Supporting information

Organocatalytic valorisation of glycerol via a dual NHC-catalysed telescoped reaction

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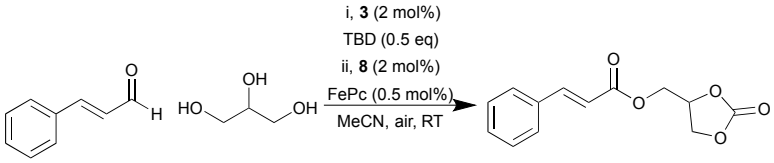
General considerations

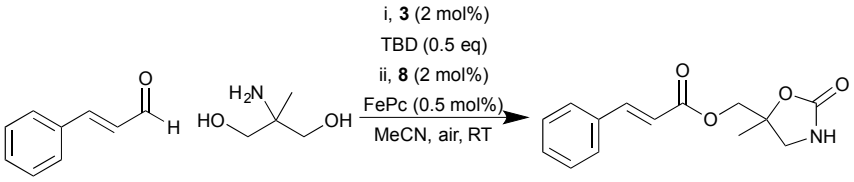
NHC-precatalysts, **3**,[1, 2] **4**[3] and **5**,[4] were synthesized according to literature procedure. Cinnamaldehyde and 4-fluorocinnamaldehyde were stored under an atmosphere of nitrogen. 4-Methylcinnamaldehyde[5] and 3,3',5,5'-tetra-tert-butyldiphenoquinone (**7**)[6] was synthesized according to literature procedure. All other solvents and reagents were purchased from commercial sources and used without modifications. ^{1}H NMR (400 MHz), ^{13}C NMR (101 MHz) and ^{19}F NMR (376 MHz) spectra were acquired on Varian 400. The chemical shifts for ^{1}H and ^{13}C NMR spectra are reported in parts per million (ppm) relative to the residual peak from solvent $CDCl_3$ as the internal standard; ^{1}H NMR at δ 7.26 ppm and ^{13}C NMR at δ 77.16 ppm. All coupling constants (J) are reported in Hertz (Hz) and multiplicities are indicated by s (singlet), d (doublet), t (triplet), dd (doublet of doublets), dt (doublet of triplets) and m (multiplet). FT-ATR-IR spectra were recorded on a Perkin-Elmer Spectrum Frontier infrared spectrometer with pike-GladiATR™ module and are reported in wavenumber (cm^{-1}) as follows: vs (very strong), s (strong), m (medium) and br (broad). Melting points were recorded on a Büchi Melting Point B-545. Purification was performed by an automated column chromatography Biotage Isolera™ Spektra One with Biotage SNAP®-10 g KP-sil columns. Flash chromatography was performed with silica gel for chromatography (35–70 micron) in the solvent reported. Thin layer chromatography (TLC) was performed on Merck TLC plates precoated with silica gel 60 F_{254} (Art 5715, 0.25 mm) and was visualized with UV-light (254 nm). High-resolution mass spectrometry (HRMS) was performed on an Agilent 6520 quadrupole time of flight instrument coupled to Agilent 1290 infinity ultra performance liquid chromatograph (Santa Clara, USA). Samples were dissolved in acetonitrile and eluted by using isocratic elution (100% acetonitrile) with a flow rate of 0.4 ml/min. Mass spectrometer was operated in positive electrospray ionization scanning between 50 and 1200 m/z. Ion source parameters were as follows; drying gas flow 10 L/min and temperature 325°C and nebulizer pressure 35 psig. Mass spectrometer was calibrated before analyses.

General procedure for the dual esterification/carbonation of glycerol



To a 10 ml round bottom flask equipped with a magnetic stirrer were added glycerol (50.7 mg, 0.55 mmol), 1,5,7-triazabicyclo[4.4.0]dec-5-ene (34.1 mg, 0.49 mmol) and 1,4-dimethyl-4*H*-1,2,4-triazol-1-ium iodide (2.3 mg, 0.01 mmol), acetonitrile (0.5 ml) and dimethyl carbonate (0.2 ml). The mixture was stirred at room temperature untilx full consumption of glycerol was observed by ^{1}H NMR, but for a minimum of 3h. The volatiles were then removed under reduced pressure yielding a clear oil. Without further purification, were 2,6-di-tert-butylphenol (2.1 mg, 0.01 mmol), acetonitrile (3.0 ml) and iron(II)phthalocyanine (1.5 mg, 0.0026 mmol) added and the mixture was stirred in contact with air for 5 min, before addition of cinnamaldehyde (66.1 mg, 0.50 mmol). The mixture was stirred at room temperature in contact with air. After 3h, ^{1}H NMR indicated full consumption of cinnamaldehyde and the mixture was purified using the Biotage using petroleum ether (40-60°C)/ethyl acetate solvent mixture (25ml/min, 100% petroleum ether →10% →22% →35% ethyl acetate in petroleum ether). The product was obtained as a clear oil that slowly solidifies (104.3 mg, 0.42 mmol, 84%).

General procedure for the synthesis of 2-oxooxazolidine esters



To a 10 ml round bottom flask equipped with a magnetic stirrer were added 2-amino-2-methyl-1,3-propanediol (52.4 mg, 0.5 mmol), 1,5,7-triazabicyclo[4.4.0]dec-5-ene (34.8 mg, 0.5 mmol) and 1,4-dimethyl-4*H*-1,2,4-triazol-1-ium iodide (2.5 mg, 0.01 mmol), acetonitrile (0.5 ml) and dimethyl carbonate (0.2 ml). The mixture was stirred at room temperature until full consumption of 2-amino-2-methyl-1,3-propanediol was observed by ^{1}H NMR, but for a minimum of 3h. The volatiles were then removed under reduced pressure yielding a clear oil. Without further purification, were 2,6-di-tert-butylphenol (2.0 mg, 0.01 mmol), acetonitrile (3.0 ml) and iron(II)phthalocyanine (1.5 mg, 0.0026 mmol) added and the mixture was stirred in contact with air for 5 min, before addition of cinnamaldehyde (66.1 mg, 0.50 mmol). The mixture was stirred at room temperature in contact with air. After 4h, ^{1}H NMR indicated full consumption of cinnamaldehyde and the mixture was purified using the Biotage using dichloromethane/methanol solvent mixture (25ml/min, 100% dichloromethane →2% →4% →10% methanol in dichloromethane). The product was obtained as a clear oil that slowly solidifies (120.9 mg, 0.46 mmol, 92%).

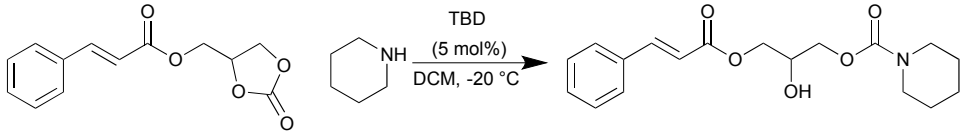
Note: If further purification is needed, it is often sufficient to dissolve the crude product in ethyl acetate (5 ml) and wash it with water (5×5ml) in an separatory funnel. If insufficient, recrystallization from ethyl acetate is possible.

Procedure for large scale preparation of (2-oxo-1,3-dioxolan-4-yl)methyl cinnamate

To a 100 ml round bottom flask equipped with a magnetic stirrer were added glycerol (780.6 mg, 8.48 mmol), 1,5,7-triazabicyclo[4.4.0]dec-5-ene (541.6 mg, 3.89 mmol) and 1,4-dimethyl-4*H*-1,2,4-triazol-1-ium (37.2 mg, 0.17 mmol), acetonitrile (7.5 ml) and dimethyl carbonate (3.0 ml). The mixture was gently stirred over night at ambient temperature. Subsequently, the volatiles were removed under reduced pressure yielding a clear dense oil. Without further purification, were acetonitrile (45 ml), 2,6-di-tert-butylphenol (31.1 mg, 0.15 mmol) and iron(II)phthalocyanine (21.4 mg, 0.04 mmol) added and the mixture was stirred in contact with air for 5 min before addition of cinnamaldehyde (991.9 mg, 0.50 mmol). The mixture was stirred at room temperature in contact with air. After 4h, ^{1}H NMR indicated full consumption of cinnamaldehyde and the volatiles were removed under reduced pressure. The resulting green oil were purified using flash chromatography initially using heptane/ethyl acetate 2:1 as eluent, and when most of the product had eluated the eluent was change to heptane/ethyl acetate 1:1. The product was obtained as a yellow oil (1627.4 mg, 6.56 mmol, 87%).

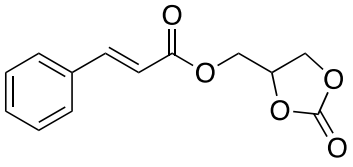
Note: The product hydrolyses upon prolonged exposure to silica and wet solvents. Recrystallization from heptane/toluene 85:15 or ethyl acetate is a viable option if the obtained product needs further purification.

Synthesis of carbamate 31

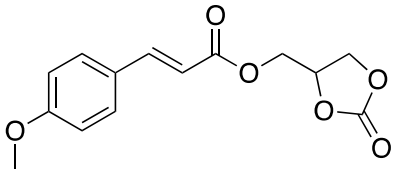


To a 10 ml pear shaped flask equipped with a magnetic stirrer were added (2-oxo-1,3-dioxolan-4-yl)methyl cinnamate (47.3 mg, 0.19mmol) and dichloromethane (0.25 ml). The flask was placed in a cooling bath that held -20 °C (ice/NaCl 3:1). The mixture was stirred at --20 °C for 5 minutes, then piperidine (20.1 mg, 0.24 mmol) and 1,5,7-triazabicyclo[4.4.0]dec-5-ene (1.4 mg, 0.01 mmol) were added. The mixture was held at -20 °C for 10h and was then allowed to slowly warm up to 8 °C over night. The volatiles were removed under reduced pressure and purified using the Biotage using heptane/ethyl acetate solvent mixture (20ml/min, 100% petroleum ether →20% →30% ethyl acetate in heptane. The product was obtained as a clear oil (53.0 mg, 0.16 mmol, 84%, 74:18:8 rr). The major regioisomer can be separated using chromatography, major regioisomer: R_f(DCM/EtOAc 1:1)=0.23, minor regioisomers: R_f(DCM/EtOAc 1:1)=0.15.

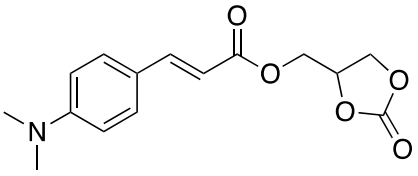
Compounds



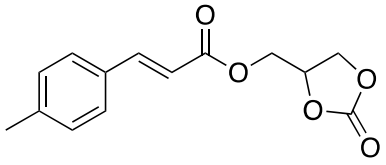
(2-oxo-1,3-dioxolan-4-yl)methyl cinnamate 1: Synthesized from cinnamaldehyde and glycerol according to the general procedure. Obtained as a clear oil that slowly solidifies (104.3 mg, 0.42 mmol, 84%). **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.73 (d, *J*=16.0 Hz, 1H), 7.56-7.50 (m, 2H), 7.42-7.36 (m, 3H), 6.45 (d, *J*=16.0 Hz, 1H), 5.04-4.96 (m, 1H), 4.60 (t, *J*=8.6 Hz, 1H), 4.51-4.39 (m, 2H), 4.37-4.34 (m, 1H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ 166.4, 154.6, 146.8, 134.0,130.9, 129.1, 128.4, 116.5, 74.0, 66.2, 63.2. **FTIR-ATR** (cm^{-1}): 1779.4 (vs), 1708.7 (vs), 1639.9 (s), 1302.1 (s), 1163.6 (vs), 1090 (vs), 766.0 (vs). **HRMS** (ESI) calcd for $C_{13}H_{12}O_5$ $[M+Na]^+$: exact mass: 271.0577, found: 271.0575. mp: 93 °C.



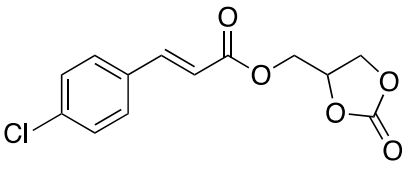
(2-oxo-1,3-dioxolan-4-yl)methyl (*E*)-3-(4-methoxyphenyl) acrylate 9: Synthesized from 4-methoxycinnamaldehyde and glycerol according to the general procedure. Obtained as a lightly yellow oil that slowly solidifies (134.5 mg, 0.48 mmol, 95%). **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.68 (d, *J*=16.0 Hz, 1H), 7.49 (d, *J*=8.8 Hz, 2H), 6.91 (d, *J*=8.8 Hz, 2H), 6.31 (d, *J*=16.0 Hz, 1H), 5.02-4.95 (m, 1H), 4.59 (t, *J*=8.6 Hz, 1H), 4.48-4.33 (m, 3H), 3.84 (s, 3H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ 166.7, 162.0, 154.6, 146.5, 130.2, 126.8, 114.6, 113.8, 74.1, 66.2, 63.1, 55.6. **FTIR-ATR** (cm^{-1}): 1792.9 (s), 1706.2 (s), 1629.7 (s), 1604.4 (s), 1161.3 (vs), 1088.3 (vs), 772.9 (s). **HRMS** (ESI) calcd for $C_{14}H_{14}O_6$ $[M+Na]^+$: exact mass: 301.0683, found: 301.0668. mp: 102 °C.



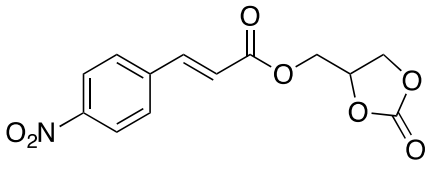
***(E)*-(2-oxo-1,3-dioxolan-4-yl)methyl 3-(4-(dimethylamino)phenyl)acrylate 10:** Synthesized from 4-dimethylaminocinnamaldehyde and glycerol according to the general procedure, the reaction was run for 6 hours. Obtained as a yellow solid (81.3 mg, 0.28 mmol, 59%). **^{1}H NMR** (400 MHz, $CDCl_3$) δ7.67 (d, *J*=15.9 Hz, 1H), 7.46-7.41 (m, 2H), 6.74-6.67 (m, 2H), 6.23 (d, *J*=15.9 Hz, 1H), 5.01-4.95 (m, 1H), 4.61-4.55 (m, 1H), 4.43-4.34 (m, 3H), 3.04 (s, 6H). **^{13}C NMR** (101MHz, $CDCl_3$) δ 167.2, 154.7, 152.2, 147.3, 130.2, 121.7, 111.8, 110.3, 74.2, 66.2, 62.8, 40.2. **FTIR-ATR** (cm^{-1}): 1792.8 (vs), 1701.8 (vs), 1600.5 (s), 1148.4 (vs), 1089 (vs), 809.0 (s) 766.0 (s). **HRMS** (ESI) calcd for $C_{15}H_{17}NO_5$ $[M+H]^+$: exact mass: 292.1179, found: 292.1175. mp: 145 °C.



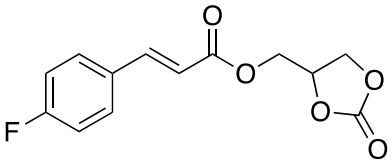
***(E)*-(2-oxo-1,3-dioxolan-4-yl)methyl 3-(p-tolyl)acrylate 11:** Synthesized from 4-methylcinnamaldehyde and glycerol according to the general procedure, the reaction was run for 7 hours. Obtained as a clear solid (69.1 mg, 0.26 mmol, 53%). **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.71 (d, *J*=16.0 Hz, 1H), 7.47-7.41 (m, 2H), 7.22-7.18 (m, 2H), 6.41 (d, *J*=16.0 Hz, 1H), 5.02-4.96 (m, 1H), 4.59 (t, *J*= 8.6 Hz, 1H), 4.47 (dd, *J*= 12.8, 3.6 Hz, 1H), 4.43-4.35 (m, 2H), 2.38 (s, 3H). **^{13}C NMR** (101MHz, $CDCl_3$) δ 166.6, 154.6, 146.9, 141.5, 131.3, 129.9, 128.5, 115.3, 74.1, 66.2, 63.1, 21.7. **FTIR-ATR** (cm^{-1}): 1792.7 (vs), 1703.2 (vs), 1632.6 (s), 1159.2 (vs), 1085.5 (vs), 815.2 (s) 772.5 (s), 498.2 (s). **HRMS** (ESI) calcd for $C_{14}H_{14}O_5$ $[M+Na]^+$: exact mass: 285.0733, found: 285.0731. mp: 98 °C.



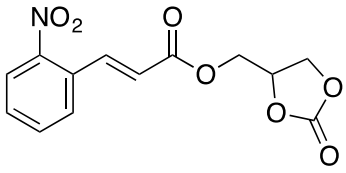
(2-oxo-1,3-dioxolan-4-yl)methyl (*E*)-3-(4-chlorophenyl) acrylate 12: Synthesized from 4-chlorocinnamaldehyde and glycerol according to the general procedure. Obtained as a clear oil that slowly solidifies (126.6 mg, 0.45 mmol, 90%). **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.68 (d, *J*=16.0 Hz, 1H), 7.49-7.45 (m, 2H), 7.41-7.36 (m, 2H), 6.43 (d, *J*=16.0 Hz, 1H), 5.03-4.96 (m, 1H), 4.60 (t, *J*=8.7 Hz, 1H), 4.49 (dd, *J*=12.6, 3.4 Hz, 1H), 4.42 (dd, *J*=12.6, 4.2 Hz, 1H), .4.37 (dd, *J*=8.9, 5.9 Hz, 1H) **^{13}C NMR** (101 MHz, $CDCl_3$) δ 166.1, 154.5, 145.3, 136.9, 132.5, 129.6, 129.4, 117.0, 74.0, 66.1, 63.3. **FTIR-ATR** (cm^{-1}): 1791.5 (vs), 1704.9 (vs), 1638.4 (s), 1164.0 (vs), 1085.9 (vs), 816.9 (vs) 770.9 (vs), 496.3 (vs). **HRMS** (ESI) calcd for $C_{13}H_{11}ClO_5$ $[M+Na]^+$: exact mass: 305.0187, found: 305.0189. mp: 111 °C.



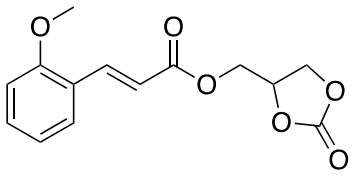
2-oxo-1,3-dioxolan-4-yl)methyl (*E*)-3-(4-nitrophenyl) acrylate 14: Synthesized from 4-nitrocinnamaldehyde and glycerol according to the general procedure. Obtained as a lightly yellow solid (124.8 mg, 0.43 mmol, 86%). **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.31-8.22 (m, 2H), 7.76 (d, *J*=16.1 Hz, 1H), 7.73-7.66 (m, 2H), 6.58 (d, *J*=16.1 Hz, 1H), 5.04-4.97 (m, 1H), 4.62 (t, *J*=8.6 Hz, 1H), 4.53 (dd, *J*=12.6, 3.2 Hz, 1H), 4.43 (dd, *J*=12.6, 4.1 Hz, 1H), .4.38 (dd, *J*=8.8, 5.7 Hz, 1H) **^{13}C NMR** (101 MHz, $CDCl_3$) δ 165.6, 154.4, 149.0, 143.8, 140.0, 129.1, 124.4, 120.8, 73.8, 66.1, 63.7. **FTIR-ATR** (cm^{-1}): 1784.0 (vs), 1717.2 (vs), 1639.4 (s), 1599.8 (s), 1511.6 (s), 1162.9 (vs), 1089.6 (vs), 830.8 (s). **HRMS** (ESI) calcd for $C_{13}H_{11}NO_7$ $[M+Na]^+$: exact mass: 316.0428, found: 316.0420. mp: 172 °C.



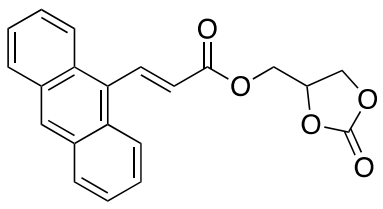
2-oxo-1,3-dioxolan-4-yl)methyl (*E*)-3-(4-fluorophenyl) acrylate 13: Synthesized from 4-fluorocinnamaldehyde and glycerol according to the general procedure. Obtained as a lightly yellow oil (96.0 mg, 0.36 mmol, 71%).**^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.70 (d, *J*=16.0 Hz, 1H), 7.57-7.51 (m, 2H), 7.13-7.06 (m, 2H), 6.38 (d, *J*=16.0 Hz, 1H), 5.03-4.97 (m, 1H), 4.61 (t, *J*=8.6 Hz, 1H), 4.48 (dd, *J*=12.5, 3,2 Hz, 1H), 4.41 (dd, *J*=12.5, 4.1 Hz, 1H), 4.37 (dd, *J*=8.8, 5.9 Hz, 1H) **^{13}C NMR** (101 MHz, $CDCl_3$) δ 166.3, 164.3 (d, $^{1}J_{C\text{-}F}$=253 Hz), 154.5, 145.5, 130.4 (d, $^{3}J_{C\text{-}F}$=9 Hz),130.3 (d, $^{4}J_{C\text{-}F}$=3 Hz), 116.3 (d, $^{2}J_{C\text{-}F}$ =22 Hz), 116.2, 74.0, 66.2, 63.3**^{19}F NMR** (376 MHz, $CDCl_3$) δ -108.6. **FTIR-ATR** (cm^{-1}): 1785.1 (vs), 1714.2 (vs), 1637.4 (s), 1509.1 (s), 1158.6 (vs), 1049.2 (vs), 824.5 (s), 508.0 (s). **HRMS** (ESI) calcd for $C_{13}H_{11}FO_5$ $[M+Na]^+$: exact mass: 289.0483, found: 289.0520.



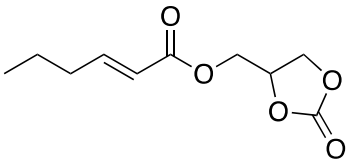
***(E)*-(2-oxo-1,3-dioxolan-4-yl)methyl 3-(2-nitrophenyl) – acrylate 15:** Synthesized from 2-nitrocinnamaldehyde and glycerol according to the general procedure, the reaction was run for 3 hours. Obtained as a clear oil, slightly yellow (110.5 mg, 0.40 mmol, 77%). **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.20 (d, *J*=15.9 Hz, 1H), 8.10 (m, 1H), 7.70-7.63 (m, 2H), 7.61-7.55 (m, 1H), 6.39 (d, *J*=15.9 Hz, 1H), 5.05-4.99 (m, 1H), 4.62 (t, *J*=8.7 Hz, 1H), 4.52 (dd, *J*=12.7, 3.3 Hz, 1H), 4.43 (dd, *J*=12.7, 4.2 Hz, 1H), .4.39 (dd, *J*=8.7, 5.9 Hz, 1H) **^{13}C NMR** (101 MHz, $CDCl_3$) δ 165.2, 154.4, 142.3, 133.8, 130.9, 130.3, 129.4, 125.2, 121.5, 73.8, 66.2, 63.6. **FTIR-ATR** (cm^{-1}): 1787.9 (vs), 1716.7 (vs), 1638.3 (s), 1519.9 (vs), 1343.1 (s), 1158.0 (vs), 1050.7 (vs), 755.9 (s). **HRMS** (ESI) calcd for $C_{13}H_{11}NO_7$ $[M+Na]^+$: exact mass: 316.0428, found: 316.0431.



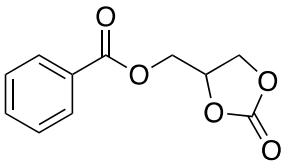
***(E)*-(2-oxo-1,3-dioxolan-4-yl)methyl 3-(2-methoxyphenyl) – acrylate 16:** Synthesized from 2-methoxycinnamaldehyde and glycerol according to the general procedure, the reaction was run in the dark for 6 hours. Obtained as a clear oil, slightly yellow (110.5 mg, 0.40 mmol, 77%). **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.04 (d, *J* = 16.0 Hz, 1H), 7.53-7.49 (m, 1H), 7.40-7.35 (m, 1H), 7.00 – 6.90 (m, 2H), 6.55 (d, *J* = 16.0 Hz, 1H), 5.02 – 4.95 (m, 1H), 4.59 (t, *J* = 8.7 Hz, 1H), 4.49 – 4.40 (m, 2H), 4.39-4.35 (m, 2H), 3.91 (s, 3H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ 167.0, 158.7, 154.6, 142.4, 132.2, 129.5, 123.0, 120.9, 116.9, 111.3, 74.1, 66.2, 63.0, 55.7. **FTIR-ATR** (cm^{-1}): 1790.2 (vs), 1711.3 (s), 1246.3 (s), 1152.6 (vs), 1105.0 (vs), 754.6 (s). **HRMS** (ESI) calcd for $C_{14}H_{14}O_6$ $[M+Na]^+$: exact mass: 301.0683, found: 301.0671.



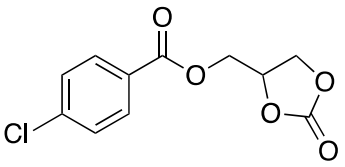
(2-oxo-1,3-dioxolan-4-yl)methyl (*E*)-3-(anthracen-9-yl)acrylate 17: Synthesized from *(E)*-3-(anthracen-9-yl)acrylaldehyde and glycerol according to the general procedure, the reaction was run for 4h. Obtained as a yellow dense oil (132.2 mg, 0.38 mmol, 76%). **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.71 (d, *J*=16.3 Hz, 1H), 8.47-8.40 (m, 1H), 8.24-8.14(m, 2H), 8-03-7.97 (m, 2H), 7.57-7.46 (m, 4H), 6.46 (d, *J*=16.3 Hz, 1H), 5.10-5.00 (m, 1H), 4.66-4.57 (m, 2H), 4.53-4.39 (m, 2H) **^{13}C NMR** (101 MHz, $CDCl_3$) δ 165.8, 154.6, 154.5, 144.21, 144.2, 131.2, 129.4, 129.0, 128.9, 126.7, 125.5, 125.3, 125.0, 74.0, 66.2, 63.5. **FTIR-ATR** (cm^{-1}): 1787.3 (vs), 1712.6 (vs), 1629. (s), 1262.1 (s), 1154.1 (vs), 1050.0 (vs), 731.1 (vs). **HRMS** (ESI) calcd for $C_{21}H_{16}O_5$ $[M+Na]^+$: exact mass: 371.0890, found: 371.0881.



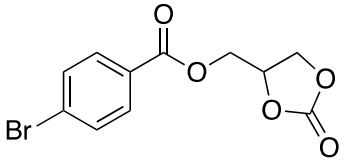
***(E)*-(2-oxo-1,3-dioxolan-4-yl)methyl hex-2-enoate 18:** **S**ynthesized from 2-hexenal (predominantly *E*) and glycerol according to the general procedure, but with 4 mol% of cat **4**, the reaction was run over night. Obtained as a yellow oil (68.9 mg, 0.32 mmol, 64%, predominantly *E*). Minor isomer indicated with *. **^{1}H NMR** (400 MHz, $CDCl_3$). 7.04 (m, 1H), 5.85 (m, 1H), 4.99 – 4.91 (m, 1H), 4.56 (t, *J* = 8.6 Hz, 1H), 4.43-4.37 (m, 2H), 4.36-4.30 (m, 2H) 2.24 – 2.17 (m, 2H), 1.55-143 (m, 2H), 0.94 (t, *J* = 7.5 Hz, 3H). **^{13}C NMR** (101MHz, $CDCl_3$) δ166.0, 154.6, 151.9, 150.8*, 120.6*, 120.0, 74.0, 66.2, 65.2*, 62.9, 34.4, 34.4*, 21.3*, 21.2, 13.8*, 13.8. **FTIR-ATR** (cm^{-1}): 1791.9 (vs), 1718.0 (vs), 1652.0 (s), 1163.1 (vs), 1051.5 (vs), 771.0 (s). **HRMS** (ESI) calcd for $C_{10}H_{14}O_5$ $[M+Na]^+$: exact mass: 237.0733, found: 237.0736.



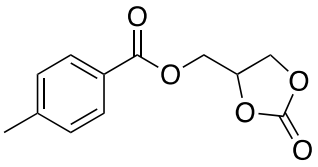
(2-oxo-1,3-dioxolan-4-yl)methyl benzoate 19[7]: Synthesized from benzaldehyde and glycerol according to the general procedure, but with 4 mol% of 4-dimethyl-4*H*-1,2,4-triazol-1-ium iodide, the reaction was run over night. Obtained as a clear light yellow oil that slowly solidified (80.3 mg, 0.36 mmol, 72%). **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.03-8.00 (m, 2H), 7.61 (m, 1H), 7.47 (m, 2H), 5.10-5.02 (m, 1H), 4.67-4.58 (m, 2H), 4.53 (dd, *J*=12.6, 3.9 Hz, 1H), 4.43 (dd, *J*=8.7, 5.7 Hz, 1H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ 166.0, 154.6, 133.8, 129.9, 128.9, 128.7, 74.0, 66.2, 63.8. mp: 69 °C (Literature value: 68-69 °C).[8]



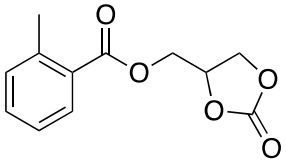
(2-oxo-1,3-dioxolan-4-yl)methyl 4-chlorobenzoate 21: Synthesized from 4-chlorobenzaldehyde and glycerol according to the general procedure, but with 4 mol% of 4-dimethyl-4*H*-1,2,4-triazol-1-ium iodide, the reaction was run over night. Obtained as a white solid (87.3 mg, 0.34 mmol, 67%). **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.98-7.94 (m, 2H), 7.46-7.42 (m, 2H), 5.08-5.02 (m, 1H), 4.63 (t, *J*=8.8 Hz, 1H) 4.61-4.57(m, 1H), 4.51 (dd, *J*=12.6, 4.0 Hz, 1H), 4.40 (dd, *J*=8.8, 5.6 Hz, 1H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ 165.3, 154.5, 140.5, 131.3, 129.2, 127.3, 73.9, 66.2, 64.0. **FTIR-ATR** (cm^{-1}): 1778.7 (vs), 1712.6 (vs), 1629.2 (s), 1262.1 (s), 1154.1 (vs), 1050.0 (vs), 731.1 (s). **HRMS** (ESI) calcd for $C_{11}H_9ClO_5$ $[M+Na]^+$: exact mass: 279.0031, found: 279.0034. mp: 88 °C.



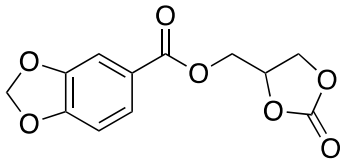
(2-oxo-1,3-dioxolan-4-yl)methyl 4-bromobenzoate 22: Synthesized from 4-bromobenzaldehyde and glycerol according to the general procedure, but with 4 mol% of 4-dimethyl-4*H*-1,2,4-triazol-1-ium iodide, the reaction was run over night. Obtained as a clear solid (77.5 mg, 0.26 mmol, 51%). **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.91-7.86 (m, 2H), 7.63-7.59 (m, 2H), 5.09-5.02 (m, 1H), 4.63 (t, *J*=8.7 Hz, 1H) 4.60(dd, *J*=12.6, 3.1 Hz 1H), 4.51 (dd, *J*=12.6, 4.2 Hz, 1H), 4.40 (dd, *J*=8.9, 5.8 Hz, 1H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ 165.4, 154.5, 132.2, 131.4, 129.2, 127.8, 73.9, 66.2, 64.1. **FTIR-ATR** (cm^{-1}): 1780.4 (vs), 1725.4 (vs), 1589.7 (s), 1396.6 (s), 1266.7 (vs), 1167.1 (vs), 1049.0 (vs), 754.2 (vs). **HRMS** (ESI) calcd for $C_{11}H_9BrO_5$ $[M+Na]^+$: exact mass: 322.9526, found: 322.9523. mp: 100 °C.



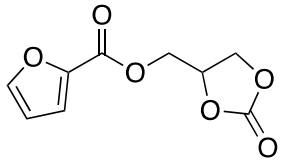
(2-oxo-1,3-dioxolan-4-yl)methyl 4-methylbenzoate 20: Synthesized from 4-methylbenzaldehyde and glycerol according to the general procedure, but with 4 mol% of 4-dimethyl-4*H*-1,2,4-triazol-1-ium iodide, the reaction was run over night. Obtained as a clear oil (69.3 mg, 0.29 mmol, 60%).**^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.00-7.89 (m, 2H), 7.28-7.24 (m, 2H), 5.09-5.00 (m, 1H), 4.62 (t, *J*=8.7 Hz, 1H) 4.57 (dd, *J*=12.6, 3.4 Hz, 1H), 4.51 (dd, *J*=12.6, 3.9 Hz, 1H), 4.42 (dd, *J*=8.8, 5.7 Hz, 1H), 2.42 (s, 3H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ 166.1, 154.6, 144.7, 130.0, 129.5, 126.1, 74.1, 66.2, 63.6, 21.9. **FTIR-ATR** (cm^{-1}): 1793.8 (vs), 1697.5 (vs), 1393.4 (s), 1276.4 (vs), 1168.7 (vs), 1085.5 (vs), 747.9 (vs), 467.4 (s). **HRMS** (ESI) calcd for $C_{12}H_{12}O_5$ $[M+Na]^+$: exact mass: 259.0577, found: 259.0592.



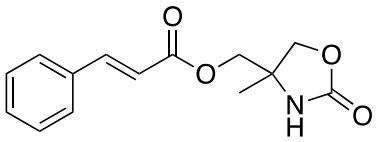
(2-oxo-1,3-dioxolan-4-yl)methyl 2-methylbenzoate 24: Synthesized from 2-methylbenzaldehyde and glycerol according to the general procedure, but with 4 mol% of 4-dimethyl-4*H*-1,2,4-triazol-1-ium iodide, the reaction was run over night. Obtained as a clear oil. (82.6 mg, 0.35 mmol, 65%). **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.94-7.89 (m, 1H), 7.47-7.41 (m, 1H), 7.30-7.24 (m, 2H), 5.09-5.02 (m, 1H), 4.62 (t, *J*=8.7 Hz, 1H) 4.58 (dd, *J*=12.6, 3.4 Hz, 1H), 4.48 (dd, *J*=12.6, 4.1 Hz, 1H), 4.42 (dd, *J*=8.7, 5.9 Hz, 1H), 2.60 (s, 3H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ 166.7, 154.6, 140.9, 132.9, 132.0, 130.9, 128.1, 126.1, 74.1, 66.2, 63.4, 21.9. **FTIR-ATR** (cm^{-1}): 1800.0 (vs), 1714.6 (vs), 1258.2 (vs), 1157.2 (vs), 1090.7 (vs), 870.2 (s), 757.4 (vs). **HRMS** (ESI) calcd for $C_{12}H_{12}O_5$ $[M+Na]^+$: exact mass: 259.0577, found: 259.0564.



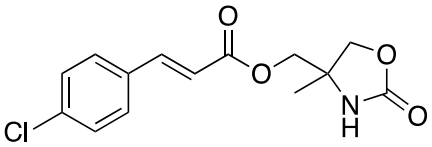
(2-oxo-1,3-dioxolan-4-yl)methyl benzo[d][1,3]dioxole-5-carboxylate 23: Synthesized from piperonal and glycerol according to the general procedure, but with 4 mol% of 4-dimethyl-4H-1,2,4-triazol-1-ium iodide, the reaction was run over night. Obtained as a clear solid (105.8 mg, 0.4 mmol, 79%). **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.66-7.62 (m, 1H), 7.44-7.42 (m, 1H), 6.87-6.84 (m, 1H), 6.06 (s, 2H), 5.07-4.98 (m, 1H), 4.62 (t, *J*=8.3 Hz, 1H), 4.55 (dd, *J*=12.6, 3.2 Hz, 1H), 4.48 (dd, *J*=12.6, 4.0 Hz, 1H), 4.40 (dd, *J*=8.8, 5.7 Hz, 1H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ 165.4, 154.6, 152.4, 148.1, 126.0, 122.7, 109.6, 108.3, 102.1, 74.1, 66.2, 63.7. **FTIR-ATR** (cm^{-1}): 1789.6 (vs), 1713.9 (vs), 1258.6 (vs), 1157.8 (s), 1035.9 (s), 755.3 (vs), 458.1 (s), 418.7 (s). **HRMS** (ESI) calcd for $C_{12}H_{10}O_7$ $[M+Na]^+$: exact mass: 289.0319, found: 289.0308. mp: 110 °C.



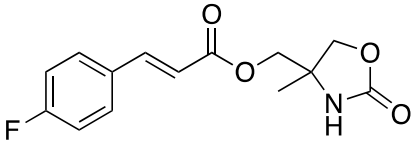
(2-oxo-1,3-dioxolan-4-yl)methyl furan-2-carboxylate 25: Synthesized from furfural and glycerol according to the general procedure, but with 4 mol% of 4-dimethyl-4H-1,2,4-triazol-1-ium iodide, the reaction was run for 5 hours. Obtained as an orange solid (74 mg, 0.35 mmol, 63%). **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.65-7.61 (m, 1H), 7.26-7.24 (m, 1H), 6.56-6.53 (m, 1H), 5.06-4.98 (m, 1H), 4.61 (t, *J*=8.4 Hz, 1H), 4.59-4.55 (m, 1H), 4.50 (dd, *J*=12.5, 4.1 Hz, 1H), 4.40 (dd, *J*=8.9, 6.0 Hz, 1H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ158.0, 154.4, 147.4, 143.4, 119.6, 112.3, 73.8, 66.1, 63.5. **FTIR-ATR** (cm^{-1}): 1782.3 (vs), 1716.8 (vs), 1470.1 (s), 1400.9 (s), 1293.6 (s), 1179.5 (vs), 1086.1 (vs), 1049.0 (vs), 758.0 (vs), 597.0 (s). **HRMS** (ESI) calcd for $C_9H_8O_6$ $[M+Na]^+$: exact mass: 235.0213, found: 235.0209. mp: 86 °C.



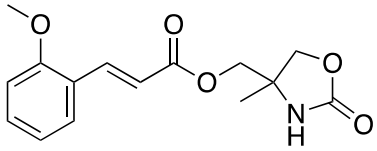
(4-methyl-2-oxooxazolidin-4-yl)methyl cinnamate 27: Synthesized from cinnamaldehyde and 2-amino-2-methyl-1,3-propanediol according to the general procedure. Obtained as a yellow oil that slowly solidifies (120.9 mg, 0.46 mmol, 92%). **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.74 (d, *J*=16.0 Hz, 1H), 7.57-7.52 (m, 2H), 7.44-7.33 (m, 3H), 6.46 (d, *J*=16.0 Hz, 1H), 5.36-5.26 (m, 1H, N-H), 4.35 (d, *J*=8.9 Hz, 1H), 4.27 (d, *J*=11.7 Hz, 1H), 4.14-4.09 (m, 2H), 1.43 (s, 3H) **^{13}C NMR** (101 MHz, $CDCl_3$) δ 166.7, 158.4, 146.6, 134.1, 130.9, 129.1, 128.4, 116.8, 73.1, 68.3, 57.3, 23.3. **FTIR-ATR** (cm^{-1}): 3285.1 (br), 1747.4 (vs), 1708.7 (vs), 1634.5 (vs), 1246.1 (s), 1155.4 (vs), 1039.8 (vs), 766.4 (vs), 709.8 (s), 683.3 (s). **HRMS** (ESI) calcd for $C_{14}H_{15}NO_4$ $[M+Na]^+$: exact mass: 284.0893, found: 284.0892. mp: 92 °C.



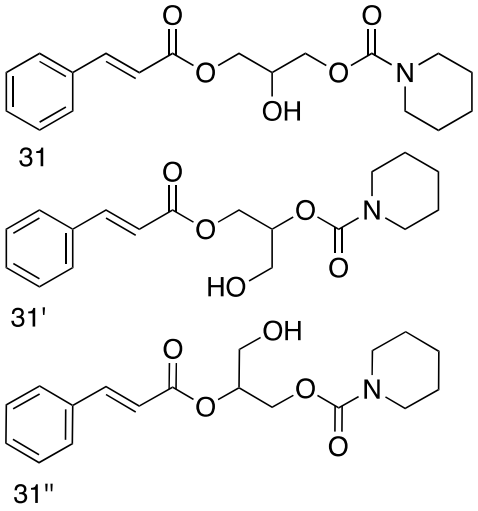
***(E)*-(4-methyl-2-oxooxazolidin-4-yl)methyl 3-(4-chlorophenyl)acrylate 30:** Synthesized from 4-chlorocinnamaldehyde and 2-amino-2-methyl-1,3-propanediol according to the general procedure. Obtained as a grey solid (145.3 mg, 0.49 mmol, 91%). **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.68 (d, *J*=16.0 Hz, 1H), 7.49-7.45 (m, 2H), 7.41-7.34 (m, 2H), 6.42 (d, *J*=16.0 Hz, 1H), 5.62-5.46 (m, 1H, N-H), 4.34 (d, *J*=8.8 Hz, 1H), 4.27 (d, *J*=11.5 Hz, 1H), 4.27 (t, *J*=9.0 Hz, 2H), 1.43 (s, 3H) **^{13}C NMR** (101 MHz, $CDCl_3$) δ 166.4, 159.2, 144.9, 136.7, 132.6, 129.5, 129.3, 117.5, 73.2, 68.5, 57.4, 23.1. **FTIR-ATR** (cm^{-1}): 3285.0 (br), 1736.5 (vs), 1703.1 (vs), 1636.3 (vs), 1404.3 (s), 1309.6 (vs), 1173.7 (vs), 1043.4 (vs), 820.8 8vs), 493.0 (vs). **HRMS** (ESI) calcd for $C_{14}H_{14}ClNO_4$ $[M+Na]^+$: exact mass: 318.0504, found: 318.0508. mp: 132 °C.



***(E)*-(4-methyl-2-oxooxazolidin-4-yl)methyl 3-(4-fluorophenyl)acrylate 29:** Synthesized from 4-fluorocinnamaldehyde and 2-amino-2-methyl-1,3-propanediol according to the general procedure. Obtained as a yellow oil (149.9 mg, 0.54 mmol, 92%). **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.69 (d, *J*=16.0 Hz, 1H), 7.55-7.50 (m, 2H), 7.11-7.04 (m, 2H), 6.36 (d, *J*=16.0 Hz, 1H), 6.09-5.95 (m, 1H, N-H), 4.34 (d, *J*=8.8 Hz, 1H), 4.25 (d, *J*=11.6 Hz, 1H), 4.11 (d, *J*=8.8 Hz, 1H), 4.10 (d, *J*=11.6 Hz, 1H), 1.43 (s, 3H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ 166.5, 164.2 (d, $^{1}J_{C\text{-}F}$=252 Hz), 159.2, 145.1, 130.4, 130.3 (d, $^{3}J_{C\text{-}F}$=9 Hz), 116.6, 116.2 (d, $^{2}J_{C\text{-}F}$ =22 Hz), 73.2, 68.4, 57.4, 23.1. **^{19}F NMR** (376 MHz, $CDCl_3$) δ -108.8. **FTIR-ATR** (cm^{-1}): 3280.4 (br), 1748.4 (vs), 1709.8 (vs), 1599.7 (s), 1508.4 (vs), 1227.1 (vs), 1156.1 (vs), 1041.3 (vs), 830.7 (vs), 729.0 (vs), 512.9 (s). **HRMS** (ESI) calcd for $C_{14}H_{14}FNO_4$ $[M+Na]^+$: exact mass: 302.0799, found: 302.0803.



***(E)*-(4-methyl-2-oxooxazolidin-4-yl)methyl 3-(2-methoxyphenyl)acrylate 28:** Synthesized from 2-methoxycinnamaldehyde and 2-amino-2-methyl-1,3propanediol according to the general procedure, but with exclusion of ambient light. Obtained as a brown oil (144.7 mg, 0.50 mmol, 90%). The compound should be stored in the dark since it isomerizes upon exposure to light. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.03 (d, *J* = 16.0 Hz, 1H), 7.54–7.47 (m, 1H), 7.41-7.333 (m, 1H), 7.00 – 6.90 (m, 2H), 6.55 (d, *J* = 16.0 Hz, 1H), 5.33 – 5.26 (m, 1H, N-H), 4.35 (d, *J* = 8.7 Hz, 1H), 4.27 (d, *J* = 11.6 Hz, 1H), 4.12 (d, *J* = 8.7 Hz, 1H), 4.10 (d, *J* = 11.6 Hz, 1H), 3.90 (s, 3H) 1.43 (s, 3H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ 167.3, 159.1, 158.5, 141.8, 131.9, 129.4, 123.0, 120.8, 117.3, 111.2, 73.1, 68.1, 57.4, 55.6, 23.1. **FTIR-ATR** (cm^{-1}): 3281 (br), 1749.6 (vs), 1707.5 (vs), 1627.3 (s), 1247.1 (vs), 1156.1 (vs), 1044.5 (vs), 754.8 (s), 730.1 (vs). **HRMS** (ESI) calcd for $C_{15}H_{17}NO_5$ $[M+Na]^+$: exact mass: 314.0999, found: 314.1000.



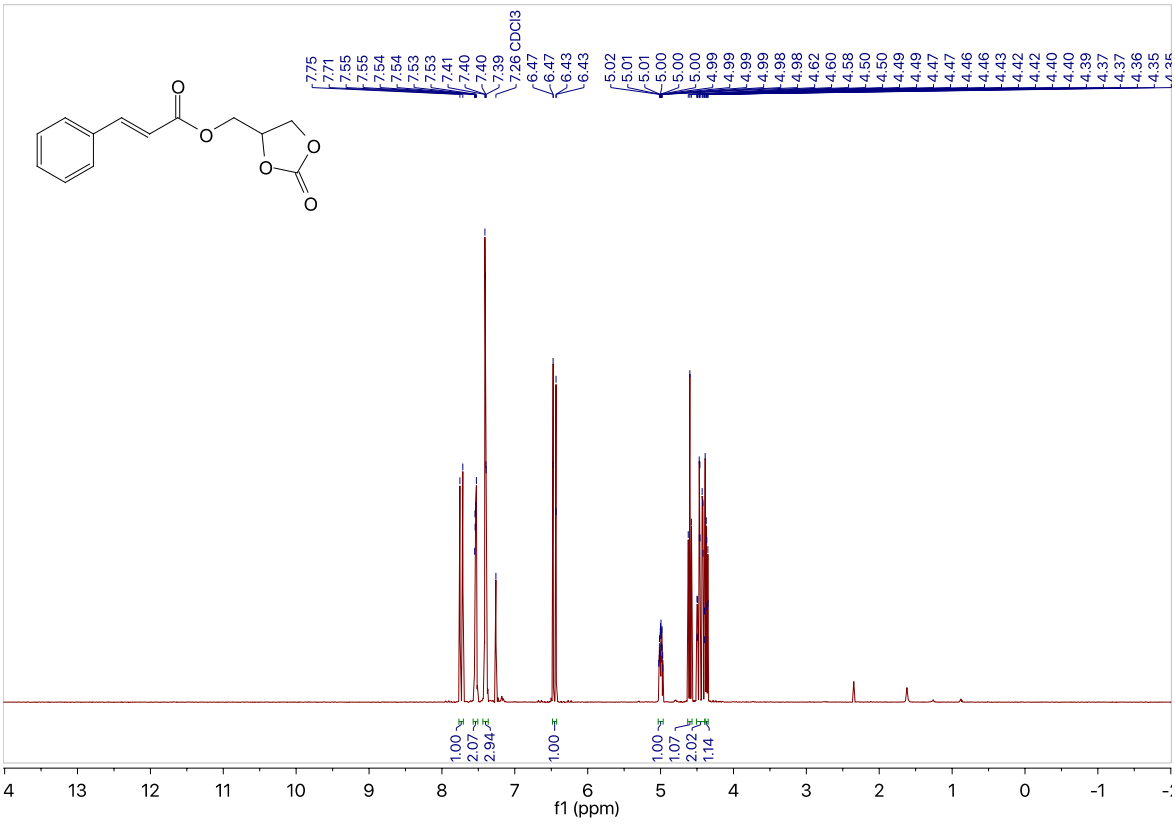
3-(cinnamoyloxy)-2-hydroxypropyl piperidine-1-carboxylate 31: ^{1}H NMR (400 MHz, $CDCl_3$) δ**^{13}C NMR** (101 MHz, $CDCl_3$) δ Synthesized according to the described procedure. The product was obtained as a clear oil (53.0 mg, 0.16 mmol, 84%, 31/31´/31´´ 74:18:8 rr).

3-(Cinnamoyloxy)-2-hydroxypropyl piperidine-1-carboxylate 31: **^{1}H NMR** (400 MHz, $CDCl_3$) δ7.72 (d, *J*=16.0 Hz, 1H), 7.55-7.49 (m, 2H), 7.43-7.35 (m, 3H), 6.47 (d, *J*=16.0 Hz, 1H), 4.34-4.20 (m, 4H), 4.17-4.11 (m, 1H), 3.45 (m, 4H), 1.62-1.51 (m, 6H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ167.0, 156.0, 145.7, 134.3, 130.6, 129.0, 128.3, 117.6, 69.2, 66.9, 65.5, 45.2, 25.7, 24.4. **FTIR-ATR** (cm^{-1}): 3418.0 (br), 2938.2 (m), 2856.0 (m), 1694.6 (vs), 1675.5 (vs), 1635.9 (s), 1432.4 (s), 1257.0 (vs), 1233.90 (vs), 1167.0 (vs), 1150.5 (vs), 765.7 (vs), 711.3 (s), 683.9 (s), 484.0 (s). **HRMS** (ESI) calcd for $C_{18}H_{23}NO_5$ $[M+H]^+$: exact mass: 334.1649, found: 334.1653.

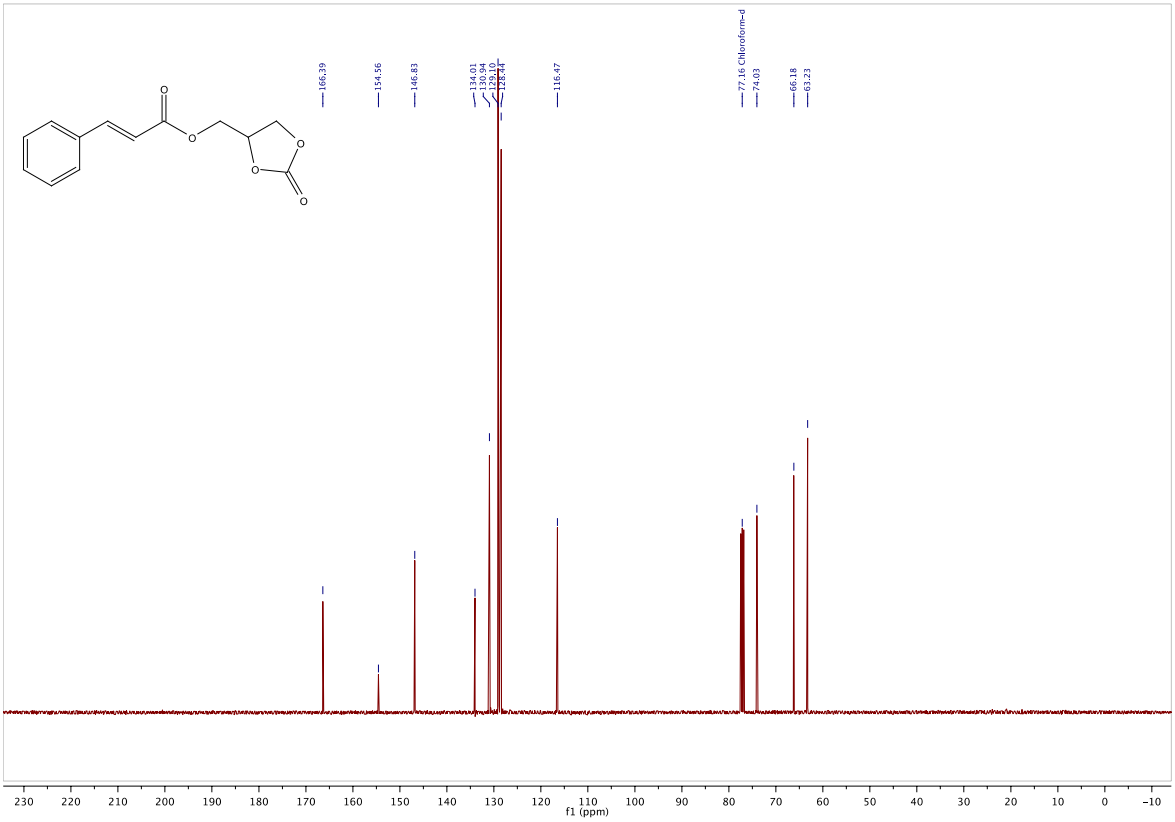
1-(Cinnamoyloxy)-3-hydroxypropan-2-yl piperidine-1-carboxylate 31´and 2-(cinnamoyloxy)-3-hydroxypropyl piperidine-1-carboxylate 31´´: Peaks belonging to 31´´are marked by * and overlapping peaks are marked with $^{\#}$. **^{1}H NMR** (400 MHz, $CDCl_3$) δ7.73* (d, *J*=16.0 Hz, 1H), δ7.72 (d, *J*=16.0 Hz, 1H), 7.56-7.4$^{\#}$ (m, 2H), 7.42-7.36$^{\#}$ (m, 3H), 6.48* (d, *J*=16.0 Hz, 1H), 6.45 (d, *J*=16.0 Hz, 1H), 5.18-5.15 (m, 4H)*, 5.07-5.00 (m, 1H), 4.48* (dd, *J*=11.8, 5.7 Hz, 2H), 4.41-4.30 (m, 2H), 3.85-3.80* (m, 2H), 3.78-3.75 (m, 2H), 3.47-3.37$^{\#}$ (m, 4H), 1.61-1.49$^{\#}$ (m, 6H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ 166.9, 166.5*, 155.6*, 155.3, 145.9*, 145.8, 134.4*, 134.3, 130.7, 130.6*, 129.1$^{\#}$, 128.3$^{\#}$, 117.7*, 117.5, 74.3, 72.9*, 62.8$^{\#}$, 62.7, 61.1*, 45.2$^{\#}$, 25.8$^{\#}$, 24.4$^{\#}$.

NMR spectra

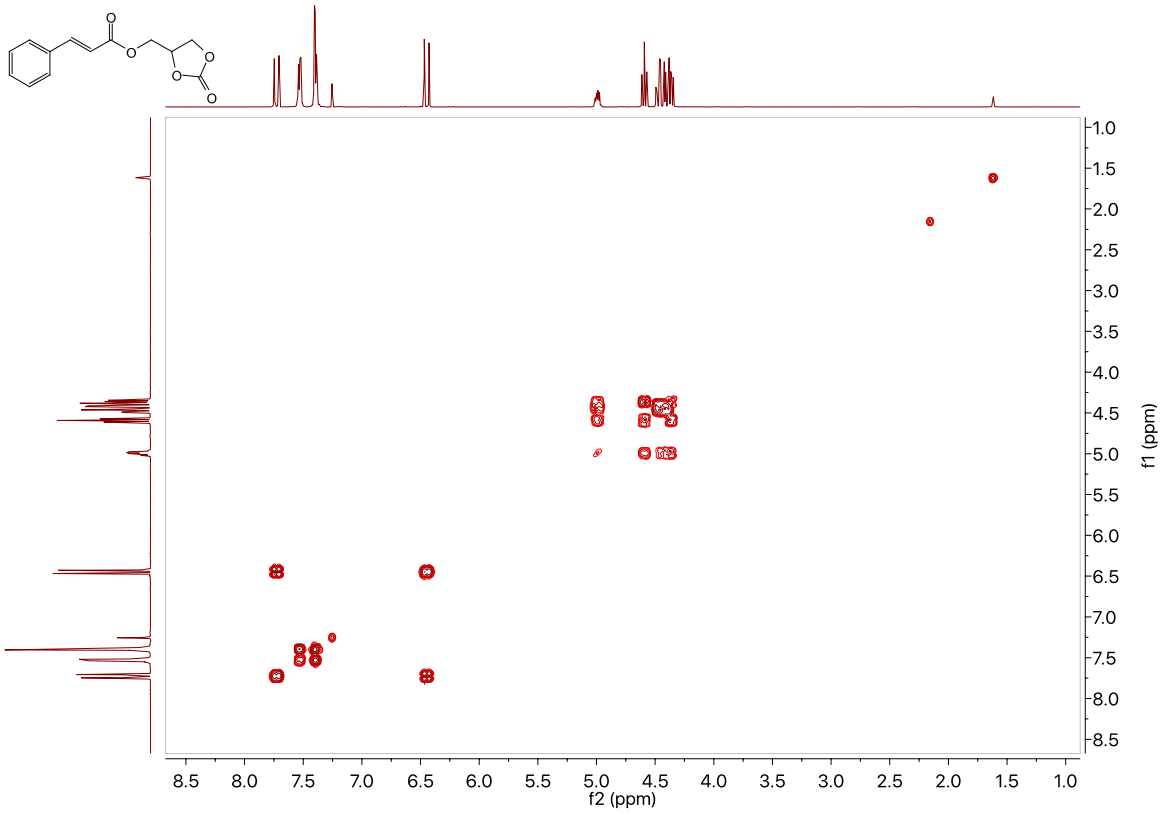
^{1}H NMR of (2-oxo-1,3-dioxolan-4-yl)methyl cinnamate (CDCl3)



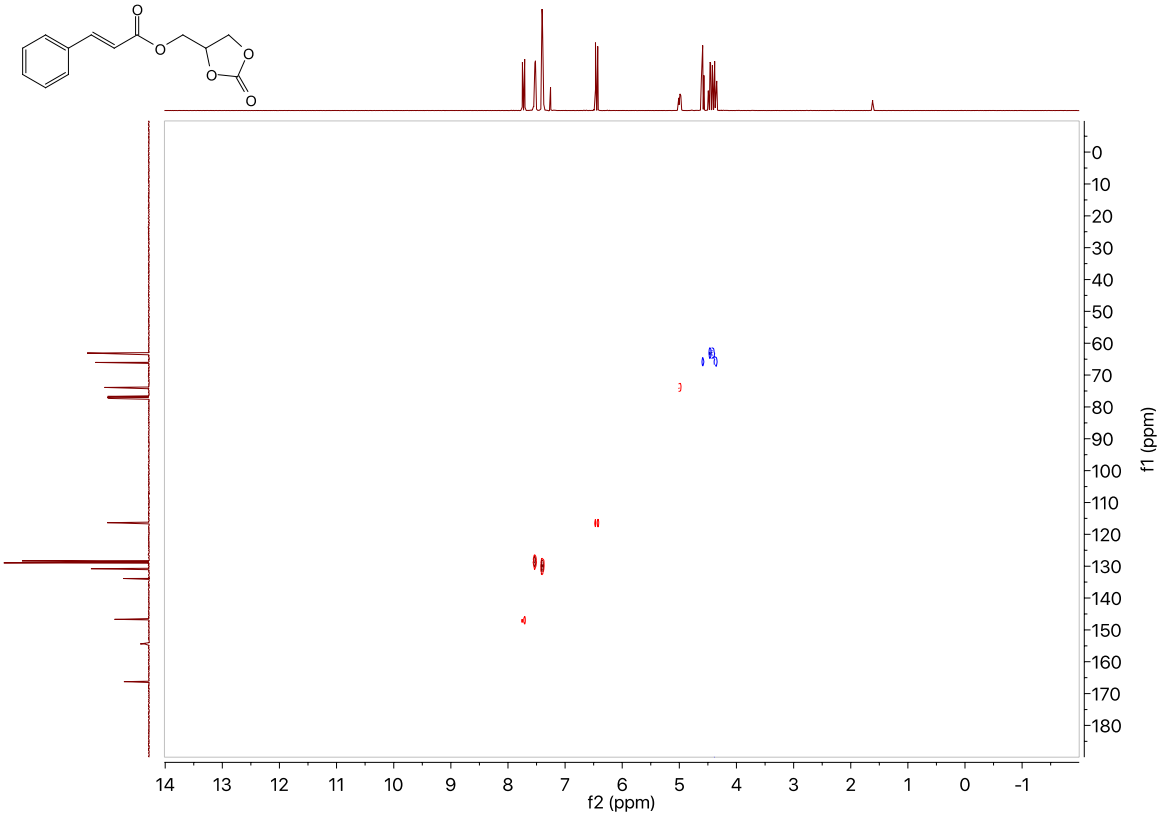
^{13}C NMR of (2-oxo-1,3-dioxolan-4-yl)methyl cinnamate ($CDCl_3$)



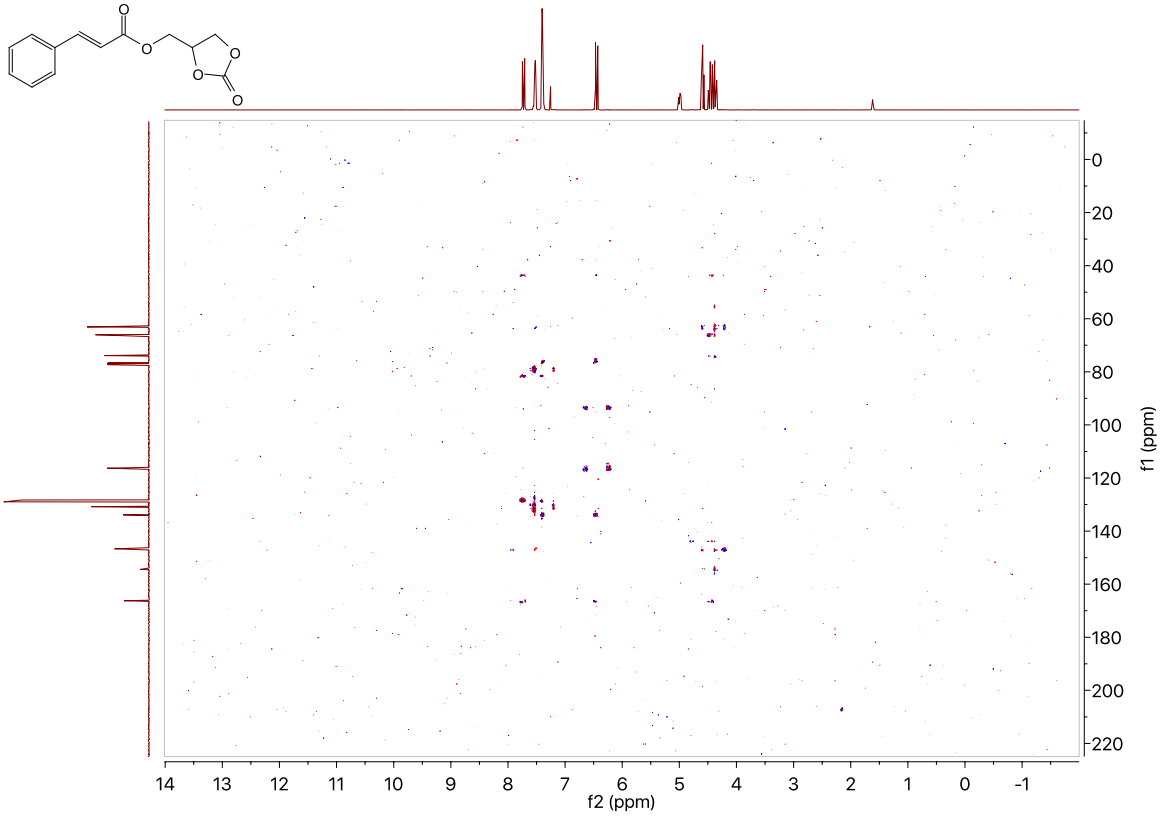
COSY NMR of (2-oxo-1,3-dioxolan-4-yl)methyl cinnamate ($CDCl_3$)



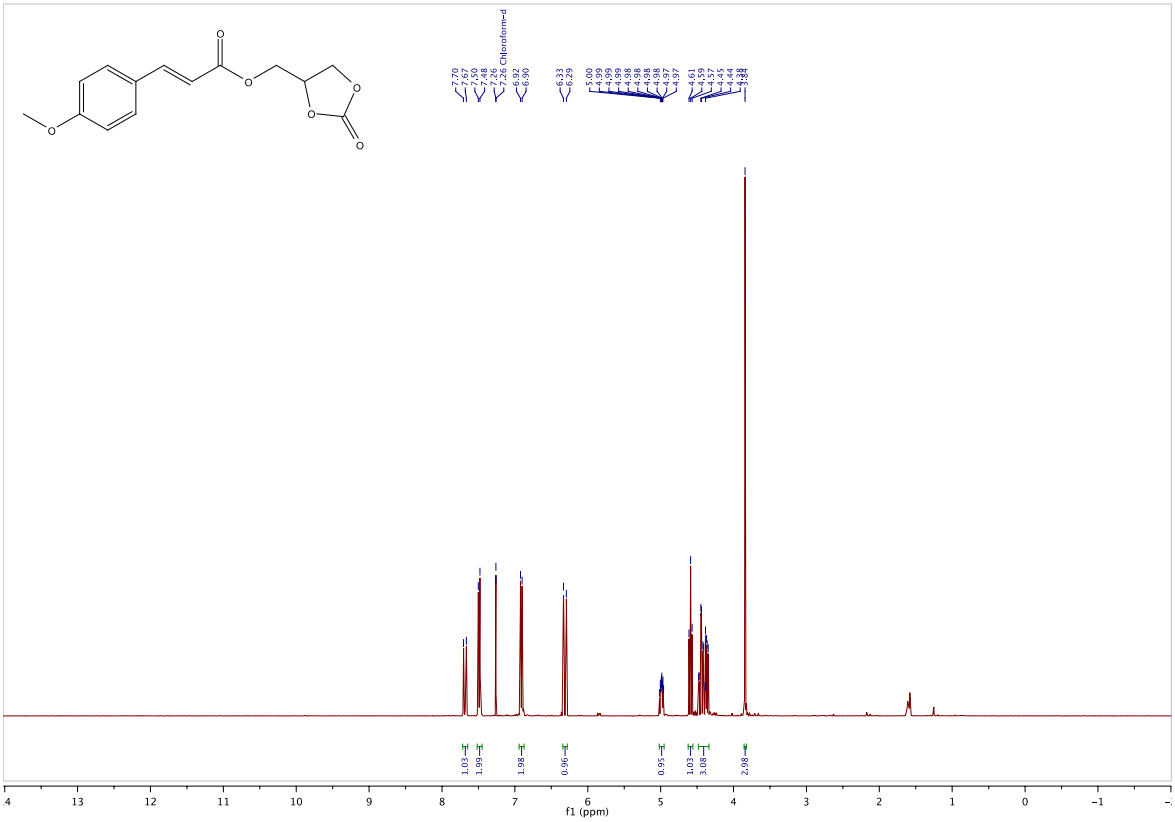
HSQC NMR of (2-oxo-1,3-dioxolan-4-yl)methyl cinnamate ($CDCl_3$)



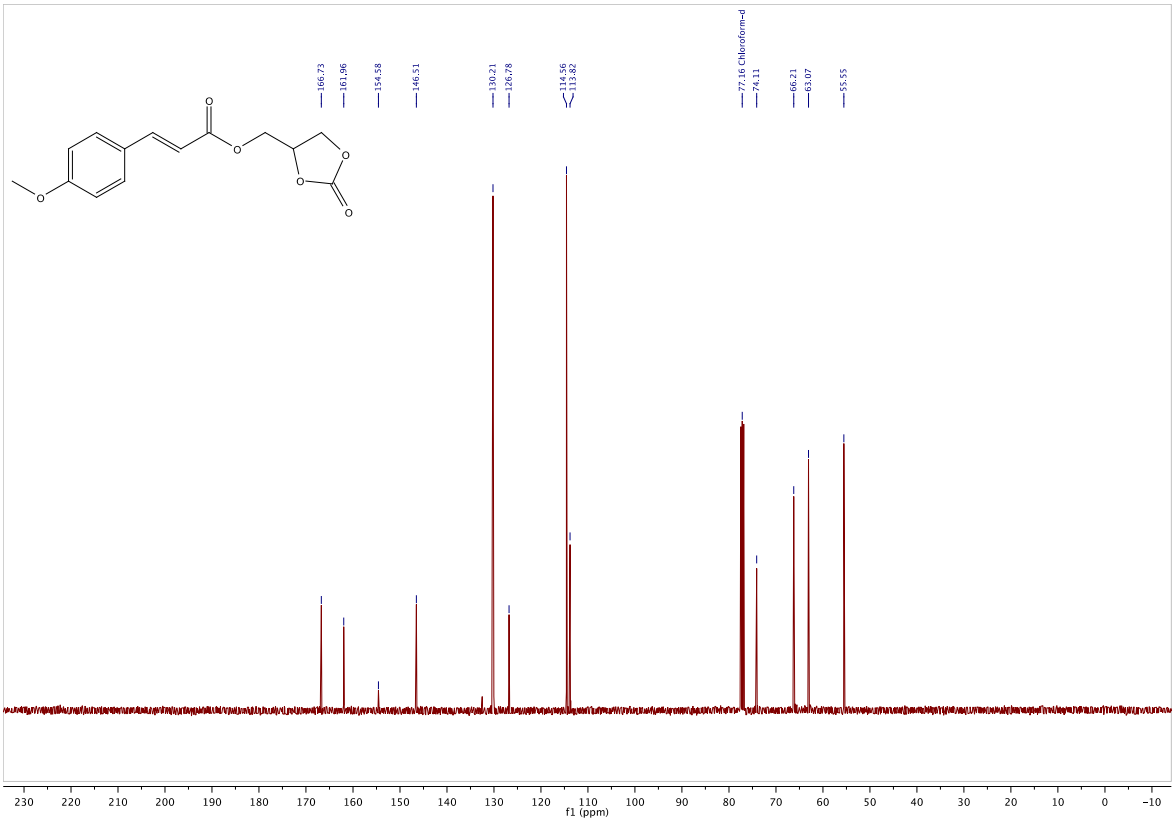
HMBC NMR of (2-oxo-1,3-dioxolan-4-yl)methyl cinnamate ($CDCl_3$)



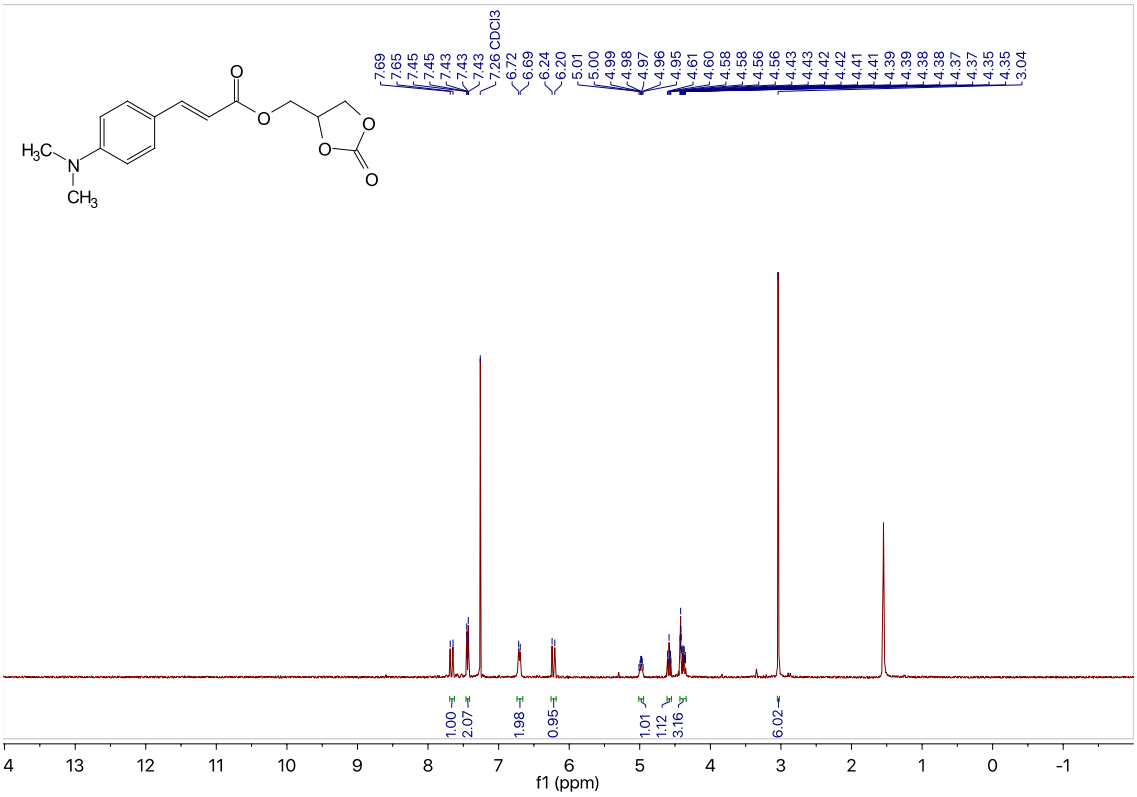
^{1}H NMR of (2-oxo-1,3-dioxolan-4-yl)methyl (E)-3-(4-methoxyphenyl) acrylate ($CDCl_3$)



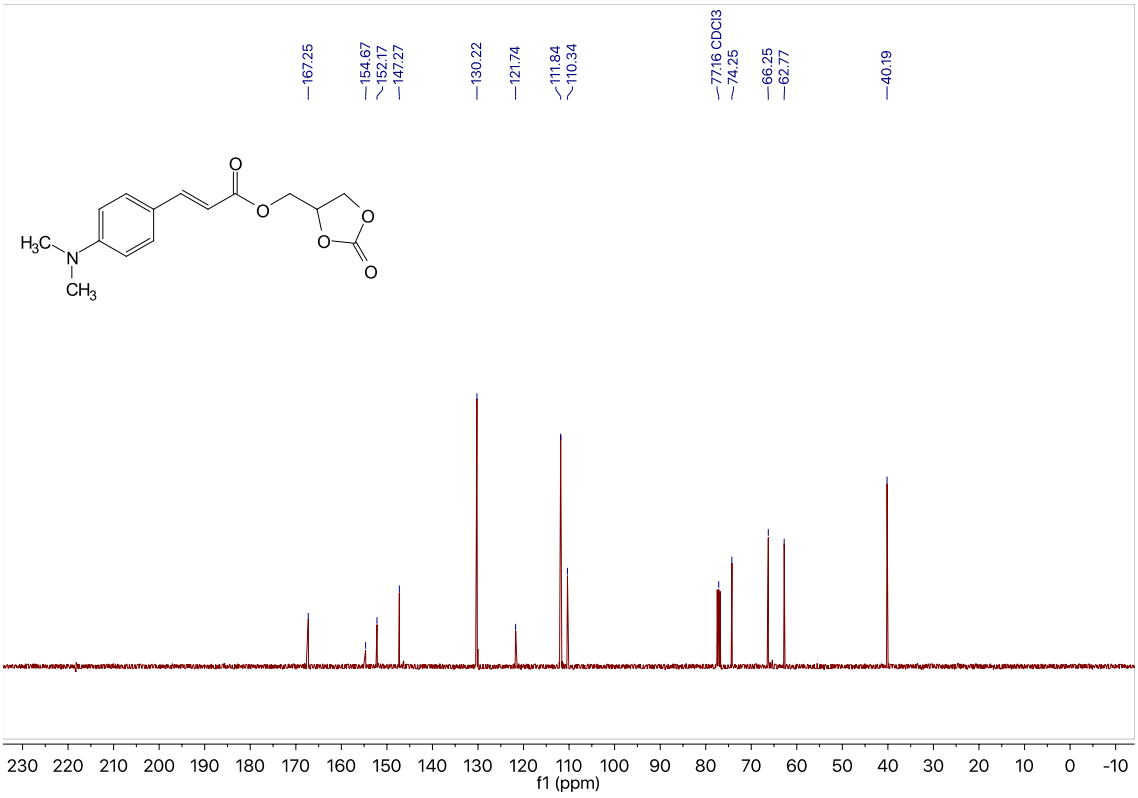
^{13}C NMR of 2-oxo-1,3-dioxolan-4-yl)methyl (E)-3-(4-methoxyphenyl) acrylate ($CDCl_3$)



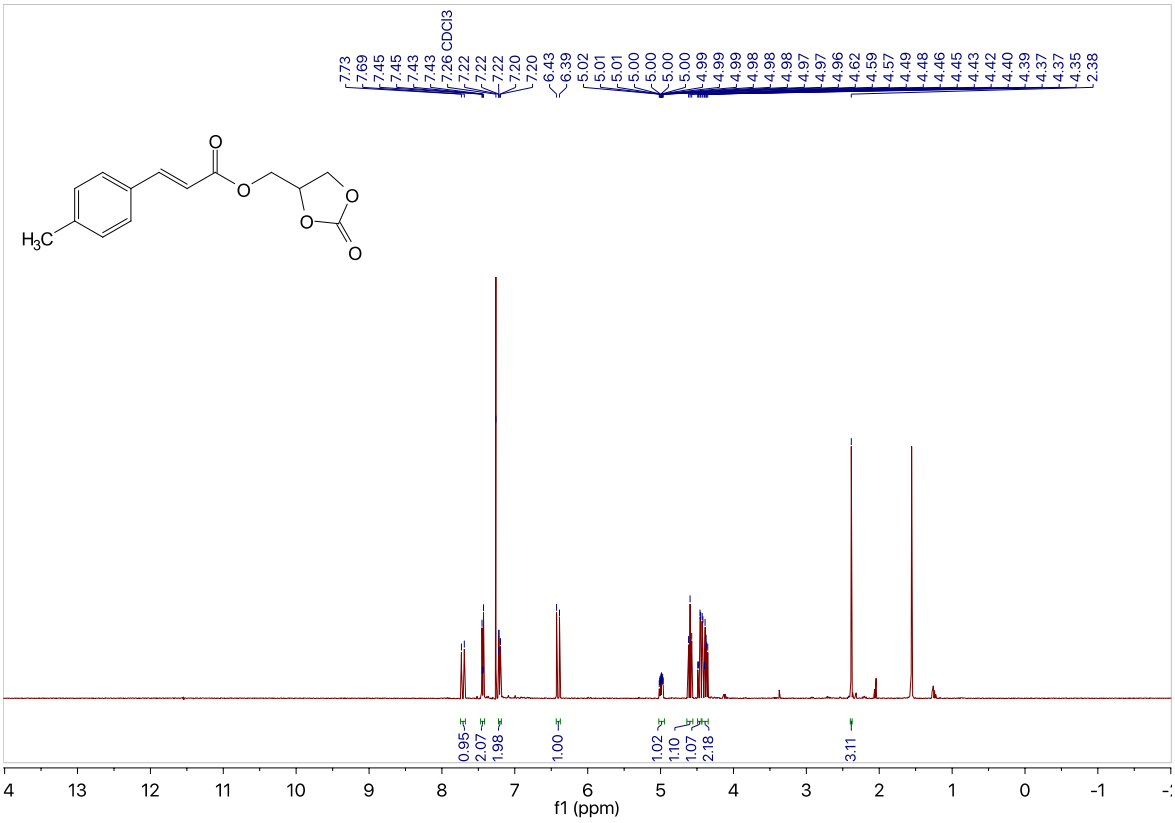
^{1}H NMR of *(E)*-(2-oxo-1,3-dioxolan-4-yl)methyl 3-(4-(dimethylamino)phenyl)acrylate ($CDCl_3$)



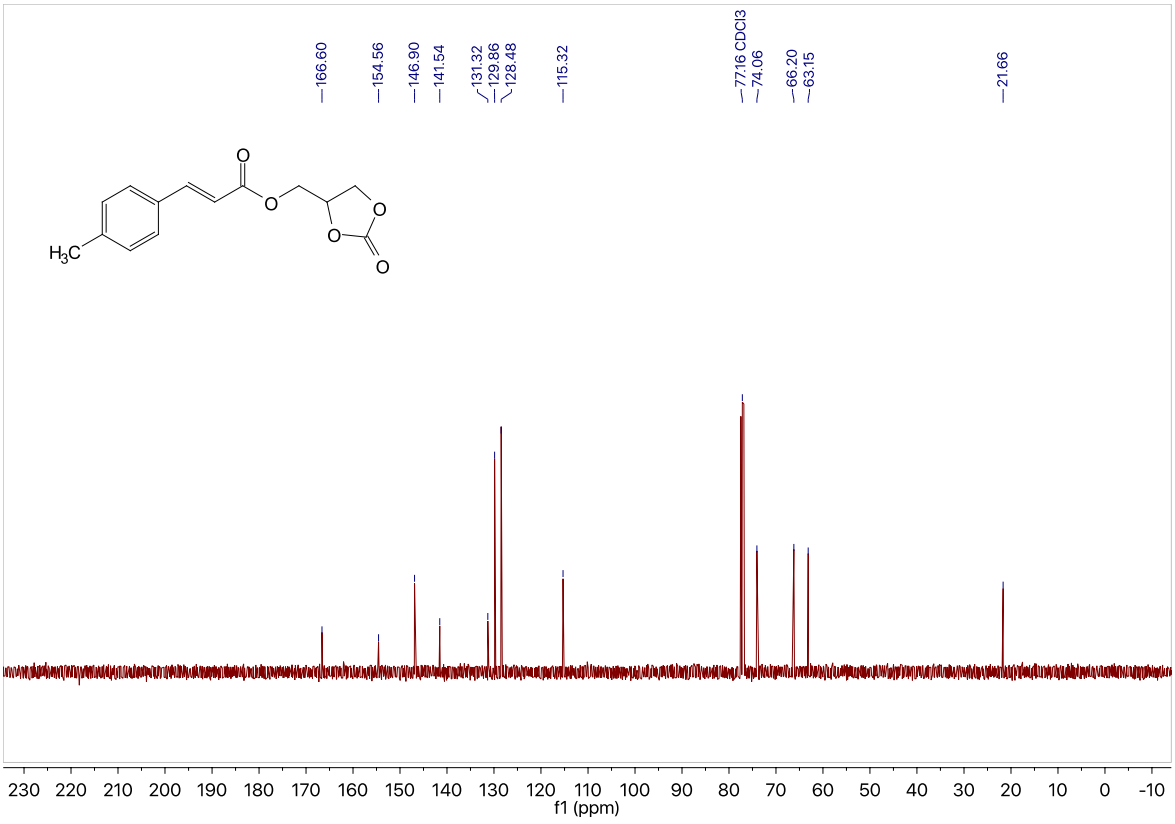
^{13}C NMR of *(E)*-(2-oxo-1,3-dioxolan-4-yl)methyl 3-(4-(dimethylamino)phenyl)acrylate ($CDCl_3$)



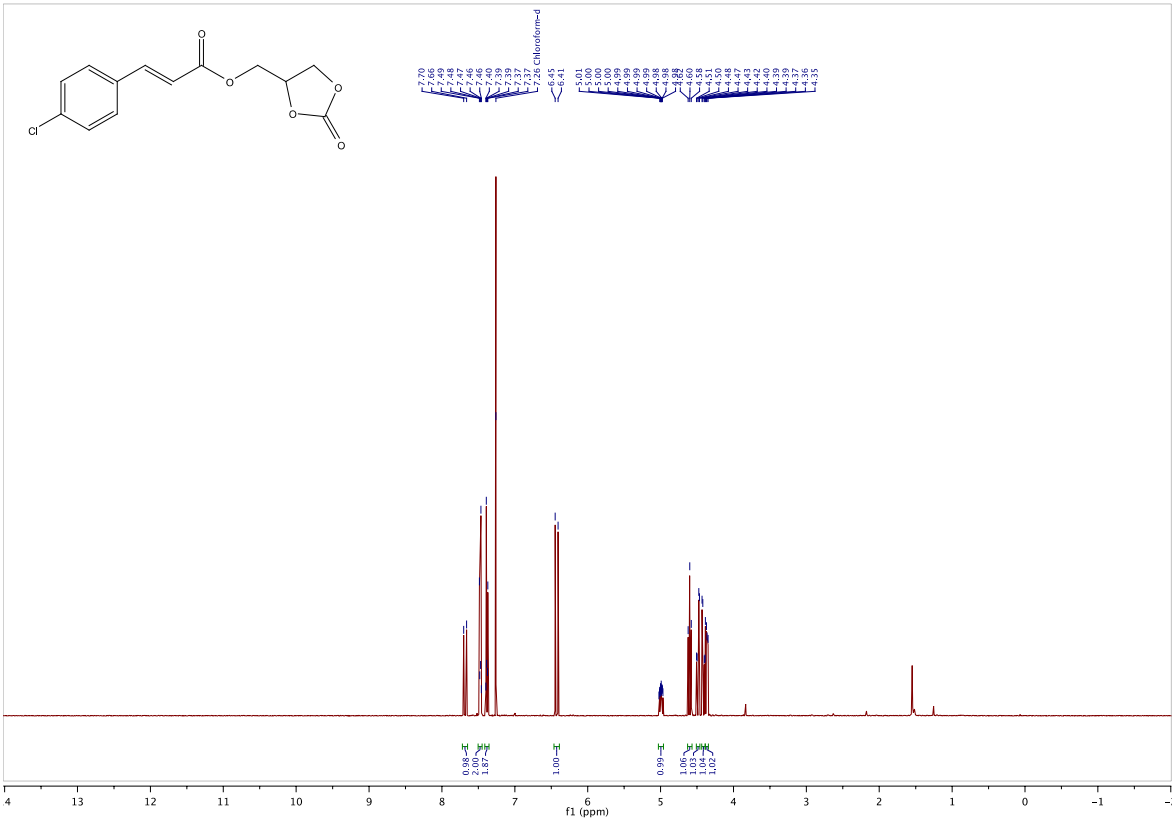
^{1}H NMR of *(E)*-(2-oxo-1,3-dioxolan-4-yl)methyl 3-(p-tolyl)acrylate ($CDCl_3$)



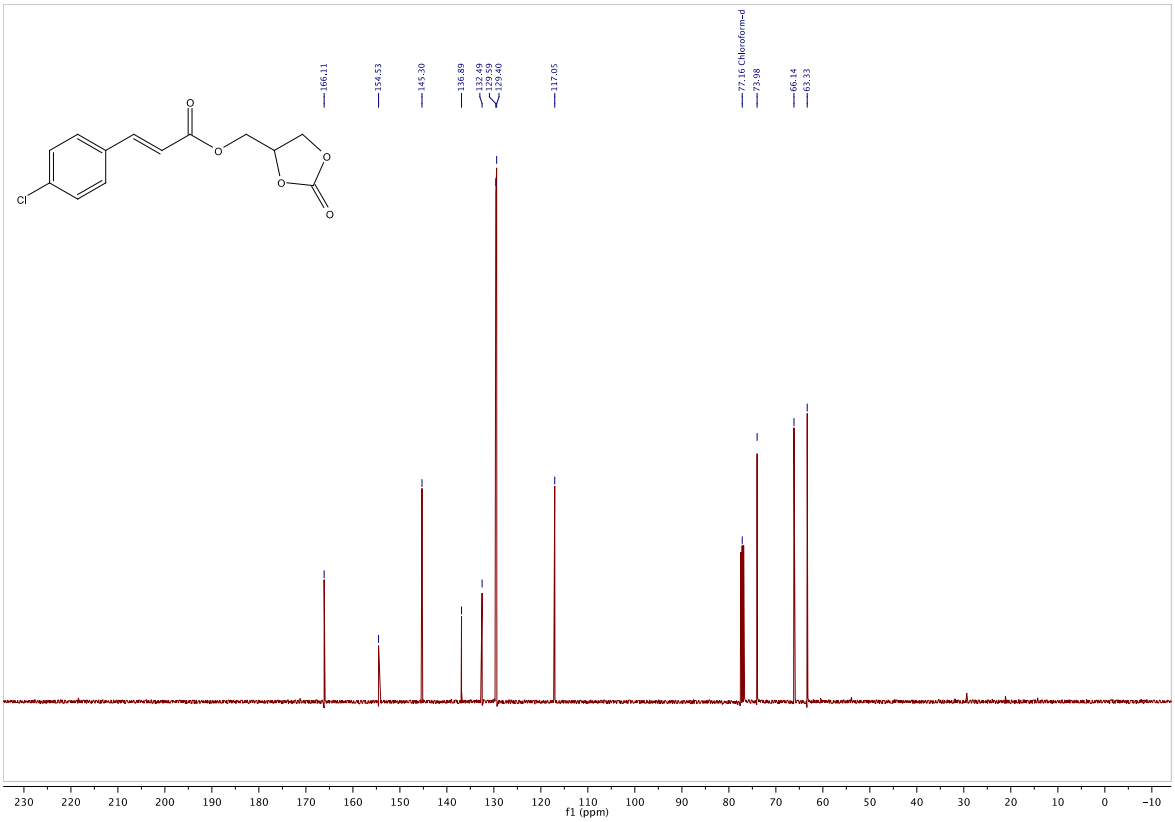
^{13}C NMR of *(E)*-(2-oxo-1,3-dioxolan-4-yl)methyl 3-(p-tolyl)acrylate ($CDCl_3$)



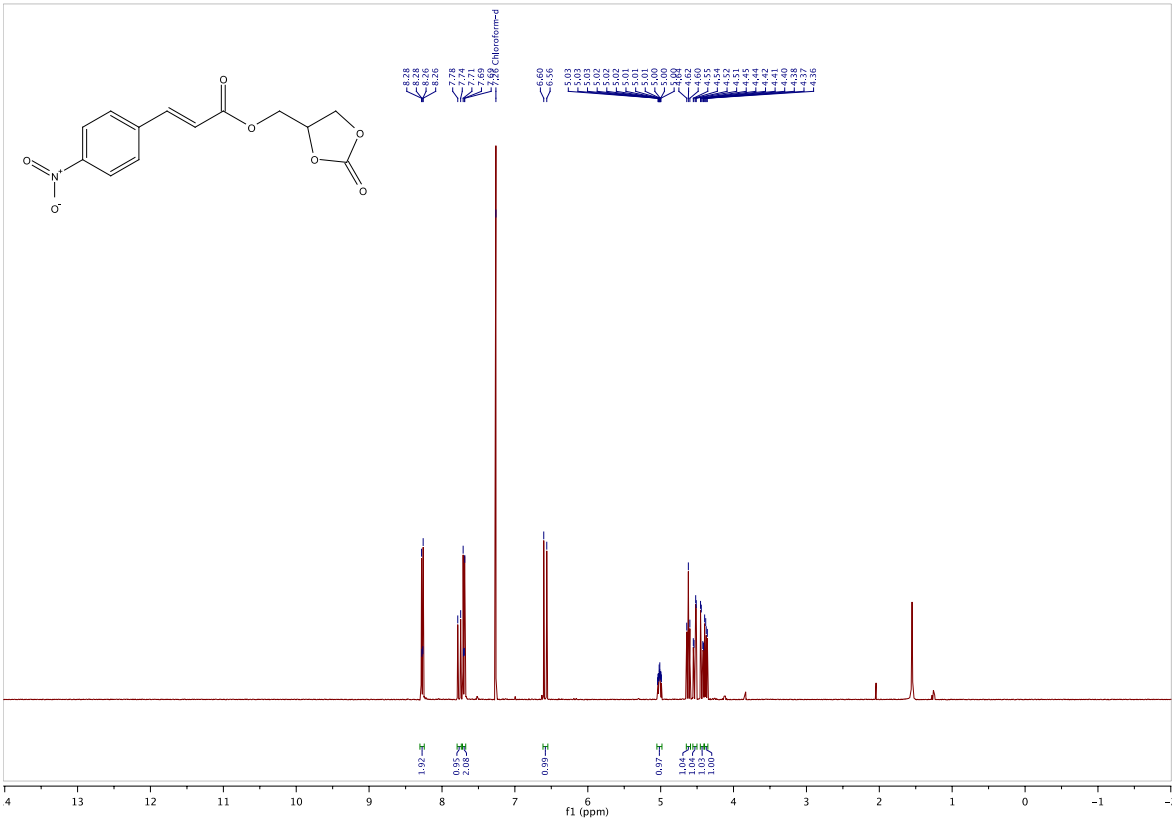
^{1}H NMR of 2-oxo-1,3-dioxolan-4-yl)methyl (E)-3-(4-chlorophenyl) acrylate ($CDCl_3$)



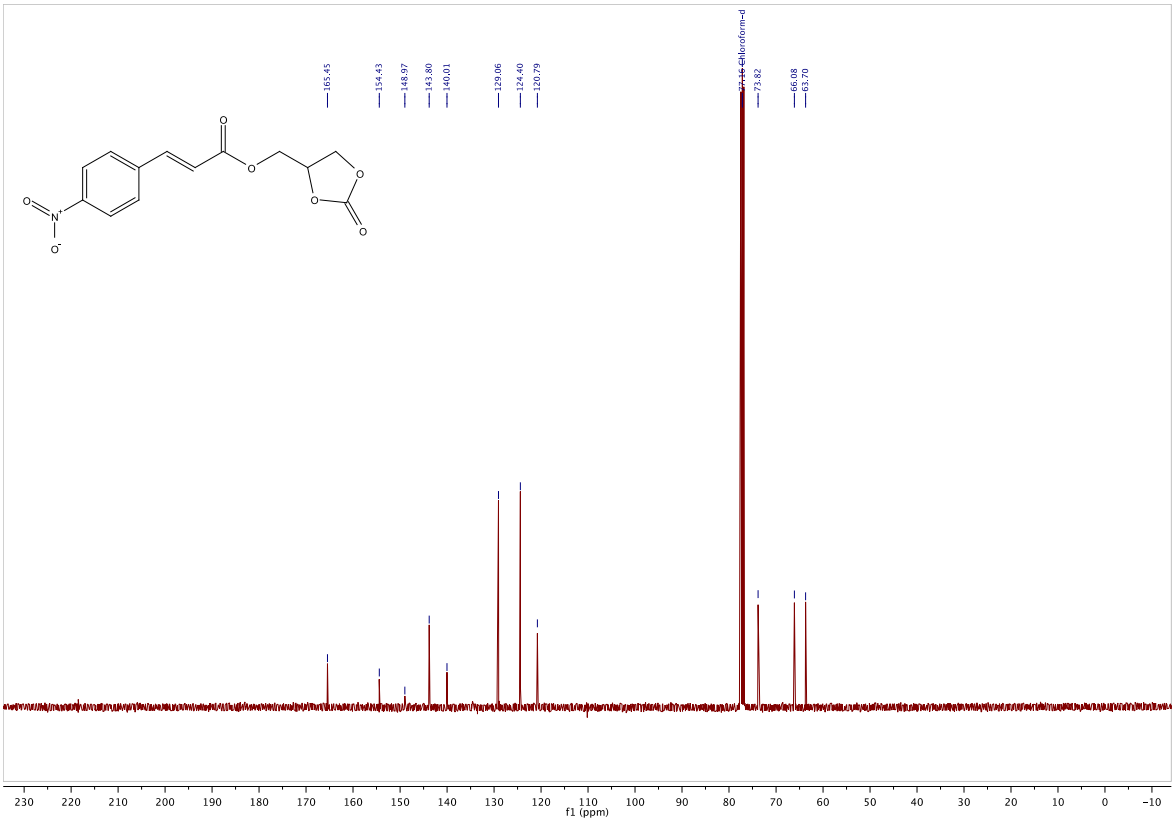
^{13}C NMR of 2-oxo-1,3-dioxolan-4-yl)methyl (E)-3-(4-chlorophenyl) acrylate ($CDCl_3$)



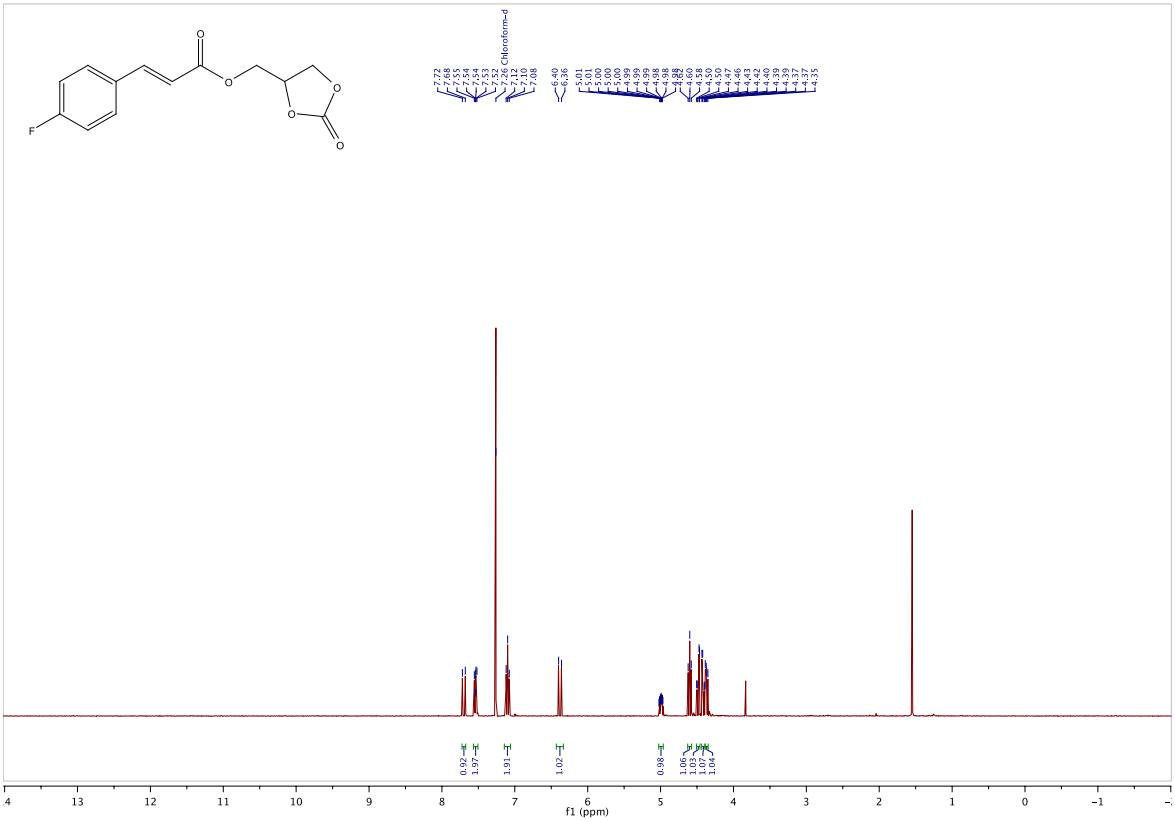
^{1}H NMR of 2-oxo-1,3-dioxolan-4-yl)methyl (E)-3-(4-chlorophenyl) acrylate ($CDCl_3$)



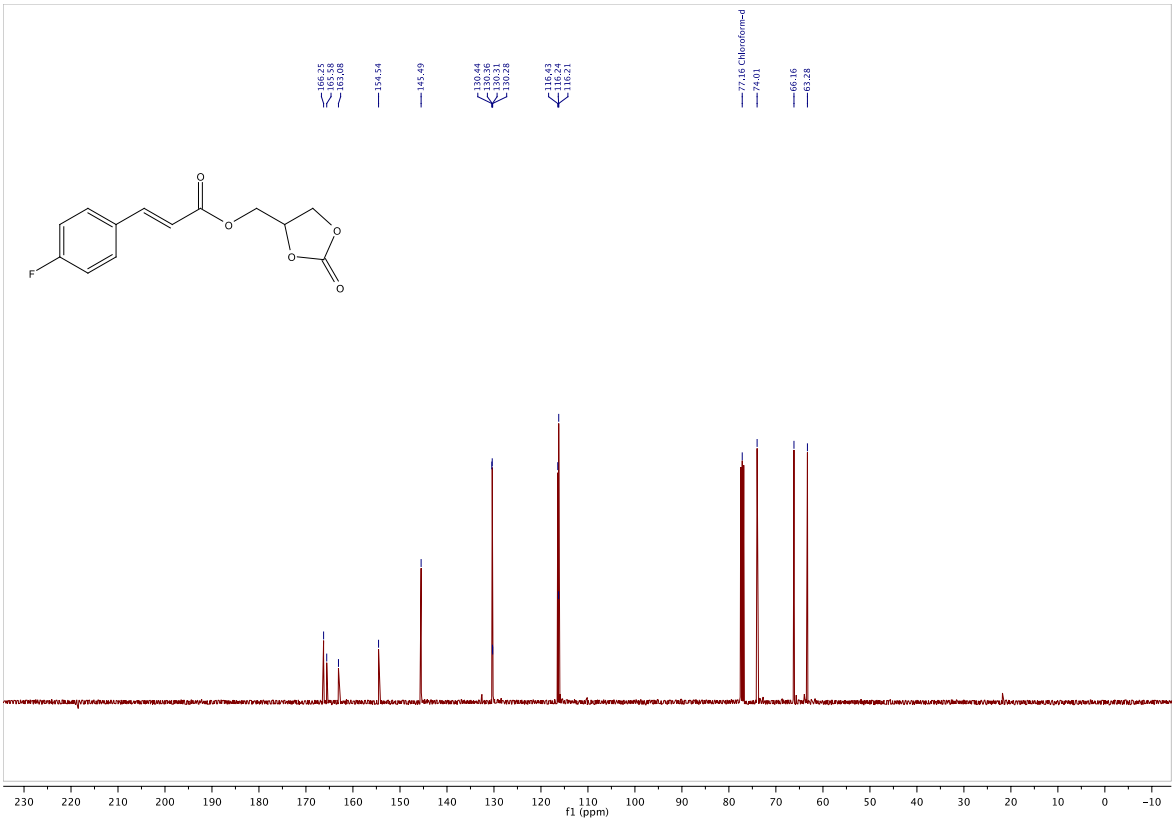
^{13}C NMR of 2-oxo-1,3-dioxolan-4-yl)methyl (E)-3-(4-nitriphenyl) acrylate ($CDCl_3$)



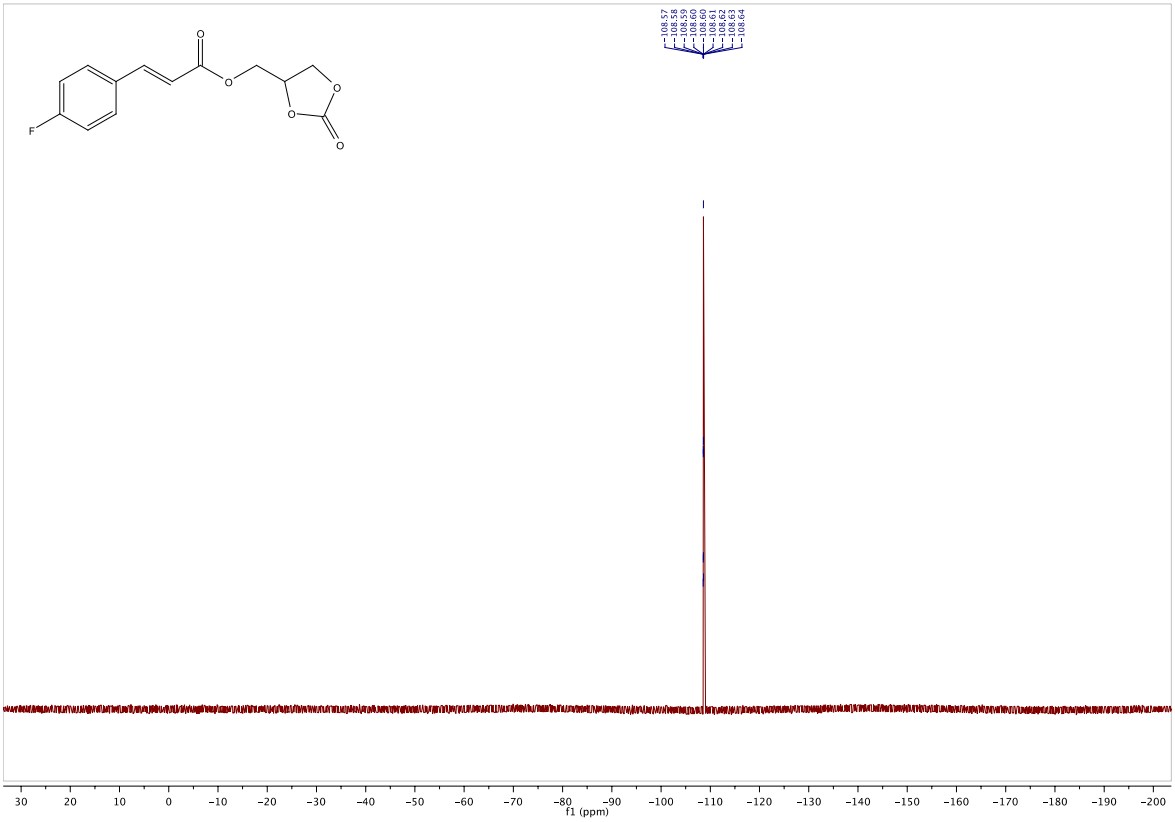
^{1}H NMR of 2-oxo-1,3-dioxolan-4-yl)methyl (E)-3-(4-fluorophenyl) acrylate ($CDCl_3$)



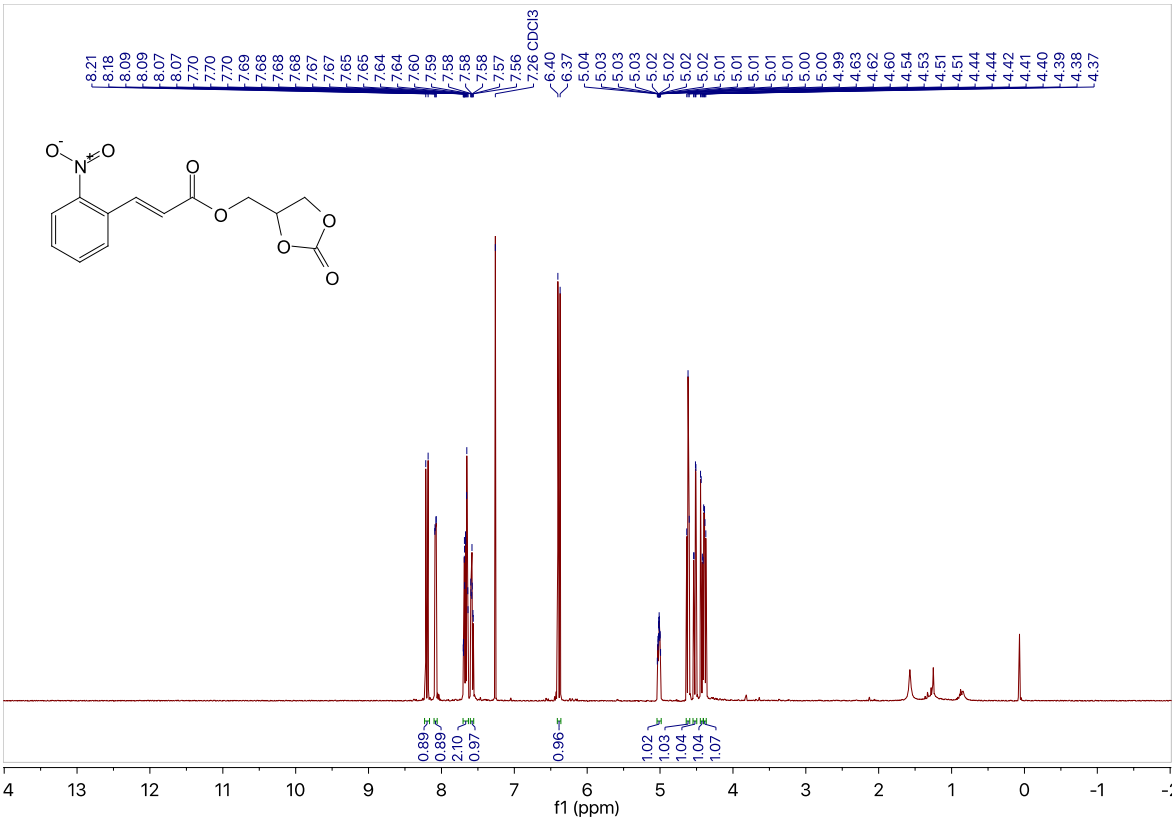
^{13}C NMR of 2-oxo-1,3-dioxolan-4-yl)methyl (E)-3-(4-fluorophenyl) acrylate ($CDCl_3$)



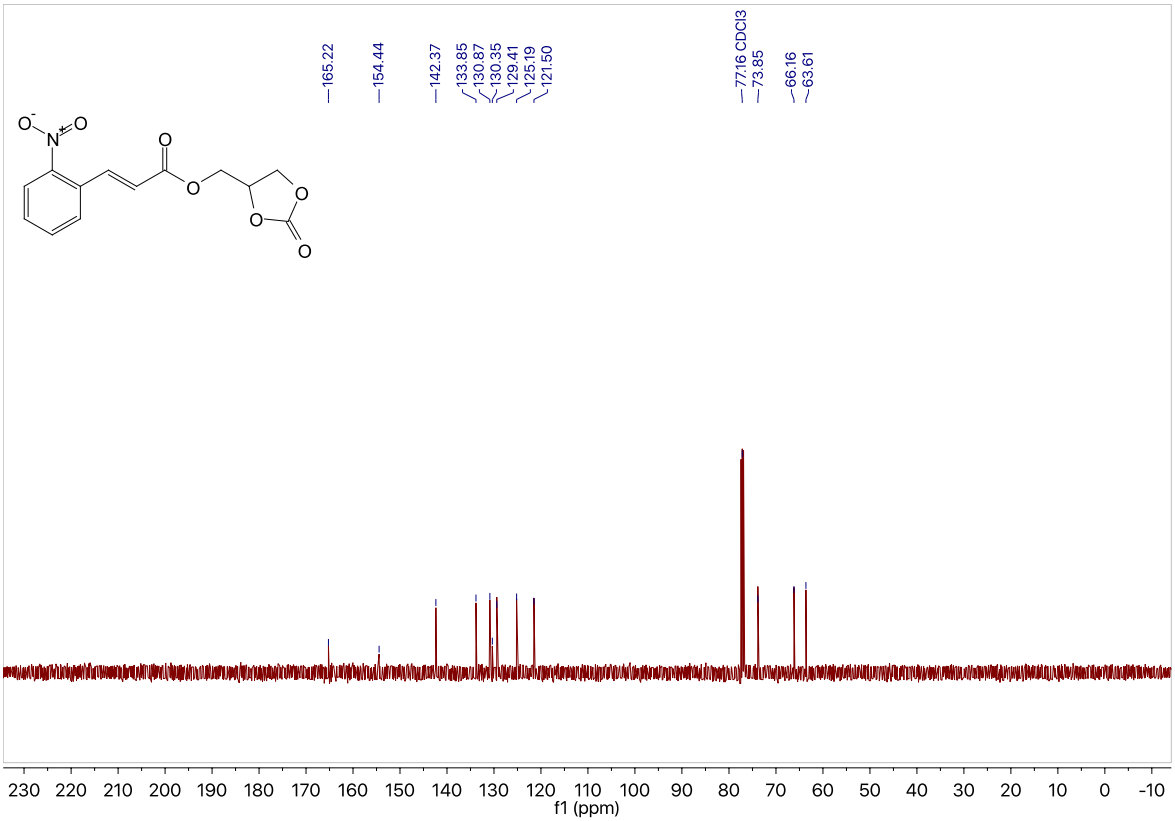
^{19}F NMR of 2-oxo-1,3-dioxolan-4-yl)methyl (E)-3-(4-fluorophenyl) acrylate ($CDCl_3$)



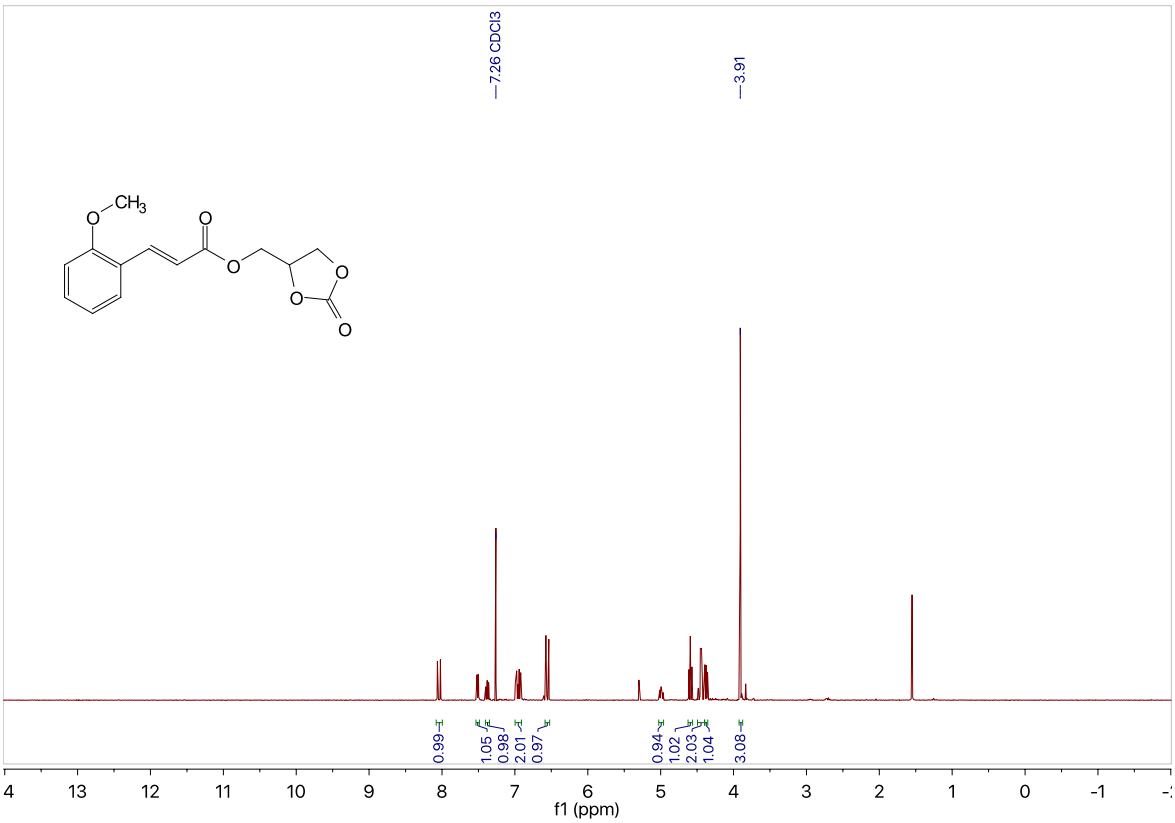
^{1}H NMR of *(E)*-(2-oxo-1,3-dioxolan-4-yl)methyl 3-(2-nitrophenyl)acrylate ($CDCl_3$)



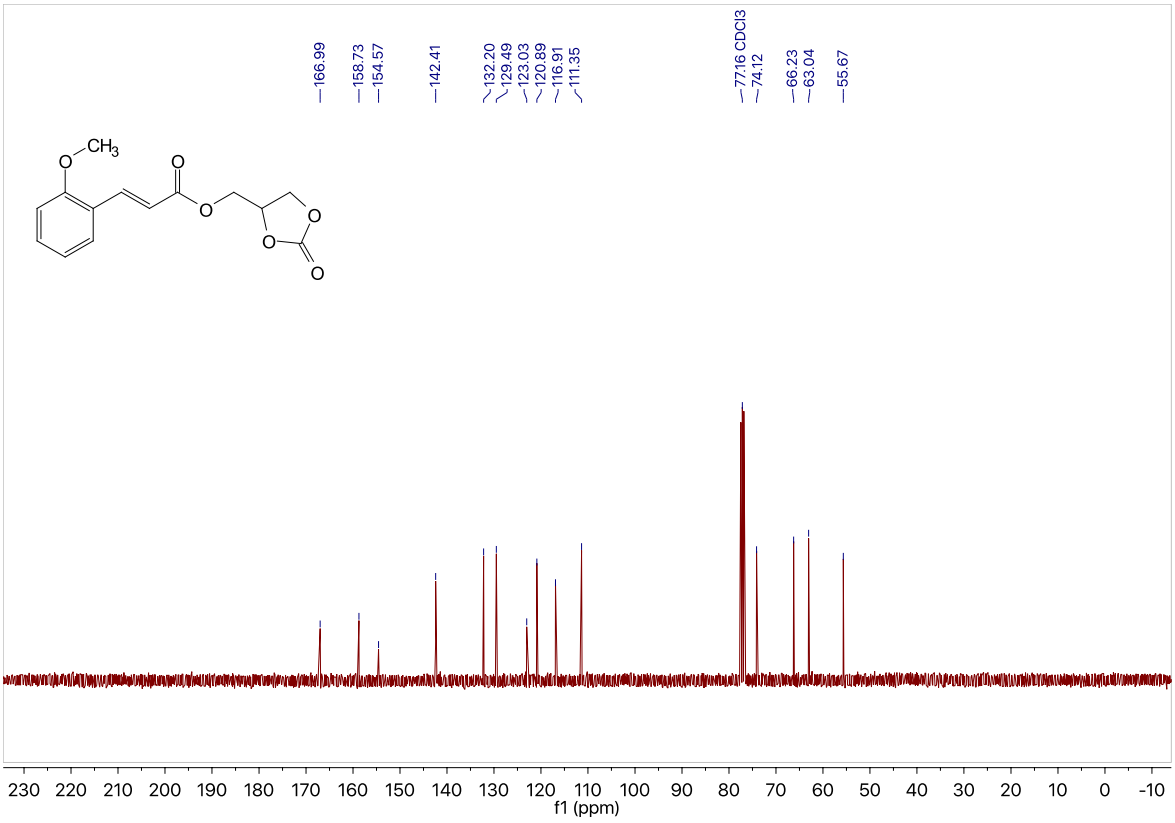
^{13}C NMR of *(E)*-(2-oxo-1,3-dioxolan-4-yl)methyl 3-(2-nitrophenyl)acrylate ($CDCl_3$)



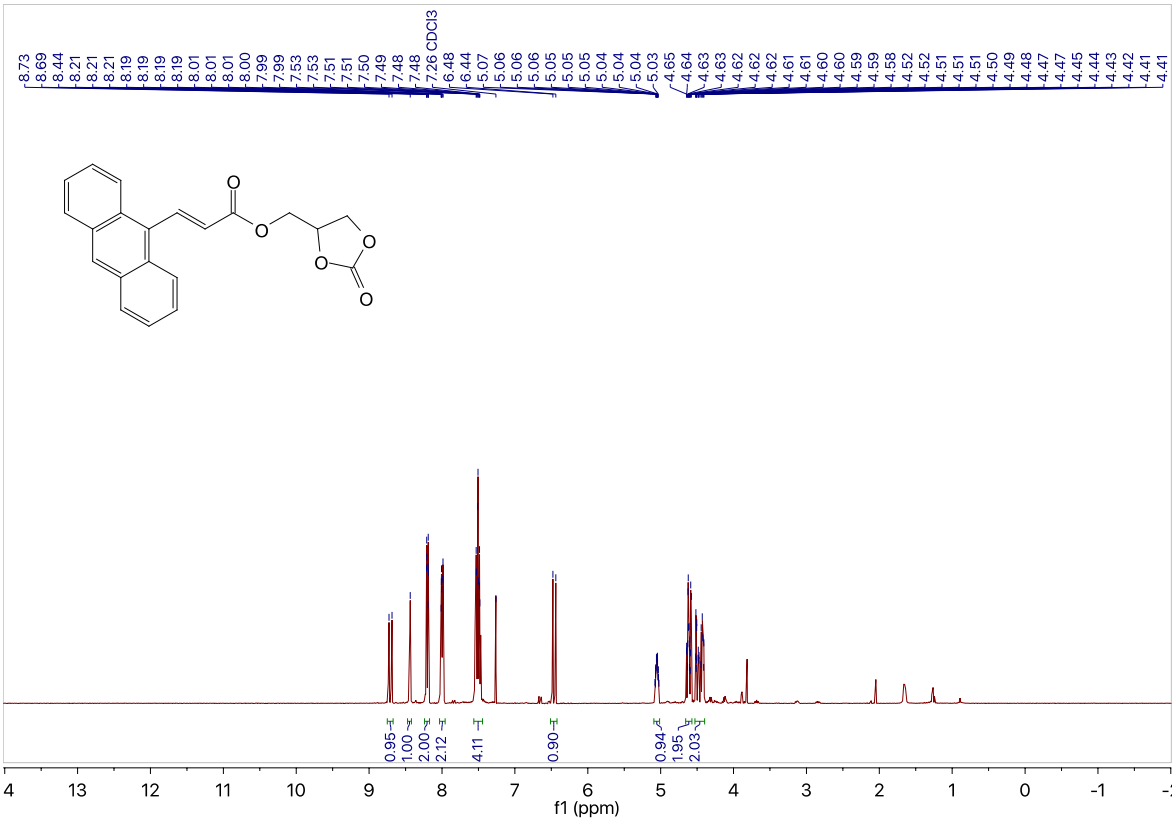
^{1}H NMR of *(E)*-(2-oxo-1,3-dioxolan-4-yl)methyl 3-(2-methoxyphenyl)acrylate ($CDCl_3$)



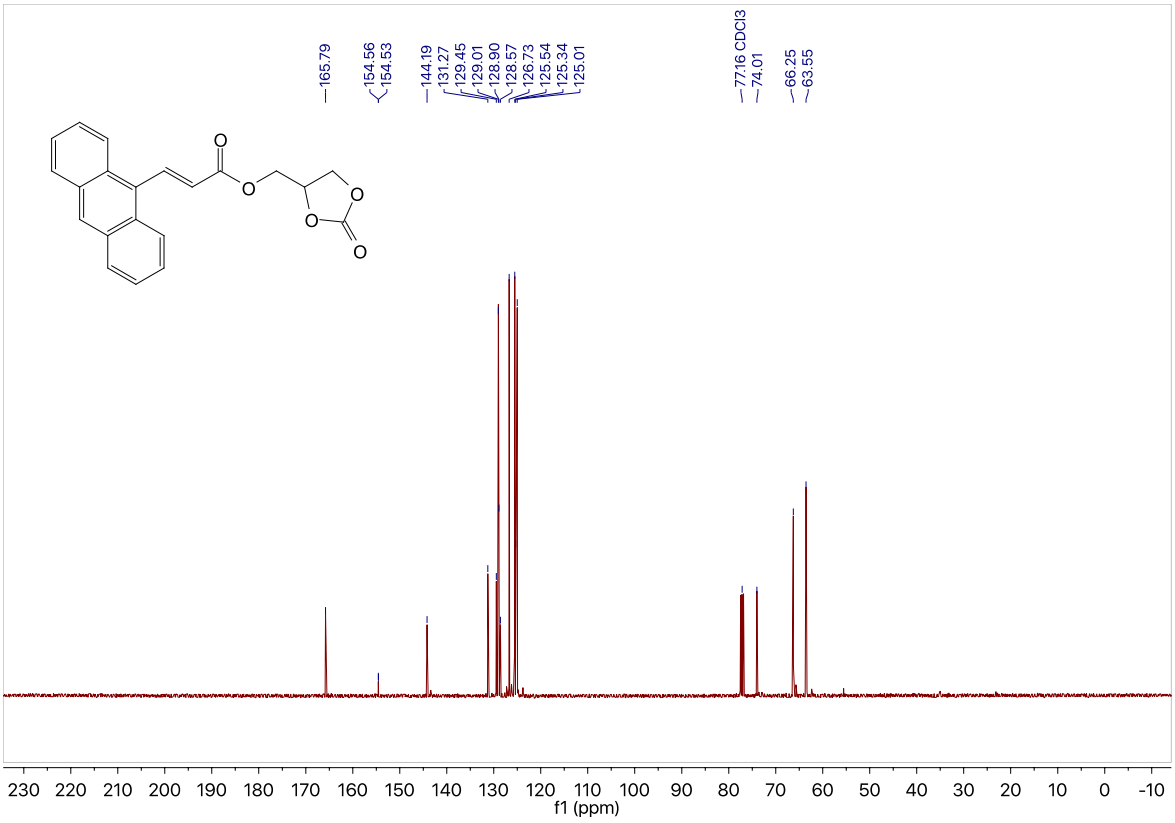
^{13}C NMR of *(E)*-(2-oxo-1,3-dioxolan-4-yl)methyl 3-(2-methoxyphenyl)acrylate ($CDCl_3$)



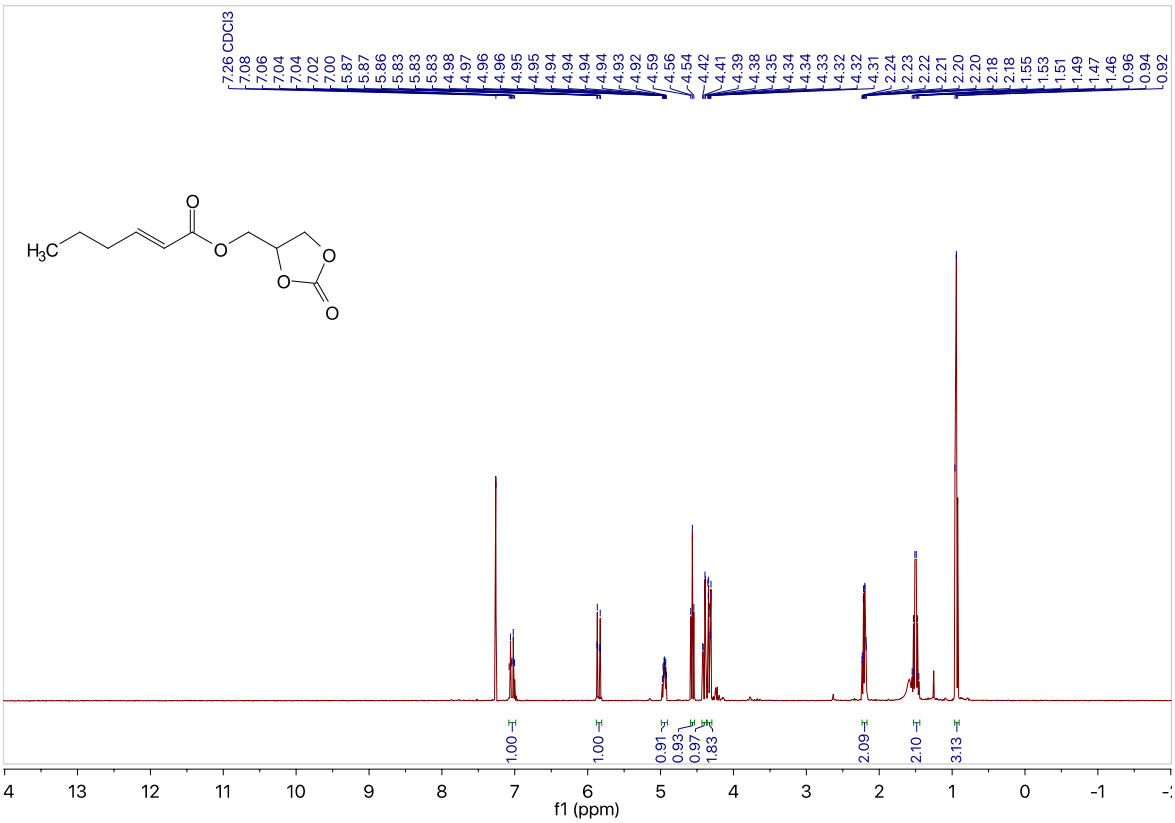
^{1}H NMR of (2-oxo-1,3-dioxolan-4-yl)methyl (*E*)-3-(anthracen-9-yl)acrylate ($CDCl_3$)



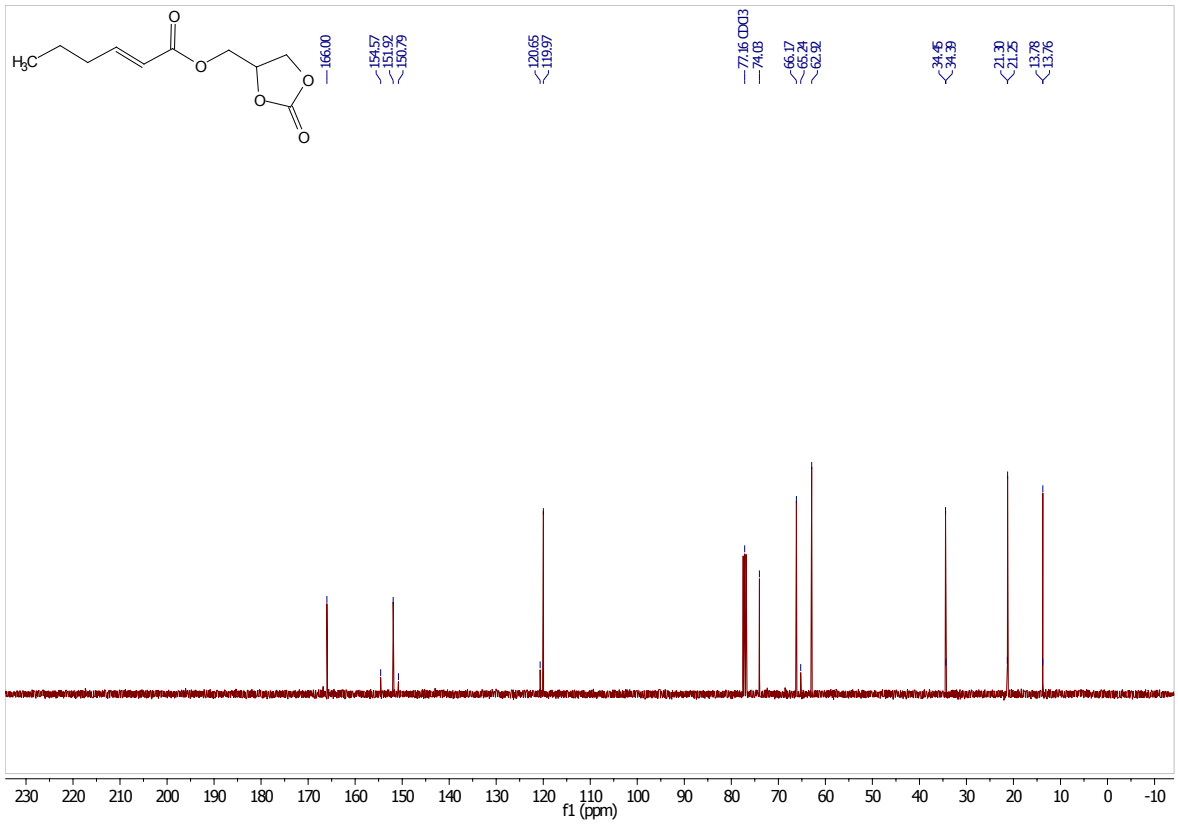
^{13}C NMR of (2-oxo-1,3-dioxolan-4-yl)methyl (*E*)-3-(anthracen-9-yl)acrylate ($CDCl_3$)



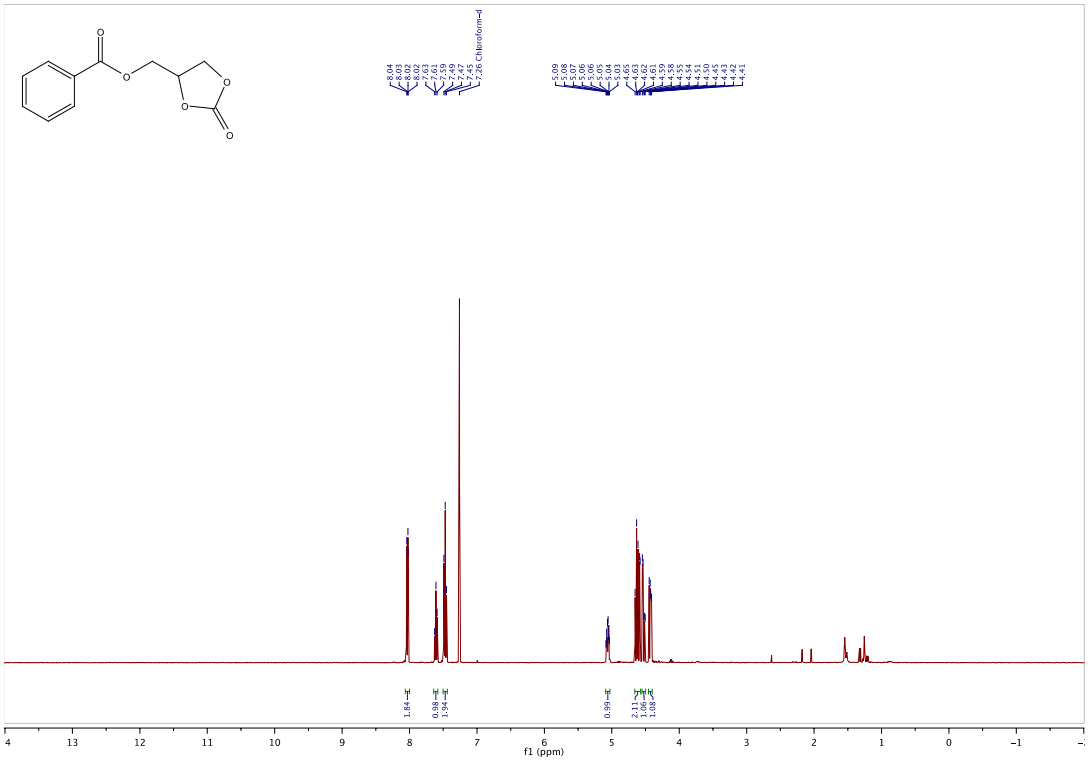
^{1}H NMR of *(E)*-(2-oxo-1,3-dioxolan-4-yl)methyl 3-(2-methoxyphenyl)acrylate ($CDCl_3$)



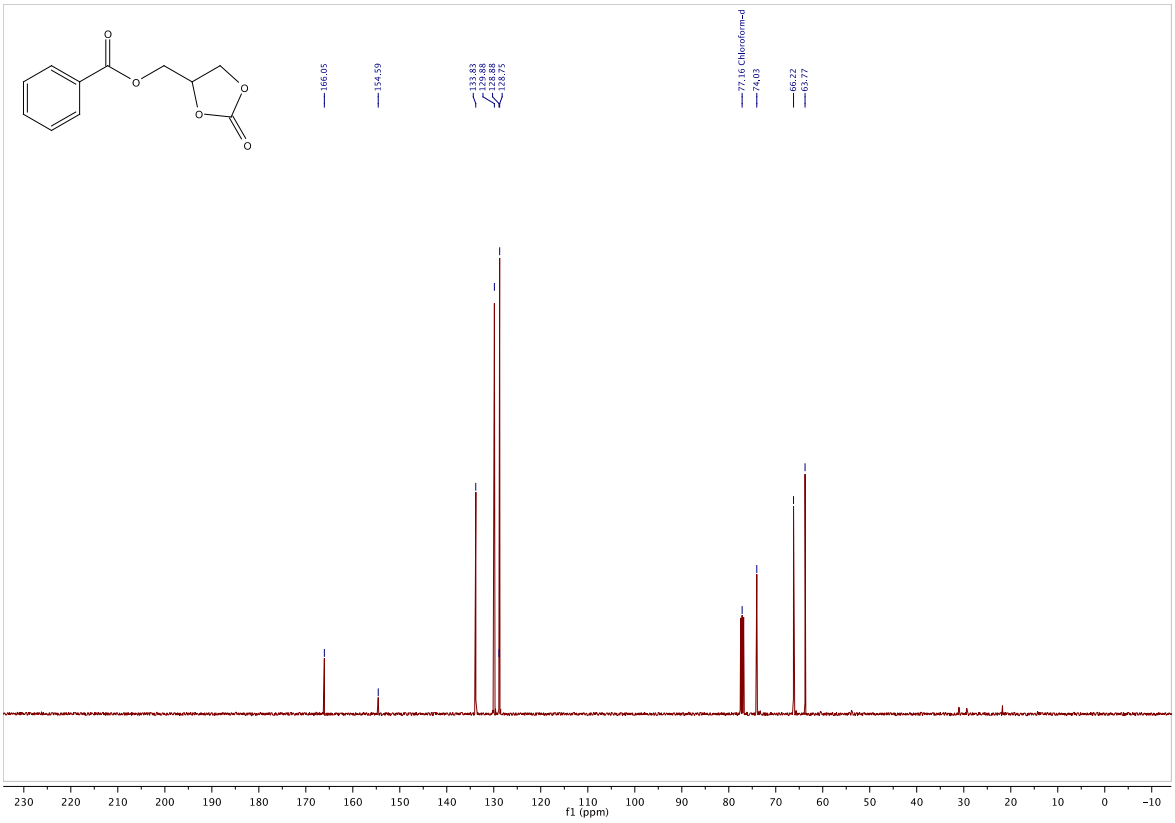
^{13}C NMR of *(E)*-(2-oxo-1,3-dioxolan-4-yl)methyl hex-2-enoate($CDCl_3$)



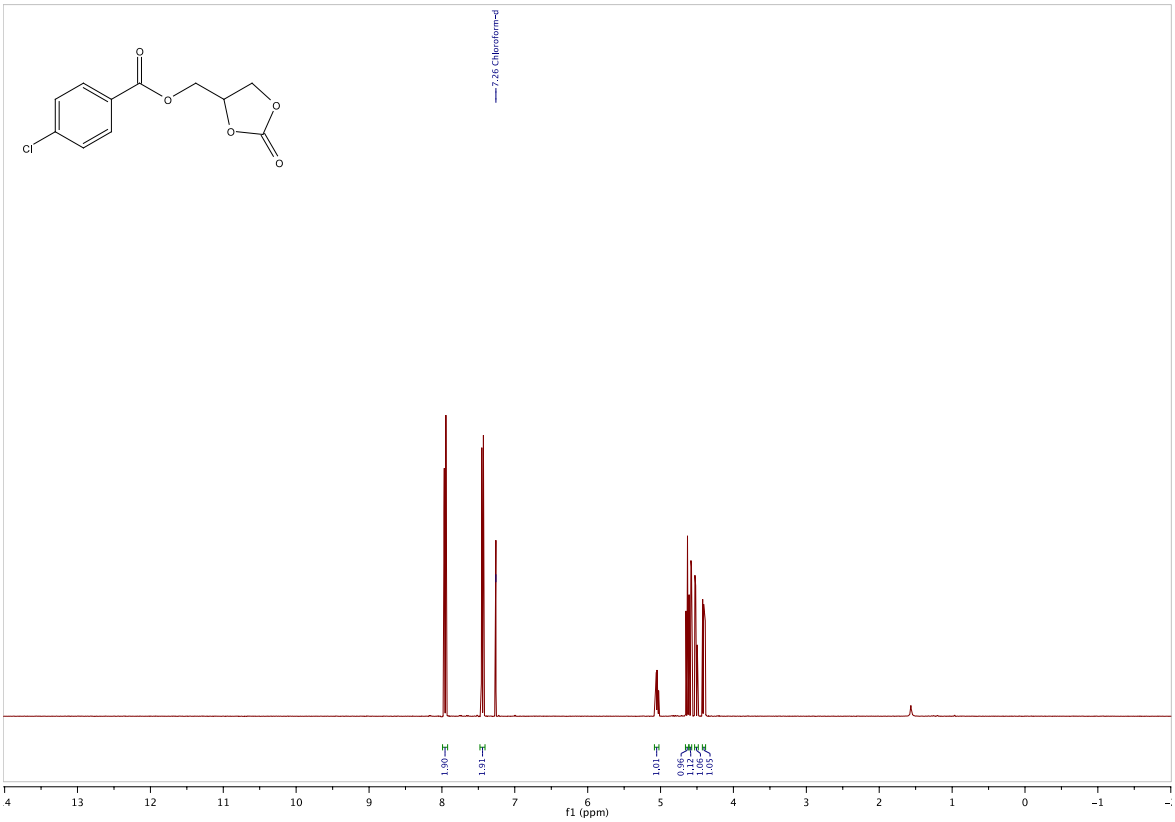
^{1}H NMR of (2-oxo-1,3-dioxolan-4-yl)methyl benzoate ($CDCl_3$)



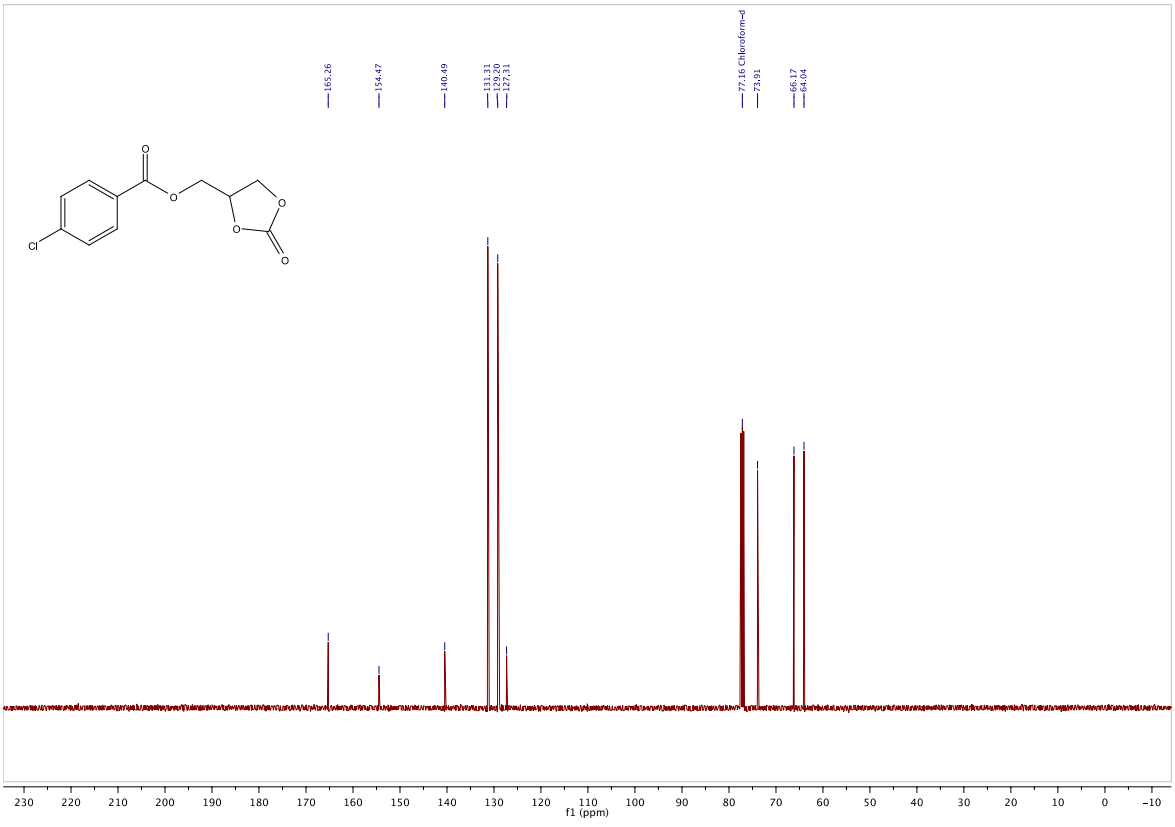
^{13}C NMR of (2-oxo-1,3-dioxolan-4-yl)methyl benzoate ($CDCl_3$)



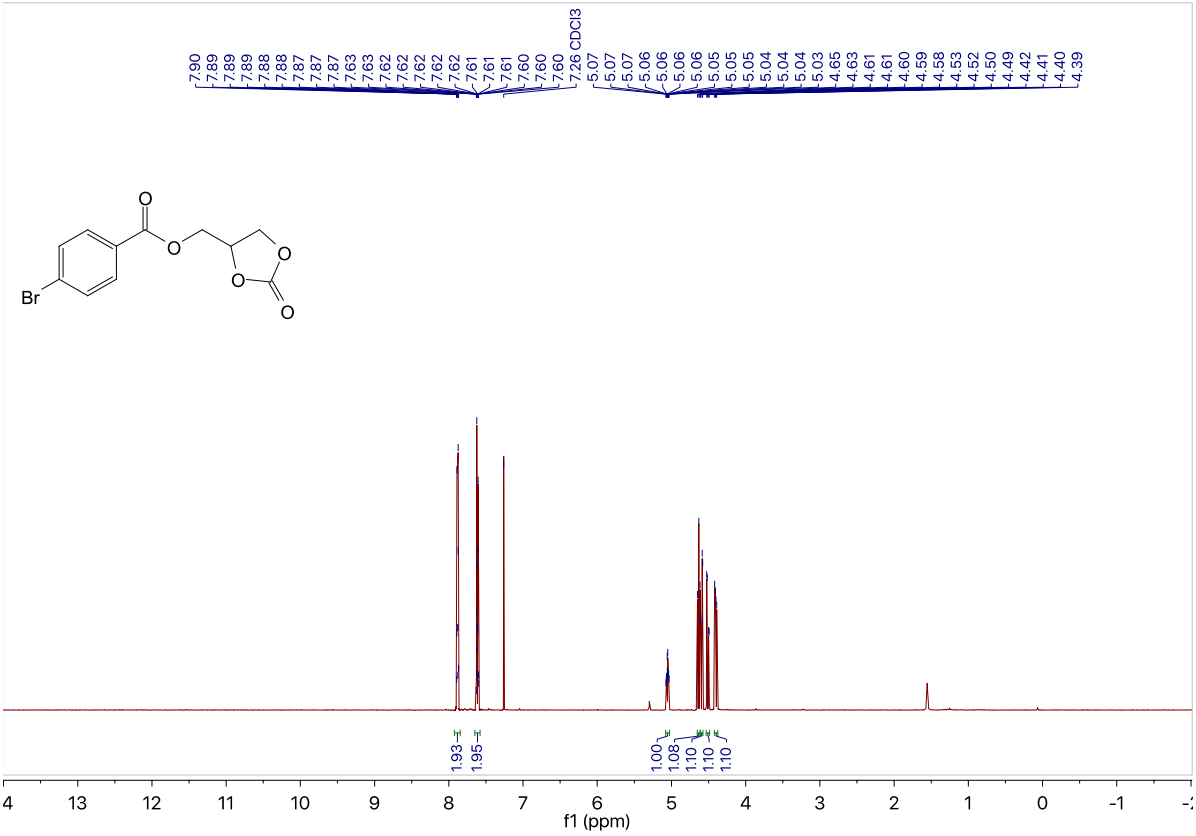
^{1}H NMR of (2-oxo-1,3-dioxolan-4-yl)methyl 4-chlorobenzoate ($CDCl_3$)



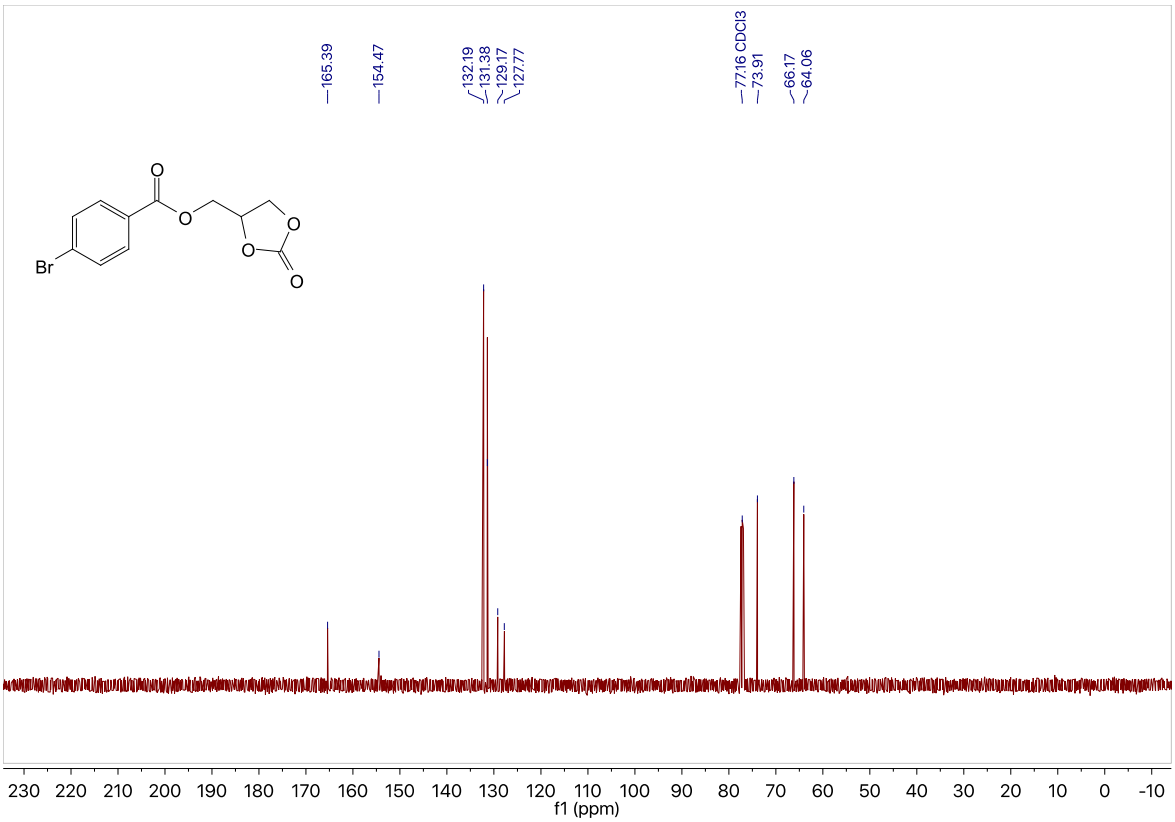
^{13}C NMR of (2-oxo-1,3-dioxolan-4-yl)methyl 4-chlorobenzoate ($CDCl_3$)



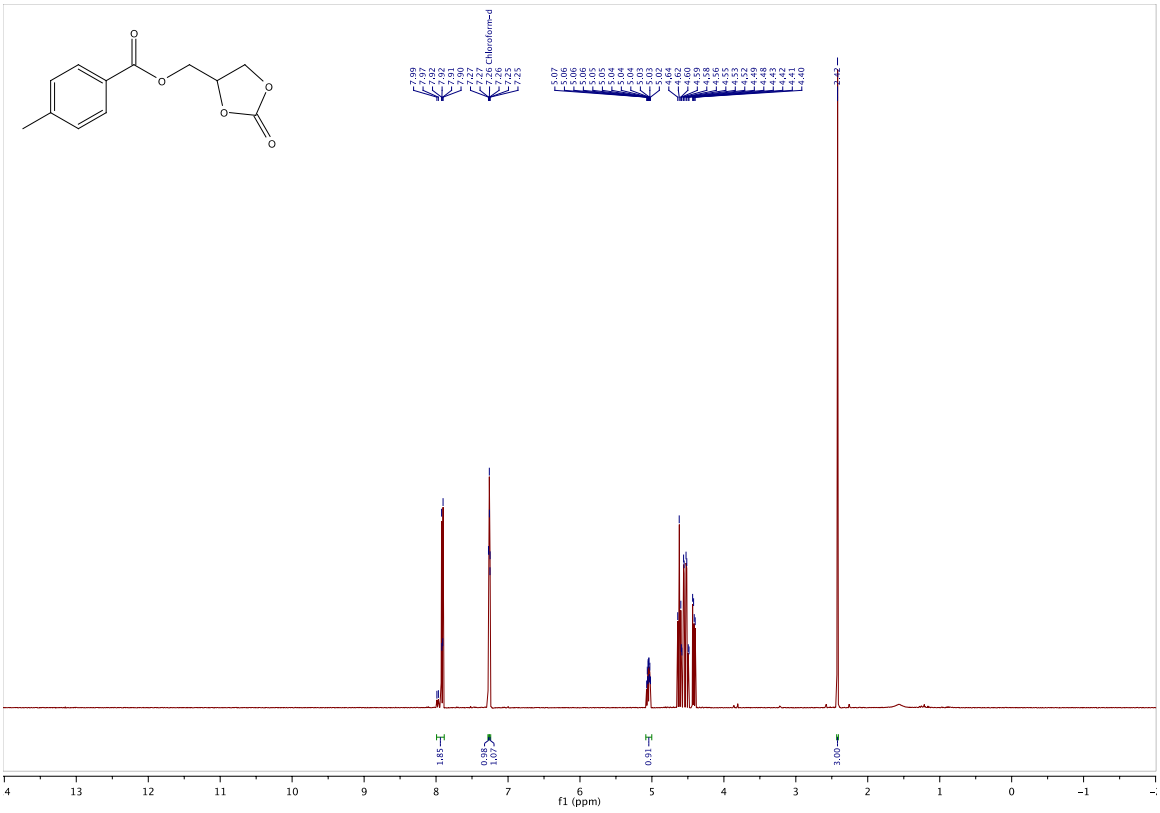
^{1}H NMR of (2-oxo-1,3-dioxolan-4-yl)methyl 4-bromobenzoate ($CDCl_3$)



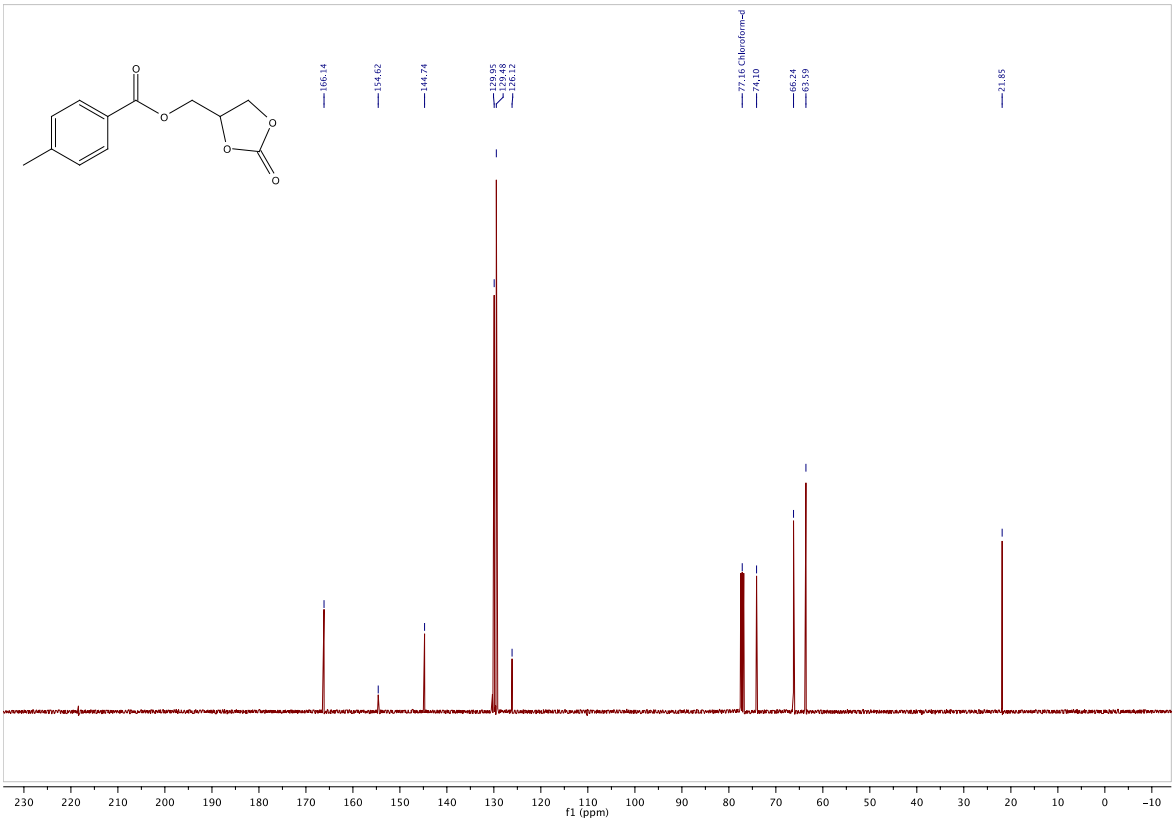
^{13}C NMR of (2-oxo-1,3-dioxolan-4-yl)methyl 4-bromobenzoate ($CDCl_3$)



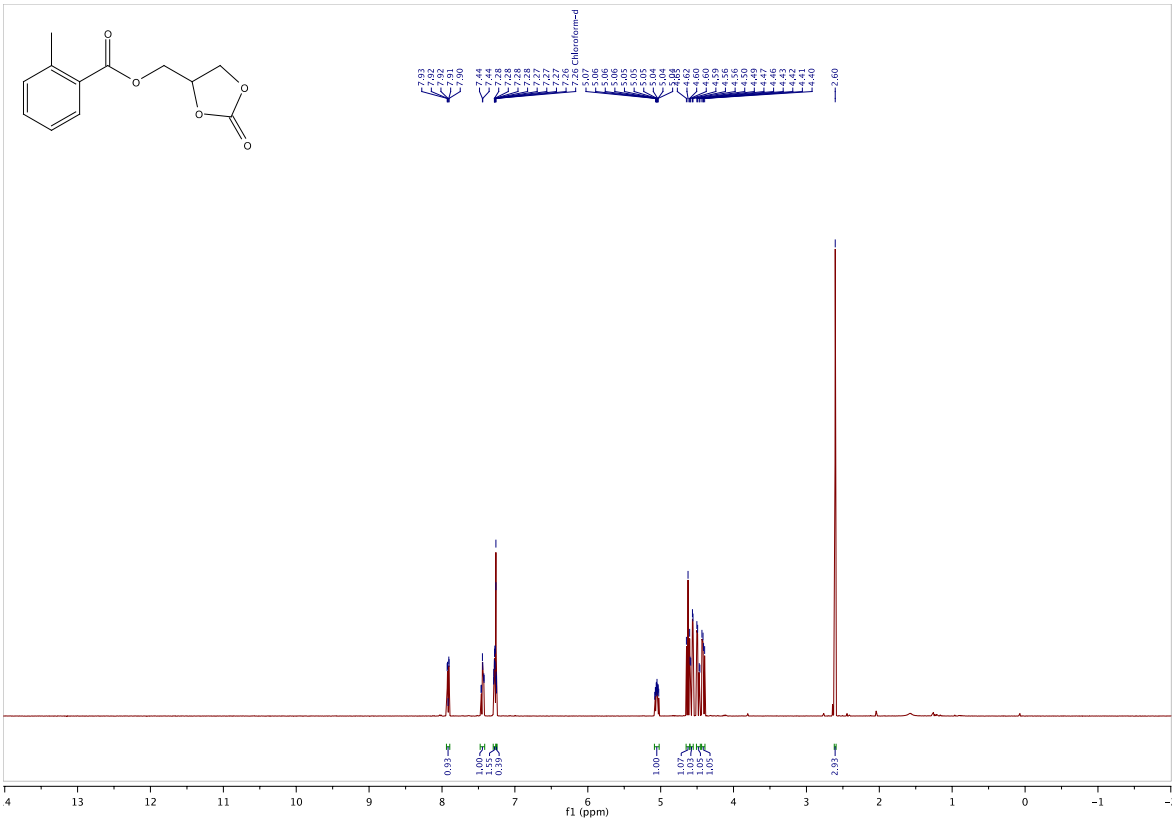
^{1}H NMR of (2-oxo-1,3-dioxolan-4-yl)methyl 4-methylbenzoate ($CDCl_3$)



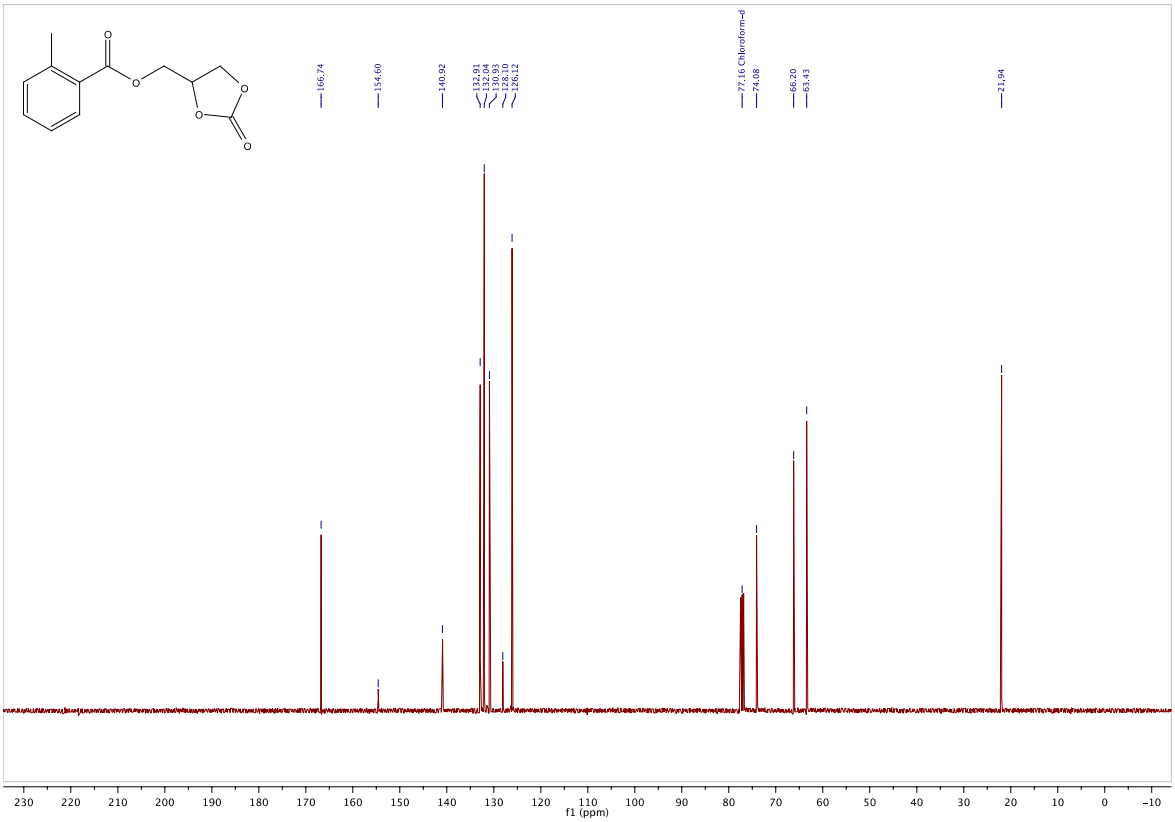
^{13}C NMR of (2-oxo-1,3-dioxolan-4-yl)methyl 4-methylbenzoate ($CDCl_3$)



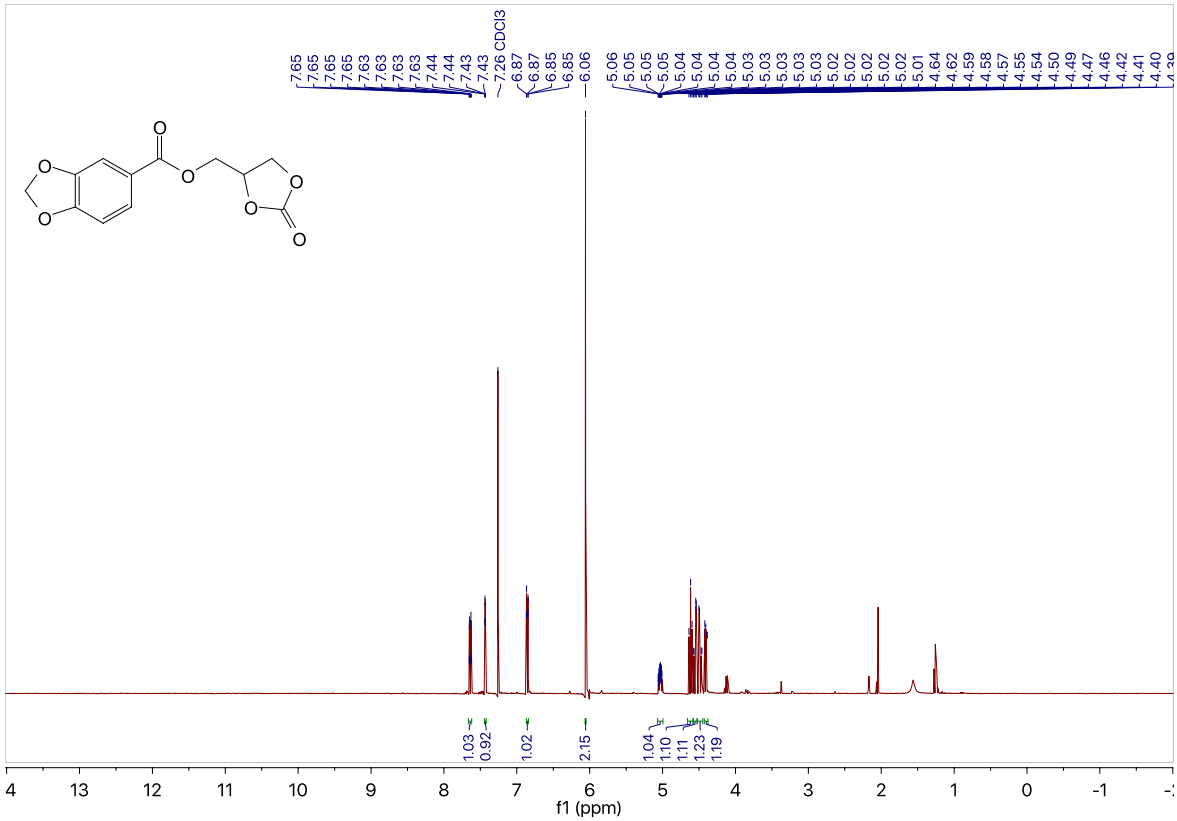
^{1}H NMR of (2-oxo-1,3-dioxolan-4-yl)methyl 2-methylbenzoate ($CDCl_3$)



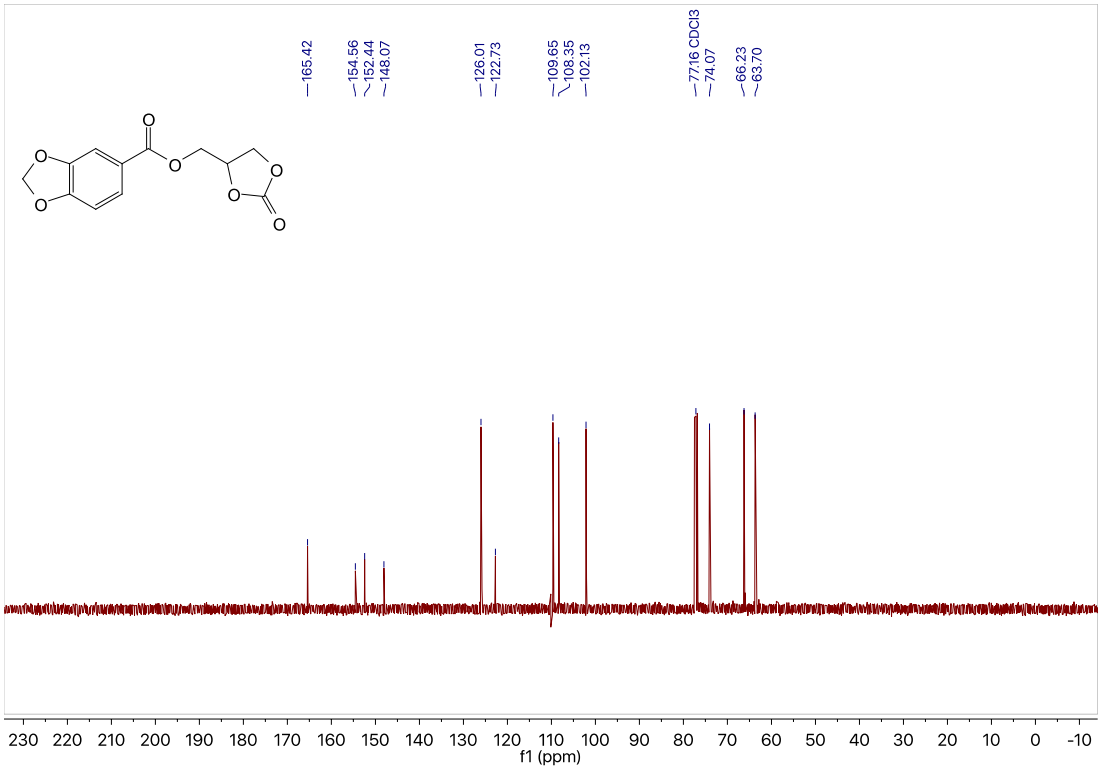
^{13}C NMR of (2-oxo-1,3-dioxolan-4-yl)methyl 2-methylbenzoate ($CDCl_3$)


166.74
154.60
140.92
132.91
132.04
130.93
128.10
126.12
77.16 Chloroform-d
74.08
66.20
63.43
21.94
230 220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 −10
f1 (ppm)

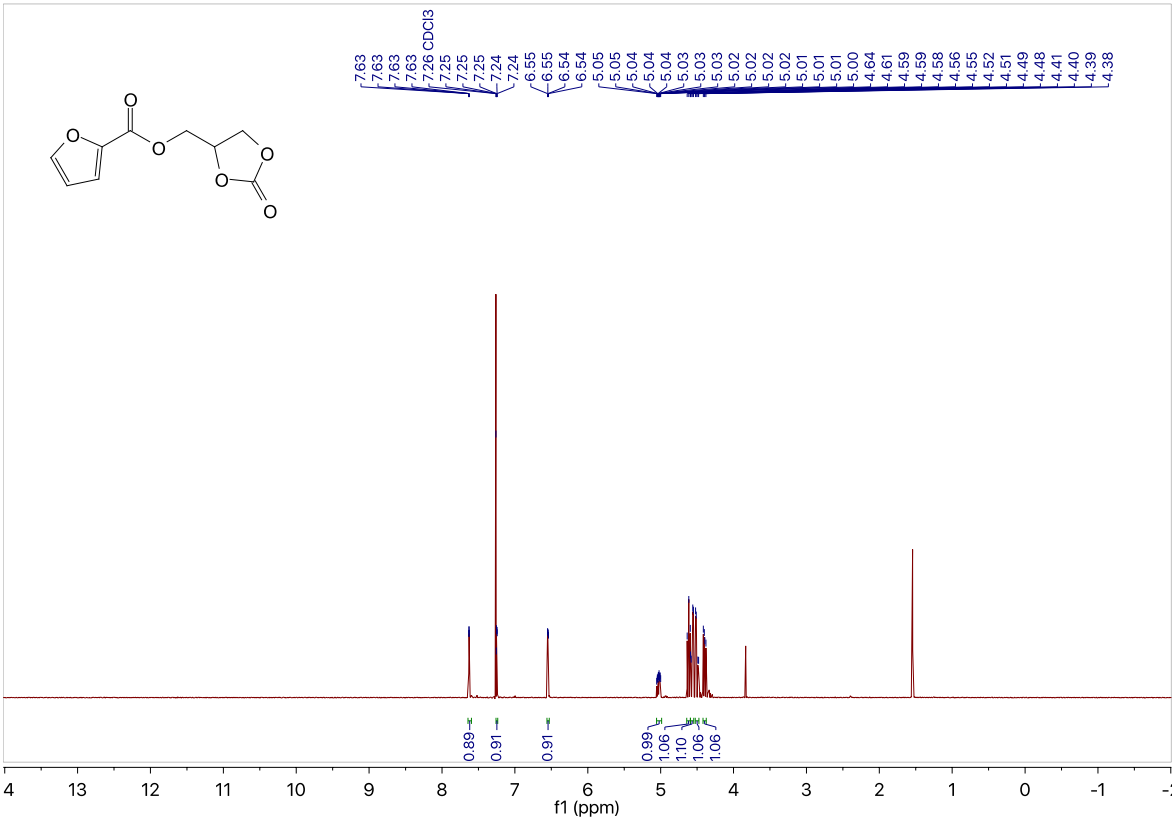
^{1}H NMR of (2-oxo-1,3-dioxolan-4-yl)methyl benzo[d][1,3]dioxole-5-carboxylate ($CDCl_3$)



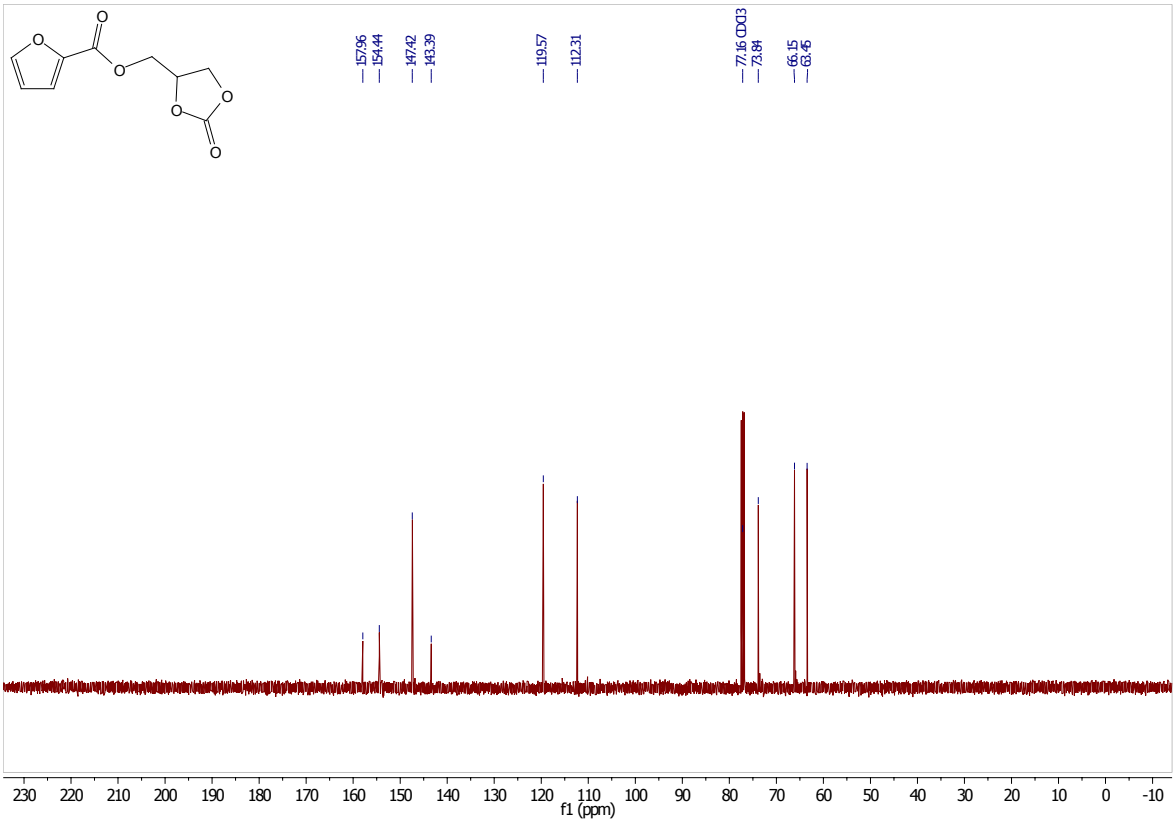
^{13}C NMR of (2-oxo-1,3-dioxolan-4-yl)methyl benzo[d][1,3]dioxole-5-carboxylate ($CDCl_3$)



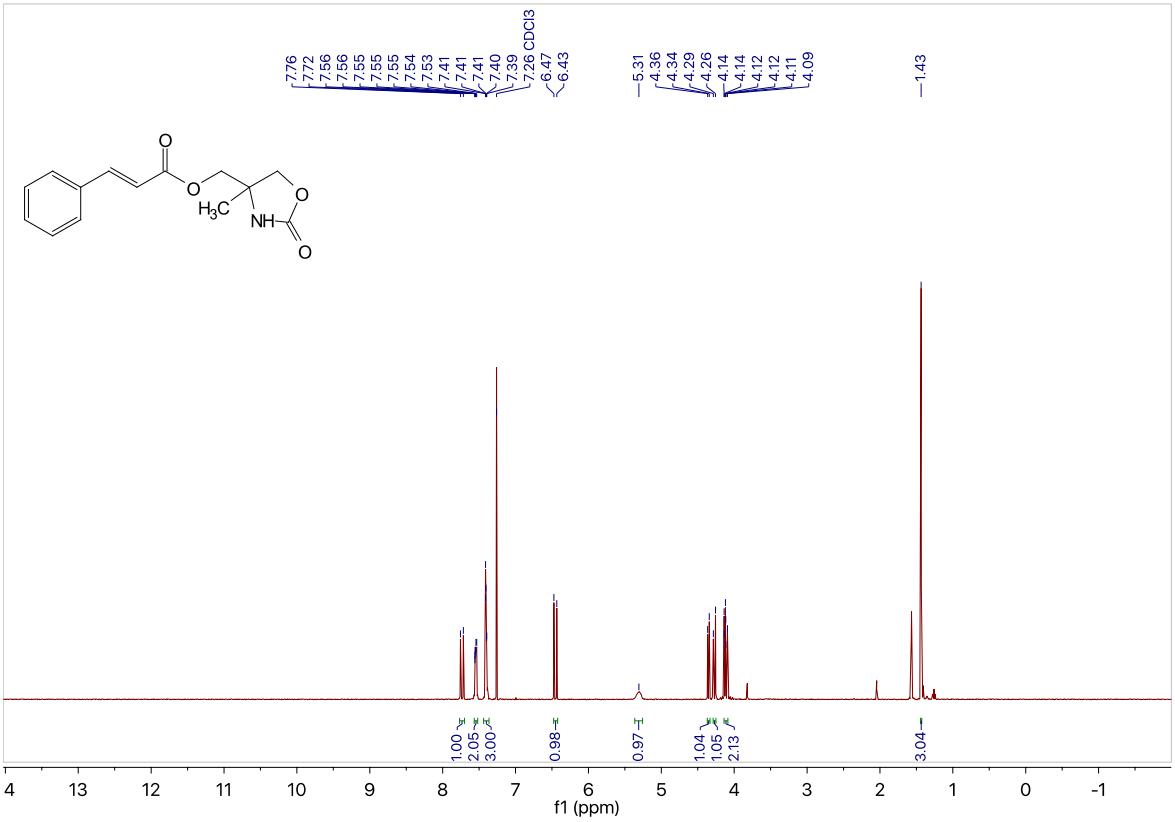
^{1}H NMR of (2-oxo-1,3-dioxolan-4-yl)methyl furan-2-carboxylate ($CDCl_3$)



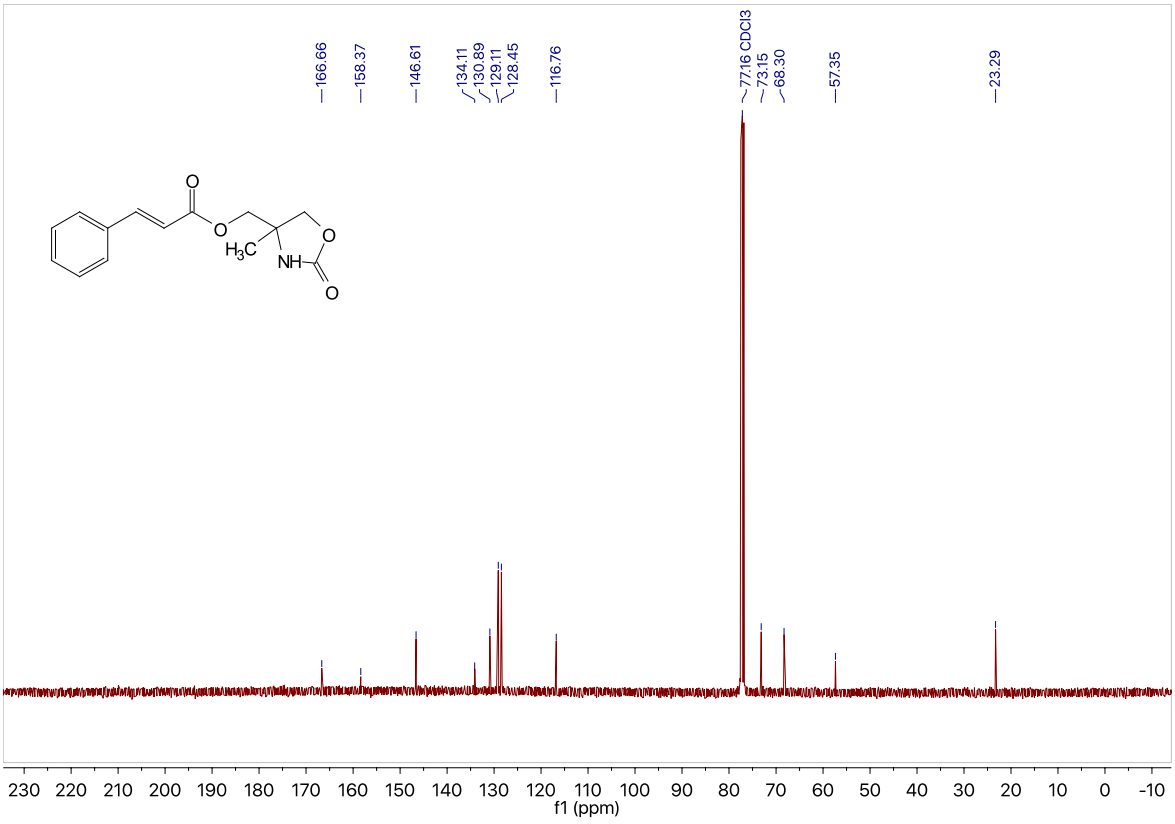
^{13}C NMR of (2-oxo-1,3-dioxolan-4-yl)methyl furan-2-carboxylate ($CDCl_3$)



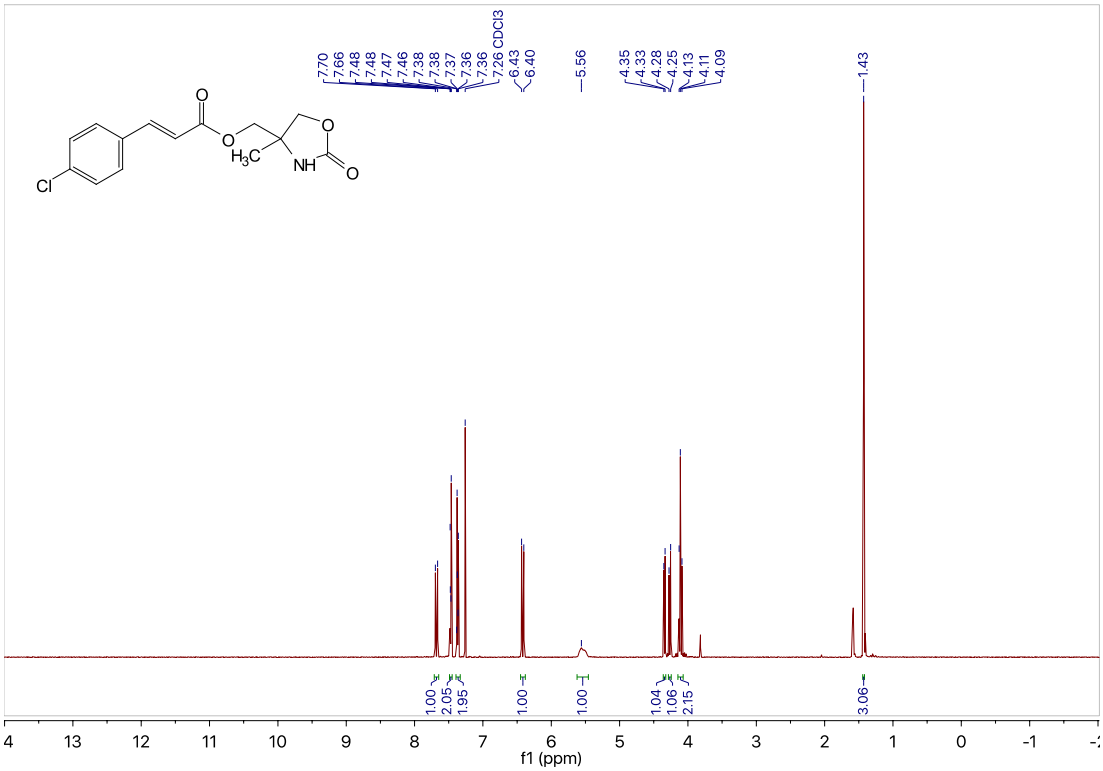
^{1}H NMR of (4-methyl-2-oxooxazolidin-4-yl)methyl cinnamate ($CDCl_3$)



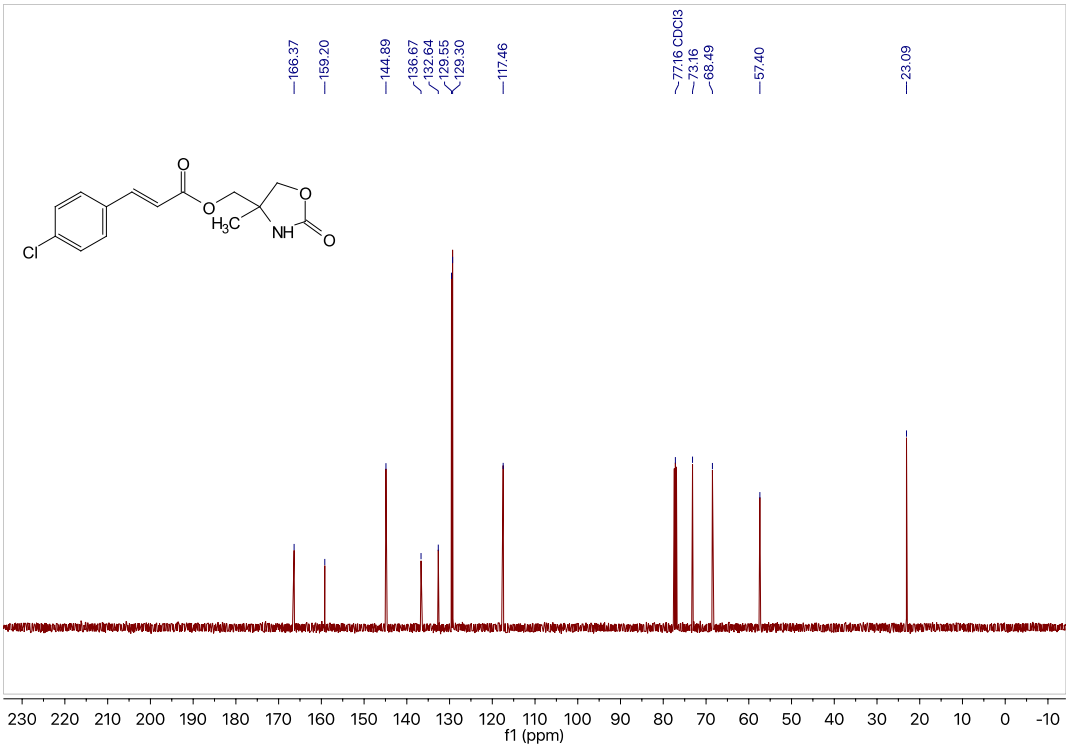
^{13}C NMR of (4-methyl-2-oxooxazolidin-4-yl)methyl cinnamate ($CDCl_3$)



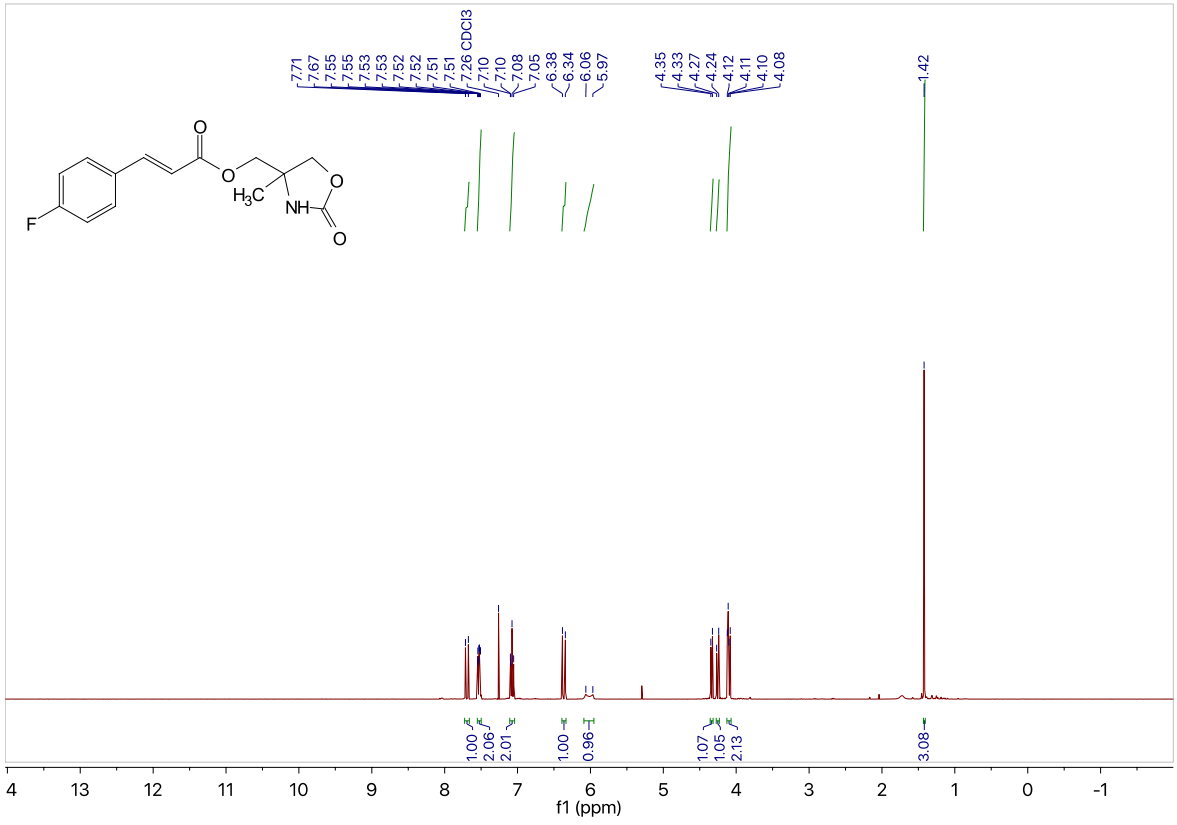
^{1}H NMR of *(E)*-(4-methyl-2-oxooxazolidin-4-yl)methyl 3-(4-chlorophenyl)acrylate ($CDCl_3$)



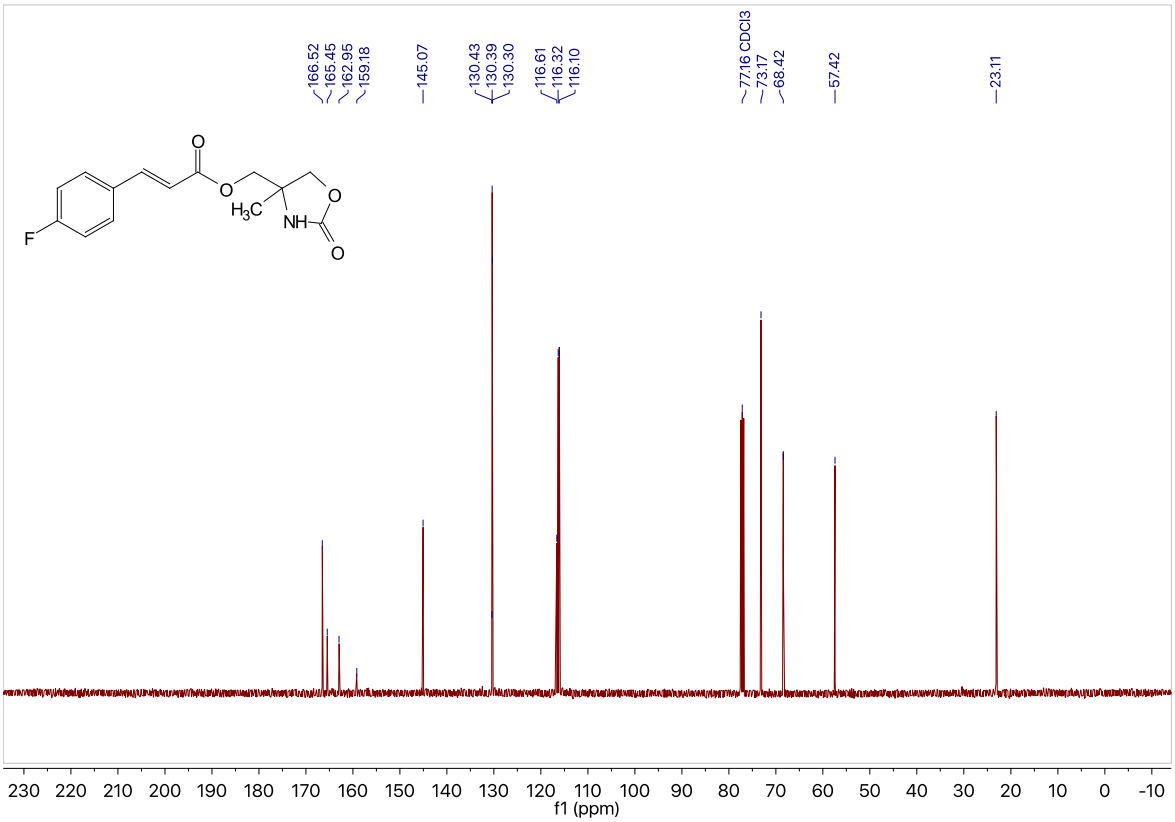
^{13}C NMR of *(E)*-(4-methyl-2-oxooxazolidin-4-yl)methyl 3-(4-chlorophenyl)acrylate ($CDCl_3$)



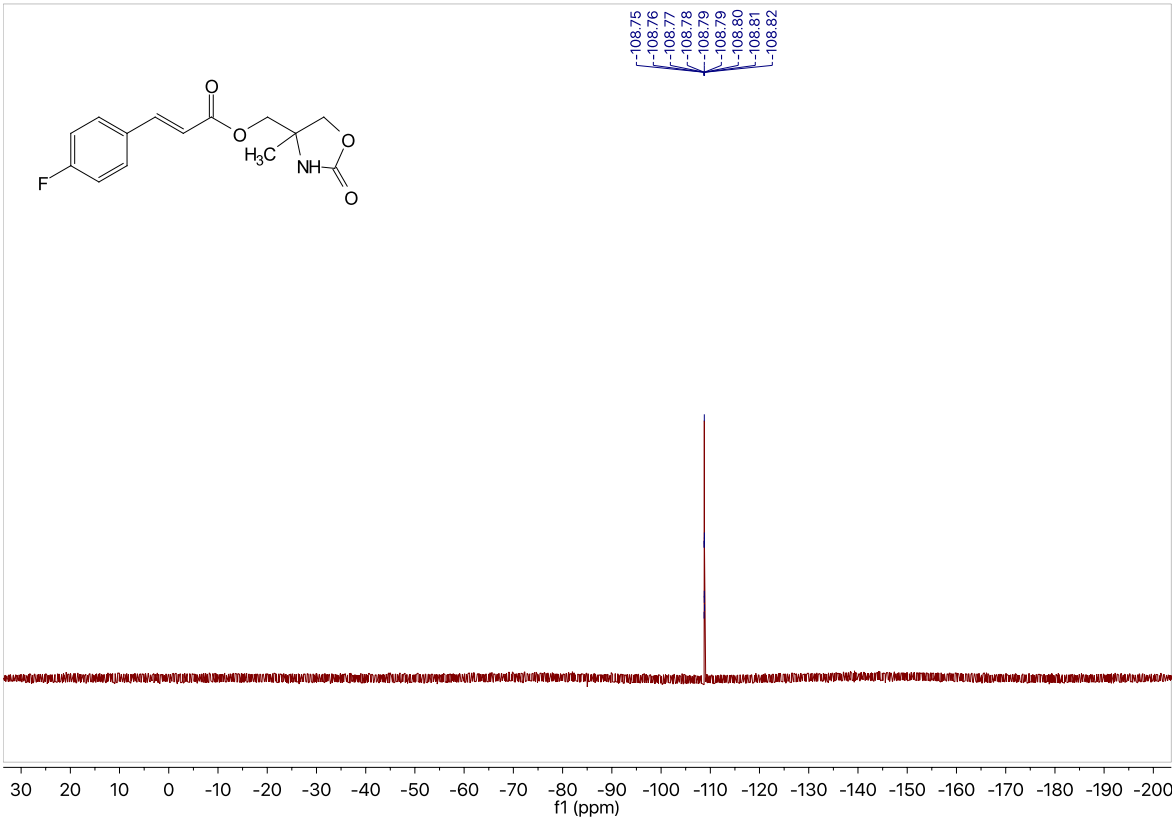
^{1}H NMR of *(E)*-(4-methyl-2-oxooxazolidin-4-yl)methyl 3-(4-fluorophenyl)acrylate ($CDCl_3$)



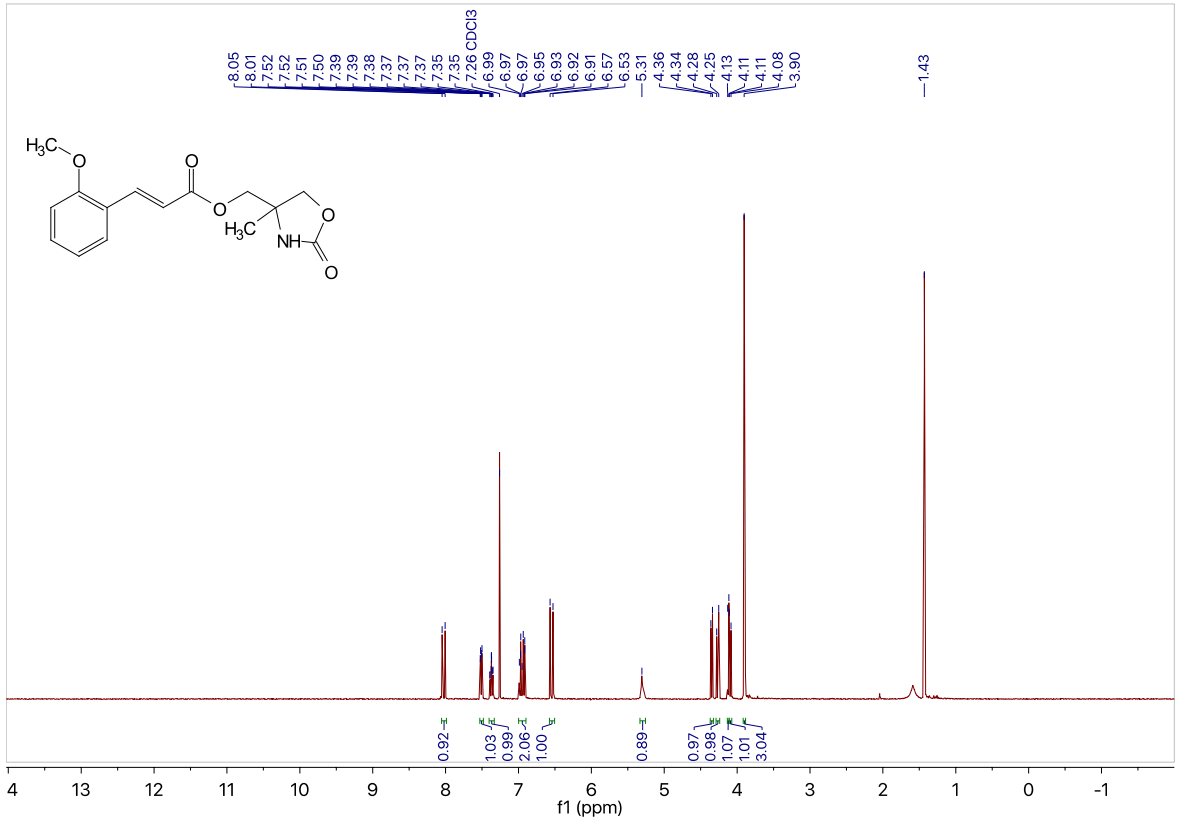
^{13}C NMR of *(E)*-(4-methyl-2-oxooxazolidin-4-yl)methyl 3-(4-fluorophenyl)acrylate ($CDCl_3$)



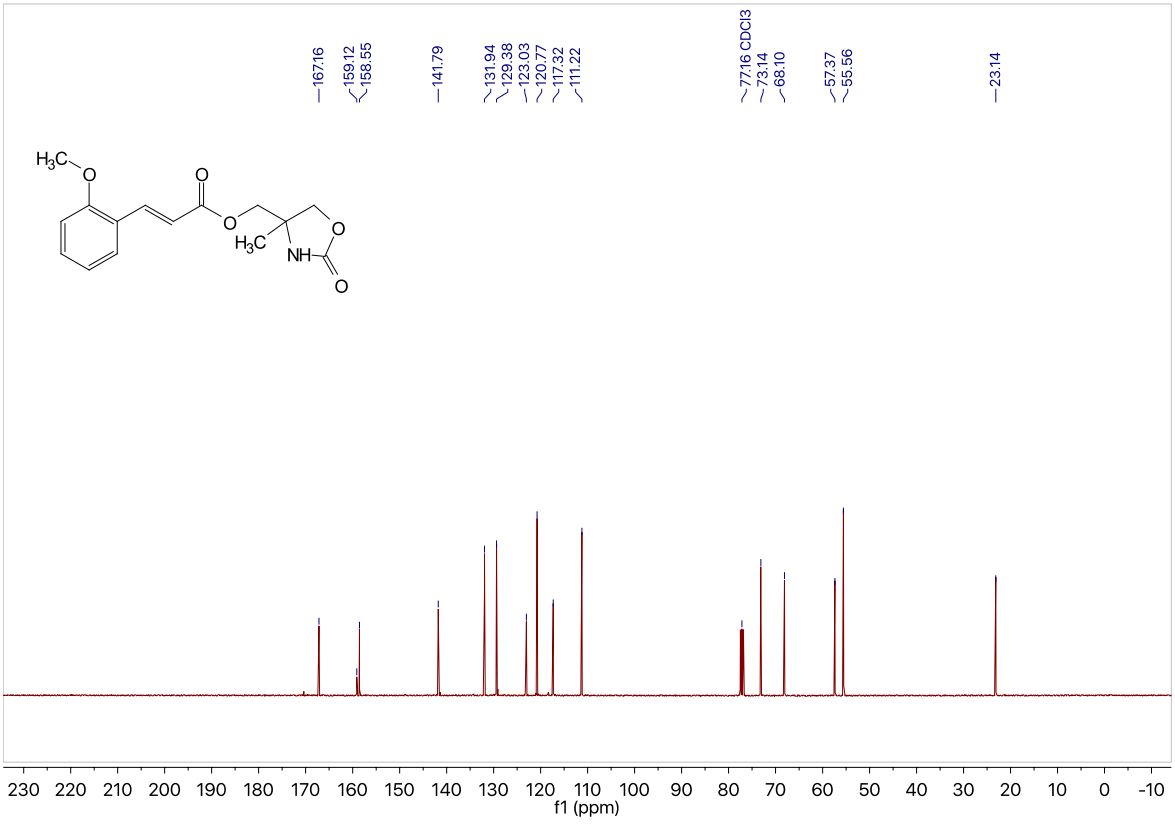
^{19}F NMR of *(E)*-(4-methyl-2-oxooxazolidin-4-yl)methyl 3-(4-fluorophenyl)acrylate ($CDCl_3$)



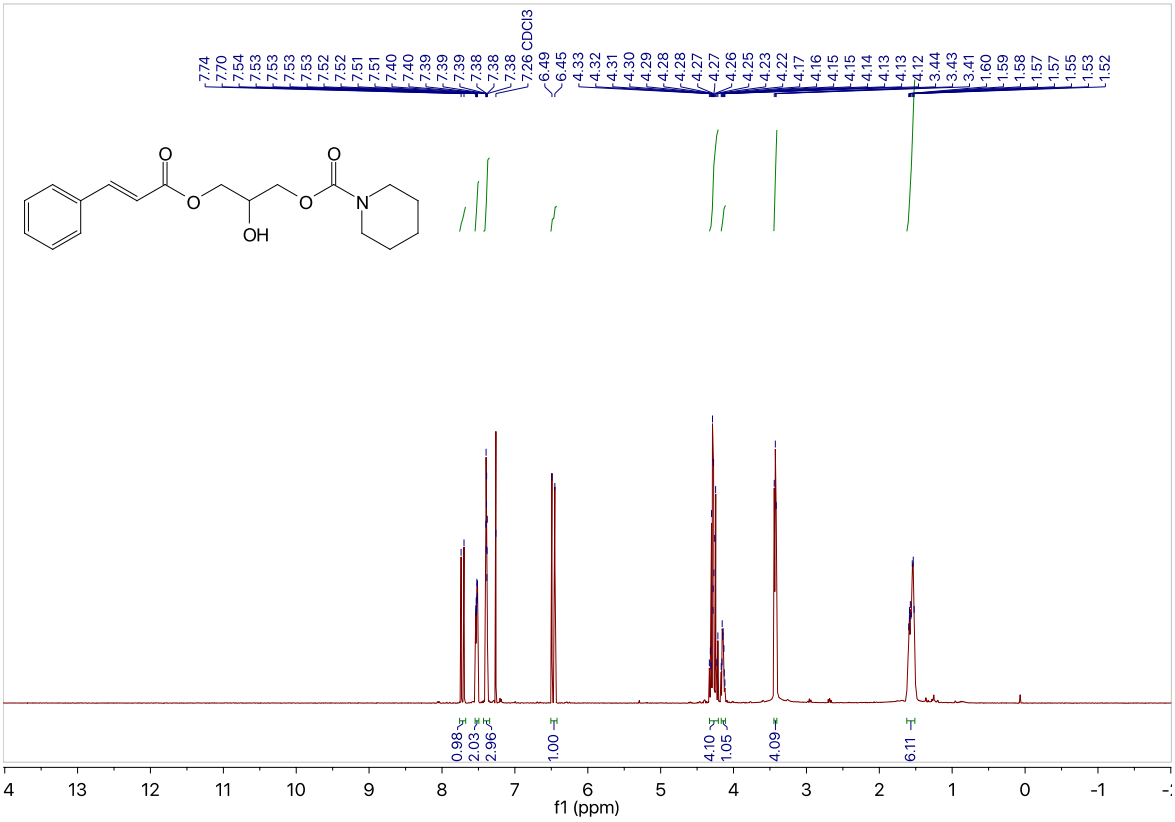
^{1}H NMR of *(E)*-(4-methyl-2-oxooxazolidin-4-yl)methyl 3-(2-methoxyphenyl)acrylate ($CDCl_3$)



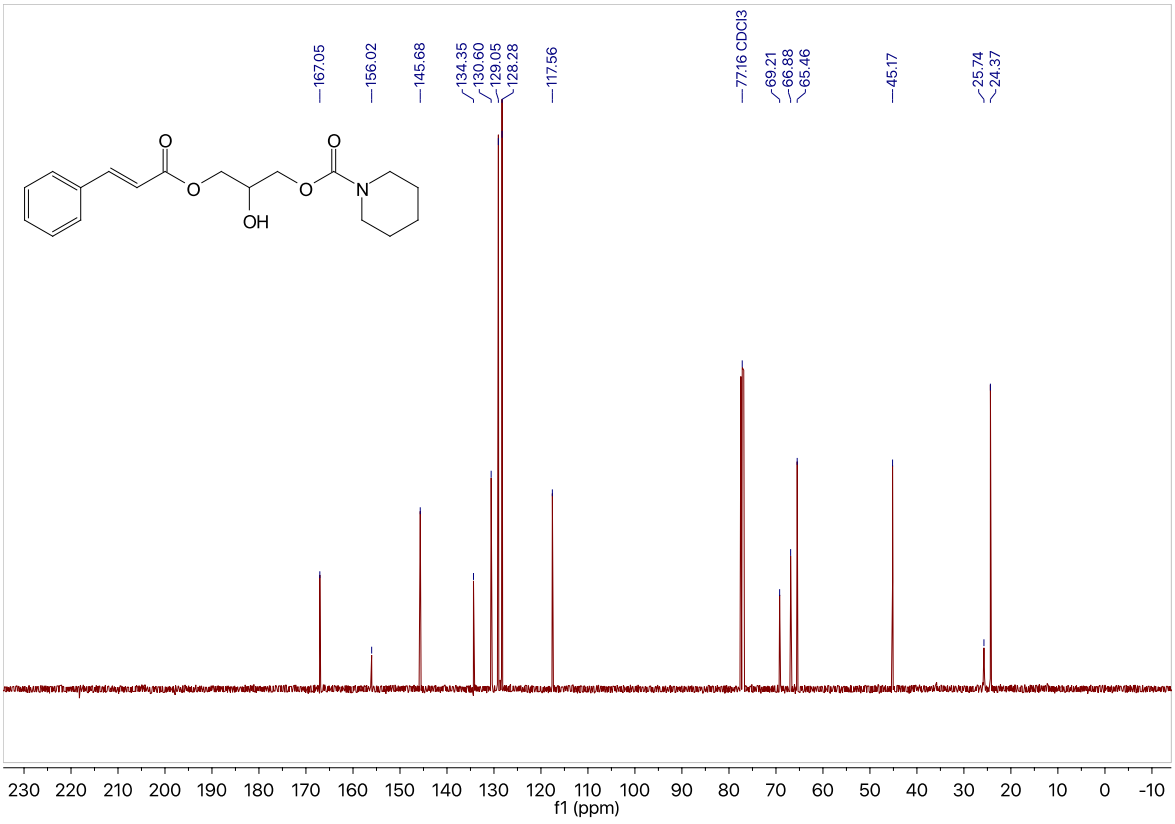
^{13}C NMR of *(E)*-(4-methyl-2-oxooxazolidin-4-yl)methyl 3-(2-methoxyphenyl)acrylate ($CDCl_3$)



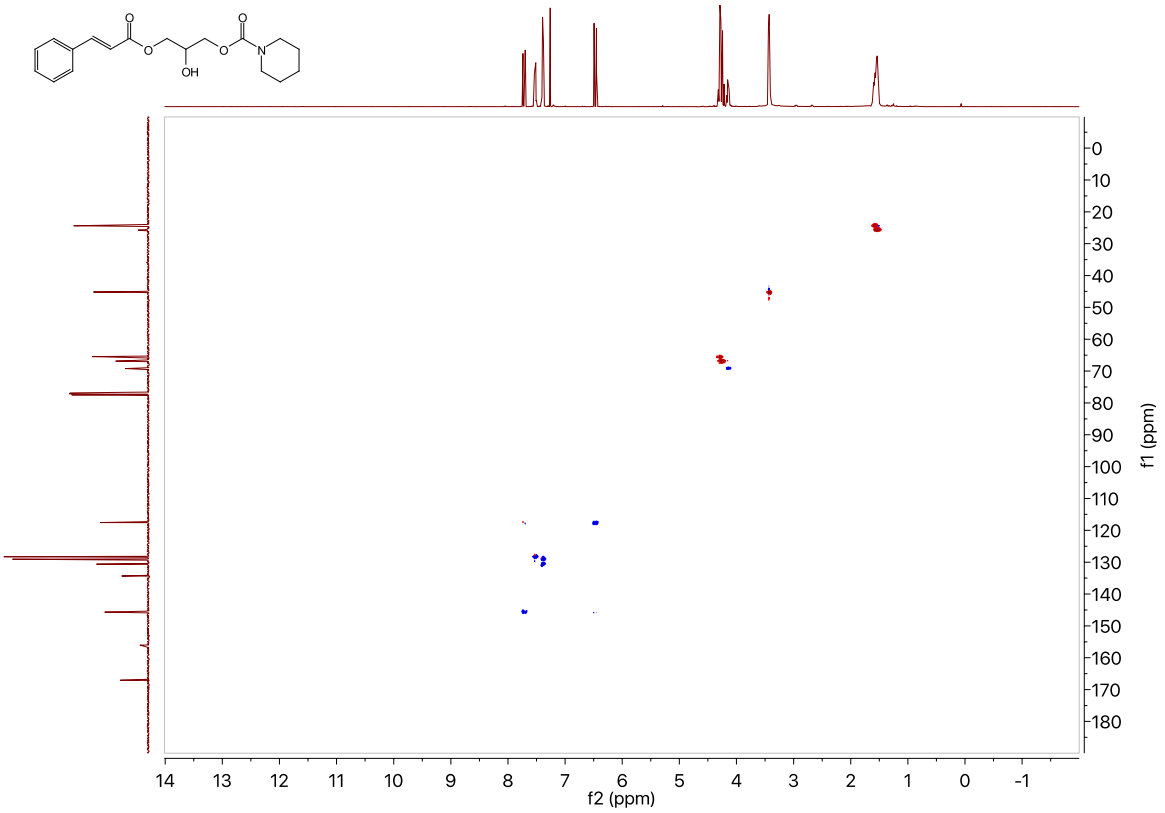
^{1}H NMR of 3-(cinnamoyloxy)-2-hydroxypropyl piperidine-1-carboxylate ($CDCl_3$)



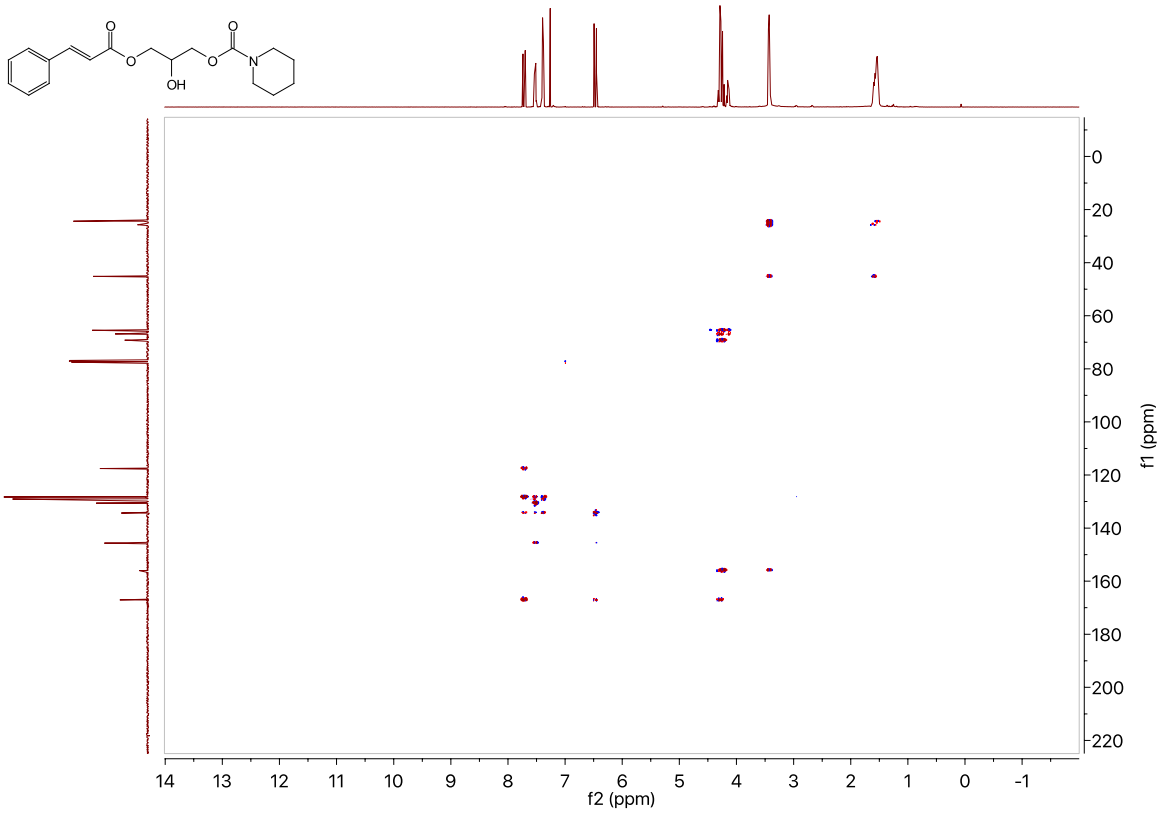
^{13}C NMR of 3-(cinnamoyloxy)-2-hydroxypropyl piperidine-1-carboxylate ($CDCl_3$)



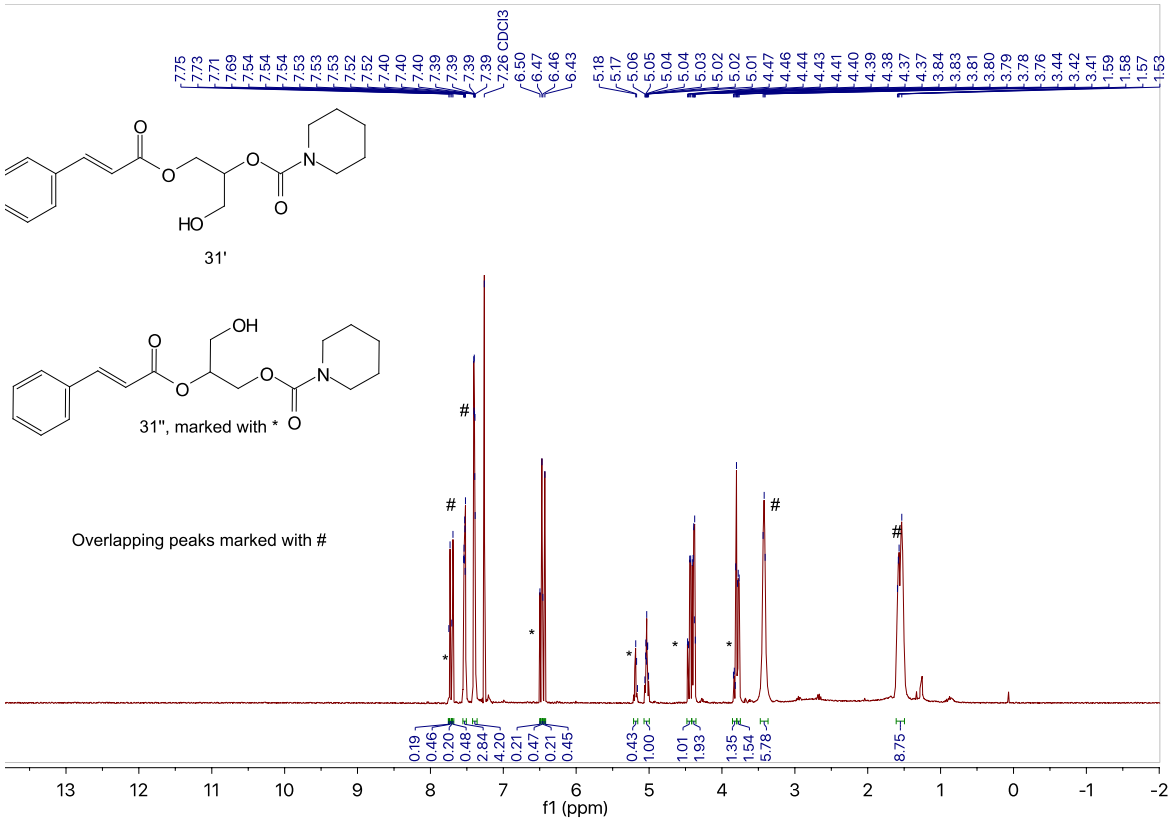
HSQC NMR of 3-(cinnamoyloxy)-2-hydroxypropyl piperidine-1-carboxylate ($CDCl_3$)



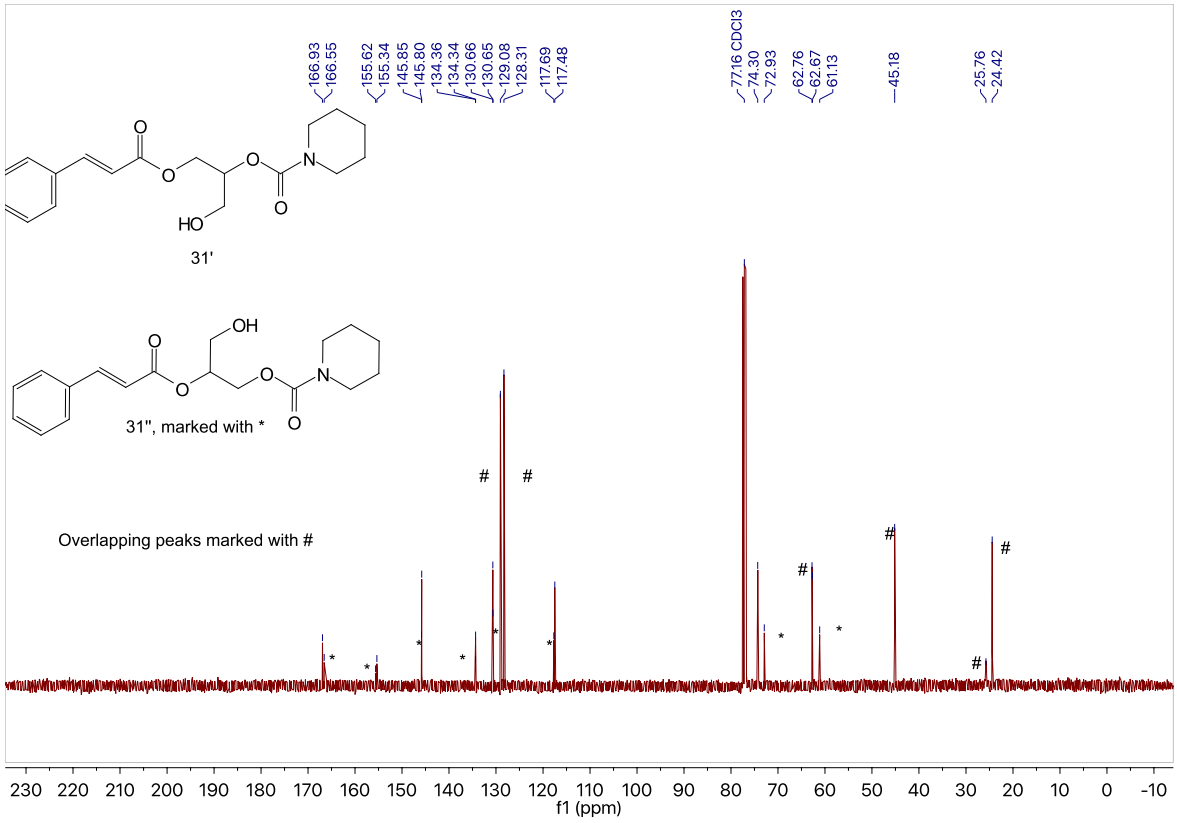
HMBC NMR of 3-(cinnamoyloxy)-2-hydroxypropyl piperidine-1-carboxylate ($CDCl_3$)



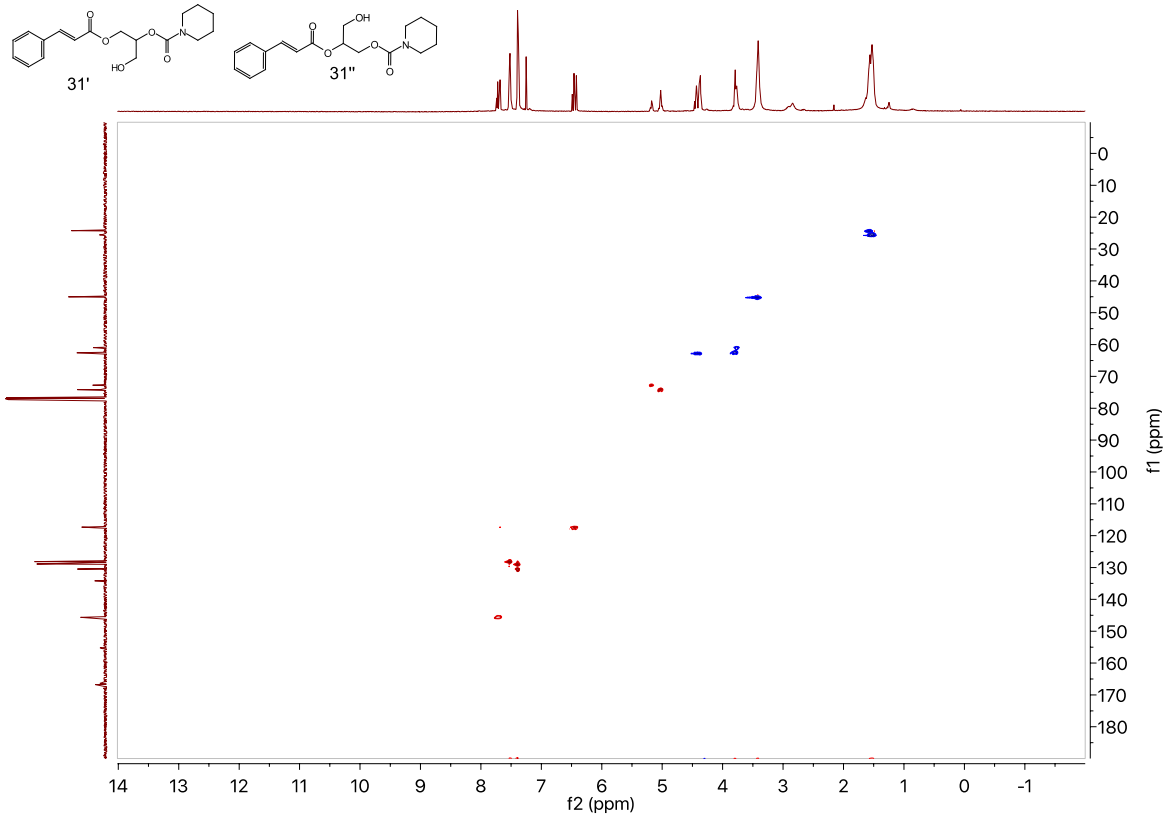
^{1}H NMR of 1-(cinnamoyloxy)-3-hydroxypropan-2-yl piperidine-1-carboxylate and 2-(cinnamoyloxy)-3-hydroxypropyl piperidine-1-carboxylate ($CDCl_3$)



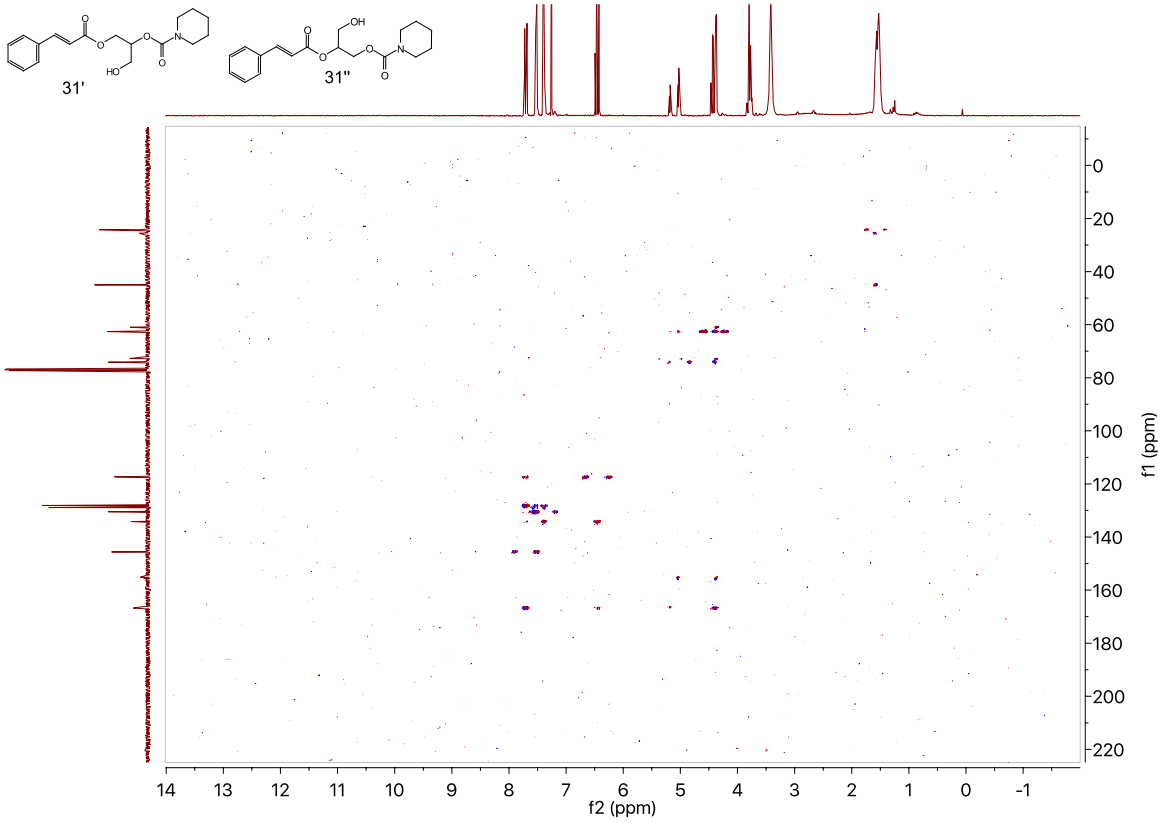
^{13}C NMR of 1-(cinnamoyloxy)-3-hydroxypropan-2-yl piperidine-1-carboxylate and 2-(cinnamoyloxy)-3-hydroxypropyl piperidine-1-carboxylate ($CDCl_3$)



HSQC NMR of 1-(cinnamoyloxy)-3-hydroxypropan-2-yl piperidine-1-carboxylate and 2-(cinnamoyloxy)-3-hydroxypropyl piperidine-1-carboxylate ($CDCl_3$)



HMBC NMR of 1-(cinnamoyloxy)-3-hydroxypropan-2-yl piperidine-1-carboxylate and 2-(cinnamoyloxy)-3-hydroxypropyl piperidine-1-carboxylate ($CDCl_3$)



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