Supporting information

Platinum(II)–Catalyzed Novel Synthesis of 3,4-Fused Furans

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EXPERIMENTAL

^1H NMR (200 MHz), ^1H NMR (300 MHz), ^1H NMR (400 MHz), ^1H NMR (500 MHz) spectra were recorded on a 200 MHz, 300 MHz, 400 MHz and 500 MHz spectrometer. Data are reported as follows: chemical shifts, multiplicity (s = singlet, d = doublet, t = triplet, m = multiplet, dd = double doublet, brs = broad singlet), coupling constant(Hz). ^{13}C NMR (50 MHz), ^{13}C NMR (75 MHz), ^{13}C NMR (100 MHz), ^{13}C NMR (125 MHz) spectra were recorded on a 200 MHz, 300 MHz 400 MHz and 500 MHz spectrometer with complete proton decoupling.. HRMS was measured using a TOF analyzer. Chromatographic purification was done with either 60–120 or 100–200 mesh silica gel (SRL). For reaction monitoring, precoated silica gel 60 F254 TLC sheets (Merck) were used. Petroleum ether refers to the fraction Boiling in the range 60–80 °C. Solvents were dried, distilled and stored over molecular sieves (4 °A).

Syntheses of 3-(2-formylcycloalkenyl)-acrylic amide (General procedure 1)

β -Bromovinyl aldehyde **1** (1 mmol), Na_2CO_3 (4 mmol), Bu_4NBr (1 mmol), PdCl_2 (10 mol%), and H_2O (5 mL) were placed in a two-neck round-bottom flask. Acrylic amide (4 mmol) was added, the mixture stirred for 2 hours in 50 °C, diluted with aq NH_4Cl solution and extracted with EtOAc (3 $\times$ 25 mL). The organic layers were combined, washed with brine, dried over Na_2SO_4 , and the solvent was evaporated. The product was purified by column chromatography using EtOAc–PE as eluent.

Typical experimental procedure for fused furan (General procedure 2)

Compound **2** (1 mmol), K_2CO_3 (2 mmol), K_2PtCl_4 (5 mol%) were placed in a two-necked round bottomed flask and combined with 5 mL of dichloromethane. Then 1 mL of methanol was added and the reaction mixture was stirred at 50 °C for three hours. After evaporating the solvent of the reaction mixture, 10 mL of diethyl ether was added to it and it was stirred with 2 mL 3N HCl for 30 min. After completion of the reaction, it was diluted with water and extracted with diethyl ether. Removal of the solvent after drying (anhydrous Na_2SO_4), afforded the crude product, which was chromatographed on Silica Gel (60-120).

Typical experimental procedure for reductive cyclization (general procedure 3)

Compound **2** (1 mmol) and NaBH₄ (2 mmol) were placed in a two-necked round bottomed flask. After the system had been flushed with nitrogen, 8 mL of acetonitrile was added and the reaction mixture was allowed to stir at room temperature and the progress of the reaction was monitored by TLC. After the disappearance of the starting material, the reaction was quenched with water and the reaction mixture was extracted with diethyl ether. The combined organic layers were dried over anhydrous Na₂SO₄ and the solvent was evaporated. The crude product was purified by column chromatography on Silica Gel (60-120).

Characterisation of the compounds (2a-4e)

(E)-3-(2-formyl-3,4-dihydronaphthalen-1-yl)acrylamide (2a). Yellow solid; mp 140°C;

¹H NMR (DMSO- *d*₆, 200 MHz) δ: 2.58-2.65 (m, 2H), 2.78-2.85 (m, 2H), 5.89 (brs, 2H), 6.22 (d, 1H, *J* = 15.0 Hz), 7.23-7.31 (m, 2H), 7.34-7.43 (m, 2H), 7.83 (d, 1H, *J* = 15.0 Hz), 10.09 (s, 1H); ¹³C NMR (DMSO- *d*₆, 50 MHz) δ: 20.2, 26.9, 110.1, 126.6, 127.8, 130.3, 131.7, 132.6, 134.1, 135.9, 137.9, 148.7, 166.4, 191.4. HRMS calcd for C₁₄H₁₃NO₂ [M⁺ + H]: 228.1026; found: 228.1025.

(E)-3-(2-formyl-5-methoxy-3,4-dihydronaphthalen-1-yl)acrylamide (2b). Yellow solid; mp; 70°C;

¹H NMR (DMSO- *d*₆, 200 MHz) δ: 2.49-2.56 (m, 2H), 2.70-2.73 (m, 2H), 3.39 (s, 3H), 5.61 (brs, 2H), 6.21 (d, 1H, *J* = 15.0 Hz), 6.85-7.04 (m, 2H), 7.09-7.19 (m, 2H), 7.63 (d, 1H, *J* = 15.0 Hz), 10.02 (s, 1H); ¹³C NMR (DMSO- *d*₆, 50 MHz) δ: 21.2, 25.4, 54.5, 126.0, 127.8, 130.1, 131.4, 132.2, 133.3, 136.8, 137.5, 139.5, 149.5, 167.7, 191.2. HRMS calcd for C₁₅H₁₅NO₃ [M⁺ + H]: 258.1132; found: 258.1133.

(E)-3-(2-formyl-6-methoxy-3,4-dihydronaphthalen-1-yl)acrylamide (2c). Yellow solid; mp; 120-

122°C; ¹H NMR (DMSO- *d*₆, 300 MHz) δ: 2.58-2.63 (m, 2H), 2.75-2.81 (m, 2H), 3.84 (s, 3H), 5.72 (brs, 2H), 6.19 (d, 1H, *J* = 15.6 Hz), 6.76 (m, 2H), 7.32 (m, 1H), 7.79 (d, 1H, *J* = 10.2 Hz), 10.03 (s, 1H); ¹³C NMR (DMSO- *d*₆, 75 MHz) δ: 20.5, 26.1, 55.6, 116.2, 122.1, 125.3, 128.2, 131.8, 133.3, 135.0, 137.2, 140.7, 150.1, 167.9, 190.8; HRMS calcd for C₁₅H₁₅NO₃ [M⁺ + H]: 258.1132; found: 258.1130

(E)-3-(2-formyl-7-methoxy-3,4-dihydronaphthalen-1-yl)acrylamide (2d). Yellow solid; mp 150°C; ¹H NMR (DMSO- *d*₆, 500 MHz) δ: 2.50-2.54 (m, 2H), 2.67 (m, 2H), 3.73 (s, 3H), 5.82 (brs, 2H), 6.14 (d, 1H, *J* = 15.0 Hz), 6.78-6.85 (m, 2H), 7.06-7.10 (m, 1H), 7.73 (d, 1H, *J* = 15.0 Hz), 10.00 (s, 1H); ¹³C NMR (DMSO- *d*₆, 125 MHz) δ: 21.1, 26.5, 55.4, 96.2, 112.8, 115.7, 120.3, 128.8, 130.5, 132.8, 136.2, 141.6, 148.7, 166.1, 191.2; HRMS calcd for C₁₅H₁₅NO₃ [M⁺ + H]: 258.1132; found: 258.1137.

(E)-3-(2-formyl-4-methyl-3,4-dihydronaphthalen-1-yl)acrylamide (2e). Yellow solid; mp 137°C; ¹H NMR (DMSO- *d*₆, 300 MHz) δ: 1.12-1.18 (m, 3H), 2.41-2.53 (m, 2H), 2.92-2.98 (m, 1H), 5.74 (brs, 2H), 6.30 (d, 1H, *J* = 15.6 Hz), 7.29-7.44 (m, 4H), 7.67 (d, 1H, *J* = 15.6 Hz), 10.05 (s, 1H); ¹³C NMR (DMSO- *d*₆, 75 MHz) δ: 19.1, 28.5, 55.3, 96.1, 112.0, 114.0, 124.4, 125.7, 130.5, 134.7, 138.1, 140.5, 145.8, 165.4, 192.5. HRMS calcd for C₁₅H₁₅NO₂ [M⁺ + H]: 242.1183; found: 242.1181

(E)-3-((Z)-2-formylcyclooct-1-enyl)acrylamide (2f) . Yellow liquid; ¹H NMR (DMSO- *d*₆, 200 MHz) δ: 1.11-1.22 (m, 6H), 1.37-1.48 (m, 2H), 2.38-2.48 (m, 2H), 2.52-2.62 (m, 2H), 5.46 (brs, 1H), 5.76 (brs, 1H), 6.23 (d, 1H, *J* = 16.0 Hz), 8.02 (d, 1H, *J* = 16.0 Hz), 10.28 (s, 1H); ¹³C NMR (DMSO- *d*₆, 50 MHz) δ: 24.9, 26.0, 26.7, 29.3, 29.9, 35.1, 126.2, 134.8, 142.7, 153.2, 167.5, 190.3. HRMS calcd for C₁₁H₁₅NO₂ [M⁺ + H]: 208.1259; found: 208.1256

(E)-3-(2-formylcyclohept-1-enyl)acrylamide (2g). Yellow liquid; ¹H NMR (DMSO- *d*₆, 200 MHz) δ: 1.46-1.58 (m, 4H), 1.70-1.80 (m, 2H), 2.57 (m, 4H), 5.73 (brs, 2H), 6.13 (d, 1H, *J* = 16.0 Hz), 8.11 (d, 1H, *J* = 16.0 Hz), 10.26 (s, 1H); ¹³C NMR (DMSO- *d*₆, 50 MHz) δ: 23.1, 24.3, 27.8, 29.8, 34.2, 125.7, 130.3, 139.9, 152.4, 166.8, 190.6. HRMS calcd for C₁₁H₁₅NO₂ [M⁺ + H]: 194.1103; found: 194.1106.

(E)-3-(2-formylcyclohex-1-enyl)acrylamide (2h). Yellow solid; mp 150°C; ¹H NMR (DMSO- *d*₆, 200 MHz) δ: 1.54-1.64 (m, 4H), 2.25 (m, 2H), 2.37 (m, 2H), 6.10 (d, 1H, *J* = 16.0 Hz), 6.49 (brs, 2H), 8.11 (d, 1H, *J* = 16.0 Hz), 10.33 (s, 1H); ¹³C NMR (DMSO- *d*₆, 50 MHz) δ: 20.7, 21.2, 22.8, 26.8, 126.4, 130.5, 134.6, 148.8, 168.3, 190.4. HRMS calcd for C₁₀H₁₃NO₂ [M⁺ + H]: 180.0946; found: 180.0945

(E)-3-(2-formylcyclopent-1-enyl)acrylamide (2i). Yellow solid; mp 130°C; ^1H NMR (DMSO- d_6 , 200 MHz) δ : 0.74 (m, 2H), 0.94 (m, 4H), 4.49 (d, 1H, J = 15.4 Hz), 5.44 (brs, 2H), 6.11 (d, 1H, J = 15.4 Hz), 8.34 (s, 1H); ^{13}C NMR(DMSO- d_6 , 50 MHz) δ : 21.3, 22.0, 23.4, 124.5, 128.7, 133.3, 145.7, 169.7, 191.4. HRMS calcd for $\text{C}_9\text{H}_{11}\text{NO}_2$ [$\text{M}^+ + \text{H}$]: 166.0790; found: 166.0792.

2-(4,5-dihydronaphtho[2,1-c]furan-1-yl)acetamide (3a). Yellow solid: mp 132°C; ^1H NMR (CDCl_3 , 200 MHz) δ : 2.53-2.57 (m, 2H), 2.68-2.72 (m, 2H), 3.73 (s, 2H), 6.30 (brs, 2H), 6.98 (s, 1H), 7.12-7.24 (m, 2H), 7.30 (s, 1H), 7.46-7.49 (m, 1H); ^{13}C NMR (CDCl_3 , 50 MHz) δ : 19.3, 30.9, 36.2, 110.4, 113.7, 116.1, 121.9, 123.1, 126.7, 134.1, 138.7, 141.7, 157.2, 170.1; IR ν_{max} (CHCl_3 , cm^{-1}): 3369, 3190, 2944, 2900, 2833, 1672, 1622, 1480. HRMS calcd for $\text{C}_{14}\text{H}_{13}\text{NO}_2$ [$\text{M}^+ + \text{H}$]: 228.1026; found: 228.1025.

2-(4,5-dihydro-6-methoxynaphtho[2,1-c]furan-1-yl)acetamide (3b). Yellow solid; mp 153-155°C; ^1H NMR (CDCl_3 , 200 MHz) δ : 2.51-2.58 (m, 2H), 2.76-2.83 (m, 2H), 3.76 (s, 5H), 6.00 (brs, 1H), 6.10 (brs, 1H), 6.69-6.73 (m, 1H), 7.04-7.14 (m, 3H); ^{13}C NMR (CDCl_3 , 50 MHz) δ : 18.5, 21.8, 36.0, 55.5, 109.0, 116.8, 119.8, 123.2, 125.1, 127.2, 130.2, 135.4, 143.1, 157.0, 171.0; IR ν_{max} (CHCl_3 , cm^{-1}): 3360, 3110, 2844, 1674, 1620, 1460; HRMS calcd for $\text{C}_{15}\text{H}_{15}\text{NO}_3$ [$\text{M}^+ + \text{H}$]: 258.1132; found: 258.1133

2-(4,5-dihydro-7-methoxynaphtho[2,1-c]furan-1-yl)acetamide (3c). Yellow solid; mp 130°C; ^1H NMR (CDCl_3 , 200 MHz) δ : 2.58-2.64 (m, 2H), 2.75-2.78 (m, 2H), 3.75 (s, 5H), 5.90 (brs, 2H), 6.74-6.77 (m, 2H), 7.13-7.14 (m, 1H), 7.34-7.40 (m, 1H); ^{13}C NMR (CDCl_3 , 50 MHz) δ : 20.4, 31.4, 33.2, 55.4, 112.4, 114.7, 119.8, 122.0, 123.1, 125.5, 135.7, 138.6, 141.7, 158.6, 171.2; IR ν_{max} (CHCl_3 , cm^{-1}): 3366, 3110, 2837, 1670, 1625, 1476; HRMS calcd for $\text{C}_{15}\text{H}_{15}\text{NO}_3$ [$\text{M}^+ + \text{H}$]: 258.1132; found: 258.1136.

2-(4,5-dihydro-8-methoxynaphtho[2,1-c]furan-1-yl)acetamide (3d). Yellow solid; mp 100°C; ^1H NMR (CDCl_3 , 200 MHz) δ : 2.62-2.68 (m, 2H), 2.76-2.83 (m, 2H), 3.71 (s, 3H), 3.86 (s, 2H), 5.84 (brs, 1H), 6.16 (brs, 1H), 6.72-6.77 (m, 1H), 6.99-7.27 (m, 3H); ^{13}C NMR (CDCl_3 , 50 MHz) δ : 19.5, 29.6, 36.1, 55.4, 110.0, 112.6, 120.2, 123.5, 129.1, 129.6, 130.1, 135.8, 142.8, 158.7, 171.7. IR ν_{max}

(CHCl₃, cm⁻¹): 3350, 3050, 2833, 1671, 1618, 1470; HRMS calcd for C₁₅H₁₅NO₃ [M⁺ + H]: 258.1132; found: 258.1131.

2-(4,5-dihydro-5-methylnaphtho[2,1-c]furan-1-yl)acetamide (3e). Yellow solid; mp 98°C; ¹H NMR (CDCl₃, 200 MHz) δ: 1.02 (d, 3H, *J* = 6.8 Hz), 2.37-2.66 (m, 3H), 3.74 (s, 2H), 6.32 (brs, 2H), 6.98 (s, 1H), 7.15-7.22 (m, 2H), 7.46- 7.50 (m, 1H), 7.58 (s, 1H); ¹³C NMR, (CDCl₃, 50 MHz) δ: 19.2, 21.4, 30.7, 50.4, 105.4, 114.7, 119.8, 122.0, 123.1, 125.5, 130.6, 138.7, 144.2, 154.9, 166.2; IR ν_{max} (CHCl₃, cm⁻¹): 3359, 3090, 2832, 1669, 1600, 1420; HRMS calcd for C₁₅H₁₅NO₂ [M⁺ + H]: 242.1183; found: 242.1186.

2-(4,5,6,7,8,9-hexahydrocycloocta[c]furan-1-yl)acetamide (3f). Yellow liquid; ¹H NMR (CDCl₃, 200 MHz) δ: 1.25-1.27 (m, 3H), 1.60-1.62 (m, 5H), 2.42-2.49 (m, 4H), 3.58 (m, 2H), 5.67 (brs, 1H), 5.78 (brs, 1H), 7.05 (s, 1H); ¹³C NMR (CDCl₃, 50 MHz) δ: 19.7, 25.8, 25.9, 29.4, 29.7, 32.2, 32.7, 124.4, 128.1, 136.7, 142.1, 170.3; IR ν_{max} (CHCl₃, cm⁻¹): 3224, 2784, 1669, 1560, 1465; HRMS calcd for C₁₂H₁₇NO₂ [M⁺ + H]: 208.1339; found: 208.1336.

2-(5,6,7,8-tetrahydro-4H-cyclohepta[c]furan-1-yl)acetamide (3g). Yellow solid; mp 106°C; ¹H NMR (CDCl₃, 200 MHz) δ: 1.35-1.67 (m, 6H), 2.37-2.39 (m, 4H), 3.41 (s, 2H), 5.80 (brs, 1H), 6.48 (brs, 1H), 6.98 (s, 1H); ¹³C NMR (CDCl₃, 50 MHz) δ: 25.8, 25.9, 29.5, 29.7, 32.7, 34.1, 124.9, 128.4, 137.0, 143.3, 172.5; IR ν_{max} (CHCl₃, cm⁻¹): 3284, 3185, 2833, 1673, 1602, 1470; HRMS calcd for Mass C₁₁H₁₅NO₂ [M⁺ + H]: 194.1183; found: 194.1182.

2-(4,5,6,7-tetrahydroisobenzofuran-1-yl)acetamide (3h). Yellow liquid; ¹H NMR (CDCl₃, 200 MHz) δ: 1.66-1.69 (m, 4H), 2.41-2.50 (m, 4H), 3.49 (s, 2H), 5.74 (brs, 1H), 5.89 (brs, 1H), 7.10 (s, 1H); ¹³C NMR (CDCl₃, 50 MHz) δ: 18.4, 24.7, 30.1, 31.9, 34.5, 120.8, 128.4, 136.2, 139.4, 170.2; IR ν_{max} (CHCl₃, cm⁻¹): 3200, 2804, 1675, 1580, 1420; HRMS calcd for C₁₀H₁₃NO₂ [M⁺ + H]: 180.1026; found: 180.1024.

2-(5,6-dihydro-4H-cyclopenta[c]furan-1-yl)acetamide (3i). Yellow liquid; ¹H NMR (CDCl₃, 200 MHz) δ: 2.04-2.09 (m, 2H), 2.38-2.51 (m, 4H), 4.30 (s, 2H), 5.46 (brs, 2H), 7.26 (s, 1H); ¹³C NMR

(CDCl₃, 50 MHz) δ : 21.6, 29.5, 32.2, 35.1, 124.9, 128.4, 137.1, 140.3, 171.5; IR $\nu_{\max}$ (CHCl₃, cm⁻¹): 3225, 2784, 1669, 1560, 1465; HRMS calcd for C₉H₁₁NO₂ [M⁺ + H]: 166.0870; found: 166.0874.

2-(1,3,4,5-tetrahydronaphtho[2,1-c]furan-1-yl)acetamide (4a). White solid; mp 140°C; ¹H NMR (CDCl₃, 500 MHz) δ : 2.47-2.53 (m, 2H), 2.65-2.70 (m, 2H), 3.35-3.38 (m, 2H), 4.56 (d, 1H, J = 13.0 Hz), 4.72-4.86 (dd, 1H, J_1 = 13.0 Hz, J_2 = 4.0 Hz), 5.46 (brs, 1H), 5.73 (brs, 1H), 6.61 (s, 1H), 6.74-6.76 (m, 1H), 6.96 (s, 1H), 7.16-7.18 (m, 2H); ¹³C NMR (CDCl₃, 125 MHz) δ : 20.2, 26.4, 40.5, 76.3, 92.9, 110.1, 114.0, 121.5, 123.5, 128.0, 130.8, 137.7, 156.2, 172.0; IR $\nu_{\max}$ (CHCl₃, cm⁻¹): 3361, 3170, 2904, 1675, 1620, 1460; HRMS calcd for C₁₄H₁₅NO₂ [M⁺ + H]: 230.1183; found: 230.1185.

2-(1,3,4,5-tetrahydro-6-methoxynaphtho[2,1-c]furan-1-yl)acetamide (4b). White solid; mp 163°C; ¹H NMR (CDCl₃, 200 MHz) δ : 2.32-2.44 (m, 3H), 2.72-2.84 (m, 2H), 3.16-3.29 (m, 1H), 3.83 (s, 3H), 4.64 (d, 1H, J = 13.4 Hz), 4.79-4.88 (dd, 1H, J_1 = 13.4 Hz, J_2 = 4.8 Hz), 5.50 (br s, 1H), 5.94 (brs, 1H), 6.48 (s, 1H), 6.61-6.65 (m, 1H), 6.78-6.81 (m, 1H), 7.10-7.14 (m, 1H); ¹³C NMR (CDCl₃, 50 MHz) δ : 20.2, 22.9, 42.2, 55.7, 76.5, 81.9, 110.2, 115.5, 122.9, 127.3, 130.7, 132.7, 136.4, 156.7, 174.0; IR $\nu_{\max}$ (CHCl₃, cm⁻¹): 3358, 3120, 2835, 1673, 1610, 1490; HRMS calcd for C₁₅H₁₇NO₃ [M⁺ + H]: 260.1360; found: 260.1363.

2-(1,3,4,5-tetrahydro-7-methoxynaphtho[2,1-c]furan-1-yl)acetamide (4c). White solid; mp 155 °C; ¹H NMR (CDCl₃, 200 MHz) δ : 2.54-2.57 (m, 3H), 2.69-2.72 (m, 2H), 3.16-3.21 (m, 1H), 3.83 (s, 3H), 4.68 (d, 1H, J = 13.4 Hz), 4.82-4.91 (dd, 1H, J_1 = 13.4 Hz, J_2 = 4.8 Hz), 5.60 (br s, 1H), 5.93 (brs, 1H), 6.39 (s, 1H), 6.52-6.56 (m, 1H), 6.68-6.72 (d, 1H, J = 7.8 Hz), 7.01-7.05 (d, 1H, J = 7.8 Hz); ¹³C NMR (CDCl₃, 50 MHz) δ : 19.8, 21.0, 42.3, 54.8, 76.1, 81.8, 109.5, 114.3, 123.0, 127.1, 129.9, 131.5, 136.4, 155.4, 174.3; IR $\nu_{\max}$ (CHCl₃, cm⁻¹): 3371, 3120, 2950, 1676, 1618, 1471; HRMS calcd for C₁₅H₁₇NO₃ [M⁺ + H]: 260.1360; found: 260.1361.

2-(1,3,4,5-tetrahydro-8-methoxynaphtho[2,1-c]furan-1-yl)acetamide (4d). White solid; mp 158°C; ¹H NMR (CDCl₃, 500 MHz) δ : 2.33-2.34 (m, 2H), 2.43-2.48 (m, 1H), 2.79-2.88 (m, 3H), 3.78 (s, 3H), 4.66 (d, 1H, J = 13.0 Hz), 4.82-4.86 (dd, 1H, J_1 = 13.0 Hz, J_2 = 4.0 Hz), 5.48 (brs, 1H), 5.64 (brs, 1H), 6.42 (s, 1H), 6.53 (s, 1H), 6.66-6.68 (m, 1H), 7.07-7.08 (m, 1H); ¹³C NMR (CDCl₃, 125 MHz)

δ : 21.0, 29.7, 42.0, 55.3, 76.1, 81.4, 109.0, 111.7, 115.0, 123.3, 128.6, 131.3, 137.5, 157.7, 173.1; IR $\nu_{\max}$ (CHCl₃, cm⁻¹): 3290, 3130, 2837, 1670, 1625, 1481; HRMS calcd for C₁₅H₁₇NO₃ [M⁺ + H]: 260.1360; found: 260.1365.

2-(1,3,4,5-tetrahydro-5-methylnaphtho[2,1-c]furan-1-yl)acetamide (4e). White solid; mp 126°C; ¹H NMR (CDCl₃, 400 MHz) δ : 1.18 (d, 3H, J = 6.40 Hz), 2.36-2.58 (m, 3H), 2.92-2.98 (m, 2H), 4.52 (d, 1H, J = 12.0 Hz), 4.70-4.74 (dd, 1H, J_1 = 12.0 Hz, J_2 = 4.4 Hz), 5.55 (brs, 1H), 5.83 (brs, 1H), 6.65-6.83 (m, 3H), 7.02-7.13 (m, 2H); ¹³C NMR (CDCl₃, 100 MHz) δ : 21.3, 29.7, 36.3, 41.5, 76.3, 81.0, 109.4, 111.0, 116.2, 124.4, 128.9, 130.5, 138.0, 155.7, 169.8; IR $\nu_{\max}$ (CHCl₃, cm⁻¹) 3230, 3100, 2727, 1679, 1635, 1461; HRMS calcd for C₁₅H₁₇NO₂ [M⁺ + H]: 244.1339; found: 244.1335.