Supporting Information

Concise Synthesis of Ketoallyl Sulfones through an Iron-Catalyzed Sequential Four-Component Assembly

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**General information**

All reactions were carried out under an atmosphere of air. Column chromatography was performed using silica gel 48-75 μm. $^1$H NMR and $^{13}$C NMR spectra were recorded on Bruker-AV (400 and 100 MHz, respectively) instrument internally referenced to tetramethylsilane (TMS) or chloroform signals. Mass spectra were measured on Agilent 5975 GC-MS instrument (EI). High-resolution mass spectra were recorded at the Institute of Chemistry, Chinese Academy of Sciences. The structures of known compounds were further corroborated by comparing their $^1$H NMR, $^{13}$C NMR data and MS data with those of literature. Most reagents were obtained from commercial suppliers and used without further purification.

**General procedure (3aa)**

A 10 mL oven-dried reaction vessel was charged with K$_2$S$_2$O$_8$ (189.2 mg, 7 mmol), sodium dodecyl (5.8 mg, 0.02 mmol), FeCl$_3$ (4 mg, 0.02 mmol), acetophenone (1a, 23.4 μL, 0.2 mmol), sulfatesodium benzenesulfinate (2a, 82 mg, 0.5 mmol), and DMA (1.2 mL) under air. The sealed reaction vessel was stirred at 110 °C for 14 h. After cooling to room temperature, the reaction was diluted with ethyl acetate (5 mL) and washed with saturated sodium chloride solution. The organic layer was separated, and the aqueous layer was extracted with ethyl acetate for three times. The combined organic layer was dried over magnesium sulfate and the volatiles were removed under reduced pressure. The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 10:1) to yield the desired product 3aa as white solid (49.8 mg, 87% yield), mp = 99-101 °C.

**phenyl-2-((phenylsulfonyl)methyl)prop-2-en-1-one (3aa)**

![Compound 3aa](image)

$^1$H NMR (400 MHz, CDCl$_3$) δ 7.93-7.91 (m, 2H), 7.67-7.50 (m, 6H), 7.43 (t, $J$ = 7.6 Hz, 2H), 6.29 (s, 1H), 6.05 (s, 1H), 4.37 (s, 2H). $^{13}$C NMR (100 MHz, CDCl$_3$) δ 194.7, 138.8, 136.2, 135.7, 134.1, 133.9, 132.6, 129.6, 129.2, 128.36, 128.3, 57.7. HRMS calcd. for: C$_{16}$H$_{14}$O$_3$SNa$^+$ (M+Na)$^+$ 309.05559, found 309.05591

**1-phenyl-2-(tosylmethyl)prop-2-en-1-one (3ab)**

![Compound 3ab](image)

The reaction was conducted with sodium acetophenone (1a, 23.4 μL, 0.2 mmol), and 4-methylbenzenesulfinate
(2b, 89 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 10:1) to yield the desired product 3ab as yellow oil. (43.2 mg, 72% yield).

1H NMR (400 MHz, CDCl₃) δ 7.78 (d, J = 8.2 Hz, 2H), 7.68-7.65 (m, 2H), 7.55 (t, J = 7.4 Hz, 1H), 7.43 (t, J = 7.8 Hz, 2H), 7.30 (d, J = 8.3 Hz, 2H), 6.25 (s, 1H), 6.02 (s, 1H), 4.35 (s, 2H), 2.39 (s, 3H). 13C NMR (100 MHz, CDCl₃) δ 194.7, 144.9, 136.1, 135.8, 135.7, 133.9, 132.6, 129.8, 129.6, 128.3, 128.2, 57.7, 21.6. HRMS calcd. for: C₁₇H₁₇O₃S+ [M+H]+ 301.08929, found 301.08908.

2-(((4-isopropylphenyl)sulfonyl)methyl)-1-phenylprop-2-en-1-one (3ac)

![Image](image1)

The reaction was conducted with acetophenone (1a, 23.4 μL, 0.2 mmol) and sodium 4-isopropylbenzenesulfinate (2c, 103.1 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 10:1) to yield the desired product 3ac as white solid. (32.8 mg, 50% yield), mp = 92-95 °C

1H NMR (400 MHz, CDCl₃) δ 7.81 (d, J = 8.4 Hz, 2H), 7.65-7.63 (m, 2H), 7.54 (t, J = 7.4 Hz, 1H), 7.42 (t, J = 7.7 Hz, 2H), 7.33 (d, J = 8.3 Hz, 2H), 6.28 (s, 1H), 6.02 (s, 1H), 4.36 (s, 2H), 2.96-2.89 (m, 1H), 1.19 (d, J = 6.9 Hz, 6H). 13C NMR (100 MHz, CDCl₃) δ 194.6, 155.6, 136.1, 135.8, 133.7, 132.6, 129.6, 128.5, 128.2, 127.3, 57.7, 34.2, 23.5. HRMS calcd. for: C₁₉H₂₁O₃S+ [M+H]+ 329.12059, found 329.12064.

2-(((4-(tert-butyl)phenyl)sulfonyl)methyl)-1-phenylprop-2-en-1-one (3ad)

![Image](image2)

The reaction was conducted with acetophenone (1a, 23.4 μL, 0.2 mmol) and sodium 4-(tert-butyl)benzenesulfinate (2d, 110.0 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 10:1) to yield the desired product 3ad as white solid. (37.6 mg, 55% yield), mp = 141-143 °C.

1H NMR (400 MHz, CDCl₃) δ 7.81 (d, J = 8.5 Hz, 2H), 7.65-7.63 (m, 2H), 7.54 (t, J = 7.4 Hz, 1H), 7.49 (d, J =
8.5 Hz, 2H), 7.41 (t, J = 7.7 Hz, 2H), 6.28 (s, 1H), 6.01 (s, 1H), 4.37 (s, 2H), 1.27 (s, 9H). 13C NMR (100 MHz, CDCl3) δ 194.6, 157.9, 136.0, 135.7, 135.6, 133.7, 129.7, 128.3, 128.2, 126.2, 57.7, 35.2, 30.9. HRMS calcd. for: C20H23O3S+ [M+H]+ 343.13624, found 343.13632.

2-(((4-methoxyphenyl)sulfonyl)methyl)-1-phenylprop-2-en-1-one (3ae)

The reaction was conducted with acetophenone (1a, 23.4 µL, 0.2 mmol) and sodium 4-methoxybenzenesulfinate (2e, 97.0 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 6:1) to yield the desired product 3ae as yellow oil. (35.1 mg, 47% yield).

1H NMR (400 MHz, CDCl3) δ 7.82 (d, J = 8.9 Hz, 2H), 7.68-7.66 (m, 2H), 7.55 (t, J = 7.4 Hz, 1H), 7.43 (t, J = 7.6 Hz, 2H), 6.95 (d, J = 8.9 Hz, 2H), 6.27 (s, 1H), 6.03 (s, 1H), 4.34 (s, 2H), 3.83 (s, 3H). 13C NMR (100 MHz, CDCl3) δ 194.8, 163.9, 136.2, 136.0, 133.9, 132.6, 130.5, 130.4, 129.6, 128.3, 114.4, 58.0, 55.6. HRMS calcd. for: C17H17O4S+ [M+H]+ 317.08421, found 317.08420.

2-(((4-fluorophenyl)sulfonyl)methyl)-1-phenylprop-2-en-1-one (3af)

The reaction was conducted with acetophenone (1a, 23.4 µL, 0.2 mmol) and sodium 4-fluorobenzenesulfinate (2f, 91.0 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 10:1) to yield the desired product 3af as yellow oil. (44.5 mg, 73% yield).

1H NMR (400 MHz, CDCl3) δ 7.94-7.91 (m, 2H), 7.67-7.75 (m, 2H), 7.57 (t, J = 7.4 Hz, 1H), 7.44 (t, J = 7.6 Hz, 2H), 7.18 (t, J = 8.6 Hz, 2H), 6.33 (s, 1H), 6.08 (s, 1H), 4.37 (s, 2H). 13C NMR (100 MHz, CDCl3) δ 194.6, 165.9 (d, J = 255.31 Hz), 136.0, 135.5, 134.9 (d, J = 3.10 Hz), 134.4, 132.7, 131.3 (d, J = 9.58 Hz), 129.5, 128.3, 116.5 (d, J = 22.53 Hz), 57.84. HRMS calcd. for: C16H15FO3SNa+ [M+Na]+ 327.04616, found 327.04535.
2-(((4-chlorophenyl)sulfonyl)methyl)-1-phenylprop-2-en-1-one (3ag)

The reaction was conducted with acetophenone (1a, 23.4 μL, 0.2 mmol) and sodium 4-chlorobenzenesulfinate (2g, 91.0 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 10:1) to yield the desired product 3ag as yellow oil. (60.9 mg, 95% yield).

\[
\begin{align*}
\delta & \text{H NMR (400 MHz, CDCl}_3) \delta 7.85-7.83 (m, 2H), 7.67-7.65 (m, 2H), 7.56-7.55 (m, 1H), 7.50-7.42 (m, 4H), 6.30 (s, 1H), 6.06 (s, 1H), 4.37 (s, 2H). \\
\delta & \text{C NMR (100 MHz, CDCl}_3) \delta 194.5, 140.6, 137.2, 136.0, 135.3, 134.3, 132.7, 129.8, 129.48, 129.45, 128.3, 57.73. \\
\text{HRMS calcd. for: C}_{16}\text{H}_{13}\text{ClO}_3\text{SNa}^+ [M+Na]^+ & \text{ found 343.01630.32.}
\end{align*}
\]

2-(((4-bromophenyl)sulfonyl)methyl)-1-phenylprop-2-en-1-one (3ah)

The reaction was conducted with acetophenone (1a, 23.4 μL, 0.2 mmol) and sodium 4-bromobenzenesulfinate (2h, 139.6 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 10:1) to yield the desired product 3ah as yellow oil. (70.8 mg, 95% yield).

\[
\begin{align*}
\delta & \text{H NMR (400 MHz, CDCl}_3) \delta 7.78-7.75 (m, 2H), 7.67-7.64 (m, 2H), 7.58-7.54 (m, 1H), 7.46-7.42 (m, 2H), 6.30 (s, 1H), 6.06 (s, 1H), 4.37 (s, 2H). \\
\delta & \text{C NMR (100 MHz, CDCl}_3) \delta 194.5, 140.6, 137.8, 135.95, 135.3, 134.3, 132.7, 132.4, 129.8, 129.5, 129.3, 128.3, 57.72. \\
\text{HRMS calcd. for: C}_{16}\text{H}_{13}\text{BrO}_3\text{SNa}^+ [M+Na]^+ & \text{ found 386.96637.}
\end{align*}
\]

1-phenyl-2-(((4-(trifluoromethyl)phenyl)sulfonyl)methyl)prop-2-en-1-one (3ai)

The reaction was conducted with acetophenone (1a, 23.4 μL, 0.2 mmol) and sodium 4-(trifluoromethyl)benzenesulfinate (2i, 116.0 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 10:1) to yield the desired product 3ai as yellow oil. (80.4 mg, 95% yield).

\[
\begin{align*}
\delta & \text{H NMR (400 MHz, CDCl}_3) \delta 7.90-7.83 (m, 2H), 7.67-7.65 (m, 2H), 7.56-7.55 (m, 1H), 7.50-7.42 (m, 4H), 6.30 (s, 1H), 6.06 (s, 1H), 4.37 (s, 2H). \\
\delta & \text{C NMR (100 MHz, CDCl}_3) \delta 194.5, 140.6, 137.8, 135.95, 135.3, 134.3, 132.7, 132.4, 129.8, 129.5, 129.3, 128.3, 57.72. \\
\text{HRMS calcd. for: C}_{16}\text{H}_{13}\text{BrO}_3\text{SNa}^+ [M+Na]^+ & \text{ found 386.96637.}
\end{align*}
\]
chromatography on silica gel (petroleum ether/ethyl acetate = 8:1) to yield the desired product 3ai as white solid.
(55.0 mg, 78% yield), mp = 99–102 °C.

$^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 8.05 (d, $J = 8.2$ Hz, 2H), 7.79 (d, $J = 8.3$ Hz, 2H), 7.66-7.64 (m, 2H), 7.57 (t, $J = 7.5$ Hz, 1H), 7.44 (t, $J = 7.7$ Hz, 2H), 6.35 (s, 1H), 6.10 (s, 1H), 4.40 (s, 2H). $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$
194.5, 142.4, 135.9, 135.1, 134.5, 132.9, 129.5, 129.1, 128.4, 126.3 (q, $J = 3.64$ Hz), 57.76. HRMS calcd. for:
C$_{17}$H$_{13}$F$_3$O$_3$SNa$^+$ [M+Na$^+$] 377.04297, found 377.04233.

2-((naphthalen-1-ylsulfonyl)methyl)-1-phenylprop-2-en-1-one (3aj)

![Structure of 3aj](image)

The reaction was conducted with acetophenone (1a, 23.4 μL, 0.2 mmol) and sodium naphthalene-1-sulfinate (2j, 107.0 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 10:1) to yield the desired product 3aj as white solid. (35.6 mg, 53% yield), mp = 113–116 °C.

$^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 8.81 (d, $J = 8.7$ Hz, 1H), 8.30-8.27 (m, 1H), 8.10 (d, $J = 8.2$ Hz, 1H), 7.96 (d, $J = 8.2$ Hz, 1H), 7.79-7.75 (m, 1H), 7.68-7.62 (m, 3H), 7.57-7.52 (m, 2H), 7.43 (t, $J = 7.6$ Hz, 2H), 6.18 (s, 1H), 5.99 (s, 1H), 4.55 (d, $J = 0.4$ Hz, 2H). $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ 194.8, 136.2, 135.6, 135.5, 134.1, 133.9, 133.8, 132.6, 131.0, 129.7, 129.2, 129.0, 128.9, 128.3, 127.2, 124.1, 57.48. HRMS calcd. for: C$_{20}$H$_{16}$O$_3$SNa$^+$ [M+Na$^+$] 359.07124, found 359.07190.

2-((naphthalen-2-ylsulfonyl)methyl)-1-phenylprop-2-en-1-one (3ak)

![Structure of 3ak](image)

The reaction was conducted with acetophenone (1a, 23.4 μL, 0.2 mmol) and sodium naphthalene-2-sulfinate (2k, 107.0 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 10:1) to yield the desired product 3ak as yellow solid. (38.3 mg, 57% yield), mp = 117–120 °C.

$^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 8.46 (s, 1H), 7.99-7.87 (m, 4H), 7.67-7.58 (m, 4H), 7.51 (t, $J = 7.4$ Hz, 1H), 7.37 (t, $J = 7.7$ Hz, 2H), 6.28 (s, 1H), 6.03 (s, 1H), 4.45 (s, 2H). $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ 194.7, 136.2, 135.6, 135.5, 134.1, 133.9, 133.8, 132.6, 131.0, 129.7, 129.2, 129.0, 128.9, 128.3, 127.2, 124.1, 57.48. HRMS calcd. for:
C_{20}H_{19}O_3S^{+} \text{[M+H]}^+ \text{ 337.08929, found 337.08911.}

1-phenyl-2-((propylsulfonyl)methyl)prop-2-en-1-one (3ai)

![Structure Image]

The reaction was conducted with acetophenone (1a, 23.4 μL, 0.2 mmol) and sodium propane-1-sulfinate (2l, 65.0 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 10:1) to yield the desired product 3ai as yellow oil (12.1 mg, 24% yield).

$^1$H NMR (400 MHz, CDCl$_3$) δ 7.80-7.78 (m, 2H), 7.60 (t, $J$ = 7.4 Hz, 1H), 7.48 (t, $J$ = 7.6 Hz, 2H), 6.43 (s, 1H), 6.13 (s, 1H), 4.20 (s, 2H), 3.01-2.98 (m, 2H), 1.96-1.90 (m, 2H), 1.08 (t, $J$ = 7.4 Hz, 3H). $^{13}$C NMR (100 MHz, CDCl$_3$) δ 195.7, 136.3, 135.7, 134.6, 132.9, 129.7, 128.5, 55.2, 54.9, 15.8, 13.1. HRMS calcd. for: C$_{13}$H$_{17}$O$_3$S$^+$ [M+H]$^+$ 253.08929, found 253.08966.

2-((cyclopropylsulfonyl)methyl)-1-phenylprop-2-en-1-one (3am)

![Structure Image]

The reaction was conducted with acetophenone (1a, 23.4 μL, 0.2 mmol) and sodium cyclopropanesulfinate (2m, 65.0 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 10:1) to yield the desired product 3am as white solid (15.5 mg, 31% yield). mp = 131–134 °C.

$^1$H NMR (400 MHz, CDCl$_3$) δ 7.81-7.79 (m, 2H), 7.61-7.57 (m, 1H), 7.50-7.46 (m, 2H), 6.40 (s, 1H), 6.12 (s, 1H), 4.30 (m, 2H), 2.46-2.40 (m, 1H), 1.27-1.23 (m, 2H), 1.03-0.98 (m, 2H). $^{13}$C NMR (100 MHz, CDCl$_3$) δ 195.4, 136.4, 135.9, 134.3, 132.8, 129.7, 128.5, 55.8, 30.2, 5.2. HRMS calcd. for: C$_{13}$H$_{15}$O$_3$S$^+$ [M+H]$^+$ 251.07364, found 251.07408.

2-((phenylsulfonyl)methyl)-1-(p-tolyl)prop-2-en-1-one(3ba)

![Structure Image]

The reaction was conducted with 1-(p-tolyl)ethanone (1b, 37 μL,, 0.2 mmol) and sodium benzenesulfinate (2a,
82 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 10:1) to yield the desired product 3ba as white solid (51.9 mg, 87% yield), mp = 133-135 °C.

\(^1\)H NMR (400 MHz, CDCl\(_3\), ppm) \(\delta 7.91-7.89\) (m, 2H), 7.59-7.57 (m, 3H), 7.52-7.48 (m, 2H), 7.22 (d, \(J = 8.0\) Hz, 2H), 6.23 (s, 1H), 6.01 (s, 1H), 4.36 (s, 2H), 2.41 (s, 3H). \(^{13}\)C NMR (100 MHz, CDCl\(_3\), ppm) \(\delta 194.4, 143.7, 138.9, 135.8, 134.0, 133.6, 123.0, 129.3, 128.5, 58.0, 21.7\). HRMS calcd. for: \text{C}_{17}\text{H}_{17}\text{O}_{3}\text{S}[\text{M+H}]^+ 301.08929, found 301.08929.

1-(4-(sec-butyl)phenyl)-2-((phenylsulfonyl)methyl)prop-2-en-1-one (3ca)

![Chemical structure of 3ca](image)

The reaction was conducted with 1-(4-(sec-butyl)phenyl)ethanone (1c, 37 \(\mu\)L., 0.2 mmol) and sodium benzenesulfinate (2a, 82 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 10:1) to yield the desired product 3ca as white solid (55.1 mg, 80% yield), mp = 91-93 °C.

\(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta 7.92-7.89\) (m, 2H), 7.61-7.57 (m, 3H), 7.52 – 7.48 (m, 2H), 7.20 (d, \(J = 8.2\) Hz, 2H), 6.22 (s, 1H), 6.02 (s, 1H), 4.37 (d, \(J = 0.5\) Hz, 2H), 2.53 (d, \(J = 7.2\) Hz, 2H), 1.89 (dt, \(J = 13.5, 6.8\) Hz, 1H), 0.91 (d, \(J = 6.6\) Hz, 6H). \(^{13}\)C NMR (100 MHz, CDCl\(_3\)) \(\delta 194.3, 147.2, 138.7, 135.6, 133.8, 133.6, 133.4, 129.7, 129.1, 129.0, 128.3, 57.8, 45.3, 30.0, 22.3\). HRMS calcd. for: \text{C}_{20}\text{H}_{23}\text{O}_{3}\text{S}[\text{M+H}]^+ 343.13624, found 343.13625

1-(4-methoxyphenyl)-2-((phenylsulfonyl)methyl)prop-2-en-1-one (3da)

![Chemical structure of 3da](image)

The reaction was conducted with 1-(4-methoxyphenyl)ethanone (1d, 31 mg,, 0.2 mmol) and sodium benzenesulfinate (2a, 82 mg, 0.5 mmol). The residue was purified by column matography on silica gel (petroleum ether/ethyl acetate = 8:1) to yield the desired product 3da as white solid (50.6 mg, 81% yield), mp = 93-95 °C.

\(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta 7.89\) (d, \(J = 7.4\) Hz, 2H), 7.72 (d, \(J = 8.7\) Hz, 2H), 7.59 (t, \(J = 7.4\) Hz, 1H), 7.50 (t, \(J = 7.7\) Hz, 2H), 6.16 (s, 1H), 5.96 (s, 1H), 4.36 (s, 2H), 3.87 (d, \(J = 0.6\) Hz, 3H). \(^{13}\)C NMR (100 MHz, CDCl\(_3\)) \(\delta \)
193.2, 163.4, 138.8, 135.6, 133.8, 132.3, 132.1, 129.1, 128.5, 128.2, 113.5, 58.2, 55.4. HRMS calcd. for: C_{17}H_{17}O_{4}S [M+H]^+ 317.08421, found 317.08405.

**1-([1,1'-biphenyl]-4-yl)-2-((phenylsulfonyl)methyl)prop-2-en-1-one(3ea)**

The reaction was conducted with 1-([1,1'-biphenyl]-4-yl)ethanone (1e, 39.2 mg, 0.2 mmol) and sodium benzenesulfinate (2a, 82 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 10:1) to yield the desired product 3ea as white solid (55.4 mg, 76% yield), mp = 117–120 °C.

$^1$H NMR (400 MHz, CDCl3) δ 7.92 (dd, J = 5.2, 3.3 Hz, 2H), 7.80-7.71 (m, 2H), 7.67-7.57 (m, 5H), 7.54-7.38 (m, 5H), 6.27 (s, 1H), 6.08 (s, 1H), 4.39 (s, 2H). $^{13}$C NMR (100 MHz, CDCl3) δ 194.2, 145.4, 139.7, 138.8, 135.7, 134.7, 133.9, 133.6, 130.2, 129.2, 128.9, 128.3, 128.2, 127.2, 126.9, 57.8. HRMS calcd. for: C_{22}H_{18}O_{3}S+ [M+H]^+ 363.10494, found 363.10483.

**1-(4-nitrophenyl)-2-((phenylsulfonyl)methyl)prop-2-en-1-one(3fa)**

The reaction was conducted with 1-(4-nitrophenyl)ethanone (1f, 33 mg, 0.2 mmol) and sodium benzenesulfinate (2a, 82 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 6:1) to yield the desired product 3fa as Yellow solid (36.1 mg, 54% yield), mp = 172-175 °C.

$^1$H NMR (400 MHz, CDCl3) δ 8.33-8.27 (m, 2H), 7.93 (d, J = 8.0 Hz, 2H), 7.86-7.80 (m, 2H), 7.66 (dd, J = 11.5, 4.3 Hz, 1H), 7.57 (t, J = 7.7 Hz, 2H), 6.38 (s, 1H), 6.02 (s, 1H), 4.37 (s, 2H). $^{13}$C NMR (100 MHz, CDCl3) δ 193.2, 150.0, 141.5, 138.8, 135.5, 135.0, 134.1, 130.4, 129.3, 128.2, 123.5, 57.4. HRMS calcd. for: C_{16}H_{13}NO_{3}SNa^+ [M+Na]^+ 354.04066, found 354.04080.
4-(2-((phenylsulfonyl)methyl)acryloyl)benzonitrile (3ga)

\[
\begin{align*}
\text{NC} & \\
\text{O} & \\
\text{O} & \\
\text{O} & \\
\end{align*}
\]

The reaction was conducted with 4-acetylbenzonitrile (1g, 33 mg, 0.2 mmol) and sodium benzenesulfinate (2a, 82 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 6:1) to yield the desired product 3ga as Yellow solid (36.1 mg, 54% yield), mp = 156-159 °C.

\(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta 7.92\) (d, \(J = 8.3\) Hz, 2H), 7.80-7.73 (m, 4H), 7.68-7.63 (m, 1H), 7.56 (t, \(J = 7.8\) Hz, 2H), 6.34 (s, 1H), 6.00 (s, 1H), 4.36 (s, 2H). \(^{13}\)C NMR (100 MHz, CDCl\(_3\)) \(\delta 193.3, 139.8, 138.8, 135.4, 134.7, 134.1, 132.1, 129.9, 129.3, 128.2, 117.8, 115.9, 57.5\). HRMS calcd. for: C\(_{17}\)H\(_{13}\)NO\(_3\)SNa\(^+\) [M+Na]+ 334.05084, found 334.05081.

1-(4-fluorophenyl)-2-((phenylsulfonyl)methyl)prop-2-en-1-one (3ha)

\[
\begin{align*}
\text{F} & \\
\text{O} & \\
\text{O} & \\
\text{O} & \\
\end{align*}
\]

The reaction was conducted with 1-(4-fluorophenyl)ethanone (1h, 24 \(\mu\)L, 0.2 mmol) and sodium benzenesulfinate (2a, 82 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 10:1) to yield the desired product 3ha as White solid (50 mg, 82% yield), mp = 108-111 °C.

\(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta 7.95-7.88\) (m, 2H), 7.78-7.69 (m, 2H), 7.65-7.58 (m, 1H), 7.56-7.49 (m, 2H), 7.12 (dd, \(J = 9.5, 7.8\) Hz, 2H), 6.24 (s, 1H), 5.99 (s, 1H), 4.36 (d, \(J = 0.7\) Hz, 2H). \(^{13}\)C NMR (100 MHz, CDCl\(_3\)) \(\delta 193.2, 165.4\) (d, \(J = 253.09\) Hz), 138.7, 135.5, 133.9, 133.4, 132.24365 (d, \(J = 9.13\) Hz), 132.2436, 129.2, 128.2, 115.5 (d, \(J = 21.81\) Hz), 57.92. HRMS calcd. for: C\(_{16}\)H\(_{14}\)FO\(_3\)S \([M+H]^+\) 305.06422, found 305.06445.

1-(4-chlorophenyl)-2-((phenylsulfonyl)methyl)prop-2-en-1-one (3ia)

\[
\begin{align*}
\text{Cl} & \\
\text{O} & \\
\text{O} & \\
\text{O} & \\
\end{align*}
\]

The reaction was conducted with 1-(4-chlorophenyl)ethanone (1i, 26 \(\mu\)L, 0.2 mmol) and sodium benzenesulfinate (2a, 82 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel
(petroleum ether/ethyl acetate = 10:1) to yield the desired product 3ia as White solid (44.0 mg, 69% yield), mp = 124-127 °C.

1H NMR (400 MHz, CDCl₃) δ 7.92-7.89 (m, 2H), 7.66-7.61 (m, 3H), 7.53 (t, J = 7.6 Hz, 2H), 7.43-7.41 (m, 2H), 6.28 (s, 1H), 6.00 (s, 1H), 4.35 (s, 2H). 13C NMR (100 MHz, CDCl₃) δ 193.5, 139.2, 138.8, 135.5, 134.4, 134.0, 133.8, 131.0, 129.2, 128.7, 128.3, 57.8. HRMS calcd. for: C₁₆H₁₄ClO₃S⁺ [M+H]⁺ 321.03467, found 321.03497.

1-(4-bromophenyl)-2-((phenylsulfonyl)methyl)prop-2-en-1-one (3ja)

![Structure](image)

The reaction was conducted with 1-(4-bromophenyl)ethanone (1j, 39.8 mg, 0.2 mmol) and sodium benzenesulfinate (2a, 82 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 10:1) to yield the desired product 3ja as White solid (56.9 mg, 78% yield), mp = 130 -132 °C.

1H NMR (400 MHz, CDCl₃) δ 7.91 (d, J = 7.7 Hz, 2H), 7.64-7.51 (m, 7H), 6.28 (s, 1H), 6.00 (s, 1H), 4.35 (s, 2H). 13C NMR (100 MHz, CDCl₃) δ 193.7, 138.83, 138.79, 135.51, 135.48, 134.8, 134.02, 134.00, 133.9, 133.8, 131.7, 131.1, 129.3, 128.3, 127.8, 77.3, 77.0, 76.6, 57.8. HRMS calcd. for: C₁₆H₁₄BrO₃S⁺ [M+H]⁺ 364.98415, found 364.98410.

1-(4-iodophenyl)-2-((phenylsulfonyl)methyl)prop-2-en-1-one (3ka)

![Structure](image)

The reaction was conducted with 1-(4-iodophenyl)ethanone (1k, 49.2 mg, 0.2 mmol) and sodium benzenesulfinate (2a, 82 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 10:1) to yield the desired product 3ka as White solid (26.1 mg, 31% yield), mp = 103-106 °C.

1H NMR (400 MHz, CDCl₃) δ 7.91-7.89 (m, 2H), 7.81 (d, J = 8.4 Hz, 2H), 7.62 (t, J = 7.5 Hz, 1H), 7.53 (t, J = 7.6 Hz, 2H), 7.40 (d, J = 8.4 Hz, 2H), 6.28 (s, 1H), 6.00 (s, 1H), 4.35 (s, 2H). 13C NMR (100 MHz, CDCl₃) δ
193.5, 139.2, 138.8, 134.4, 134.0, 133.8, 131.1, 129.3, 128.7, 128.3, 57.8. HRMS calcd. for: C_{16}H_{14}IO_{3}S^{+} [M+H]^{+} 412.97028, found 412.97052.

2-((phenylsulfonyl)methyl)-1-(m-tolyl)prop-2-en-1-one (3la)

\[
\begin{align*}
\text{O} & \\
\text{O} & \\
\text{O} & \\
\end{align*}
\]

The reaction was conducted with 1-(m-tolyl)ethanone (1l, 27 \mu L, 0.2 mmol) and sodium benzenesulfinate (2a, 82 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 10:1) to yield the desired product 3la as Yellow oil. (50 mg, 83% yield).

\(^{1}\text{H NMR (400 MHz, CDCl}_3\text{)} \delta 7.94-7.86 (m, 2H), 7.63-7.57 (m, 1H), 7.55-7.48 (m, 2H), 7.46-7.40 (m, 2H), 7.37-7.28 (m, 2H), 6.27 (s, 1H), 6.03 (s, 1H), 4.37 (d, J = 0.6 Hz, 2H), 2.38 (s, 3H). \(^{13}\text{C NMR (100 MHz, CDCl}_3\text{)} \delta 194.8, 138.8, 138.1, 136.1, 135.7, 134.1, 133.9, 133.3, 129.9, 129.1, 128.3, 128.0, 126.8, 57.6, 21.2. HRMS calcd. for: C_{17}H_{16}O_{3}SNa^{+} [M+Na]^{+} 323.07124, found 323.07123.

1-(3-methoxyphenyl)-2-((phenylsulfonyl)methyl)prop-2-en-1-one (3ma)

\[
\begin{align*}
\text{O} & \\
\text{O} & \\
\text{O} & \\
\end{align*}
\]

The reaction was conducted with 1-(3-methoxyphenyl)ethanone (1m, 27.5 \mu L, 0.2 mmol) and sodium benzenesulfinate (2a, 82 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 9:1) to yield the desired product 3ma as Yellow oil. (50 mg, 79% yield).

\(^{1}\text{H NMR (400 MHz, CDCl}_3\text{)} \delta 7.92-7.90 (m, 2H), 7.63-7.59 (m, 1H), 7.52 (t, J = 7.6 Hz, 2H), 7.33 (t, J = 7.9 Hz, 1H), 7.23-7.21 (m, 1H), 7.17-7.16 (m, 1H), 7.09-7.07 (m, 1H), 6.25 (s, 1H), 6.05 (s, 1H), 4.37 (s, 2H), 3.83 (s, 3H). \(^{13}\text{C NMR (100 MHz, CDCl}_3\text{)} \delta 194.4, 159.4, 138.7, 137.4, 135.6, 134.2, 133.9, 129.18, 129.15, 128.31, 122.2, 118.9, 114.0, 57.6, 55.4. HRMS calcd. for: C_{17}H_{17}O_{4}S^{+} [M+H]^{+} 317.08421, found 317.08441.
2-((phenylsulfonyl)methyl)-1-(3-(trifluoromethyl)phenyl)prop-2-en-1-one (3na)

The reaction was conducted with 1-(3-(trifluoromethyl)phenyl)ethanone (1n, 30.5 µL, 0.2 mmol) and sodium benzenesulfinate (2a, 82 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 9:1) to yield the desired product 3na as Yellow oil. (50 mg, 71% yield).

$^1$H NMR (400 MHz, CDCl$_3$) δ 7.93-7.91 (m, 2H), 7.88-7.87 (m, 2H), 7.81 (d, J = 7.6 Hz, 1H), 7.64-7.52 (m, 4H), 6.30 (s, 1H), 5.99 (s, 1H), 4.39 (s, 2H). $^{13}$C NMR (100 MHz, CDCl$_3$) δ 193.3, 138.6, 136.8, 135.5, 134.4, 134.1, 132.7, 129.3, 129.1, 129.0, 128.3, 126.2 (q, J = 3.80 Hz), 124.9, 122.2, 57.6. HRMS calcd. for: C$_{17}$H$_{14}$F$_{3}$O$_3$S$^+$ [M+H]$^+$ 355.06103, found 355.06116.

1-(3-fluorophenyl)-2-((phenylsulfonyl)methyl)prop-2-en-1-one (3oa)

The reaction was conducted with 1-(3-fluorophenyl)ethanone (1o, 24.5 µL, 0.2 mmol) and sodium benzenesulfinate (2a, 82 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 9:1) to yield the desired product 3oa as Yellow oil. (48 mg, 79% yield).

$^1$H NMR (400 MHz, CDCl$_3$) δ 7.92-7.90 (m, 2H), 7.63 (t, J = 7.4 Hz, 1H), 7.54 (t, J = 7.6 Hz, 2H), 7.47-7.41 (m, 2H), 7.35-7.32 (m, 1H), 7.28-7.23 (m, 1H), 6.29 (s, 1H), 6.04 (s, 1H), 4.36 (s, 2H). $^{13}$C NMR (100 MHz, CDCl$_3$) δ 193.3, 162.3 (d, J = 246.93 Hz), 138.7, 138.1 (d, J = 6.46 Hz), 135.1, 134.3, 134.0, 130.0 (d, J = 7.66 Hz), 129.2, 128.3, 125.3 (d, J = 2.95 Hz), 119.7 (d, J = 21.20 Hz), 116.3 (d, J = 22.59 Hz), 57.6. HRMS calcd. for: C$_{16}$H$_{13}$FO$_3$SNa$^+$ [M+Na]$^+$ 327.04616, found 327.04616.

1-(3-bromophenyl)-2-((phenylsulfonyl)methyl)prop-2-en-1-one (3pa)

The reaction was conducted with 1-(3-bromophenyl)ethanone (1p, 26.5 µL, 0.2 mmol) and sodium benzenesulfinate (2a, 82 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel
(petroleum ether/ethyl acetate = 9:1) to yield the desired product 3pa as White oil. (51.7 mg, 71% yield).

$^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.92-7.90 (m, 2H), 7.74-7.73 (m, 1H), 7.69-7.52 (m, 5H), 7.32 (t, $J = 7.8$ Hz, 1H), 6.29 (s, 1H), 6.02 (s, 1H), 4.36 (s, 2H). $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ 193.2, 138.6, 137.9, 135.5, 135.4, 134.4, 134.0, 132.2, 129.9, 129.2, 128.3, 128.1, 122.5, 57.5. HRMS calcd. for: C$_{16}$H$_{14}$BrO$_3$S$^+$ [M+H]$^+$ 364.98415, found 364.98428;

2-((phenylsulfonyl)methyl)-1-(o-tolyl)prop-2-en-1-one (3qa)

![Chemical Structure of 2-((phenylsulfonyl)methyl)-1-(o-tolyl)prop-2-en-1-one (3qa)](image)

The reaction was conducted with 1-(o-tolyl)ethanone (1q, 26.1 $\mu$L, 0.2 mmol) and sodium benzenesulfinate (2a, 82 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 10:1) to yield the desired product 3qa as White solid. (47.2 mg, 79% yield). mp = 148-151 °C.

$^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.96-7.93 (m, 2H), 7.67-7.63 (m, 1H), 7.58-7.55 (m, 2H), 7.35-7.31 (m, 1H), 7.22-7.12 (m, 3H), 6.41 (s, 1H), 6.00 (s, 1H), 4.37 (s, 2H), 2.18 (s, 3H). $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ 196.7, 138.9, 137.0, 136.8, 136.71, 136.68, 133.9, 131.0, 130.4, 129.2, 128.5, 128.2, 125.0, 55.5, 19.5. HRMS calcd. for: C$_{17}$H$_{17}$O$_3$S$^+$ [M+H]$^+$ 301.08929, found 301.08908.

1-(2-nitrophenyl)-2-((phenylsulfonyl)methyl)prop-2-en-1-one (3ra)

![Chemical Structure of 1-(2-nitrophenyl)-2-((phenylsulfonyl)methyl)prop-2-en-1-one (3ra)](image)

The reaction was conducted with 1-(2-nitrophenyl)ethanone (1r, 26.6 $\mu$L, 0.2 mmol) and sodium benzenesulfinate (2a, 82 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 8:1) to yield the desired product 3ra as White solid (43.1 mg, 65% yield). mp = 137-140 °C.

$^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 8.18-8.16 (m, 1H), 7.98-7.96 (m, 2H), 7.75-7.58 (m, 5H), 7.28-7.26 (m, 1H), 6.45 (s, 1H), 5.87 (s, 1H), 4.37 (s, 2H). $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ 192.06, 146.32, 138.72, 136.16, 135.78, 134.53, 134.10, 134.00, 130.78, 129.17, 128.76, 128.46, 124.49, 77.32, 77.00, 76.68, 55.10. HRMS calcd. for: C$_{16}$H$_{13}$NO$_5$S$^+$ [M+H]$^+$ 332.05872, found 332.05869.
1-(2-fluorophenyl)-2-((phenylsulfonyl)methyl)prop-2-en-1-one (3sa)

![Chemical Structure Image]

The reaction was conducted with 1-(2-fluorophenyl)ethanone (1s, 24 μL, 0.2 mmol) and sodium benzenesulfinate (2a, 82 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 9:1) to yield the desired product 3s as yellow solid. (37.0 mg, 61% yield). mp = 92 - 96 °C.

$^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.93 (d, $J = 7.8$ Hz, 2H), 7.64 (t, $J = 7.4$ Hz, 1H), 7.55 (t, $J = 7.6$ Hz, 2H), 7.50-7.45 (m, 1H), 7.31-7.27 (m, 1H), 7.19 (t, $J = 7.5$ Hz, 1H), 7.13-7.08 (m, 1H), 6.40 (s, 1H), 6.11-6.10 (m, 1H), 4.34 (s, 2H). $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ 191.5, 159.6 ($J$ = 251.18 Hz), 136.6, 136.5 ($J$ = 12.20 Hz), 136.4, 133.9, 133.1 (d, $J = 8.28$ Hz), 130.4 (d, $J = 2.72$ Hz), 129.1, 128.6, 125.3 (d, $J = 14.76$ Hz), 124.2 (d, $J = 3.60$ Hz), 116.2 (d, $J = 21.44$ Hz), 55.94. HRMS calcd. for: C$_{16}$H$_{14}$FO$_3$S $^+$ [M+H]$^+$ 305.06422, found 305.06430.

1-(2-chlorophenyl)-2-((phenylsulfonyl)methyl)prop-2-en-1-one (3ta)

![Chemical Structure Image]

The reaction was conducted with 1-(2-chlorophenyl)ethanone (1t, 26 μL, 0.2 mmol) and sodium benzenesulfinate (2a, 82 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 10:1) to yield the desired product 3ta as white solid (53.7 mg, 84% yield). mp = 115-118 °C.

$^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.95-7.92 (m, 2H), 7.68-7.64 (m, 1H), 7.59-7.55 (m, 2H), 7.38-7.37 (m, 2H), 7.31-7.27 (m, 1H), 7.12-7.10 (m, 1H), 6.50 (s, 1H), 6.03 (s, 1H), 4.36 (s, 2H). $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ 193.5, 138.6, 137.8, 136.8, 136.1, 133.9, 131.2, 131.0, 130.0, 129.1, 128.9, 128.5, 126.45, 55.0. HRMS calcd. for: C$_{16}$H$_{14}$ClO$_3$S $^+$ [M+H]$^+$ 321.03467, found 321.03442.
**1-(2,4-dimethylphenyl)-2-((phenylsulfonyl)methyl)prop-2-en-1-one (3ua)**

![Structure of 3ua](image)

The reaction was conducted with 1-(2,4-dimethylphenyl)ethanone (1u, 30 μL, 0.2 mmol) and sodium benzenesulfinate (2a, 82 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 10:1) to yield the desired product 3ua as white solid (50.4 mg, 81% yield). mp = 146-149 °C.

\[ ^1H\text{ NMR (400 MHz, CDCl}_3\] \( \delta \) 7.93 (d, \( J = 8.0 \) Hz, 2H), 7.63 (t, \( J = 7.4 \) Hz, 1H), 7.55 (t, \( J = 7.3 \) Hz, 2H), 7.07 (d, \( J = 7.7 \) Hz, 1H), 7.02-6.97 (m, 2H), 6.37-6.36 (s, 1H), 5.99 (s, 1H), 4.36 (s, 2H), 2.33 (s, 3H), 2.17 (s, 3H). \[ ^13C\text{ NMR (100 MHz, CDCl}_3\] \( \delta \) 196.4, 140.8, 138.9, 137.1, 137.1, 136.0, 133.9, 133.8, 131.9, 129.1, 128.9, 128.5, 125.6, 55.8, 21.3, 19.6. HRMS calcd. for: C\textsubscript{18}H\textsubscript{19}O\textsubscript{3}S\textsuperscript{+} [M+H]\textsuperscript{+} 315.10494, found 315.10519.

**1-(2,5-dichlorophenyl)-2-((phenylsulfonyl)methyl)prop-2-en-1-one (3va)**

![Structure of 3va](image)

The reaction was conducted with 1-(2,5-dichlorophenyl)ethanone (1v, 37.8 mg, 0.2 mmol) and sodium benzenesulfinate (2a, 82 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 10:1) to yield the desired product 3va as yellow solid. (53.0 mg, 75% yield). mp = 124-127 °C.

\[ ^1H\text{ NMR (400 MHz, CDCl}_3\] \( \delta \) 7.94-7.92 (m, 2H), 7.68 (t, \( J = 7.4 \) Hz, 1H), 7.59 (t, \( J = 7.6 \) Hz, 2H), 7.34-7.33 (m, 2H), 7.01 (d, \( J = 2.2 \) Hz, 1H), 6.56 (s, 1H), 6.05 (s, 1H), 4.34 (s, 2H). \[ ^13C\text{ NMR (100 MHz, CDCl}_3\] \( \delta \) 192.1, 138.6, 138.19, 138.17, 135.9, 134.1, 132.8, 131.3, 131.2, 129.3, 129.2, 128.7, 128.6, 54.94. HRMS calcd. for: C\textsubscript{16}H\textsubscript{13}Cl\textsubscript{2}O\textsubscript{3}S\textsuperscript{+} [M+H]\textsuperscript{+} 354.99570, found 354.99600.

**1-(3,4-dimethoxyphenyl)-2-((phenylsulfonyl)methyl)prop-2-en-1-one (3wa)**

![Structure of 3wa](image)

The reaction was conducted with 1-(3,4-dimethoxyphenyl)ethanone (1w, 30 μL, 0.2 mmol) and sodium
benzenesulfinate (2a, 82 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 6:1) to yield the desired product 3wa as white solid (50.5 mg, 75% yield). mp = 135-138 °C.

1H NMR (400 MHz, CDCl₃) δ 7.90 (d, J = 7.6 Hz, 2H), 7.60 (t, J = 7.3 Hz, 1H), 7.51 (t, J = 7.7 Hz, 2H), 7.40 (dd, J = 8.3, 1.0 Hz, 1H), 7.31 (s, 1H), 6.88 (d, J = 8.4 Hz, 1H), 6.15 (s, 1H), 5.98 (s, 1H), 4.37 (s, 2H), 3.95 (s, 3H), 3.91 (s, 3H). 13C NMR (100 MHz, CDCl₃) δ 193.3, 153.2, 148.8, 138.7, 135.4, 133.8, 132.2, 129.1, 128.6, 128.2, 125.0, 111.6, 109.6, 58.4, 56.0, 55.9. HRMS calcd. for: C₁₈H₁₉O₅S+ [M+H]+ 347.09477, found 347.09488.

1-(naphthalen-1-yl)-2-((phenylsulfonyl)methyl)prop-2-en-1-one (3xa)

![Image]

The reaction was conducted with 1-(naphthalen-1-yl)ethanone (1x, 30.4 µL, 0.2 mmol) and sodium benzenesulfinate (2a, 82 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 10:1) to yield the desired product 3xa as white solid. (55.8 mg, 84% yield). mp = 127-130 °C.

1H NMR (400 MHz, CDCl₃) δ 7.99-7.93 (m, 3H), 7.88-7.85 (m, 1H), 7.77-7.75 (m, 1H), 7.69-7.65 (m, 1H), 7.60-7.56 (m, 2H), 7.53-7.43 (m, 4H), 6.42 (s, 1H), 6.06 (s, 1H), 4.47 (s, 2H). 13C NMR (100 MHz, CDCl₃) δ 196.0, 138.8, 137.4, 137.0, 134.5, 133.9, 133.5, 131.4, 130.6, 129.2, 128.5, 128.3, 127.4, 127.3, 126.5, 125.1, 124.1, 55.78. HRMS calcd. for: C₂₀H₁₇O₃S+ [M+H]+ 337.08929, found 337.08929.

1-(naphthalen-2-yl)-2-((phenylsulfonyl)methyl)prop-2-en-1-one (3ya)

![Image]

The reaction was conducted with 1-(naphthalen-2-yl)ethanone (1y, 34.0 mg, 0.2 mmol) and sodium benzenesulfinate (2a, 82 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 10:1) to yield the desired product 3ya as white solid. (52.8 mg, 79% yield). mp
= 94-95 °C.

$^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 8.17 (s, 1H), 7.95-7.92 (m, 3H), 7.87 (d, $J = 8.4$ Hz, 2H), 7.75-7.72 (m, 1H), 7.62-7.54 (m, 3H), 7.50 (t, $J = 7.5$ Hz, 2H), 6.32 (s, 1H), 6.10 (s, 1H), 4.43 (s, 2H). $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ 194.5, 138.7, 135.7, 135.2, 134.0, 133.9, 133.2, 132.0, 131.3, 129.3, 129.2, 128.4, 128.3, 127.3, 127.7, 126.9, 125.2, 57.80. HRMS calcd. for: C$_{20}$H$_{17}$O$_3$S$^+$ [M+H]$^+$ 337.08929, found 337.08929.

1-(furan-2-yl)-2-((phenylsulfonyl)methyl)prop-2-en-1-one (3za)

The reaction was conducted with 1-(furan-2-yl)ethanone (1z, 20.0 µL, 0.2 mmol) and sodium benzenesulfinate (2a, 82 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 8:1) to yield the desired product 3za as white solid (36.5 mg, 66% yield). mp = 153-156 °C.

$^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.86-7.84 (m, 2H), 7.63 (m, 1H), 7.60-7.56 (m, 1H), 7.49-7.45 (m, 2H), 7.14 (d, $J = 3.6$ Hz, 1H), 6.55-6.53 (m, 1H), 6.42 (s, 1H), 6.17 (s, 1H), 4.31 (s, 2H). $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ 180.1, 151.1, 147.3, 138.4, 135.3, 133.9, 132.4, 129.0, 128.5, 120.5, 112.2, 57.87. HRMS calcd. for: C$_{14}$H$_{12}$O$_4$SNa$^+$ [M+Na]$^+$ 299.03485, found 299.03500.

2-((phenylsulfonyl)methyl)-1-(thiophen-2-yl)prop-2-en-1-one (3aaa)

The reaction was conducted with 1-(thiophen-2-yl)ethanone (1aa, 21.6 µL, 0.2 mmol) and sodium benzenesulfinate (2a, 82 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 9:1) to yield the desired product 3aaa as white solid (45.7 mg, 78% yield). mp = 124-127 °C.

$^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.86 (d, $J = 8.0$ Hz, 2H), 7.68 (d, $J = 4.9$ Hz, 1H), 7.63-7.62 (m, 1H), 7.58 (t, $J = 7.4$ Hz, 1H), 7.47 (t, $J = 7.7$ Hz, 2H), 7.13 (t, $J = 4.3$ Hz, 1H), 6.21 (m, 1H), 6.10 (m, 1H), 4.33 (s, 2H). $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ 185.8, 141.7, 138.3, 135.9, 134.7, 134.6, 133.9, 131.5, 129.1, 128.4, 127.9, 58.3. HRMS calcd. for: calcd for C$_{14}$H$_{13}$O$_3$S$_2^+$ [M+H]$^+$ 293.03006, found 293.03040.
2-((phenylsulfonyl)methyl)-1-(pyridin-3-yl)prop-2-en-1-one (3aba)

The reaction was conducted with 1-(pyridin-3-yl)ethanone (1ab, 22.0 μL, 0.2 mmol) and sodium benzenesulfinate (2a, 82 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 5:1) to yield the desired product 3aba as yellow oil (20.2 mg, 35% yield).

1H NMR (400 MHz, CDCl3) δ 8.87 (s, 1H), 8.79-8.78 (m, 1H), 8.01-7.99 (m, 1H), 7.93-7.90 (m, 2H), 7.66-7.62 (m, 1H), 7.57-7.53 (m, 2H), 7.44-7.40 (m, 1H), 6.33 (s, 1H), 6.05 (s, 1H), 4.38 (m, 2H). 13C NMR (100 MHz, CDCl3) δ 193.0, 153.1, 150.3, 138.5, 137.0, 135.7, 134.6, 131.8, 129.3, 128.3, 123.3, 57.39. HRMS calcd. for: C15H14NO3S+ [M+H]+ 288.06889, found 288.06894.

1-cyclopropyl-2-((phenylsulfonyl)methyl)prop-2-en-1-one (3aca)

The reaction was conducted with 1-cyclopropylethanone (1ac, 20.0 μL, 0.2 mmol) and sodium benzenesulfinate (2a, 82 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 10:1) to yield the desired product 3aca as white solid (41.9 mg, 35% yield), mp = 99-101 °C.

1H NMR (400 MHz, CDCl3) δ 7.85-7.83 (m, 2H), 7.63 (t, J = 7.4 Hz, 1H), 7.52 (t, J = 7.7 Hz, 2H), 6.52 (s, 1H), 6.27 (s, 1H), 4.20 (s, 2H), 2.32-2.26 (m, 1H), 0.87-0.82 (m, 4H). 13C NMR (100 MHz, CDCl3) δ 198.4, 138.5, 137.3, 133.7, 131.5, 128.9, 128.6, 56.2, 15.8, 11.7. HRMS calcd. for: C13H14O3S+ [M+H]+ 251.07364, found 251.07402.

3-((phenylsulfonyl)methyl)chroman-4-one (5aa)

The reaction was conducted with 1-(2-hydroxyphenyl)ethanone (4a, 24.0 μL, 0.2 mmol) and sodium benzenesulfinate (2a, 82 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 10:1) to yield the desired product 5aa as white solid (42.7 mg, 71% yield), mp
= 108–111 °C.

$^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.97 (d, $J$ = 7.4 Hz, 2H), 7.84-7.82 (m, 1H), 7.69 (t, $J$ = 7.4 Hz, 1H), 7.60 (t, $J$ = 7.6 Hz, 2H), 7.52-7.48 (m, 1H), 7.04-6.99 (m, 2H), 5.02-4.09 (m, 1H), 4.35 (t, $J$ = 11.8 Hz, 1H), 4.01-4.00 (m, 1H), 3.45-3.38 (m, 1H), 3.04-2.98 (m, 1H). $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ 189.9, 161.6, 138.7, 136.5, 134.2, 129.5, 127.9, 127.5, 121.7, 119.9, 118.0, 69.5, 51.6, 40.7. HRMS calcd. for: C$_{16}$H$_{14}$O$_4$SNa$^+$ [M+Na]$^+$ 325.05050, found 325.05023.

6-fluoro-3-((phenylsulfonyl)methyl)chroman-4-one (5ba)

![6-fluoro-3-((phenylsulfonyl)methyl)chroman-4-one (5ba)](image)

The reaction was conducted with 1-(5-fluoro-2-hydroxyphenyl)ethanone (4b, 31.0 mg, 0.2 mmol) and sodium benzenesulinate (2a, 82 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 8:1) to yield the desired product 5ba as white solid. (33.5 mg, 55% yield), mp = 141–144 °C.

$^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.98 - 7.96 (m, 2H), 7.72 - 7.70 (m, 1H), 7.63 – 7.60 (m, 1H), 7.49 – 7.46 (m, 1H), 7.26-7.21 (m, 1H), 7.01 - 6.98 (m, 1H), 5.03 - 4.99 (m, 1H), 4.34 (t, $J$ = 11.9 Hz, 1H), 3.98 - 3.94 (m, 1H), 3.46 - 3.39 (m, 1H), 3.04- 2.98 (m, 1H). $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ 188.8, 160.6, 139.2, 138.9, 134.3, 129.9, 129.6, 128.0, 121.2, 120.1, 114.5, 51.6, 40.6. HRMS calcd. for: C$_{16}$H$_{14}$FO$_4$S$^+$ [M+H]$^+$ 321.05913, found 321.05902.

6-bromo-3-((phenylsulfonyl)methyl)chroman-4-one (5ca)

![6-bromo-3-((phenylsulfonyl)methyl)chroman-4-one (5ca)](image)

The reaction was conducted with 1-(5-bromo-2-hydroxyphenyl)ethanone (4c, 43.0 mg, 0.2 mmol) and sodium benzenesulinate (2a, 82 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 8:1) to yield the desired product 5ca as white solid. (29.2 mg, 39% yield), mp = 178–181 °C.

$^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.98-7.93 (m, 3H), 7.70 (t, $J$ = 7.4 Hz, 1H), 7.63-7.56 (m, 3H), 6.91 (d, $J$ = 8.9
**7-methoxy-3-((phenylsulfonyl)methyl)chroman-4-one (5da)**

The reaction was conducted with 1-(2-hydroxy-4-methoxyphenyl)ethanone (4d, 33.2 mg, 0.2 mmol) and sodium benzenesulfinate (2a, 82 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 6:1) to yield the desired product 5da as white solid. (40.6 mg, 61% yield), mp = 241 - 244 °C.

$^1$H NMR (400 MHz, CDCl$_3$) δ 7.98-7.96 (m, 2H), 7.77 (d, $J = 8.9$ Hz, 1H), 7.71-7.67 (m, 1H), 7.60 (t, $J = 7.6$ Hz, 2H), 6.59-6.57 (m, 1H), 6.43 (d, $J = 2.4$ Hz, 1H), 5.02-4.98 (m, 1H), 4.35 (t, $J = 11.6$ Hz, 1H), 4.01-3.97 (m, 1H), 3.84 (s, 3H), 3.39-3.32 (m, 1H), 3.02-2.96 (m, 1H).  $^{13}$C NMR (100 MHz, CDCl$_3$) δ 188.4, 166.4, 163.7, 138.9, 134.1, 129.5, 129.3, 128.0, 113.8, 110.6, 100.7, 69.9, 55.7, 51.9, 40.4. HRMS calcd. for: C$_{17}$H$_{17}$O$_5$S$^+$ [M+H]$^+$ 333.07912, found 333.07956.

**3-((phenylsulfonyl)methyl)-2H-benzo[h]chromen-4(3H)-one (5ea)**

The reaction was conducted with 1-(1-hydroxynaphthalen-2-yl)ethanone (4e, 37.0 mg, 0.2 mmol) and sodium benzenesulfinate (2a, 82 mg, 0.5 mmol). The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 10:1) to yield the desired product 5ea as yellow solid. (24.9 mg, 61% yield), mp = 164–167 °C.

$^1$H NMR (400 MHz, CDCl$_3$) δ 8.31 (d, $J = 8.3$ Hz, 1H), 8.01-8.00 (m, 2H), 7.78 (d, $J = 8.7$ Hz, 2H), 7.72-7.54 (m, 5H), 7.40 (d, $J = 8.7$ Hz, 1H), 5.31-5.27 (m, 1H), 4.56 (t, $J = 11.8$ Hz, 1H), 4.07-4.03 (m, 1H), 3.55-3.48 (m, 1H), 3.11-3.04 (m, 1H). $^{13}$C NMR (100 MHz, CDCl$_3$) δ 189.4, 160.2, 138.9, 137.6, 134.2, 130.1, 129.6, 128.0,
127.8, 126.5, 124.6, 123.5, 121.8, 121.5, 114.5, 70.3, 52.0, 40.2. HRMS calcd. for: C_{20}H_{16}O_4SNa [M+Na]^+ 375.06615, found 375.06622.

2-methyl-1-phenyl-3-(phenylsulfonyl)propan-1-one (7a)

![Chemical structure of 7a]

A 10 mL oven-dried reaction vessel was charged with 1-phenyl-2-((phenylsulfonyl)methyl)prop-2-en-1-one (3aa) (57.2 mg, 0.2 mmol), Sodium borohydride (3.8 mg, 0.1 mmol), NMP (1.0 mL) and trifluoroacetic acid (14.9 μL, 0.2 mmol) under air. The sealed reaction vessel was stirred at rt for 1.0 h. Then, the reaction was diluted with ethyl acetate (5 mL) and washed with saturated sodium chloride solution. The organic layer was separated, and the aqueous layer was extracted with ethyl acetate for three times. The combined organic layer was dried over magnesium sulfate and the volatiles were removed under reduced pressure. The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 8:1) to yield the desired product 7a as yellow solid (31.7 mg, 55% yield).

1H NMR (400 MHz, CDCl₃) δ 7.92-7.86 (m, 4H), 7.92-7.86 (m, 2H), 7.52-7.46(m, 4H), 4.21-4.17(m, 1H), 3.94-3.87(m, 1H), 3.21-3.16(m, 1H), 1.35 (d, J = 7.2 Hz, 3H). 13C NMR (100 MHz, CDCl₃) δ 200.0, 139.4, 134.8, 133.8, 133.6, 129.3, 128.8, 128.5, 127.9, 58.5, 35.5, 18.7.

1-phenyl-3-(phenylsulfonyl)-2-((phenylsulfonyl)methyl)propan-1-one (8a)

![Chemical structure of 8a]

A 10 mL oven-dried reaction vessel was charged with 1-phenyl-2-((phenylsulfonyl)methyl)prop-2-en-1-one (3aa) (28.6 mg, 0.2 mmol), benzenesulfonylhydrazide (17.2 mg, 0.1 mmol) and H₂O (0.5 mL) under air. The sealed reaction vessel was stirred at 65 °C for 10 h. After cooling to room temperature, the reaction was diluted with ethyl acetate (5 mL) and washed with saturated sodium chloride solution. The organic layer was separated, and the aqueous layer was extracted with ethyl acetate for three times. The combined organic layer was dried over...
magnesium sulfate and the volatiles were removed under reduced pressure. The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 7.5:1) to yield the desired product 8a as white solid (30.0 mg, 70% yield).

$^1$H NMR (400 MHz, CDCl$_3$) δ 7.86-7.83 (m, 4H), 7.73-7.70 (m, 2H), 7.60-7.55 (m, 7H), 7.38-7.34 (m, 2H), 4.38-4.35 (m, 1H), 3.70-3.65 (m, 2H), 3.56-3.51 (m, 2H). $^{13}$C NMR (100 MHz, CDCl$_3$) δ 195.0, 138.2, 134.23, 134.19, 133.8, 129.5, 129.0, 128.4, 128.3, 55.2, 35.2.
NMR Spectra for the compounds prepared

![NMR Spectra Image](image-url)