Supporting Information

Ruthenium-Catalyzed Isomerization of Oxa/azabicyclic Alkenes: an Expedient Route for the Synthesis of 1,2-Naphthalene Oxides and Imines.

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General Information: All reactions were carried out in an atmosphere of dry nitrogen at ambient temperature unless otherwise stated. Standard column chromatography was performed on 230-400 mesh silica gel (obtained from Silicycle) using flash column chromatography techniques.¹ Analytical thin-layer chromatography (TLC) was performed on Merck precoated silica gel 60 F₂₅₄ plates. All glassware was flame dried under an inert atmosphere of dry nitrogen. Infrared spectra were taken on a Bomem MB-100 FTIR spectrophotometer. ¹H and ¹³C NMR spectra were recorded on a Bruker Avance-300 or 400 spectrometers. Chemical shifts for ¹H NMR spectra are reported in parts per million (ppm) from tetramethylsilane with the solvent resonance as the internal standard (chloroform: δ 7.26 ppm). Chemical shifts for ¹³C NMR spectra are reported in parts per million (ppm) from tetramethylsilane with the solvent as the internal standard (deuteriochloroform: δ 77.0 ppm). High resolution mass spectra were done by McMaster Regional Centre for Mass Spectrometry at McMaster University, Hamilton, Ontario. Elemental analyses were performed by Canadian Microanalytical Service Ltd., British Columbia or by Quantitative Technologies Inc., New Jersey.

Reagents: Unless stated otherwise, commercial reagents were used without purification. Solvents were purified by distillation under dry nitrogen: from CaH₂ (1,2-dichloroethane, DMF and nitromethane); from sodium (toluene); from magnesium sulfate (acetone); and from potassium/benzophenone (THF). Bicyclic alkenes **1a**,² **1b**,³ **1c**,⁴ **1d**,⁵ **1e**,⁶ **1f**,⁷ **1g**,⁸ **1h**² and **4**,⁹ Cp*Ru(cod)Cl,¹⁰ Cp*Ru(cod)Br and Cp*Ru(cod)I¹¹ were prepared according to literature procedures.

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⁴ Jung, K.-Y.; Koreeda, M. *J. Org. Chem.* **1989**, *54*, 5667.

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⁶ Batt, D. G.; Jones, D. G.; La Greca, S. *J. Org. Chem.* **1991**, *56*, 6704.

⁷ Sapountzis, I.; Lin, W.; Fischer, M.; Knochel, P. *Angew. Chem. Int. Ed.* **2004**, *43*, 4364.

Ruthenium-catalyzed isomerization of 7-oxabenzonorbornadiene **1a to 1-naphthol **2a**:** a solution of alkene **1a** (75.9 mg, 0.526 mmol) and dichloroethane (0.7 mL) in an oven-dried vial was added via a cannula to an oven-dried vial containing $\text{Cp}^*\text{Ru}(\text{cod})\text{Cl}$ (weighed out from a dry box, 10.8 mg, 0.0284 mmol) under nitrogen. The reaction mixture was heated at 60°C for 0.25 h. The crude product was purified by column chromatography (EtOAc:hexanes=1:9) to give 2-naphthol **2a** (69.1 mg, 0.479 mmol, 91%). R_f 0.38 (EtOAc:hexanes=3:7); ^1H NMR (CDCl_3 , 300 MHz) δ 8.22-8.25 (m, 1H), 7.85-7.91 (m, 1H), 7.48-7.61 (m, 3H), 7.34 (apt t, 1H, $J = 7.4$ Hz), 6.82 (d, 1H, $J = 7.4$ Hz), 5.42 (br s, 1H); ^{13}C NMR (APT, CDCl_3 , 75 MHz) δ 151.2, 134.7, 127.6, 126.4, 125.8, 125.3, 124.3, 121.4, 120.7, 108.6. HRMS (CI) calcd. for $\text{C}_{10}\text{H}_8\text{O}$ ($(\text{M}+\text{H})^+$): 145.0653; found: 145.0666.

Ruthenium-catalyzed isomerization of 7-oxabenzonorbornadiene **1a to 1,2-naphthalene oxide **3a**:** a solution of alkene **1a** (65.4 mg, 0.454 mmol) and dichloroethane (0.6 mL) in an oven-dried vial was added via a cannula to an oven-dried vial containing $\text{Cp}^*\text{Ru}(\text{cod})\text{Cl}$ (weighed out from a dry box, 9.1 mg, 0.024 mmol) under nitrogen. The reaction mixture was heated at 60°C for 0.25 h. Two third of the solvent was evaporated under vacuum. The crude was then filtrated over neutral alumina (Et_2O :pentane=1:4) and the solvent was removed under vacuum (-70°C) to give 1,2-naphthalene oxide **3a** (56.3 mg, 0.391 mmol, 86%) as a white solid (mp.= $42-46^\circ\text{C}$). IR (CH_2Cl_2) 3055 (m), 3022 (m), 2996 cm^{-1} ; ^1H NMR (C_6D_6 , 400 MHz) δ 7.19 (dd, 1H, $J = 7.2, 0.7$ Hz), 6.92-7.05 (m, 3H), 6.39 (dd, 1H, $J = 9.6, 1.4$ Hz), 6.00 (dd, 1H, $J = 9.6, 3.8$ Hz), 4.04 (d, 1H, $J = 3.8$ Hz), 3.62 (apt td, 1H, $J = 3.8, 1.6$ Hz); ^{13}C NMR (APT, C_6D_6 , 100 MHz) δ 133.2, 132.8, 131.5, 130.0, 128.9, 128.7, 127.9, 125.5, 57.0, 53.1. HRMS (EI) calcd. for $\text{C}_{10}\text{H}_8\text{O}$ (M^+) 144.0575; found: 144.0580.

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¹⁰ P. J. Fagan, W. S. Mahoney, J. C. Calabrese, I. D. Williams, *Organometallics*. **1990**, 9, 1843.

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Ruthenium-catalyzed isomerization of 7-oxabenzonorbornadiene **1b to 1,2-naphthalene oxide **3b**:**

a solution of alkene **1b** (71.4 mg, 0.350 mmol) and dichloroethane (0.6 mL) in an oven-dried vial was added via a cannula to an oven-dried vial containing $\text{Cp}^*\text{Ru}(\text{cod})\text{Cl}$ (weighed out from a dry box, 4.3 mg, 0.011 mmol) under nitrogen. The reaction mixture was heated at 60°C for 0.25 h. Two third of the solvent was evaporated under vacuum. The crude was then filtrated over neutral alumina (Et_2O :pentane=1:4) and the solvent was removed under vacuum (-70°C) to give 1,2-naphthalene oxide **3b** (66.1 mg, 0.324 mmol, 93%) as a white solid (mp.= $58\text{--}63^\circ\text{C}$). IR (CH_2Cl_2) 3000 (m), 2942 (m), 2901 (m), 1479 (s), 1263 (s), 1087 (s) cm^{-1} ; ^1H NMR (C_6D_6 , 300 MHz) δ 7.36 (dd, 1H, $J=9.9, 1.5$ Hz), 6.42 (br s, 2H), 6.11 (dd, 1H, $J=9.9, 3.7$ Hz), 4.98 (d, 1H, $J=3.9$ Hz), 3.68 (apt br td, 1H, $J=3.9, 1.5$ Hz), 3.33 (s, 3H), 3.29 (s, 3H); ^{13}C NMR (APT, C_6D_6 , 75 MHz) δ 154.0, 150.8, 125.3, 125.1, 123.4, 123.1, 110.8, 110.6, 55.8, 55.6, 53.0, 51.9. HRMS (EI) calcd. for $\text{C}_{12}\text{H}_{12}\text{O}_3$ (M^+) 204.0786; found: 204.0779.

Ruthenium-catalyzed isomerization of 7-oxabenzonorbornadiene **1c to 1,2-naphthalene oxide **3c**:**

a solution of alkene **1c** (63.7 mg, 0.370 mmol) and dichloroethane (0.5 mL) in an oven-dried vial was added via a cannula to an oven-dried vial containing $\text{Cp}^*\text{Ru}(\text{cod})\text{Cl}$ (weighed out from a dry box, 8.2 mg, 0.022 mmol) under nitrogen. The reaction mixture was heated at 60°C for 0.25 h. Two third of the solvent was evaporated under vacuum. The crude was then filtrated over neutral alumina (Et_2O :pentane=1:4) and the solvent was removed under vacuum (-70°C) to give 1,2-naphthalene oxide **3c** (56.7 mg, 0.329 mmol, 89%) as a colorless oil. IR (neat) 3052 (m), 3021 (s), 2948 (s), 2926 (s), 2869 (m), 1484 (s), 1463 (s) cm^{-1} ; ^1H NMR (C_6D_6 , 300 MHz) δ 7.28 (s, 1H), 6.96 (d, 1H, $J=7.7$ Hz), 6.92 (d, 1H, $J=7.7$ Hz), 6.83 (dd, 1H, $J=9.9, 1.6$ Hz), 6.22 (dd, 1H, $J=9.9, 3.7$ Hz), 4.46 (d, 1H, $J=4.0$ Hz), 3.80 (apt br td, 1H, $J=3.9, 1.6$ Hz), 2.30 (s, 3H), 2.16 (s, 3H); ^{13}C NMR (APT, C_6D_6 , 75 MHz) δ 136.0, 133.4, 131.2, 131.0, 130.2, 129.7, 128.3, 124.8, 54.4, 53.3, 19.0, 18.5. HRMS (CI) calcd. for $\text{C}_{12}\text{H}_{12}\text{O}$ ($(\text{M}+\text{H})^+$): 173.0966; found: 173.0960.

Ruthenium-catalyzed isomerization of 7-oxabenzonorbornadiene **1d to 1,2-naphthalene oxide **3d**:**

a solution of alkene **1d** (35.0 mg, 0.116 mmol) and dichloroethane (0.4 mL) in an oven-dried vial was added via a cannula to an oven-dried vial containing Cp*Ru(cod)Cl (weighed out from a dry box, 4.8 mg, 0.013 mmol) under nitrogen. The reaction mixture was heated at 60°C for 0.25 h. Two third of the solvent was evaporated under vacuum. The crude was then filtrated over neutral alumina (Et₂O:pentane=1:4) and the solvent was removed under vacuum (-70°C) to give 1,2-naphthalene oxide **3d** (30.8 mg, 0.102 mmol, 88%) as a white solid (mp.= 107-110°C). IR (CH₂Cl₂) 3054 (m), 2987 (m), 1422 (s), 1264 (s) cm⁻¹; ¹H NMR (C₆D₆, 400 MHz) δ 7.21 (s, 1H), 7.00 (s, 1H), 5.95 (dd, 1H, *J*= 9.6, 1.6 Hz), 5.87 (dd, 1H, *J*= 9.6, 3.7 Hz), 3.62 (d, 1H, *J*= 3.7 Hz), 3.39 (apt br td, 1H, *J*= 3.7, 1.6 Hz), 3.33 (s, 3H), 3.29 (s, 3H); ¹³C NMR (APT, C₆D₆, 75 MHz) δ 134.7, 133.5, 133.4, 132.9, 129.5, 127.2, 125.0, 123.6, 55.6, 52.6. HRMS (CI) calcd. for C₁₀H₆Br₂O ((M+H)⁺): 204.0786; found: 204.0779.

Ruthenium-catalyzed isomerization of 7-oxabenzonorbornadiene **1e to 1,2-naphthalene oxide **3e**:**

a solution of alkene **1e** (31.1 mg, 0.144 mmol) and dichloroethane (0.4 mL) in an oven-dried vial was added via a cannula to an oven-dried vial containing Cp*Ru(cod)Cl (weighed out from a dry box, 3.8 mg, 0.010 mmol) under nitrogen. The reaction mixture was heated at 60°C for 2 h. The crude product was purified by column chromatography (Et₂O:hexanes=1:4) to give 1,2-naphthalene oxide **3e** (25.6 mg, 0.118 mmol, 82%) as a colorless oil. *R_f* 0.38 (EtOAc:hexanes=3:7); IR (CH₂Cl₂) 3060 (m), 2986 (m), 2933 (m), 1703 (s), 1633 (s), 1278 (s) cm⁻¹; ¹H NMR (CDCl₃, 400 MHz) δ 7.75 (br d, 1H, *J*= 2.0 Hz), 7.69 (dd, 1H, *J*= 7.4, 2.4 Hz), 7.43-7.51 (m, 3H), 4.71 (dd, 1H, *J*= 4.0, 2.0 Hz), 4.52 (d, 1H, *J*= 4.0 Hz), 4.37 (q, 2H, *J*= 7.1Hz), 1.39 (t, 3H, *J*= 7.1Hz); ¹³C NMR (APT, CDCl₃, 100 MHz) δ 166.1, 138.0, 134.0, 131.3, 130.9, 130.1, 129.2, 127.0, 61.1, 57.1, 52.8, 14.3. HRMS (CI) calcd. for C₁₃H₁₂O₃ ((M+H)⁺): 217.0865; found: 217.0854.

Ruthenium-catalyzed isomerization of 7-oxabenzonorbornadiene **1f to 1,2-naphthalene oxides **3f** and **3f'**:**

a solution of alkene **1f** (44.2 mg, 0.219 mmol) and dichloroethane (0.5 mL) in an oven-dried vial was added via a cannula to an oven-dried vial containing Cp^{*}Ru(cod)Cl (weighed out from a dry box, 4.2 mg, 0.011 mmol) under nitrogen. The reaction mixture was heated at 60°C for 0.25 h. The crude product was purified by column chromatography (Et₂O:hexanes=1:4) to give an inseparable mixture of 1,2-naphthalene oxides **3f** and **3f'** (35.3 mg, 0.175 mmol, 80%, **3f**:**3f'**= 56:44 based on ¹H NMR of crude mixture) as a colorless oil. *R_f* 0.34 (EtOAc:hexanes=3:7); IR (CH₂Cl₂) 3006 (m), 2952 (m), 1718 (vs), 1290 (vs) cm⁻¹; HRMS (CI) calcd. for C₁₂H₁₀O₃ ((M+H)⁺): 203.0708; found: 203.0716; ¹H NMR (CDCl₃, 400 MHz) of **3f**: δ 8.30 (br d, 1H, *J*= 1.5 Hz), 8.04 (dd, 1H, *J*= 8.0, 1.7 Hz), 7.37 (d, 1H, *J*= 8.0 Hz), 6.78 (dd, 1H, *J*= 9.6, 1.6 Hz), 6.57 (dd, 1H, *J*= 9.6, 3.8 Hz), 4.53 (d, 1H, *J*= 3.8 Hz), 4.14 (apt td, 1H, *J*= 3.8, 1.6 Hz); **3f'**: δ 8.01 (dd, 1H, *J*= 8.3, 1.6 Hz), 7.99 (br s, 1H), 7.69 (d, 1H, *J*= 8.3 Hz), 6.49 (dd, 1H, *J*= 9.6, 3.8 Hz), 6.49 (dd, 1H, *J*= 9.6, 3.8 Hz), 4.50 (d, 1H, *J*= 3.8 Hz), 4.14 (apt td, 1H, *J*= 3.8, 1.6 Hz); ¹³C NMR (APT, CDCl₃, 75 MHz) of **3f**: δ 166.4, 136.1, 132.2, 131.21, 131.18, 129.4, 128.2, 127.9, 57.0, 53.2, 52.2; **3f'**: δ 166.5, 136.7, 132.3, 131.0, 130.6, 130.05, 129.97, 125.8, 56.8, 53.7, 52.2.

Ruthenium-catalyzed isomerization of 7-oxabenzonorbornadiene **1g to 1,2-naphthalene oxide **3g**:**

a solution of alkene **1g** (53.5 mg, 0.265 mmol) and dichloroethane (0.6 mL) in an oven-dried vial was added via a cannula to an oven-dried vial containing Cp^{*}Ru(cod)Cl (weighed out from a dry box, 6.4 mg, 0.017 mmol) under nitrogen. The reaction mixture was heated at 60°C for 1 h then a second portion of Cp^{*}Ru(cod)Cl (weighed out from a dry box, 5.9 mg, 0.016 mmol) in dichloroethane (0.2 mL) was added via cannula and heated for another 1 h. The crude product was purified by column chromatography (Et₂O:hexanes=1:4) to give 1,2-naphthalene oxide **3g** (43.1 mg, 0.213 mmol, 81%) as a white solid (mp.= 44-46°C). *R_f* 0.26 (EtOAc:hexanes=1:4); IR (CH₂Cl₂) 3070 (w), 3036 (w), 3009 (w), 2954 (w), 1740 (vs), 1214 (vs) cm⁻¹; ¹H NMR (CDCl₃, 400 MHz) δ 7.76 (dd, 1H, *J*= 7.5, 0.8 Hz), 7.33-7.42 (m, 3H), 6.84 (dd, 1H, *J*= 9.6, 1.6 Hz), 6.38 (dd, 1H, *J*= 9.6, 3.8 Hz), 4.21 (dd, 1H, *J*= 3.8, 1.6

Hz), 3.91 (s, 3H); ^{13}C NMR (APT, CDCl_3 , 75 MHz) δ 168.7, 133.3, 131.9, 129.9, 129.3, 129.2, 129.1, 128.2, 122.5, 59.9, 58.9, 52.9. HRMS (CI) calcd. for $\text{C}_{12}\text{H}_{10}\text{O}_3$ ((M+H) $^+$): 203.0708; found: 203.0712.

Ruthenium-catalyzed isomerization of 7-oxabenzonorbornadiene **1h to 1-naphthol **2h**:** a solution of alkene **1a** (75.9 mg, 0.526 mmol) and dichloroethane (0.7 mL) in an oven-dried vial was added via a cannula to an oven-dried vial containing $\text{Cp}^*\text{Ru}(\text{cod})\text{Cl}$ (weighed out from a dry box, 10.8 mg, 0.0284 mmol) under nitrogen. The reaction mixture was heated at 60°C for 0.25 h. The crude product was purified by column chromatography (EtOAc:hexanes=1:9) to give 2-naphthol **2a** (69.1 mg, 0.479 mmol, 91%). R_f 0.38 (EtOAc:hexanes=3:7); ^1H NMR (CDCl_3 , 400 MHz) δ 8.22 (dd, 1H, $J = 7.9, 1.6$ Hz), 7.95 (d, 1H, $J = 7.9$ Hz), 7.49-7.58 (m, 2H), 7.13 (d, 1H, $J = 7.5$ Hz), 6.72 (d, 1H, $J = 7.5$ Hz), 5.21 (br s, 1H), 2.62 (s, 3H); ^{13}C NMR (APT, CDCl_3 , 75 MHz) δ 149.9, 133.5, 126.6, 126.2, 126.1, 124.9, 124.5, 124.2, 122.0, 108.1, 18.8. HRMS (CI) calcd. for $\text{C}_{11}\text{H}_{10}\text{O}$ ((M+H) $^+$): 159.0810; found: 159.0817.

Synthesis of *rac*-4**:** To a cold (-20°C) solution of trimethylaluminum in heptane (2.0 M, 0.25 mL, 0.50 mmol) diluted with diethyl ether (1.0 mL) was slowly added a solution of methyllithium in diethyl ether (1.6 M, 0.29 mL, 0.46 mmol). The reaction mixture was stirred at room temperature for 30 minutes then cooled back to -20°C . Meanwhile, a solution of alkene **1a** (50.5 mg, 0.350 mmol) and dichloroethane (0.4 mL) in an oven-dried vial was added via a cannula to an oven-dried vial containing $\text{Cp}^*\text{Ru}(\text{cod})\text{Cl}$ (weighed out from a dry box, 6.5 mg, 0.0171 mmol) under nitrogen. The reaction mixture was heated at 60°C for 10 minutes. The solvent was exchanged by first evaporating dichloroethane under reduced pressure then diluting with diethyl ether (1 mL) under nitrogen. After the suspension was cooled to -20°C , the lithium tetramethylaluminate suspension prepared above was added at once using a cannula. The reaction mixture was allowed to warm to 10°C over 2h, then carefully quenched with isopropanol, followed by water. The pH was adjusted to ca. 6.5 with 1N

aqueous HCl. Layers were separated. The aqueous phase was extracted 3 times with diethyl ether, and the combined organic extracts were dried over anhydrous sodium sulfate and concentrated to dryness. The crude product was purified by column chromatography (EtOAc:hexanes=1:9) to give **4** (23.1 mg, 0.144 mmol, 41%). R_f 0.26 (EtOAc:hexanes=1:4); IR (CH₂Cl₂) 3344 (s), 3054 (m), 3026 (m), 2958 (s), 2925 (m), 2870 (m) cm⁻¹; ¹H NMR (CDCl₃, 400 MHz) δ 7.38-7.43 (m, 1H), 7.22-7.30 (m, 2H), 7.07-7.13 (m, 1H), 6.46 (d, 1H, J = 9.4 Hz), 5.93 (dd, 1H, J = 9.4, 4.4 Hz), 4.47 (apt t, 1H, J = 6.3 Hz), 2.57-2.70 (m, 1H), 1.77 (d, 1H, J = 7.0 Hz), 1.07 (t, 3H, J = 7.3 Hz); ¹³C NMR (APT, CDCl₃, 75 MHz) δ 135.8, 132.4, 128.3, 127.6, 127.2, 126.4, 125.8, 125.7, 74.1, 37.5, 17.0. HRMS (EI) calcd. for C₁₁H₁₂O (M⁺) 160.0888; found: 160.0883. Spectral data obtained were identical to those reported in literature.¹²

Synthesis of *rac*-5: a solution of alkene **1a** (47.4 mg, 0.329 mmol) and dimethylformamide (0.5 mL) in an oven-dried vial was added via a cannula to an oven-dried vial containing Cp^{*}Ru(cod)Cl (weighed out from a dry box, 6.2 mg, 0.0163 mmol) under nitrogen. The reaction mixture was heated at 60°C for 10 minutes then cooled to room temperature. The crude reaction mixture was added via cannula to a vial containing tetrakis(triphenylphosphine)palladium(0) (12.4 mg, 0.0107 mmol), diethylmalonate (75 μ L, 0.49 mmol) and dimethylformamide (0.5 mL). After stirring at 25°C for 2 h, the reaction was quenched with water, and extracted 3 times with diethyl ether. The combined organic layers were washed with brine, dried over anhydrous sodium sulfate and concentrated to dryness. The crude was purified by column chromatography (EtOAc:hexanes=1:9) to give **5** (40.4 mg, 0.133 mmol, 40%) as a colorless oil. R_f 0.21 (EtOAc:hexanes=1:4); IR (neat) 3525 (m), 3065 (w), 3036 (m), 2983 (m), 2938 (m), 2906 (m), 1744 (s), 1731 (s) cm⁻¹; ¹H NMR (CDCl₃, 400 MHz) δ 7.49 (dd, 1H, J = 8.0, 1.8 Hz), 7.21-7.32 (m, 3H), 6.32 (ddd, 1H, J = 10.0, 4.8, 1.2 Hz), 6.15 (dd, 1H, J = 10.1, 4.4 Hz), 5.00 (m, 1H), 4.23 (q, 2H, J = 7.1 Hz), 3.99-4.07 (m, 3H), 3.97 (d, 1H, J = 4.8 Hz), 3.02 (d, 1H, J = 10.9 Hz), 1.27 (t, 3H, J = 7.1 Hz), 1.09 (t, 3H, J = 7.1 Hz); ¹³C NMR (APT, CDCl₃, 100 MHz) δ 168.2, 137.9, 135.0, 130.5, 130.0, 128.2, 127.5, 127.4, 127.3, 65.0, 61.8, 61.4, 57.3 38.7, 14.0, 13.8. HRMS (EI) calcd. for C₁₇H₂₀O₅ (M⁺) 304.1311; found: 304.1305.

¹² Jeffrey A. M.; Yeh H. J. C.; Jerina D. M.; DeMarinis R. M.; Foster C. H.; Piccolo D. E.; Berchtold G. A. *J. Am. Chem. Soc.* **1974**, *96*, 6929

Ruthenium-catalyzed isomerization of 7-azabenzonorbornadiene 4 to aziridine 7: a solution of alkene **6** (58.9 mg, 0.198 mmol) and dichloroethane (0.6 mL) in an oven-dried vial was added via a cannula to an oven-dried vial containing Cp^{*}Ru(cod)Cl (weighed out from a dry box, 3.7 mg, 0.097 mmol) under nitrogen. The oven-dried vial was rinsed with dichloroethane (0.1 mL) and cannula to the reaction mixture. The reaction mixture was heated at 60°C for 0.5 h. Half of the solvent was evaporated under vacuum. The crude was then filtrated over neutral alumina (Et₂O:pentane=1:4) and the solvent was removed under vacuum (-70°C) to give **7** (50.5 mg, 0.169 mmol, 86%) as a white solid. (mp.= 103-105°C). *R_f* 0.35 (EtOAc:hexanes=3:7); IR (CH₂Cl₂) 3053 (m), 2927 (m), 1323 (s) cm⁻¹; ¹H NMR (CDCl₃, 400 MHz) δ 7.82 (d, 2H, *J*= 8.3 Hz), 7.39 (d, 1H, *J*= 7.3 Hz), 7.25-7.34 (m, 2H), 7.31 (d, 2H, *J*= 8.4 Hz), 7.20 (d, 1H, *J*= 7.3 Hz), 6.66 (d, 1H, *J*= 9.5 Hz), 6.20 (dd, 1H, *J*= 9.6, 4.0 Hz), 4.34 (d, 1H, *J*= 6.7 Hz), 4.00 (dd, 1H, *J*= 6.8, 4.4 Hz), 2.43 (s, 3H); ¹³C NMR (APT, CDCl₃, 100 MHz) δ 144.5, 135.2, 132.1, 131.9, 129.7, 129.51, 129.1, 128.9, 128.6, 127.7, 127.3, 121.4, 45.3, 42.0, 21.6. Anal. calcd. for C₁₇H₁₅NO₂S= C, 68.66%; H, 5.08%; found = C, 68.91%; H, 4.97%. HRMS (EI) calcd. for C₁₇H₁₅NO₂S (M⁺): 297.0823; found: 297.0829.