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**General Methods**

All reactions were carried out with magnetic stirring and in flame dried glassware. Standard syringe techniques were applied for transfer of dry solvents. All solvents before used were dried and distilled under standard methods. All other commercially available reagents were used as received. Proton ($^1$H NMR) and carbon ($^{13}$C NMR) nuclear magnetic resonance spectra were recorded at 400 MHz and 101 MHz, respectively. The chemical shifts are given in parts per million (ppm) on the delta ($\delta$) scale. The solvent peak was used as a reference value, for $^1$H NMR: CDCl$_3$ = 7.27 ppm, for $^{13}$C NMR: CDCl$_3$ = 77.23. Infrared spectra were recorded on a FT-IR spectrometer with KBr discs. Analytical TLC was performed on precoated silica gel GF254 plates. Column chromatography was carried out on silica gel or alumina (200–300 mesh). HRMS were carried out on an Orbitrap analyzer.
General procedure for the benzylation reaction of isoquinolines

In a 10 mL tube, 1a (0.2 mmol, 1.0 equiv), 2a (1.8 mmol, 9 equiv), Y(OTf)$_3$ (0.01 mmol, 0.05 equiv) and di-tert-butyl peroxide (0.6 mmol, 3.0 equiv) were added. Then the tube was sealed and the resulting solution was heated in a 120 °C oil bath with vigorous stirring for 24 h. Then the reaction mixture was cooled to 0 °C and treated with saturated aqueous NaHCO$_3$. The mixture was extracted with ethyl acetate (10 mL × 3), and the combined organic layer was dried over MgSO$_4$, filtered and the solvent was evaporated under vacuum. The residue was purified by flash chromatography using ethyl acetate/petroleum ether (10:90) as eluent to afford 3a (32.0 mg, 73% yield).

General procedure for the benzylation reaction of isoquinolines

In a 10 mL tube, 1a (0.2 mmol, 1.0 equiv), 2a (1.8 mmol, 9 equiv), TFA (0.2 mmol, 1.0 equiv), MnO$_2$ (0.02 mmol, 10 mol %) and TBHP (5–6 M solution in decane, 1.0 mmol, 5.0 equiv) were added. Then the tube was sealed and the resulting solution was heated in a 120 °C oil bath with vigorous stirring for 24 h. Then the reaction mixture was cooled to 0 °C and treated with saturated aqueous NaHCO$_3$. The mixture was extracted with ethyl acetate (10 mL × 3), and the combined organic layer was dried over MgSO$_4$, filtered and the solvent was evaporated under vacuum. The residue was purified by flash chromatography using ethyl acetate/petroleum ether (10:90) as eluent to afford 4a (30.3 mg, 65% yield).
Analytical data for products

1-Benzylisoquinoline (3a)

$^1$H NMR (400 MHz, CDCl$_3$) $\delta$ = 8.52 (d, $J$ = 5.7 Hz, 1H), 8.16 (d, $J$ = 8.4 Hz, 1H), 7.82 (d, $J$ = 8.2 Hz, 1H), 7.64 (t, $J$ = 7.5 Hz, 1H), 7.60–7.51 (m, 2H), 7.33–7.24 (m, 4H), 7.18 (t, $J$ = 6.9 Hz, 1H), 4.70 (s, 2H), $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ = 160.3, 142.2, 139.6, 136.8, 130.0, 128.8, 128.7, 127.5, 127.4, 126.4, 126.0, 120.0, 42.2.

These data are consistent with reported literature values.$^1$

1-(2-Methylbenzyl)isoquinoline (3b)

It was prepared following the general method for benzylation and purified by flash chromatography on silica gel using ethyl acetate/petroleum ether (10:90) as eluent to afford 3b (35.0 mg, 75% yield). $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ = 8.52 (d, $J$ = 5.7 Hz, 1H), 8.05 (d, $J$ = 8.5 Hz, 1H), 7.86 (d, $J$ = 8.2 Hz, 1H), 7.72–7.64 (m, 1H), 7.59 (d, $J$ = 5.7 Hz, 1H), 7.56–7.51 (m, 1H), 7.24 (d, $J$ = 7.5 Hz, 1H), 7.14 (t, $J$ = 7.4 Hz, 1H), 7.04 (t, $J$ = 7.5 Hz, 1H), 6.80 (d, $J$ = 7.6 Hz, 1H), 4.66 (s, 2H), 2.44 (s, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ = 160.2, 142.3, 138.0, 136.6, 136.4, 130.3, 130.1, 129.0, 127.7, 127.6, 127.4, 126.5, 126.2, 125.8, 119.9, 39.5, 20.2; IR $\nu_{\text{max}}$ 3045, 2920, 2851, 1586, 1529, 1387, 1036, 815, 787 cm$^{-1}$; HRMS (EI) $m/z$ [M + H]$^+$ calculated for C$_{17}$H$_{16}$N : 234.1277, found 234.1280.
1-(3-Methylbenzyl)isoquinoline (3c)

It was prepared following the general method for benzylation and purified by flash chromatography on silica gel using ethyl acetate/petroleum ether (10:90) as eluent to afford 3c (37.3 mg, 80% yield). \( ^1 \)H NMR (400 MHz, CDCl\(_3\)) \( \delta = 8.53 \) (d, \( J = 5.7 \) Hz, 1H), 8.18 (d, \( J = 8.5 \) Hz, 1H), 7.82 (d, \( J = 8.2 \) Hz, 1H), 7.69–7.62 (m, 1H), 7.60–7.50 (m, 2H), 7.21–7.07 (m, 3H), 7.00 (d, \( J = 7.3 \) Hz, 1H), 4.66 (s, 2H), 2.29 (s, 3H); \(^{13}\)C NMR (101 MHz, CDCl\(_3\)) \( \delta = 160.4, 142.2, 139.5, 138.3, 136.7, 130.0, 129.5, 128.6, 127.5, 127.4, 127.2, 126.0, 125.8, 120.0, 42.2, 21.6. \) These data are consistent with reported literature values.\(^2\)

1-(3-Chlorobenzyl)isoquinoline (3d)

It was prepared following the general method for benzylation and purified by flash chromatography on silica gel using ethyl acetate/petroleum ether (10:90) as eluent to afford 3d (27.9 mg, 55% yield). \(^1\)H NMR (400 MHz, CDCl\(_3\)) \( \delta = 8.50 \) (d, \( J = 5.7 \) Hz, 1H), 8.09 (d, \( J = 8.4 \) Hz, 1H), 7.81 (d, \( J = 8.2 \) Hz, 1H), 7.64 (t, \( J = 7.5 \) Hz, 1H), 7.55 (dd, \( J = 17.4, 6.8 \) Hz, 2H), 7.29–7.25 (m, 1H), 7.18–7.11 (m, 3H), 4.63 (s, 2H); \(^{13}\)C NMR (101 MHz, CDCl\(_3\)) \( \delta = 159.4, 142.3, 141.6, 136.8, 134.5, 130.2, 129.9, 128.9, 127.6, 127.6, 127.3, 127.0, 126.7, 125.7, 120.2, 41.7; \) IR \( \nu_{\text{max}} \) 3051, 2927, 2856, 1574, 1522, 1388, 1023, 828, 793 \( \text{cm}^{-1} \); HRMS (EI) \( m/z \) \([\text{M} + \text{H}]^+\) calculated for C\(_{16}\)H\(_{13}\)\(^{35}\)ClN : 254.0731, found 254.0733; \([\text{M} + \text{H}]^+\) calculated for C\(_{16}\)H\(_{13}\)\(^{37}\)ClN : 256.0702, found 256.0703.
1-(4-Methylbenzyl)isoquinoline (3e)

It was prepared following the general method for benzylation and purified by flash chromatography on silica gel using ethyl acetate/petroleum ether (10:90) as eluent to afford 3e (33.6 mg, 72% yield). $^1$H NMR (400 MHz, CDCl$_3$) δ = 8.51 (d, $J$ = 5.7 Hz, 1H), 8.17 (d, $J$ = 8.4 Hz, 1H), 7.81 (d, $J$ = 8.2 Hz, 1H), 7.67–7.61 (m, 1H), 7.58–7.51 (m, 2H), 7.19 (d, $J$ = 7.8 Hz, 2H), 7.08 (d, $J$ = 7.8 Hz, 2H), 4.65 (s, 2H), 2.29 (s, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) δ = 160.6, 142.2, 136.8, 136.6, 135.9, 130.0, 129.4, 128.7, 127.5, 127.4, 126.0, 119.9, 41.9, 21.2; IR $\nu_{\text{max}}$ 3050, 2920, 2856, 1561, 1513, 1384, 1020, 823, 797 cm$^{-1}$; HRMS (EI) $m/z$ [M + H]$^+$ calculated for C$_{17}$H$_{16}$N : 234.1277, found 234.1275.

1-(4-Methoxybenzyl)isoquinoline (3f)

It was prepared following the general method for benzylation and purified by flash chromatography on silica gel using ethyl acetate/petroleum ether (20:80) as eluent to afford 3f (30.4 mg, 61% yield). $^1$H NMR (400 MHz, CDCl$_3$) δ = 8.50 (d, $J$ = 5.7 Hz, 1H), 8.17 (d, $J$ = 8.4 Hz, 1H), 7.82 (d, $J$ = 8.2 Hz, 1H), 7.64 (t, $J$ = 7.5 Hz, 1H), 7.60–7.51 (m, 2H), 7.21 (d, $J$ = 8.5 Hz, 2H), 6.80 (d, $J$ = 8.6 Hz, 2H), 4.62 (s, 2H), 3.75 (s, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) δ = 160.7, 158.3, 142.2, 136.8, 131.8, 130.1, 129.8, 127.6, 127.4, 126.1, 120.0, 114.2, 55.4, 41.4. These data are consistent with reported literature values.$^1$
1-(4-Bromobenzyl)isoquinoline (3g)

It was prepared following the general method for benzylation and purified by flash chromatography on silica gel using ethyl acetate/petroleum ether (10:90) as eluent to afford **3g** (41.7 mg, 70% yield). $^1$H NMR (400 MHz, CDCl₃) $\delta$ = 8.50 (d, $J = 5.7$ Hz, 1H), 8.09 (d, $J = 8.5$ Hz, 1H), 7.82 (d, $J = 8.3$ Hz, 1H), 7.65 (t, $J = 7.5$ Hz, 1H), 7.60–7.51 (m, 2H), 7.38 (d, $J = 8.4$ Hz, 2H), 7.16 (d, $J = 8.4$ Hz, 2H), 4.62 (s, 2H); $^{13}$C NMR (101 MHz, CDCl₃) $\delta$ = 159.7, 142.2, 138.6, 136.8, 131.8, 130.6, 130.2, 127.6, 127.5, 127.2, 125.7, 120.4, 120.2, 41.5; IR $\nu_{\text{max}}$ 3055, 2927, 2849, 1566, 1519, 1387, 1026, 819, 795 cm⁻¹; HRMS (EI) $m/z$ [M + H]$^+$ calculated for C₁₆H₁₃BrN : 298.0226, found 298.0228; [M + H]$^+$ calculated for C₁₆H₁₃BrN : 300.0205, found 300.0207.

1-(4-Chlorobenzyl)isoquinoline (3h)

It was prepared following the general method for benzylation and purified by flash chromatography on silica gel using ethyl acetate/petroleum ether (10:90) as eluent to afford **3h** (24.9 mg, 49% yield). $^1$H NMR (400 MHz, CDCl₃) $\delta$ = 8.51 (d, $J = 5.7$ Hz, 1H), 8.10 (d, $J = 8.4$ Hz, 1H), 7.83 (d, $J = 8.2$ Hz, 1H), 7.66 (t, $J = 7.2$ Hz, 1H), 7.61–7.51 (m, 2H), 7.24–7.19 (m, 4H), 4.64 (s, 2H); $^{13}$C NMR (101 MHz, CDCl₃) $\delta$ = 159.8, 142.3, 138.1, 136.8, 132.3, 130.2, 128.8, 127.7, 127.6, 127.3, 125.7, 120.2, 41.5; IR $\nu_{\text{max}}$ 3051, 2916, 2852, 1554, 1517, 1388, 1022, 826, 790 cm⁻¹; HRMS (EI) $m/z$ [M + H]$^+$ calculated for C₁₆H₁₃ClN : 254.0731, found 254.0732; [M + H]$^+$ calculated for C₁₆H₁₃ClN : 256.0702, found 256.0701.
1-(Thiophen-2-ylmethyl)isoquinoline (3i)

It was prepared following the general method for benzylation and purified by flash chromatography on silica gel using ethyl acetate/petroleum ether (10:90) as eluent to afford 3i (15.8 mg, 35% yield). $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ = 8.51 (d, $J$ = 5.7 Hz, 1H), 8.23 (d, $J$ = 8.4 Hz, 1H), 7.83 (d, $J$ = 8.1 Hz, 1H), 7.67 (t, $J$ = 7.4 Hz, 1H), 7.62–7.54 (m, 2H), 7.13 (d, $J$ = 4.9 Hz, 1H), 6.91–6.87 (m, 1H), 6.86–6.84 (m, 1H), 4.84 (s, 2H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ = 159.4, 142.3, 141.9, 136.8, 130.2, 127.6, 127.5, 127.0, 127.0, 125.7, 125.6, 124.3, 120.3, 36.6; IR $\nu_{\text{max}}$ 2920, 2851, 1586, 1559, 1499, 1387, 805, 757, 703 cm$^{-1}$; HRMS (EI) $m/z$ [M + H]$^+$ calculated for C$_{14}$H$_{12}$NS: 226.0685, found 226.0689.

1-(Naphthalen-2-ylmethyl)isoquinoline (3j)

It was prepared following the general method for benzylation and purified by flash chromatography on silica gel using ethyl acetate/petroleum ether (10:90) as eluent to afford 3j (38.8 mg, 72% yield). $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ = 8.57 (d, $J$ = 5.7 Hz, 1H), 8.22 (d, $J$ = 8.5 Hz, 1H), 7.83 (d, $J$ = 7.8 Hz, 1H), 7.80–7.71 (m, 4H), 7.64 (d, $J$ = 7.6 Hz, 1H), 7.60 (d, $J$ = 6.0 Hz, 1H), 7.51 (t, $J$ = 7.7 Hz, 1H), 7.49–7.38 (m, 3H), 4.87 (s, 2H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ = 160.2, 142.3, 137.3, 136.8, 133.8, 132.3, 130.0, 128.3, 127.8, 127.8, 127.6, 127.4, 127.3, 127.1, 126.1, 126.0, 125.6, 120.1, 42.5. These data are consistent with reported literature values.$^3$
1-(Naphthalen-1-ylmethyl)isoquinoline (3k)

It was prepared following the general method for benzylation and purified by flash chromatography on silica gel using ethyl acetate/petroleum ether (10:90) as eluent to afford 3k (22.1 mg, 41% yield). $^1$H NMR (400 MHz, CDCl$_3$) δ = 8.52 (d, J = 5.7 Hz, 1H), 8.26 (d, J = 8.2 Hz, 1H), 8.06 (d, J = 8.5 Hz, 1H), 7.85 (dd, J = 15.6, 7.9 Hz, 2H), 7.71 (d, J = 8.2 Hz, 1H), 7.65–7.42 (m, 5H), 7.30–7.23 (m, 1H), 6.96 (d, J = 7.1 Hz, 1H), 5.12 (s, 2H); $^{13}$C NMR (101 MHz, CDCl$_3$) δ = 160.2, 142.4, 136.6, 135.9, 134.0, 132.3, 130.1, 129.0, 127.8, 127.6, 127.4, 127.2, 126.7, 126.3, 125.9, 125.8, 125.7, 124.0, 120.0, 39.2; IR $\nu_{\text{max}}$ 3049, 2918, 1560, 1498, 1383, 1014, 822, 790, 774, 751 cm$^{-1}$; HRMS (EI) m/z [M + H]$^+$ calculated for C$_{20}$H$_{16}$N: 270.1277, found 270.1275.

1-(3,5-Dimethylbenzyl)isoquinoline (3l)

It was prepared following the general method for benzylation and purified by flash chromatography on silica gel using ethyl acetate/petroleum ether (10:90) as eluent to afford 3l (34.6 mg, 70% yield). $^1$H NMR (400 MHz, CDCl$_3$) δ = 8.54 (d, J = 5.7 Hz, 1H), 8.20 (d, J = 8.4 Hz, 1H), 7.82 (d, J = 8.2 Hz, 1H), 7.70–7.61 (m, 1H), 7.60–7.51 (m, 2H), 6.94 (s, 2H), 6.83 (s, 1H), 4.62 (s, 2H), 2.26 (s, 6H); $^{13}$C NMR (101 MHz, CDCl$_3$) δ = 160.6, 142.2, 139.5, 138.1, 136.8, 130.0, 128.2, 127.5, 127.3, 126.6, 126.1, 119.9, 42.1, 21.4; IR $\nu_{\text{max}}$ 3054, 2922, 1553, 1480, 1381, 1002, 836, 778 cm$^{-1}$; HRMS (EI) m/z [M + H]$^+$ calculated for C$_{18}$H$_{18}$N : 248.1434, found 248.1431.
1-(3-Bromo-5-methylbenzyl)isoquinoline (3m)

It was prepared following the general method for benzylation and purified by flash chromatography on silica gel using ethyl acetate/petroleum ether (10:90) as eluent to afford 3m (45.0 mg, 72% yield). \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta = 8.51\) (d, \(J = 5.5\) Hz, 1H), 8.11 (d, \(J = 8.3\) Hz, 1H), 7.82 (d, \(J = 7.9\) Hz, 1H), 7.68–7.61 (m, 1H), 7.60–7.51 (m, 2H), 7.25 (s, 1H), 7.15 (s, 1H), 7.02 (s, 1H), 4.60 (s, 2H), 2.23 (s, 3H); \(^13\)C NMR (101 MHz, CDCl\(_3\)) \(\delta = 159.5, 142.2, 141.6, 140.4, 136.8, 130.3, 130.1, 128.8, 128.3, 127.6, 127.6, 127.3, 125.7, 122.5, 120.2, 41.6, 21.3; IR \(\nu_{\text{max}}\) 3048, 2927, 2864, 1550, 1506, 1372, 1029, 834, 786 cm\(^{-1}\); HRMS (EI) \(m/z\) [M + H]\(^+\) calculated for C\(_{17}\)H\(_{15}\)\(^{79}\)BrN : 312.0382, found 312.0387; [M + H]\(^-\) calculated for C\(_{17}\)H\(_{15}\)\(^{81}\)BrN : 314.0362, found 314.0364.

1-(4-Ethylbenzyl)isoquinoline (3n)

It was prepared following the general method for benzylation and purified by flash chromatography on silica gel using ethyl acetate/petroleum ether (10:90) as eluent to afford 3n (37.1 mg, 75% yield). \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta = 8.52\) (d, \(J = 5.5\) Hz, 1H), 8.19 (d, \(J = 8.4\) Hz, 1H), 7.81 (d, \(J = 8.1\) Hz, 1H), 7.64 (t, \(J = 7.4\) Hz, 1H), 7.59–7.49 (m, 2H), 7.23 (d, \(J = 7.5\) Hz, 2H), 7.11 (d, \(J = 7.5\) Hz, 2H), 4.67 (s, 2H), 2.60 (q, \(J = 7.4\) Hz, 2H), 1.20 (t, \(J = 7.5\) Hz, 3H); \(^13\)C NMR (101 MHz, CDCl\(_3\)) \(\delta = 160.6, 142.3, 142.2, 136.8, 136.8, 130.0, 128.7, 128.2, 127.5, 127.4, 127.3, 126.1,
119.9, 41.8, 28.6, 15.7; IR νmax 3042, 2909, 2840, 1573, 1525, 1377, 1033, 834, 780 cm⁻¹; HRMS (EI) m/z [M + H]⁺ calculated for C₁₈H₁₈N: 248.1434, found 248.1433.

![Chemical Structure]

1-(4-Isopropylbenzyl)isoquinoline (3o)

It was prepared following the general method for benzylation and purified by flash chromatography on silica gel using ethyl acetate/petroleum ether (10:90) as eluent to afford 3o (42.9 mg, 82% yield). ¹H NMR (400 MHz, CDCl₃) δ = 8.51 (d, J = 5.7 Hz, 1H), 8.20 (d, J = 8.4 Hz, 1H), 7.82 (d, J = 8.2 Hz, 1H), 7.68–7.62 (m, 1H), 7.59–7.51 (m, 2H), 7.23 (d, J = 8.1 Hz, 2H), 7.13 (d, J = 8.0 Hz, 2H), 4.66 (s, 2H), 2.85 (dt, J = 13.8, 6.9 Hz, 1H), 1.21 (d, J = 6.9 Hz, 6H); ¹³C NMR (101 MHz, CDCl₃) δ = 160.6, 146.9, 142.2, 136.9, 136.8, 130.1, 128.7, 127.5, 127.5, 127.4, 126.8, 126.1, 119.9, 41.8, 33.8, 24.2; IR νmax 3039, 2930, 2839, 1548, 1508, 1377, 1009, 837, 778 cm⁻¹; HRMS (EI) m/z [M + H]⁺ calculated for C₁₉H₂₀N : 262.1590, found 262.1591.

![Chemical Structure]

1-(3-Ethylbenzyl)isoquinoline (3p)

It was prepared following the general method for benzylation and purified by flash chromatography on silica gel using ethyl acetate/petroleum ether (10:90) as eluent to afford 3p (29.7 mg, 60% yield). ¹H NMR (400 MHz, CDCl₃) δ = 8.52 (d, J = 5.7 Hz, 1H), 8.19 (d, J = 8.5 Hz, 1H), 7.82 (d, J = 8.2 Hz, 1H), 7.65 (t, J = 7.5 Hz, 1H), 7.59–7.51 (m, 2H), 7.21–7.14 (m, 2H), 7.09 (d, J = 7.6 Hz, 1H), 7.03 (d, J = 7.6 Hz,
1H), 4.67 (s, 2H), 2.59 (q, J = 7.6 Hz, 2H), 1.19 (t, J = 7.6 Hz, 3H); \(^{13}\)C NMR (101 MHz, CDCl\(_3\)) \(\delta = 160.5, 144.7, 142.2, 139.6, 136.8, 130.1, 128.7, 128.5, 127.5, 127.4, 126.1, 126.0, 120.0, 42.3, 29.0, 15.7; IR \(\nu_{\text{max}}\) 3043, 2922, 2846, 1569, 1521, 1396, 1011, 826, 785 cm\(^{-1}\); HRMS (EI) \(m/z\) [M + H]\(^{+}\) calculated for C\(_{18}\)H\(_{18}\)N : 248.1434, found 248.1436.

![Chemical structure of 1-(2-Ethylbenzyl)isoquinoline (3q)](image)

**1-(2-Ethylbenzyl)isoquinoline (3q)**

It was prepared following the general method for benzylation and purified by flash chromatography on silica gel using ethyl acetate/petroleum ether (10:90) as eluent to afford 3q (30.7 mg, 62% yield). \(^{1}\)H NMR (400 MHz, CDCl\(_3\)) \(\delta = 8.52\) (d, \(J = 5.7\) Hz, 1H), 8.05 (d, \(J = 8.5\) Hz, 1H), 7.85 (d, \(J = 8.2\) Hz, 1H), 7.66 (t, \(J = 7.5\) Hz, 1H), 7.59 (d, \(J = 5.7\) Hz, 1H), 7.55–7.50 (m, 1H), 7.28 (d, \(J = 6.7\) Hz, 1H), 7.19 (t, \(J = 7.3\) Hz, 1H), 7.03 (t, \(J = 7.4\) Hz, 1H), 6.80 (d, \(J = 7.6\) Hz, 1H), 4.72 (s, 2H), 2.84 (q, \(J = 7.5\) Hz, 2H), 1.30 (t, \(J = 7.5\) Hz, 3H); \(^{13}\)C NMR (101 MHz, CDCl\(_3\)) \(\delta = 160.5, 142.3, 142.1, 137.3, 136.6, 130.0, 129.3, 128.5, 127.7, 127.6, 127.4, 126.7, 126.1, 125.9, 119.8, 39.0, 26.3, 14.8; IR \(\nu_{\text{max}}\) 3058, 2914, 2860, 1557, 1518, 1374, 1039, 829, 782 cm\(^{-1}\); HRMS (EI) \(m/z\) [M + H]\(^{+}\) calculated for C\(_{18}\)H\(_{18}\)N : 248.1434, found 248.1432.

![Chemical structure of 1-Benzyl-6,7-dimethoxyisoquinoline (3r)](image)

**1-Benzyl-6,7-dimethoxyisoquinoline (3r)**

It was prepared following the general method for benzylation and purified by flash
chromatography on silica gel using ethyl acetate/petroleum ether (30:70) as eluent to afford 3r (27.9 mg, 50% yield). $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ = 8.40 (d, $J$ = 5.6 Hz, 1H), 7.45 (d, $J$ = 5.6 Hz, 1H), 7.34–7.25 (m, 5H), 7.23–7.15 (m, 1H), 7.06 (s, 1H), 4.63 (s, 2H), 4.01 (s, 3H), 3.89 (s, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ = 157.8, 152.5, 149.9, 141.2, 139.8, 133.6, 128.7, 126.4, 123.1, 118.9, 105.4, 104.4, 56.1, 56.0, 42.9; IR $\nu_{\text{max}}$ 3050, 2920, 2856, 1561, 1513, 1384, 1020, 823, 797 cm$^{-1}$; HRMS (EI) $m/z$ [M + H]$^+$ calculated for C$_{18}$H$_{19}$NO$_2$ : 280.1332, found 280.1336.

![Structure of 3r](image)

1-Benzyl-5,6,7-trimethoxyisoquinoline (3s)

It was prepared following the general method for benzylation and purified by flash chromatography on silica gel using ethyl acetate/petroleum ether (30:70) as eluent to afford 3s (25.4 mg, 41% yield). $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ = 8.41 (d, $J$ = 5.8 Hz, 1H), 7.77 (d, $J$ = 5.8 Hz, 1H), 7.31–7.24 (m, 4H), 7.21–7.16 (m, 1H), 7.14 (s, 1H), 4.60 (s, 2H), 4.03 (s, 3H), 3.99 (s, 3H), 3.86 (s, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ = 158.1, 153.5, 147.3, 143.8, 140.7, 139.8, 128.8, 128.8, 128.7, 126.5, 124.4, 114.0, 100.7, 61.7, 61.3, 56.0, 43.0; IR $\nu_{\text{max}}$ 3030, 2929, 2838, 1539, 1493, 1382, 1010, 805, 778 cm$^{-1}$; HRMS (EI) $m/z$ [M + H]$^+$ calculated for C$_{19}$H$_{20}$NO$_3$ : 310.1438, found 310.1436.

![Structure of 3s](image)
1-Benzyl-4-phenylisoquinoline (3t)
It was prepared following the general method for benzylation and purified by flash chromatography on silica gel using ethyl acetate/petroleum ether (10:90) as eluent to afford 3t (38.4 mg, 65% yield). $^1$H NMR (400 MHz, CDCl₃) δ = 8.50 (s, 1H), 8.25 (d, J = 8.2 Hz, 1H), 7.93 (d, J = 8.4 Hz, 1H), 7.65–7.56 (m, 2H), 7.56–7.52 (m, 4H), 7.51–7.46 (m, 1H), 7.37 (d, J = 7.5 Hz, 2H), 7.31 (t, J = 7.5 Hz, 2H), 7.21 (t, J = 7.2 Hz, 1H), 4.75 (s, 2H); $^{13}$C NMR (101 MHz, CDCl₃) δ = 159.7, 142.0, 139.7, 137.5, 135.2, 132.6, 130.4, 130.1, 128.9, 128.7, 128.7, 128.0, 127.2, 127.0, 126.5, 126.2, 125.8, 42.4; IR νmax 3028, 2927, 2848, 1507, 1490, 1384, 1257, 1028, 763, 754 cm⁻¹; HRMS (El) m/z [M + H]$^+$ calculated for C₂₂H₁₈N: 296.1434, found 296.1433.

1-Benzyl-4-bromoisoquinoline (3u)
It was prepared following the general method for benzylation and purified by flash chromatography on silica gel using ethyl acetate/petroleum ether (10:90) as eluent to afford 3u (25.0 mg, 42% yield). $^1$H NMR (400 MHz, CDCl₃) δ = 8.71 (s, 1H), 8.18 (dd, J = 15.2, 8.5 Hz, 2H), 7.77 (t, J = 7.7 Hz, 1H), 7.61 (t, J = 7.7 Hz, 1H), 7.30–7.26 (m, 4H), 7.24–7.17 (m, 1H), 4.66 (s, 2H); $^{13}$C NMR (101 MHz, CDCl₃) δ = 160.0, 143.9, 139.1, 135.4, 131.3, 128.8, 128.8, 128.6, 128.4, 127.0, 126.7, 126.5, 118.7, 42.0. These data are consistent with reported literature values.$^1$
1-(3,4-Dimethoxybenzyl)-6,7-dimethoxyisoquinoline (3v)
It was prepared following the general method for benzylation and purified by flash chromatography on silica gel using ethyl acetate/petroleum ether (60:40) as eluent to afford 3v (27.2 mg, 40% yield). $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ = 8.37 (d, $J = 5.6$ Hz, 1H), 7.43 (d, $J = 5.7$ Hz, 1H), 7.35 (s, 1H), 7.05 (s, 1H), 6.82 (d, $J = 7.0$ Hz, 2H), 6.76 (d, $J = 8.6$ Hz, 1H), 4.54 (s, 2H), 4.00 (s, 3H), 3.91 (s, 3H), 3.82 (s, 3H), 3.77 (s, 3H). $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ = 158.0, 152.7, 150.0, 149.3, 147.8, 141.2, 133.7, 132.5, 123.2, 120.7, 118.9, 112.2, 111.5, 105.5, 104.5, 56.2, 56.1, 56.2, 56.0, 42.4. These data are consistent with reported literature values.$^5$

![Isoquinolin-1-yl(phenyl)methanone (4a)](image)

Isoquinolin-1-yl(phenyl)methanone (4a)
$^1$H NMR (400 MHz, CDCl$_3$) $\delta$ = 8.62 (d, $J = 5.6$ Hz, 1H), 8.23 (d, $J = 8.5$ Hz, 1H), 8.00–7.91 (m, 3H), 7.82 (d, $J = 5.6$ Hz, 1H), 7.79–7.72 (m, 1H), 7.66–7.59 (m, 2H), 7.49 (t, $J = 7.7$ Hz, 2H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ = 194.9, 156.7, 141.4, 136.9, 136.9, 133.9, 131.0, 130.9, 128.7, 128.5, 127.3, 126.6, 126.4, 122.8. These data are consistent with reported literature values.$^4$

![Isoquinolin-1-yl(4-methylphenyl)methanone (4b)](image)

Isoquinolin-1-yl(4-methylphenyl)methanone (4b)
It was prepared following the general method for benzylation and purified by flash chromatography on silica gel using ethyl acetate/petroleum ether (10:90) as eluent to afford 4b (29.7 mg, 60% yield). $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ = 8.61 (d, $J = 5.6$ Hz, 1H), 8.20 (d, $J = 8.5$ Hz, 1H), 7.93 (d, $J = 8.3$ Hz, 1H), 7.86 (d, $J = 8.2$ Hz, 2H), 7.81
(d, J = 5.6 Hz, 1H), 7.78–7.72 (m, 1H), 7.67–7.57 (m, 1H), 7.28 (d, J = 8.8 Hz, 2H), 2.43 (s, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) δ = 194.7, 157.1, 144.9, 141.4, 136.9, 134.3, 131.1, 130.9, 129.4, 128.4, 127.3, 126.6, 126.5, 122.6, 22.0. These data are consistent with reported literature values.$^5$

![Isoquinolin-1-yl(4-methoxyphenyl)methanone (4c)](image1)

**Isoquinolin-1-yl(4-methoxyphenyl)methanone (4c)**

It was prepared following the general method for benzylation and purified by flash chromatography on silica gel using ethyl acetate/petroleum ether (20:80) as eluent to afford 4c (26.3 mg, 50% yield). $^1$H NMR (400 MHz, CDCl$_3$) δ = 8.60 (d, J = 5.6 Hz, 1H), 8.18 (d, J = 8.5 Hz, 1H), 8.00–7.90 (m, 3H), 7.80 (d, J = 5.7 Hz, 1H), 7.74 (t, J = 7.6 Hz, 1H), 7.61 (t, J = 7.7 Hz, 1H), 6.96 (d, J = 8.9 Hz, 2H), 3.88 (s, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) δ = 193.6, 164.4, 157.3, 141.4, 136.9, 133.4, 130.9, 129.8, 128.3, 127.2, 126.6, 126.5, 122.4, 114.0, 55.8. These data are consistent with reported literature values.$^5$

![Isoquinolin-1-yl(4-methoxyphenyl)methanone (4d)](image2)

**(4-Bromophenyl)(isoquinolin-1-yl)methanone (4d)**

It was prepared following the general method for benzylation and purified by flash chromatography on silica gel using ethyl acetate/petroleum ether (10:90) as eluent to afford 4d (30.6 mg, 49% yield). $^1$H NMR (400 MHz, CDCl$_3$) δ = 8.60 (d, J=5.6 Hz, 1H), 8.27 (d, J = 8.5 Hz, 1H), 7.94 (d, J = 8.3 Hz, 1H), 7.87–7.81 (m, 3H), 7.79–7.74
(m, 1H), 7.68–7.60 (m, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) δ = 193.8, 155.8, 141.3, 137.0, 135.7, 132.4, 132.0, 131.0, 129.2, 128.7, 127.4, 126.7, 126.3, 123.2. These data are consistent with reported literature values.$^6$

![Chemical Structure](image1)

(4-Chlorophenyl)(isoquinolin-1-yl)methanone (4e)

It was prepared following the general method for benzylation and purified by flash chromatography on silica gel using ethyl acetate/petroleum ether (10:90) as eluent to afford 4e (21.4 mg, 40% yield). $^1$H NMR (400 MHz, CDCl$_3$) δ = 8.61 (d, $J = 5.6$ Hz, 1H), 8.26 (d, $J = 8.5$ Hz, 1H), 7.97–7.89 (m, 3H), 7.83 (d, $J = 5.6$ Hz, 1H), 7.80–7.73 (m, 1H), 7.70–7.60 (m, 1H), 7.46 (d, $J = 8.6$ Hz, 2H); $^{13}$C NMR (101 MHz, CDCl$_3$) δ = 193.6, 155.9, 141.3, 140.4, 137.0, 135.3, 132.4, 131.0, 129.0, 128.7, 127.4, 126.7, 126.3, 123.2. These data are consistent with reported literature values.$^7$

![Chemical Structure](image2)

Isoquinolin-1-yl(3-methylphenyl)methanone (4f)

It was prepared following the general method for benzylation and purified by flash chromatography on silica gel using ethyl acetate/petroleum ether (10:90) as eluent to afford 4f (31.7 mg, 64% yield). $^1$H NMR (400 MHz, CDCl$_3$) δ = 8.62 (d, $J = 5.6$ Hz, 1H), 8.21 (d, $J = 8.5$ Hz, 1H), 7.93 (d, $J = 8.3$ Hz, 1H), 7.82 (d, $J = 5.6$ Hz, 1H), 7.78 (brs, 1H), 7.74 (dd, $J = 7.2$, 5.4 Hz, 2H), 7.63 (t, $J = 7.6$ Hz, 1H), 7.43 (d, $J = 7.5$ Hz, 1H), 7.36 (t, $J = 7.6$ Hz, 1H), 2.40 (s, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) δ = 195.2,
156.9, 141.4, 138.5, 136.9, 134.7, 131.2, 130.9, 128.6, 128.5, 128.3, 127.3, 126.6, 126.4, 122.7, 21.5. These data are consistent with reported literature values.5

![Chemical structure](image)

(3-Chlorophenyl)(isoquinolin-1-yl)methanone (4g)

It was prepared following the general method for benzylation and purified by flash chromatography on silica gel using ethyl acetate/petroleum ether (10:90) as eluent to afford 4g (20.3 mg, 38% yield). 1H NMR (400 MHz, CDCl3) δ = 8.62 (d, J = 5.6 Hz, 1H), 8.28 (d, J = 8.5 Hz, 1H), 7.95 (d, J = 9.2 Hz, 2H), 7.85 (d, J = 5.7 Hz, 2H), 7.78 (t, J = 7.6 Hz, 1H), 7.66 (t, J = 7.7 Hz, 1H), 7.59 (d, J = 8.0 Hz, 1H), 7.43 (t, J = 7.9 Hz, 1H); 13C NMR (101 MHz, CDCl3) δ = 193.4, 155.6, 141.3, 138.6, 137.0, 134.9, 133.6, 131.0, 130.9, 130.0, 129.1, 128.8, 127.4, 126.7, 126.2, 123.3. IR νmax 3047, 2922, 1660, 1582, 1424, 1249, 1158, 830, 748 cm⁻¹; HRMS (EI) m/z [M + H]⁺ calculated for C16H10ClNO : 268.0524, found 268.0526; [M + H]⁺ calculated for C16H10ClNO : 270.0494, found 270.0497.

![Chemical structure](image)

Isoquinolin-1-yl(2-methylphenyl)methanone (4h)

It was prepared following the general method for benzylation and purified by flash chromatography on silica gel using ethyl acetate/petroleum ether (10:90) as eluent to afford 4h (29.7 mg, 60% yield). 1H NMR (400 MHz, CDCl3) δ = 8.57 (d, J = 5.5 Hz, 1H), 8.43 (d, J = 8.5 Hz, 1H), 7.94 (d, J = 8.2 Hz, 1H), 7.82–7.74 (m, 2H), 7.68 (t, J = 7.7 Hz, 1H), 7.48–7.38 (m, 2H), 7.33 (d, J = 7.6 Hz, 1H), 7.22 (t, J = 7.5 Hz, 1H),
2.55 (s, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ = 197.9, 157.2, 141.6, 139.9, 137.5, 137.0, 132.3, 132.0, 132.0, 130.9, 128.8, 127.3, 126.6, 126.5, 125.7, 123.1, 21.5. These data are consistent with reported literature values.$^5$

(3,5-Dimethylphenyl)(isoquinolin-1-yl)methanone (4i)

It was prepared following the general method for benzylation and purified by flash chromatography on silica gel using ethyl acetate/petroleum ether (10:90) as eluent to afford 4i (26.7 mg, 51% yield). $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ = 8.61 (d, $J$ = 5.6 Hz, 1H), 8.19 (d, $J$ = 8.3 Hz, 1H), 7.93 (d, $J$ = 8.3 Hz, 1H), 7.81 (d, $J$ = 5.6 Hz, 1H), 7.74 (dd, $J$ = 8.0, 7.1 Hz, 1H), 7.62 (t, $J$ = 7.7 Hz, 1H), 7.55 (s, 2H), 7.25 (s, 1H), 2.35 (s, 6H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ = 195.5, 157.2, 141.4, 138.4, 137.0, 136.9, 135.7, 130.9, 128.6, 128.4, 127.3, 126.5, 126.4, 122.5, 21.4; IR $\nu_{max}$ 3044, 2921, 1663, 1579, 1464, 1253, 1205, 825, 751 cm$^{-1}$; HRMS (EI) $m/z$ [M + H]$^+$ calculated for C$_{18}$H$_{16}$NO: 262.1226, found 262.1228.

Isoquinolin-1-yl(naphthalen-2-yl)methanone (4j)

It was prepared following the general method for benzylation and purified by flash chromatography on silica gel using ethyl acetate/petroleum ether (10:90) as eluent to afford 4j (27.8 mg, 49% yield). $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ = 8.66 (d, $J$ = 5.6 Hz, 1H), 8.36 (s, 1H), 8.26 (d, $J$ = 8.5 Hz, 1H), 8.17 (dd, $J$ = 8.6, 1.6 Hz, 1H), 7.96 (d, $J$ =
8.4 Hz, 2H), 7.82–7.74 (m, 3H), 7.77 (t, J = 7.6 Hz, 1H), 7.66–7.58 (m, 2H), 7.51 (t, J = 7.5 Hz, 1H); $^{13}$C NMR (101 MHz, CDCl₃) δ = 195.0, 156.9, 141.5, 136.9, 136.1, 134.2, 133.9, 132.6, 130.9, 130.0, 129.0, 128.9, 128.0, 127.3, 126.9, 126.7, 126.4, 125.5, 122.8. These data are consistent with reported literature values.$^5$

(6,7-Dimethoxyisoquinolin-1-yl)(phenyl)methanone (4k)

It was prepared following the general method for benzylation and purified by flash chromatography on silica gel using ethyl acetate/petroleum ether (30:70) as eluent to afford 4k (26.4 mg, 45% yield). $^1$H NMR (400 MHz, CDCl₃) δ = 8.47 (d, J = 5.4 Hz, 1H), 7.96 (d, J = 7.1 Hz, 2H), 7.68–7.58 (m, 3H), 7.48 (t, J = 7.7 Hz, 2H), 7.15 (s, 1H), 4.06 (s, 3H), 3.97 (s, 3H); $^{13}$C NMR (101 MHz, CDCl₃) δ = 195.6, 153.4, 153.2, 151.5, 140.3, 137.4, 134.3, 133.6, 131.1, 128.5, 123.3, 121.8, 105.1, 104.3, 56.3, 56.3. These data are consistent with reported literature values.$^4$

Phenyl(5,6,7-trimethoxyisoquinolin-1-yl)methanone (4l)

It was prepared following the general method for benzylation and purified by flash chromatography on silica gel using ethyl acetate/petroleum ether (30:70) as eluent to afford 4l (35.6 mg, 55% yield). $^1$H NMR (400 MHz, CDCl₃) δ = 8.50 (d, J = 5.6 Hz, 1H), 8.02 (d, J = 5.6 Hz, 1H), 7.96 (d, J = 7.4 Hz, 2H), 7.62 (t, J = 7.4 Hz, 1H), 7.49
(t, J = 7.7 Hz, 2H), 7.45 (s, 1H), 4.09 (s, 3H), 4.04 (s, 3H), 3.95 (s, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) δ = 195.5, 155.0, 153.6, 147.0, 144.5, 139.8, 137.3, 133.7, 131.1, 129.5, 128.6, 124.2, 117.1, 100.5, 61.9, 61.5, 56.3; IR $\nu_{\text{max}}$ 3032, 2941, 2836, 1678, 1461, 1272, 1248, 1150, 965, 860, 765 cm$^{-1}$; HRMS (EI) $m/z$ [M + H]$^+$ calculated for C$_{19}$H$_{18}$NO$_4$: 324.1230, found 324.1234.

![Phenyl(4-phenylisoquinolin-1-yl) methanone (4m)](image)

Phenyl(4-phenylisoquinolin-1-yl)methanone (4m)

It was prepared following the general method for benzylation and purified by flash chromatography on silica gel using ethyl acetate/petroleum ether (5:95) as eluent to afford 4m (40.8 mg, 66% yield). $^1$H NMR (400 MHz, CDCl$_3$) δ = 8.58 (s, 1H), 8.32 (d, J = 8.4 Hz, 1H), 8.03 (t, J = 8.0 Hz, 3H), 7.75–7.69 (m, 1H), 7.68–7.61 (m, 2H), 7.60–7.56 (m, 4H), 7.55–7.49 (m, 3H); $^{13}$C NMR (101 MHz, CDCl$_3$) δ = 195.0, 155.9, 141.2, 136.9, 136.8, 135.5, 135.3, 133.9, 131.0, 131.0, 130.3, 128.9, 128.7, 128.5, 128.3, 126.5, 126.4, 125.6. IR $\nu_{\text{max}}$ 3051, 2924, 2852, 1674, 1450, 1263, 1241, 1146, 957, 862, 777 cm$^{-1}$; HRMS (EI) $m/z$ [M + H]$^+$ calculated for C$_{22}$H$_{18}$NO$_4$: 310.1226, found 310.1229.

![2-(4-Bromoisoquinolin-1-yl)(phenyl)methanone (4n)](image)

(4-Bromoisoquinolin-1-yl)(phenyl)methanone (4n)
It was prepared following the general method for benzoylation and purified by flash chromatography on silica gel using ethyl acetate/petroleum ether (5:95) as eluent to afford 4n (26.8 mg, 43% yield). $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ = 8.81 (s, 1H), 8.30 (d, $J = 8.5$ Hz, 1H), 8.24 (d, $J = 8.5$ Hz, 1H), 7.96 (d, $J = 7.3$ Hz, 2H), 7.88 (t, $J = 7.7$ Hz, 1H), 7.70 (t, $J = 7.7$ Hz, 1H), 7.64 (t, $J = 7.4$ Hz, 1H), 7.49 (t, $J = 7.7$ Hz, 2H); $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ = 194.2, 155.9, 143.1, 136.6, 135.7, 134.1, 132.2 130.9, 129.4, 128.7, 127.8, 126.9, 126.7, 122.0. IR $\nu_{\text{max}}$ 3035, 2922, 1685, 1578, 1443, 1231, 1193, 1141, 952, 836, 753 cm$^{-1}$; HRMS (EI) $m/z$ [M + H]$^+$ calculated for C$_{16}$H$_{11}$BrNO : 312.0019, found 312.0017; [M + H]$^+$ calculated for C$_{16}$H$_{11}$BrNO : 313.9998, found 314.0001.
Mechanistic Studies

Procedure for determination of intermolecular KIE under the benzylation condition:

In a 10 mL tube, 1a (0.2 mmol, 1.0 equiv), 2a (0.9 mmol, 4.5 equiv), D₈-2a (0.9 mmol, 4.5 equiv), Y(OTf)₃ (0.01 mmol, 0.05 equiv) and di-tert-butyl peroxide (0.6 mmol, 3.0 equiv) were added. Then the tube was sealed and the resulting solution was heated in a 120 °C oil bath with vigorous stirring for 4 h. Then the reaction mixture was cooled to 0 °C and treated with saturated aqueous NaHCO₃. The mixture was extracted with ethyl acetate (10 mL × 3), and the combined organic layer was dried over MgSO₄, filtered and the solvent was evaporated under vacuum. The residue was purified by flash chromatography using ethyl acetate/petroleum ether (10:90) as eluent to afford a mixture of non-deuterated and deuterated products. The product ratio of D₀ to D₇ was calculated by acquiring a ¹H NMR spectrum (400 MHz, CDCl₃) and comparing the intensities of the signals from benzyl-H to signals from hydrogen of NCHCH.

Procedure for determination of intermolecular KIE under the benzylation condition:

In a 10 mL tube, 1a (0.2 mmol, 1.0 equiv), 2a (0.9 mmol, 4.5 equiv), D₈-2a (0.9 mmol, 4.5 equiv), TFA (0.2 mmol, 1.0 equiv), MnO₂ (0.02 mmol, 10 mol %) and TBHP (5–6 M solution in decane, 1.0 mmol, 5.0 equiv) were added. Then the tube was sealed and the resulting solution was heated in a 120 °C oil bath with vigorous stirring for 4 h. Then the reaction mixture was cooled to 0 °C and treated with saturated aqueous NaHCO₃. The mixture was extracted with ethyl acetate (10 mL × 3), and the combined organic layer was dried over MgSO₄, filtered and the solvent was evaporated under vacuum. The residue was purified by flash chromatography using ethyl acetate/petroleum ether (10:90) as eluent to afford a mixture of non-deuterated and deuterated products. The product ratio of D₀ to D₇ was calculated by acquiring a ¹H NMR spectrum (400 MHz, CDCl₃) and comparing the intensities of the signals from hydrogen of the phenyl ring to signals from hydrogen of NCHCH.

Reference


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$^1$H and $^{13}$C NMR spectra