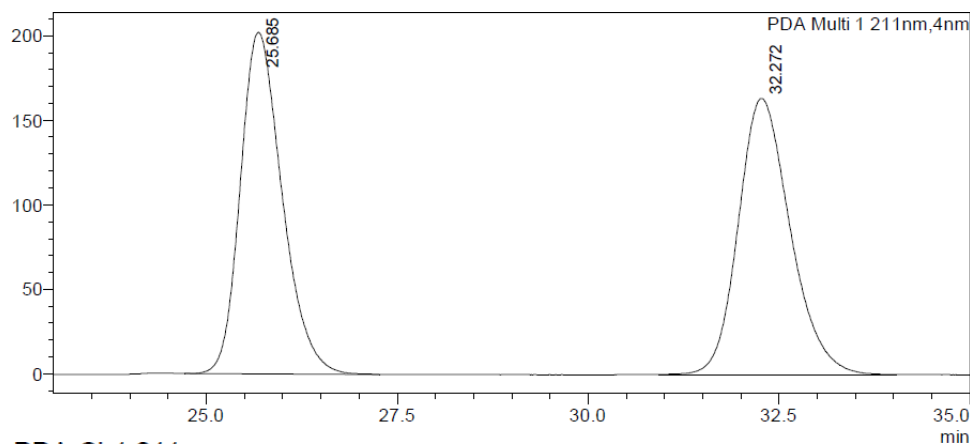
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	20.764	6.793
2	23.495	93.207
Total		100.000

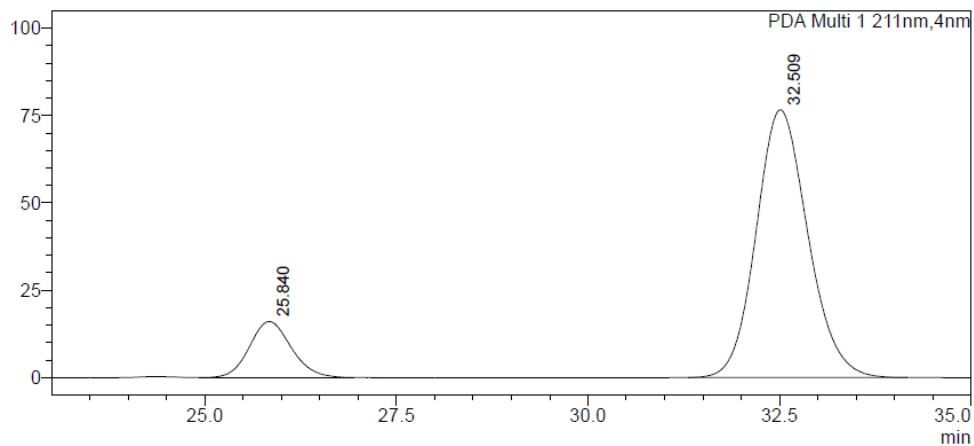
1-Allyl-3-hydroxy-3-(thiophen-3-yl)pyrrolidin-2-one **32**



Chiralpak AD-H (95:5 hexane:IPA, flow rate 1 mL min<sup>-1</sup>, 211 nm, 30 °C) t<sub>R</sub> (*S*): 25.8 min, t<sub>R</sub> (*R*): 32.5 min, 14.503:85.497 er.

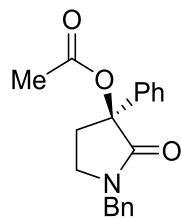


Peak#	Ret. Time	Area%
1	25.685	49.878
2	32.272	50.122
Total		100.000

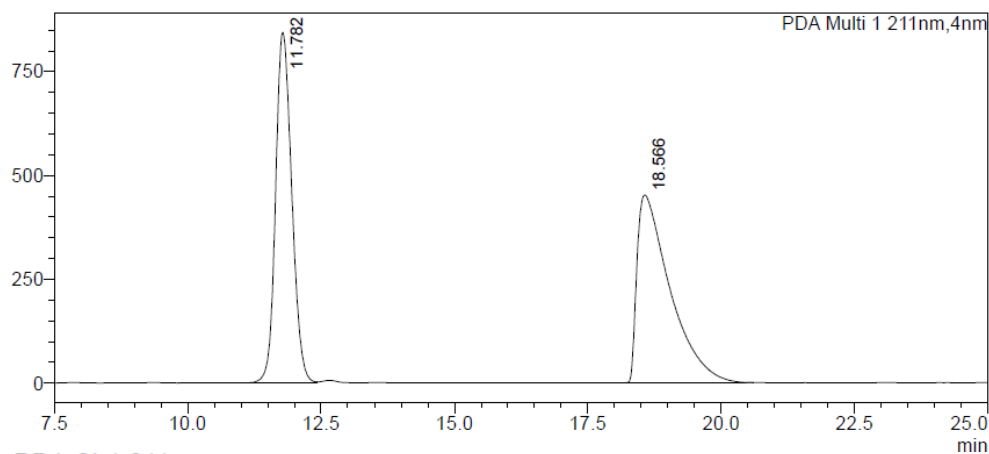


Peak#	Ret. Time	Area%
1	25.840	14.503
2	32.509	85.497
Total		100.000

1-Benzyl-2-oxo-3-phenylpyrrolidin-3-yl acetate **S29**

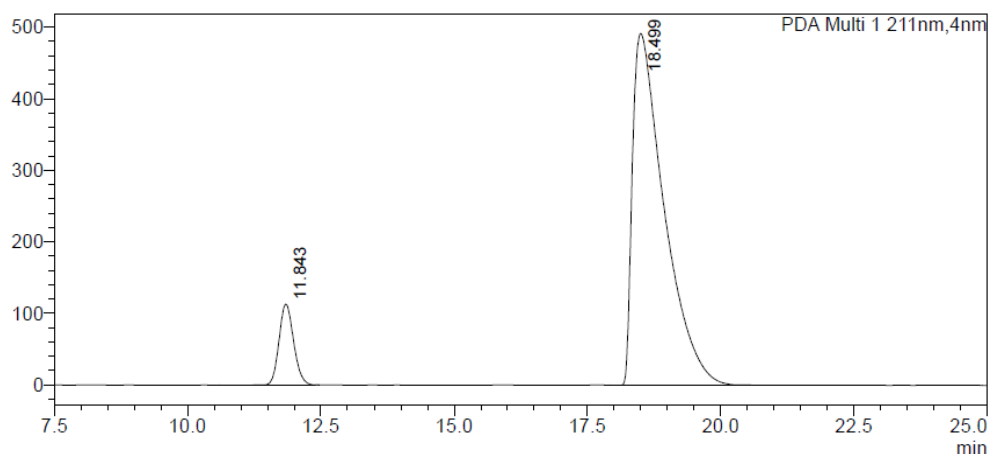


Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (*R*): 11.8 min, t<sub>R</sub> (*S*): 18.5 min, 9.629:90.371 er.



PDA Ch1 211nm

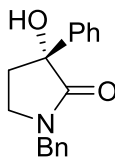
Peak#	Ret. Time	Area%
1	11.782	47.861
2	18.566	52.139
Total		100.000



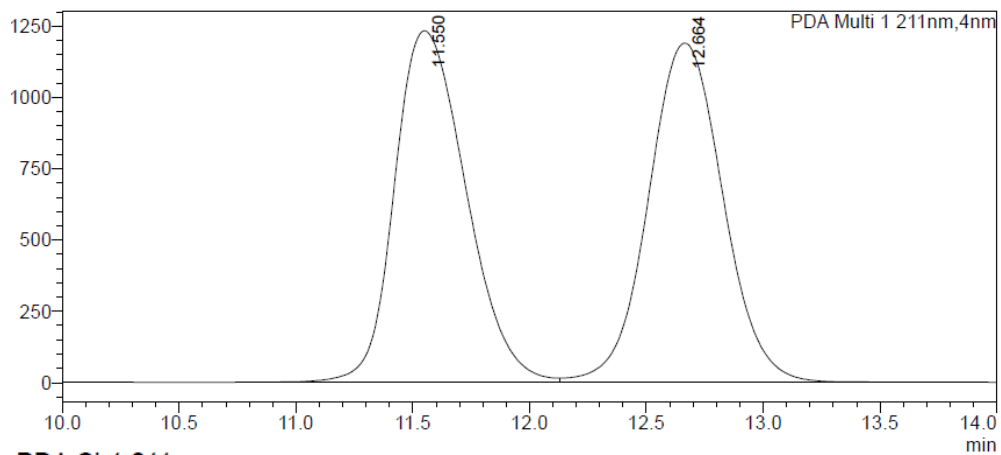
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	11.843	9.629
2	18.499	90.371
Total		100.000

### 1-Benzyl-3-hydroxy-3-phenylpyrrolidin-2-one **33**

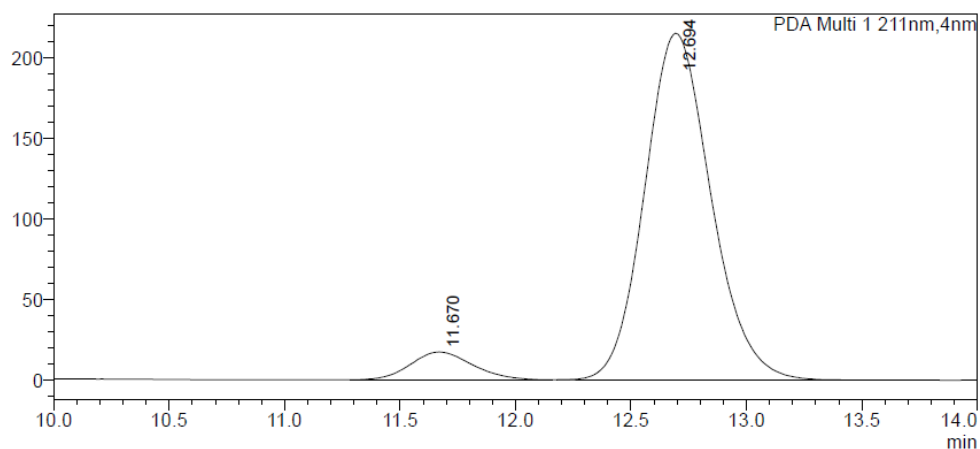


Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (S): 11.7 min, t<sub>R</sub> (R): 12.7 min, 7.025:92.975 er.



PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	11.550	49.825
2	12.664	50.175
Total		100.000

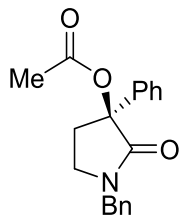


PDA Ch1 211nm

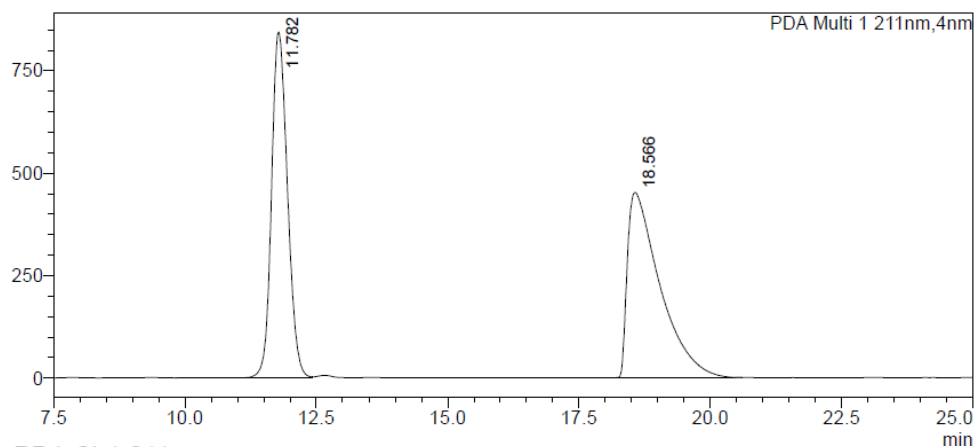
Peak#	Ret. Time	Area%
1	11.670	7.025
2	12.694	92.975
Total		100.000

## Scale-up

### 1-Benzyl-2-oxo-3-phenylpyrrolidin-3-yl acetate **S29**

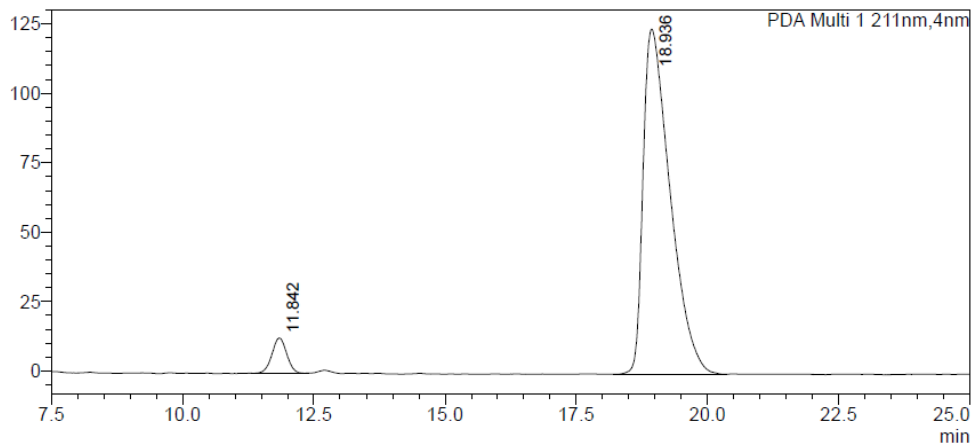


Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (*R*): 11.8 min, t<sub>R</sub> (*S*): 18.5 min, 5.267:94.733 (*R*:*S*) er.



PDA Ch1 211nm

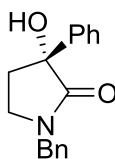
Peak#	Ret. Time	Area%
1	11.782	47.861
2	18.566	52.139
Total		100.000



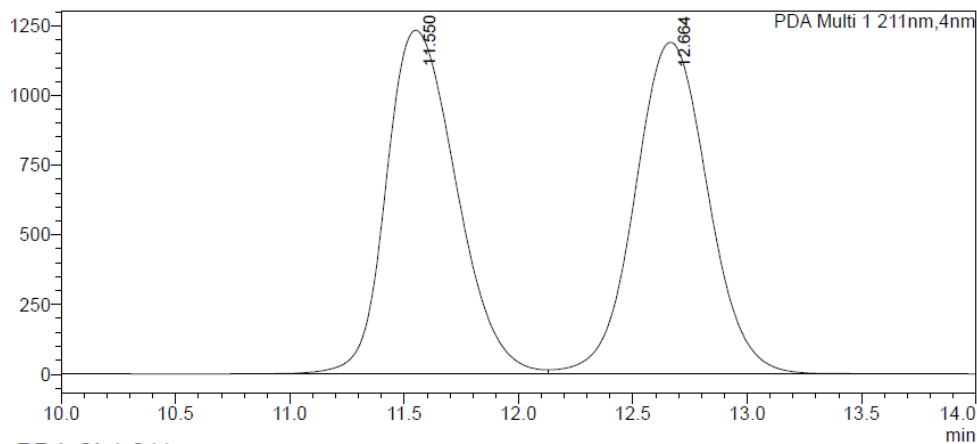
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	11.842	5.267
2	18.936	94.733
Total		100.000

### 1-Benzyl-3-hydroxy-3-phenylpyrrolidin-2-one **33**

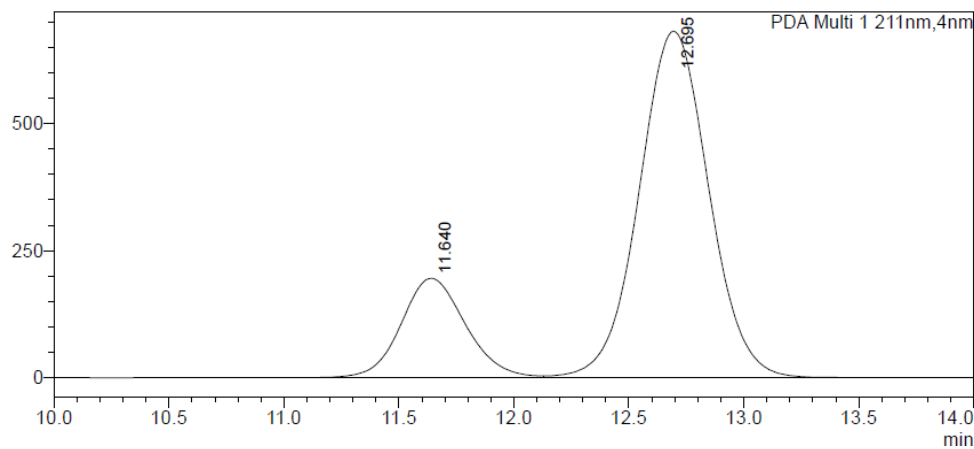


Chiralpak AD-H (90:10 hexane:IPA, flow rate 1.5 mL min<sup>-1</sup>, 211 nm, 40 °C) t<sub>R</sub> (S): 11.6 min, t<sub>R</sub> (R): 12.7 min, 21.021:78.975 (S:R) er.



PDA Ch1 211nm

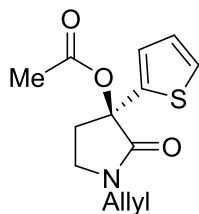
Peak#	Ret. Time	Area%
1	11.550	49.825
2	12.664	50.175
Total		100.000



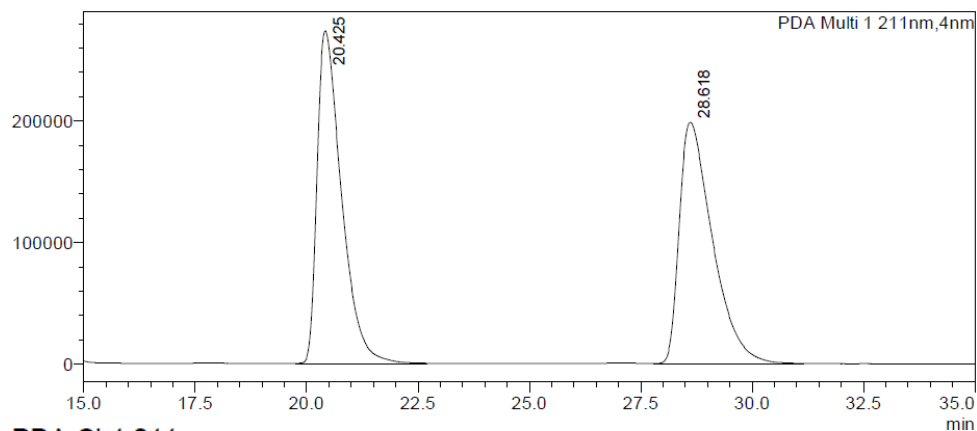
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	11.640	21.021
2	12.695	78.979
Total		100.000

1-Allyl-2-oxo-3-(thiophen-2-yl)pyrrolidin-3-yl acetate **S30**

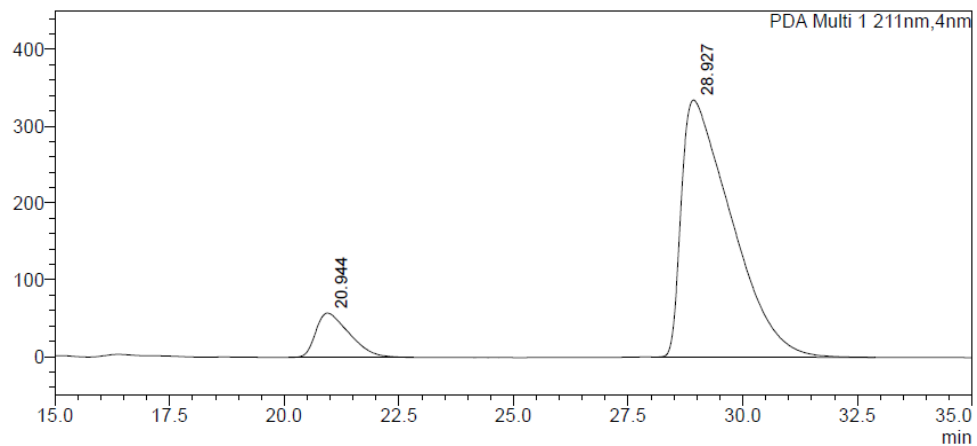


Chiralpak OD-H (95:5 hexane:IPA, flow rate 1 mL min<sup>-1</sup>, 211 nm, 30 °C) t<sub>R</sub> (S): 20.9 min, t<sub>R</sub> (R): 28.9 min, 10.279:89.721 er.



PDA Ch1 211nm

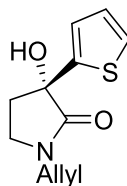
Peak#	Ret. Time	Area%
1	20.425	50.335
2	28.618	49.665
Total		100.000



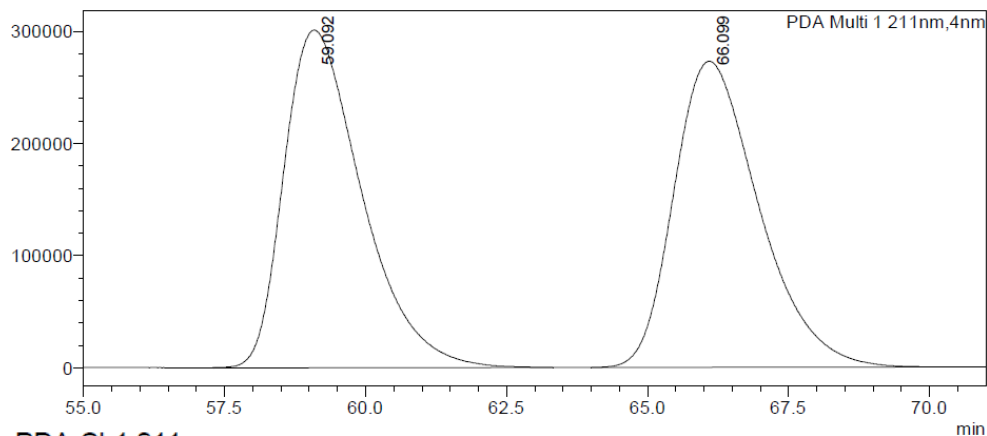
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	20.944	10.279
2	28.927	89.721
Total		100.000

1-Allyl-3-hydroxy-3-(thiophen-2-yl)pyrrolidin-2-one **34**

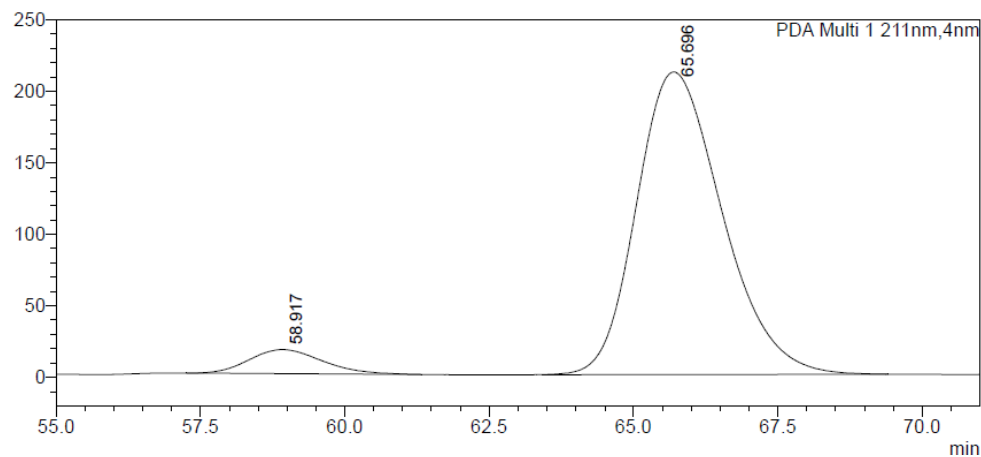


Chiralpak AD-H (98:2 hexane:IPA, flow rate 1 mL min<sup>-1</sup>, 211 nm, 30 °C) t<sub>R</sub> (R): 58.9 min, t<sub>R</sub> (S): 65.7 min, 6.365:93.635 er.



PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	59.092	50.275
2	66.099	49.725
Total		100.000

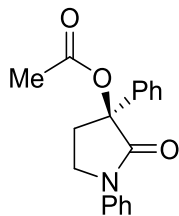


PDA Ch1 211nm

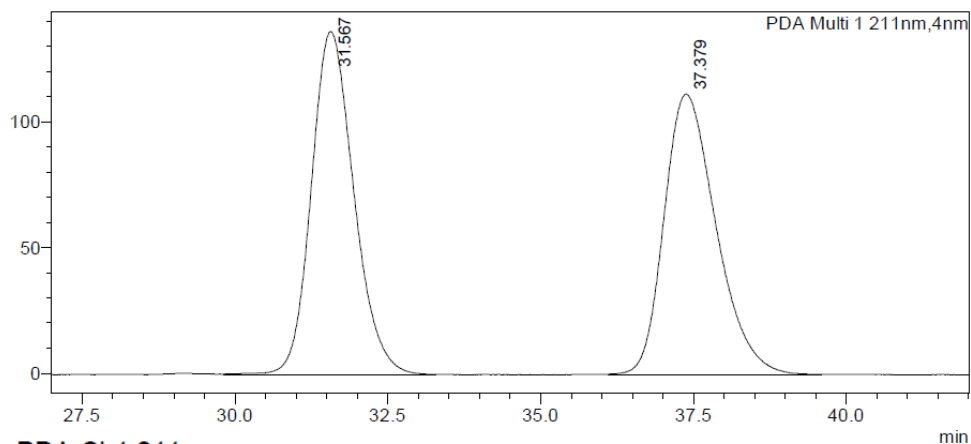
Peak#	Ret. Time	Area%
1	58.917	6.365
2	65.696	93.635
Total		100.000



2-Oxo-1,3-diphenylpyrrolidin-3-yl acetate **S31**

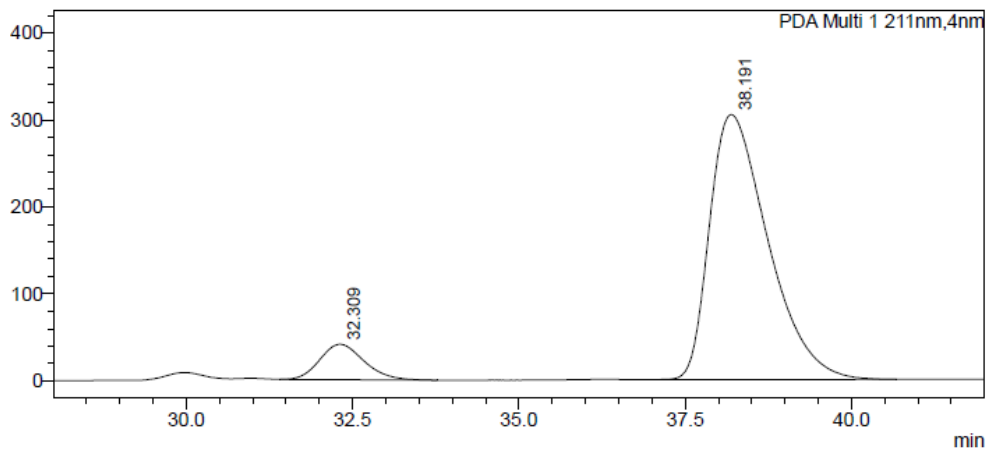


Chiralpak AD-H (90:10 hexane:IPA, flow rate 1 mL min<sup>-1</sup>, 211 nm, 30 °C) t<sub>R</sub> (R): 32.3 min, t<sub>R</sub> (S): 38.2 min, 9.153:90.847 er.



PDA Ch1 211nm

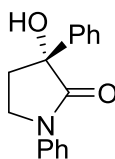
Peak#	Ret. Time	Area%
1	31.567	50.051
2	37.379	49.949
Total		100.000



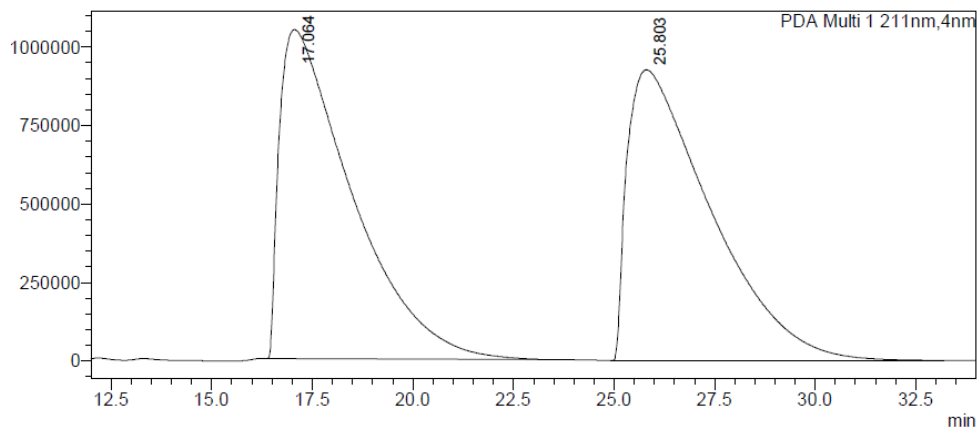
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	32.309	9.153
2	38.191	90.847
Total		100.000

### 3-Hydroxy-1,3-diphenylpyrrolidin-2-one **35**

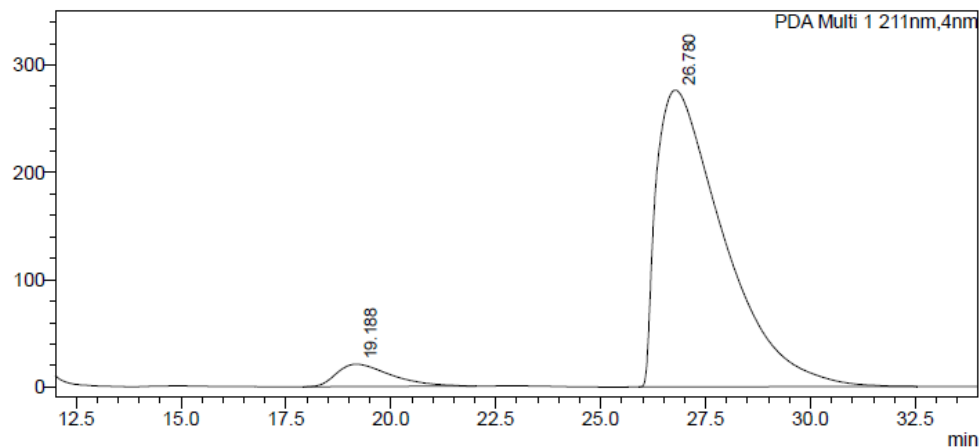


Chiralpak AD-H (95:5 hexane:IPA, flow rate 1 mL min<sup>-1</sup>, 211 nm, 30 °C) t<sub>R</sub> (*S*): 19.2 min, t<sub>R</sub> (*R*): 26.8 min, 5.717:94.283 er.



PDA Ch1 211nm

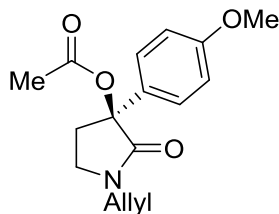
Peak#	Ret. Time	Area%
1	17.064	49.549
2	25.803	50.451
Total		100.000



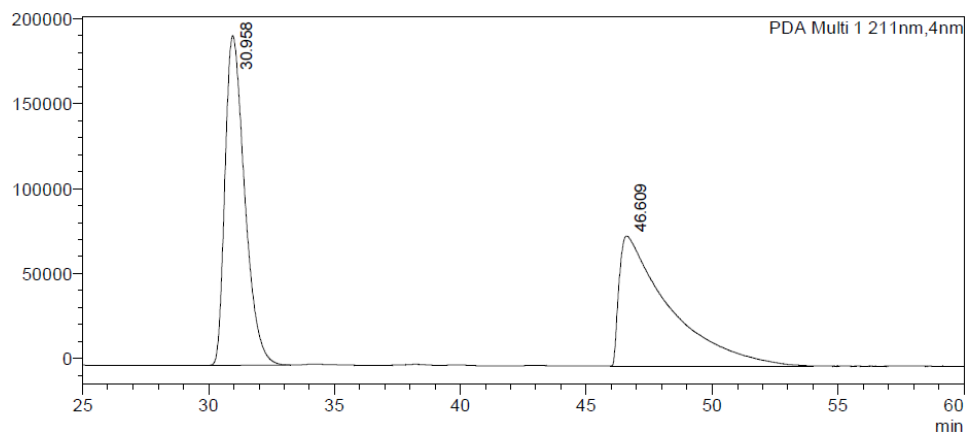
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	19.188	5.717
2	26.780	94.283
Total		100.000

1-Allyl-3-(4-methoxyphenyl)-2-oxopyrrolidin-3-yl acetate **S32**

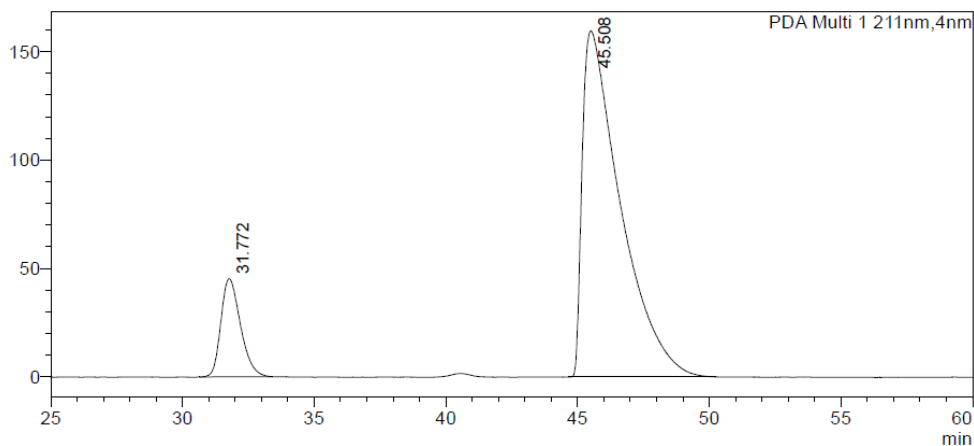


Chiralpak AD-H (95:5 hexane:IPA, flow rate 1 mL min<sup>-1</sup>, 211 nm, 30 °C) *t<sub>R</sub>* (*R*): 31.8 min, *t<sub>R</sub>* (*S*): 45.5 min, 12.686:87.314 er.



PDA Ch1 211nm

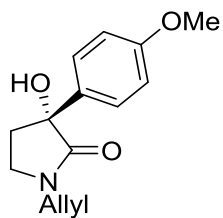
Peak#	Ret. Time	Area%
1	30.958	50.016
2	46.609	49.984
Total		100.000



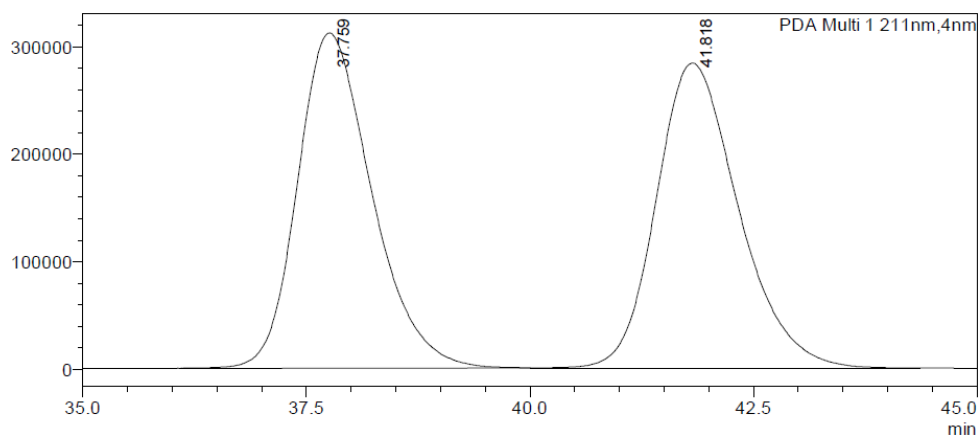
PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	31.772	12.686
2	45.508	87.314
Total		100.000

1-Allyl-3-hydroxy-3-(4-methoxyphenyl)pyrrolidin-2-one **36**

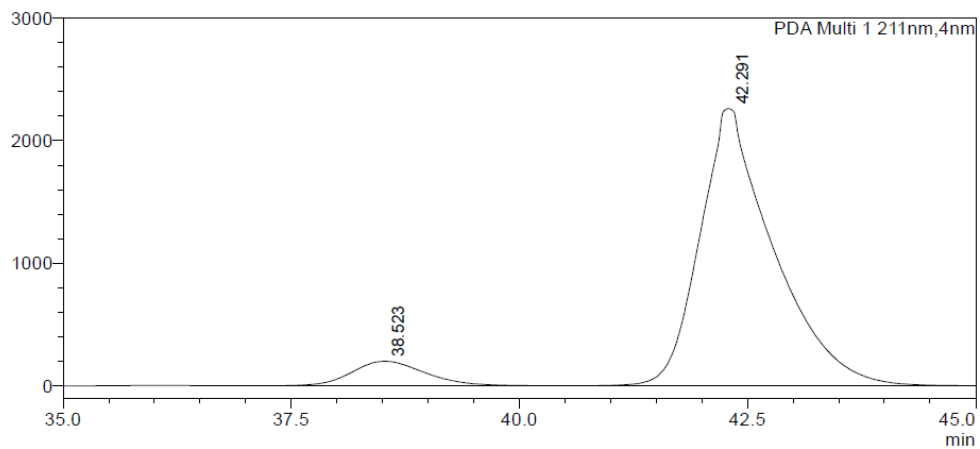


Chiralpak AD-H (95:5 hexane:IPA, flow rate 1 mL min<sup>-1</sup>, 211 nm, 30 °C) *t<sub>R</sub>* (*S*): 38.5 min, *t<sub>R</sub>* (*R*): 42.3 min, 8.165:91.835 er.



PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	37.759	49.853
2	41.818	50.147
Total		100.000



PDA Ch1 211nm

Peak#	Ret. Time	Area%
1	38.523	8.165
2	42.291	91.835
Total		100.000

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