Supporting Information

Electrooxidative 1,2-Bromoesterification of Alkenes with Acids and N-Bromosuccinimide

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(A) Typical experimental procedure

(a) General information

The $^1$H and $^{13}$C NMR spectra were recorded in CDCl$_3$ solvent on a NMR spectrometer using TMS as internal standard. The instrument for electrolysis is DC power source (PM3005B) (made in China). Cyclic voltammograms were obtained on a CHI 605E potentiostat.

(b) Procedures for the Electrolysis

A 10 mL three-necked round bottom flask was charged with Tempo (0.25 mmol, 0.5 equiv), the alkene (0.5 mmol, 1.0 equiv), $^n$Bu$_4$NBF$_4$ (1 mmol, 2.0 equiv), NBS (1 mmol, 2.0 equiv) and carboxylic acid (1 mmol, 2.0 equiv). The flask was equipped with a graphite rod anode ($\Phi 6$mm$\times$80mm) and a graphite rod ($\Phi 6$mm$\times$80mm) cathode. The flask was flushed with argon and MeCN (10 mL) were added. The constant current (10.0 mA) electrolysis was carried out at room temperature until complete consumption of the substrate (monitored by TLC or GC-MS analysis). The solvent was removed under reduced pressure. The residue was chromatographed through silica gel eluting with AcOEt/hexane to give the desired product.

(c) General procedure for the synthesis of substituted styrenes:

To a stirred suspension of methyltriphenylphosphonium bromide in THF, base (inorganic base like NaH, NaNH$_2$ or organic base like $^n$BuLi) was added under argon at 0 ºC and stirred for 30 min. After the mixture was cooled again to 0 ºC, aromatic aldehyde or ketone in THF was added drop wise and stirred for 12 h. The mixture was concentrated in vacuo and residue was dissolved in water and the aqueous layer was
extracted with DCM (3 x 35 mL). The combined organic extracts were dried over anhydrous Na₂SO₄, concentrated and purified by silica gel column chromatography in petroleum ether: ethyl acetate (95:5) to afford pure styrene (85-99% yield).

(d) Typical Experimental Procedure for the synthesis of Vinyl-estrone:

Vinyl-estrone were prepared according to the known method.¹

(B) Gram scale synthesis

A 25 mL three-necked round bottom flask was charged with TEMPO (0.5 mmol, 0.5 equiv), the alkene (1 mmol, 1.0 equiv), nBu₄NBF₄ (2 mmol, 2.0 equiv), NBS (2 mmol, 2.0 equiv) and carboxylic acid (2 mmol, 2.0 equiv). The flask was equipped with a graphite rod anode (Φ 6mm×80mm) and a graphite rod (Φ 6mm×80mm) cathode. The flask was flushed with argon and MeCN (20 mL) were added. The constant current (10.0 mA) electrolysis was carried out at room temperature until complete consumption of the substrate (monitored by TLC or GC-MS analysis). The solvent was removed under reduced pressure. The residue was chromatographed through silica gel eluting with AcOEt/hexane to give 0.3 g 4aaa.
Figure S1. Cyclic Voltammogram Curves. Using carbon plate as working and counter electrode; Ag/AgCl as reference electrode at 100 mV/s scan rate. (1) (black) \( ^{n}\text{Bu}_4\text{NBF}_4 \) (0.1 M), Tempo (25 mM) and MeCN; (2) (red) 1a (0.05 M), 3a (0.1 M), \( ^{n}\text{Bu}_4\text{NBF}_4 \) (0.1 M), Tempo (25 mM) and MeCN; (3) (blue) 1a (0.05 M), 2a (0.1 M), 3a (0.1 M), \( ^{n}\text{Bu}_4\text{NBF}_4 \) (0.1 M), Tempo (25 mM).

An obvious oxidation peak of substrate 3a could be observed at -1.25 V (Fig. 1, black line), while there was no obvious oxidation peak in the cyclic voltammograms (Fig. 1, blue line). A reduction peak was observed at -1.60V under the reaction solvent system (Fig. 1, blue line).
(D) Analytical data

2-Bromo-1,1-diphenylethyl benzoate (4aaa):

\[
\text{O} \quad \begin{array}{c}
\text{Ph} \\
\text{Ph} \\
\text{Br}
\end{array}
\]

167.8 mg, 88% yield; White solid; mp 153.2-154.7 °C (uncorrected); \(^1\)H NMR (500 MHz, CDCl\(_3\)) \(\delta\): 8.17-8.15 (d, \(J = 7.5\) Hz, 2H), 7.62-7.59 (t, \(J = 7.5\) Hz, 1H), 7.51-7.48 (t, \(J = 7.5\) Hz, 2H), 7.46-7.45 (d, \(J = 7.5\) Hz, 4H), 7.37-7.34 (d, \(J = 7.5\) Hz, 4H), 7.37-7.34 (t, \(J = 7.5\) Hz, 2H), 4.84 (s, 2H); \(^{13}\)C NMR (125 MHz, CDCl\(_3\)) \(\delta\): 164.5, 142.4, 133.2, 130.6, 129.7, 128.5, 128.3 (2), 127.8, 126.1, 84.3, 39.4; HRMS \(m/z\) (ESI) calcd for C\(_{21}\)H\(_{18}\)BrO\(_2\) ([M+H]\(^+\)) 381.0490, found 381.0498.

2-Bromo-1,1-diphenylethyl 4-methylbenzoate (4aba):

\[
\text{O} \quad \begin{array}{c}
\text{Ph} \\
\text{Ph} \\
\text{Br}
\end{array}
\]

162.1 mg, 82% yield; White solid; mp 158.2-159.7 °C (uncorrected); \(^1\)H NMR (500 MHz, CDCl\(_3\)) \(\delta\): 8.06-8.04(d, \(J = 8.5\) Hz, 2H), 7.45-7.44(d, \(J = 7.5\) Hz, 4H), 7.36-7.33 (t, \(J = 5.0\) Hz, 4H), 7.30-7.27 (t, \(J = 7.5\) Hz, 4H), 4.83 (s, 2H), 2.43 (s, 3H); \(^{13}\)C NMR (125 MHz, CDCl\(_3\)) \(\delta\): 164.6, 144.0, 142.6, 129.8, 129.2, 128.3, 127.7, 126.1, 84.1, 39.5, 21.7; HRMS \(m/z\) (ESI) calcd for C\(_{22}\)H\(_{20}\)BrO\(_2\) ([M+H]\(^+\)) 395.0647, found 395.0654.

2-Bromo-1,1-diphenylethyl 4-cyanobenzoate (4aca):

\[
\text{O} \quad \begin{array}{c}
\text{Ph} \\
\text{Ph} \\
\text{Br}
\end{array}
\]

117.8 mg, 58% yield; White solid; mp 148.4-150.3 °C (uncorrected); \(^1\)H NMR (500 MHz, CDCl\(_3\)) \(\delta\): 8.24-8.23 (d, \(J = 8.5\) Hz, 2H), 7.80-7.78 (d, \(J = 8.5\) Hz, 2H), 7.43-7.42 (d, \(J = 7.5\) Hz, 4H), 7.38-7.35 (t, \(J = 7.5\) Hz, 4H), 7.33-7.30 (t, \(J = 7.5\) Hz, 2H), 4.82 (s, 2H); \(^{13}\)C NMR (125 MHz,
**2-Bromo-1,1-diphenylethyl 3-methoxybenzoate (4ada):**

148.1 mg, 72% yield; Colorless oil; mp 159.3-160.5 °C (uncorrected); $^1$H NMR (500 MHz, CDCl$_3$) δ: 7.81-7.79 (d, $J = 7.5$ Hz, 1H), 7.64-7.63 (m, 1H), 7.45-7.44 (d, $J = 8$ Hz, 4H), 7.42-7.39 (t, $J = 7.5$ Hz, 1H), 7.36-7.33 (t, $J = 7.5$ Hz, 4H), 7.30-7.27 (t, $J = 7.5$ Hz, 2H), 7.15-7.13 (m, 1H), 4.86 (s, 2H), 3.87 (s, 3H); $^{13}$C NMR (125 MHz, CDCl$_3$) δ: 164.4, 159.6, 142.4, 131.9, 129.5, 128.3, 127.8, 126.1, 122.0, 119.6, 114.3, 84.3, 55.4, 39.4; HRMS m/z (ESI) calcd for C$_{22}$H$_{17}$BrNO$_2$ ([M+H]$^+$) 406.0443, found 406.0450.

**2-Bromo-1,1-diphenylethyl 3-methylbenzoate (4aea):**

160.1 mg, 81% yield; White solid; mp 152.3-154.7 °C (uncorrected); $^1$H NMR (500 MHz, CDCl$_3$) δ: 7.99-7.6 (d, $J = 7.5$ Hz, 1H), 7.94 (s, 1H), 7.46-7.44 (d, $J = 7.5$ Hz, 4H), 7.42-7.38 (m, 2H), 7.37-7.34 (t, $J = 7.5$ Hz, 4H), 7.30-7.27 (t, $J = 7.5$ Hz, 2H), 4.84 (s, 2H), 2.43 (s, 3H); $^{13}$C NMR (125 MHz, CDCl$_3$) δ: 164.7, 142.5, 138.3, 134.0, 130.6, 130.3, 128.4, 128.3, 127.7, 126.9, 126.1, 84.2, 39.5, 21.4; HRMS m/z (ESI) calcd for C$_{22}$H$_{20}$BrO$_2$ ([M+H]$^+$) 395.0647, found 395.0654.

**2-Bromo-1,1-diphenylethyl 3-chlorobenzoate (4afa):**

180.8 mg, 87% yield; Yellow solid; mp 155.4-157.3 °C (uncorrected); $^1$H NMR (500 MHz, CDCl$_3$) δ: 8.11 (s, 1H), 8.04-8.02 (d, $J = 7.5$ Hz, 1H), 7.57-7.55 (d, $J = 8.0$ Hz, 1H), 7.44-7.42 (d, $J = 7.5$ Hz,
5H), 7.37-7.34 (d, J = 7.5 Hz, 4H), 7.31-7.28 (t, J = 7.5 Hz, 2H), 4.82 (s, 2H); 13C NMR (125 MHz, CDCl3) δ: 163.3, 142.1, 134.6, 133.2, 132.4, 129.8, 129.7, 128.3, 127.9, 127.8, 126.1, 84.8, 39.3; HRMS m/z (ESI) calcd for C21H17BrClO2 ([M+H]+) 415.0100, found 415.0106.

2-Bromo-1,1-diphenylethyl 2-methylbenzoate (4aga):

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146.3 mg, 74% yield; Colorless oil; 1H NMR (500 MHz, CDCl3) δ: 8.14-8.12 (d, J = 7.5 Hz, 1H), 7.46-7.44 (d, J = 7.5 Hz, 5H), 7.36-7.33 (t, J = 7.5 Hz, 5H), 7.29-7.25 (t, J = 7.5 Hz, 3H), 4.85 (s, 2H), 2.51 (s, 3H); 13C NMR (125 MHz, CDCl3) δ: 165.5, 142.5, 140.2, 132.0, 131.6, 130.3 (2), 128.3, 127.7, 126.1, 125.8, 84.2, 39.6, 21.3; HRMS m/z (ESI) calcd for C22H20BrO2 ([M+H]+) 395.0647, found 395.0654.
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2-Bromo-1,1-diphenylethyl 2-bromobenzoate (4aha):

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184.1 mg, 80% yield; Colorless oil; 1H NMR (500 MHz, CDCl3) δ: 7.96-7.94 (d, J = 7.5 Hz, 1H), 7.66-7.65 (d, J = 7.5 Hz, 1H), 7.45-7.43 (d, J = 7.5 Hz, 4H), 7.42-7.39 (t, J = 7.5 Hz, 1H), 7.39-7.32 (t, J = 7.5 Hz, 5H), 7.28-7.25 (t, J = 7.5 Hz, 2H), 4.85 (s, 2H); 13C NMR (125 MHz, CDCl3) δ: 164.1, 142.0, 134.3, 132.7, 132.5, 131.3, 128.1, 127.8, 127.2, 126.2, 121.3, 85.3, 39.2; HRMS m/z (ESI) calcd for C21H17Br2O2 ([M+H]+) 458.9595, found 458.9599.
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2-Bromo-1,1-diphenylethyl 2,3,4,5,6-pentafluorobenzoate (4aia):

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169.6 mg, 72% yield; White solid; mp 148.4-150.3 °C (uncorrected); 1H NMR (500 MHz, CDCl3) δ: 7.40-7.39 (d, J
= 7.5 Hz, 4H), 7.37-7.34 (t, $J = 7.5$ Hz, 4H), 7.31-7.29 (t, $J = 7.5$ Hz, 2H), 4.80 (s, 2H); $^{13}$C NMR (125 MHz, CDCl$_3$) δ: 156.8, 146.8, 141.3, 138.7, 136.6, 131.5, 128.4, 128.1, 126.2, 87.3, 38.6; $^{19}$F NMR (MHz, CDCl$_3$) δ: -136.2- -136.3 (m), -146.1- -146.2 (m), -159.7- -159.8 (m); HRMS m/z (ESI) calcd for C$_{21}$H$_{13}$BrF$_5$O$_2$ ([M+H$^+$]) 471.0019, found 471.0043.

2-Bromo-1,1-diphenylethyl 1-naphthoate (4aja):

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\text{O} \quad \text{Ph} \quad \text{Ph} \quad \text{Br}
\]

160.9 mg, 76% yield; White solid; mp 162.4-164.3 °C (uncorrected); $^1$H NMR (500 MHz, CDCl$_3$) δ: 8.73 (s, 1H), 8.18-8.16 (d, $J = 9.0$ Hz, 1H), 8.01-8.00 (d, $J = 8.0$ Hz, 1H), 7.94-7.90 (m, 2H), 7.63-7.55 (m, 2H), 7.52-7.50 (d, $J = 8.0$ Hz, 4H), 7.40-7.37 (t, $J = 8.0$ Hz, 4H), 7.33-7.30 (t, $J = 8.0$ Hz, 2H), 4.89 (s, 2H); $^{13}$C NMR (125 MHz, CDCl$_3$) δ: 164.8, 142.5, 135.6, 132.5, 131.3, 129.4, 128.4 (2), 127.9, 127.8 (2), 126.7, 126.2, 125.2, 84.5, 39.5; HRMS m/z (ESI) calcd for C$_{25}$H$_{20}$BrO$_2$ ([M+H$^+$]) 431.0647, found 431.0655.

2-Bromo-1,1-diphenylethyl thiophene-2-carboxylate (4aka):

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\text{O} \quad \text{Ph} \quad \text{Ph} \quad \text{Br}
\]

170.4 mg, 88% yield; White solid; mp 151.7-153.3 °C (uncorrected); $^1$H NMR (500 MHz, CDCl$_3$) δ: 7.90-7.89 (d, $J = 4.0$ Hz, 1H), 7.62-7.60 (m, 1H), 7.44-7.43 (d, $J = 8.0$ Hz, 4H), 7.37-7.34 (t, $J = 8.0$ Hz, 4H), 7.31-7.28 (t, $J = 8.0$ Hz, 2H), 7.15-7.14 (m, 1H), 4.82 (s, 2H); $^{13}$C NMR (125 MHz, CDCl$_3$) δ: 160.0, 142.2, 134.0, 133.9 (2), 132.7, 128.3, 127.9, 127.3, 126.1, 84.7, 39.4; HRMS m/z (ESI) calcd for C$_{19}$H$_{16}$BrSO$_2$ ([M+H$^+$]) 387.0054, found 387.0061.
2-Bromo-1,1-diphenylethyl cinnamate (4ala):

158.8 mg, 78% yield; White solid; mp 142.3-144.3 °C (uncorrected); ¹H NMR (500 MHz, CDCl₃) δ: 7.75-7.72 (d, J = 8.0 Hz, 1H), 7.60-7.58 (m, 2H), 7.43-7.40 (m, 8H), 7.36-7.33 (m, 5H), 7.29-7.26 (t, J = 7.5 Hz, 2H), 6.63-6.60 (d, J = 16.0 Hz, 1H), 4.79 (s, 2H); ¹³C NMR (125 MHz, CDCl₃) δ: 164.9, 145.6, 142.4, 134.1, 130.5, 128.9, 128.2 (2), 127.7, 126.1, 118.3, 83.8, 39.4; HRMS m/z (ESI) calcd for C₂₃H₂₀BrO₂ ([M+H]⁺) 407.0647, found 407.0653.

2-Bromo-1,1-diphenylethyl adamantane-1-carboxylate (4ama):

101.1 mg, 46% yield; White solid; mp 138.1-140.3 °C (uncorrected); ¹H NMR (500 MHz, CDCl₃) δ: 7.35-7.30 (m, 8H), 7.27-7.24 (m, 2H), 4.74 (s, 2H), 2.21 (s, 2H), 1.97 (s, 3H), 1.70-1.69 (m, 9H), 1.64-1.62 (m, 3H), 1.55 (s, 1H); ¹³C NMR (125 MHz, CDCl₃) δ: 170.0, 142.6, 128.1, 127.6, 126.4, 83.8, 49.8, 42.3, 39.3, 36.7, 33.1, 28.6; HRMS m/z (ESI) calcd for C₂₅H₂₈BrO₂ ([M+H]⁺) 439.1273, found 439.1280.

2-Bromo-1,1-diphenylethyl cyclohexanecarboxylate (4ana):

141.4 mg, 73% yield; Colorless oil; ¹H NMR (500 MHz, CDCl₃) δ: 7.34-7.29 (m, 8H), 7.26-7.23 (m, 2H), 4.72 (s, 2H), 2.50-2.44 (m, 1H), 2.05-2.02 (m, 2H), 1.81-1.77 (m, 2H), 1.68-1.65 (m, 1H), 1.57-1.54 (m, 1H), 1.52-1.49 (m, 1H), 1.37-1.31 (m, 2H), 1.28-1.22 (m, 1H); ¹³C NMR (125 MHz, CDCl₃) δ: 173.8, 142.7, 128.2, 127.5, 126.0, 82.9, 44.0, 39.5, 29.0, 25.7, 25.40; HRMS m/z (ESI) calcd for C₂₁H₂₄BrO₂ ([M+H]⁺) 387.0960, found 387.0965.
2-Bromo-1,1-diphenylethyl cyclopentanecarboxylate (4aoa):

111.9 mg, 60% yield; Colorless oil; $^1$H NMR (500 MHz, CDCl$_3$) $\delta$: 7.34-7.29 (m, 8H), 7.26-7.23 (m, 2H), 4.72 (s, 2H), 2.95-2.88 (m, 1H), 2.04-1.95 (m, 4H), 1.81-1.74 (m, 2H), 1.70-1.63 (m, 2H); $^{13}$C NMR (125 MHz, CDCl$_3$) $\delta$: 174.4, 142.7, 128.2, 127.5, 126.0, 83.0, 44.7, 39.5, 29.7, 25.7; HRMS m/z (ESI) calcd for C$_{20}$H$_{22}$BrO$_2$ ([M+H]$^+$) 373.0803, found 373.0811.

2-Bromo-1,1-diphenylethyl tetrahydrofuran-2-carboxylate (4apa):

116.3 mg, 62% yield; Colorless oil; $^1$H NMR (500 MHz, CDCl$_3$) $\delta$: 7.35-7.30 (m, 8H), 7.29-7.26 (m, 2H), 4.76-4.74 (d, $J = 10.5$ Hz, 1H), 4.70-4.68 (d, $J = 10.5$ Hz, 1H), 4.62-4.60 (m, 1H), 4.08-4.03 (m, 1H), 3.98-3.94 (m, 1H), 2.37-2.19 (m, 2H), 2.00-1.90 (m, 2H); $^{13}$C NMR (125 MHz, CDCl$_3$) $\delta$: 171.3, 142.1, 142.0, 128.2 (2), 127.8 (2), 126.0 (2), 84.0, 69.4, 39.2, 30.2, 25.1; HRMS m/z (ESI) calcd for C$_{19}$H$_{19}$BrNaO$_3$ ([M+H]$^+$) 397.0415, found 397.0408.

2-Bromo-1,1-diphenylethyl (tert-butoxycarbonyl)glycinate (4aqa):

91.3 mg, 42% yield; White solid; mp 147.4-150.5 oC (uncorrected); 1H NMR (500 MHz, CDCl$_3$) $\delta$: 7.33-7.32 (m, 8H), 7.30-7.26 (m, 2H), 4.99 (s, 1H), 4.70 (s, 2H), 4.10-4.09 (d, $J = 5.0$ Hz, 2H), 1.44 (m, 9H); 13C NMR (125 MHz, CDCl$_3$) $\delta$:168.4, 155.5, 141.8, 128.3, 127.9, 126.1, 84.8, 80.0, 43.1, 39.0, 28.3; HRMS m/z (ESI) calcd for C$_{21}$H$_{25}$BrNO$_4$ ([M+H]$^+$) 434.0967, found 434.0973.

2-Bromo-1,1-diphenylethyl N-(tert-butoxycarbonyl)-N-methylglycinate (4ara):
110.9 mg, 48% yield; Colorless oil; $^1$H NMR (500 MHz, CDCl$_3$) $\delta$: 7.36-7.30 (m, 8.0H), 7.30-7.26 (m, 2.0H), 4.74 (s, 1.2H), 4.73 (s, 0.8H), 4.14 (s, 0.8H), 4.08 (s, 1.2H), 2.99 (s, 1.2H), 2.89 (s, 1.8H), 1.49 (s, 3.6H), 1.41 (s, 5.4H); $^{13}$C NMR (125 MHz, CDCl$_3$) $\delta$: 168.0, 167.8, 155.8, 155.3, 142.0, 128.3, 127.8, 127.7, 126.0, 84.5, 80.3, 80.2, 51.4, 51.0, 39.1, 39.0, 35.6, 35.5, 28.3, 28.2; HRMS $m/z$ (ESI) calcd for C$_{22}$H$_{27}$BrNO$_4$ ([M+H]$^+$) 448.1123, found 448.1237.

2-Bromo-1,1-diphenylethyl N-(tert-butoxycarbonyl)-N-ethylglycinate (4asa):

93.5 mg, 40% yield; Colorless oil; $^1$H NMR (500 MHz, CDCl$_3$) $\delta$: 7.38-7.23 (m, 10H), 5.84-5.82 (d, $J = 11.0$ Hz, 1H), 4.88 (s, 0.96H), 3.92 (s, 2H), 2.04-1.98 (m, 1H), 1.76-1.67 (m, 1H), 1.41 (s, 9H), 0.95-0.92 (t, $J = 7.5$ Hz, 3H); $^{13}$C NMR (125 MHz, CDCl$_3$) $\delta$: 168.5, 155.5, 139.6, 129.3, 129.1, 128.2, 128.1, 127.5, 127.1, 79.9, 60.4, 43.2, 28.3, 21.0, 13.4; HRMS $m/z$ (ESI) calcd for C$_{23}$H$_{29}$BrNO$_4$ ([M+H]$^+$) 462.1280, found 462.1288.

2-Bromo-1,1-di-p-tolylethyl benzoate (4baa):

169.8 mg, 83% yield; White solid; mp 155.4-157.3 °C (uncorrected); $^1$H NMR (500 MHz, CDCl$_3$) $\delta$: 8.16-8.14 (d, $J = 7.5$ Hz, 2H), 7.59-7.56 (t, $J = 7.5$ Hz, 1H), 7.48-7.45 (t, $J = 7.5$ Hz, 2H), 7.34-7.32 (d, $J = 8.0$ Hz, 4H), 7.15-7.13 (d, $J = 8.0$ Hz, 4H), 4.80 (s, 2H), 2.31 (s, 6H); $^{13}$C NMR (125 MHz, CDCl$_3$) $\delta$: 164.6, 139.7, 137.4, 133.1, 130.8, 129.7, 128.9, 128.4, 126.0, 84.3, 39.7, 21.0; HRMS $m/z$ (ESI) calcd for C$_{23}$H$_{22}$BrO$_2$ ([M+H]$^+$) 409.0803, found 409.0807.
2-Bromo-1,1-bis(4-chlorophenyl)ethyl benzoate (4caa):

175.6 mg, 78% yield; White solid; mp 157.2-160.4 °C (uncorrected); \(^1\)H NMR (500 MHz, CDCl\(_3\)) \(\delta\): 8.11-8.10 (d, \(J = 8.0\) Hz, 2H), 7.63-7.60 (t, \(J = 7.5\) Hz, 1H), 7.51-7.48 (t, \(J = 7.5\) Hz, 2H), 7.37-7.32 (m, 8H), 4.74 (s, 2H); \(^{13}\)C NMR (125 MHz, CDCl\(_3\)) \(\delta\): 164.4, 140.5, 134.0, 133.5, 130.3, 129.7, 128.6, 127.7, 83.5, 38.6; HRMS \(m/z\) (ESI) calcd for C\(_{21}\)H\(_{16}\)BrCl\(_2\)O\(_2\) ([M+H]\(^+\)) 448.9711, found 448.9715.

2-Bromo-1,1-bis(4-fluorophenyl)ethyl benzoate (4daa):

156.5 mg, 75% yield; White solid; mp 161.4-162.4 °C (uncorrected); \(^1\)H NMR (500 MHz, CDCl\(_3\)) \(\delta\): 8.12-8.11 (d, \(J = 7.5\) Hz, 2H), 7.63-7.60 (t, \(J = 7.5\) Hz, 1H), 7.51-7.48 (t, \(J = 7.5\) Hz, 2H), 7.42-7.39 (m, 4H), 7.07-7.03 (m, 4H), 4.76 (s, 2H); \(^{13}\)C NMR (125 MHz, CDCl\(_3\)) \(\delta\): 164.5, 163.1, 161.1, 138.1, 138.0, 133.4, 130.4, 129.7, 128.6, 128.2 (2), 115.4, 115.2, 83.7, 39.1; \(^{19}\)F NMR (MHz, CDCl\(_3\)) \(\delta\): -105.7; HRMS \(m/z\) (ESI) calcd for C\(_{21}\)H\(_{15}\)BrF\(_2\)NaO\(_2\) ([M+Na]\(^+\)) 439.0121, found 439.0126.

2-Bromo-1-phenyl-1-(p-tolyl)ethyl benzoate (4eaa):

118.6 mg, 60% yield; White solid; mp 148.7-150.3 °C (uncorrected); \(^1\)H NMR (500 MHz, CDCl\(_3\)) \(\delta\): 8.16-8.15 (d, \(J = 7.0\) Hz, 2H), 7.60-7.57 (t, \(J = 7.25\) Hz, 1H), 7.49-7.44 (m, 4H), 7.36-7.32 (d, \(J = 7.5\) Hz, 4H), 7.29-7.26 (t, \(J = 7.5\) Hz, 1H), 7.16-7.14 (d, \(J = 7.5\) Hz, 2H), 4.87-4.85 (d, \(J = 10.5\) Hz, 1H), 4.79-4.77 (d, \(J = 10.5\) Hz, 1H).
HZ, 1H), 2.31 (s, 3H); 13C NMR (125 MHz, CDCl3) δ: 164.6, 142.6, 139.5, 137.5, 133.2, 130.7, 129.7, 129.0, 128.5, 128.2, 127.7, 126.1, 126.0, 84.3, 39.6, 21.1; HRMS m/z (ESI) calcd for C_{22}H_{19}BrNaO_{2} ([M+Na]^{+}) 417.0466, found 417.0472.

2-Bromo-1-(4-bromophenyl)-1-phenylethyl benzoate (4faa):

184.1 mg, 80% yield; White solid; mp 156.2-158.3 °C (uncorrected); 1H NMR (500 MHz, CDCl3) δ: 8.14-8.13 (d, J = 7.5 Hz, 2H), 7.63-7.60 (t, J = 7.5 Hz, 1H), 7.50-7.49 (t, J = 7.5 Hz, 2H), 7.50-7.49 (d, J = 6.5 Hz, 2H), 7.43-7.41 (d, J = 7.5 Hz, 2H), 7.38-7.29 (m, 5 H), 4.84-4.82 (d, J = 10.5 Hz, 1H), 4.75-4.73 (d, J = 10.5 Hz, 1H); 13C NMR (125 MHz, CDCl3) δ: 164.5, 141.8, 141.6, 133.4, 131.5, 130.4, 129.7, 128.5, 128.4, 128.0 (2), 126.2, 122.9, 83.9, 38.9; HRMS m/z (ESI) calcd for C_{21}H_{17}Br_{2}O_{2} ([M+H]^{+}) 458.9595, found 458.9599.

2-Bromo-1-(4-chlorophenyl)-1-phenylethyl benzoate (4gaa):

172.5 mg, 83% yield; White solid; mp 157.4-158.4 °C (uncorrected); 1H NMR (500 MHz, CDCl3) δ: 8.15-8.13 (d, J = 7.5 Hz, 2H), 7.64-7.61 (t, J = 7.5 Hz, 1H), 7.52-7.49 (t, J = 7.5 Hz, 2H), 7.44-7.42 (d, J = 7.5 Hz, 2H), 7.40-7.36 (m, 4H), 7.34-7.30(m, 3H), 4.85-4.83 (d, J = 10.5 Hz, 1H), 4.77-4.74 (d, J = 10.5 Hz, 1H); 13C NMR (125 MHz, CDCl3) δ: 164.5, 142.0, 141.1, 133.8, 133.4, 130.5, 129.8, 128.5, 128.1, 127.8, 126.2, 84.0, 39.0; HRMS m/z (ESI) calcd for C_{21}H_{17}BrClO_{2} ([M+H]^{+}) 415.0100, found 415.0097.

2-Bromo-1-(4-fluorophenyl)-1-phenylethyl benzoate (4haa):
2-Bromo-1-phenyl-1-(m-tolyl)ethyl benzoate (4iaa):

164.0 mg, 83% yield; Colorless oil; \(^1\)H NMR (500 MHz, CDCl\(_3\)) \(\delta\): 8.17-8.16 (d, \(J = 7.5 \text{ Hz}, 2H\)), 7.62-7.59 (t, \(J = 7.5 \text{ Hz}, 1H\)), 7.51-7.48 (t, \(J = 7.5 \text{ Hz}, 2H\)), 7.37-7.34 (t, \(J = 7.5 \text{ Hz}, 2H\)), 7.30-7.22 (m, 5H), 7.10-7.09 (d, \(J = 7.5 \text{ Hz}, 1H\)), 4.89-4.87 (d, \(J = 10.5 \text{ Hz}, 1H\)), 4.79-4.77 (d, \(J = 10.5 \text{ Hz}, 1H\)); \(^{13}\)C NMR (125 MHz, CDCl\(_3\)) \(\delta\): 164.5, 142.6, 142.4, 138.0, 133.2, 130.7, 129.7, 128.6, 128.5, 128.3, 128.2, 126.6, 126.1, 123.1, 84.3, 39.5, 21.7; HRMS m/z (ESI) calcd for C\(_{22}\)H\(_{20}\)BrO\(_2\) ([M+H]+) 395.0647, found 395.0657.

2-Bromo-1-(3-chlorophenyl)-1-phenylethyl benzoate (4jaa):

166.3 mg, 80% yield; White oil; mp 148.4-150.3 \(\text{°C}\) (uncorrected); \(^1\)H NMR (500 MHz, CDCl\(_3\)) \(\delta\): 8.15-8.14 (d, \(J = 7.5 \text{ Hz}, 2H\)), 7.64-7.61 (t, \(J = 7.5 \text{ Hz}, 1H\)), 7.53-7.49 (t, \(J = 7.5 \text{ Hz}, 2H\)), 7.48-7.45 (d, \(J = 7.5 \text{ Hz}, 1H\)), 7.42-7.39 (t, \(J = 7.5 \text{ Hz}, 1H\)), 7.37-7.32 (t, \(J = 7.5 \text{ Hz}, 1H\)), 7.09-7.06 (t, \(J = 7.5 \text{ Hz}, 2H\)), 4.88-4.86 (d, \(J = 10.5 \text{ Hz}, 1H\)), 4.82-4.80 (d, \(J = 10.5 \text{ Hz}, 1H\)); \(^{13}\)C NMR (125 MHz, CDCl\(_3\)) \(\delta\): 164.5, 142.6, 142.4, 138.0, 133.2, 130.7, 129.7, 128.6, 128.5, 128.3, 128.2, 126.6, 126.1, 123.1, 84.3, 39.5, 21.7; HRMS m/z (ESI) calcd for C\(_{22}\)H\(_{20}\)BrO\(_2\) ([M+H]+) 395.0647, found 395.0657.
7.5 Hz, 2H), 7.45-7.43 (m, 3H), 7.38-7.35 (t, J = 7.5 Hz, 2H), 7.34-7.32 (m, 2H),
7.29-7.28 (m, 2H), 4.85-4.83 (d, J = 10.5 Hz, 1H), 4.76-4.74 (d, J = 10.5 Hz, 1H); \(^{13}\)C
NMR (125 MHz, CDCl\(_3\)) \(\delta\): 164.4, 144.5, 141.7, 134.3, 133.4, 130.4, 129.7, 129.6,
128.6, 128.5, 128.1, 128.0, 126.5, 126.0, 124.4, 83.7, 38.9.; HRMS \(m/z\) (ESI) calcd
for C\(_{21}\)H\(_{16}\)BrClNaO\(_2\) ([M+Na\(^+\)]\(^+\)) 436.9920, found 436.9924.

**2-Bromo-1-(naphthalen-2-yl)-1-phenylethyl benzoate (4kaa):**

\[
\begin{align*}
&157.4 \text{ mg, 73\% yield; White solid; mp 147.1-149.3 °C} \\
&(\text{uncorrected); } ^{1}\text{H NMR (500 MHz, CDCl}\(_3\)) \delta: 8.20-8.18 (m, \\
&2\text{H}), 8.06 (s, 1H), 7.90-7.88 (d, J = 8.0 Hz, 1H), 7.80-7.76 (m, \\
&2\text{H}), 7.64-7.61 (t, J = 7 Hz, 1H), 7.53-7.47 (m, 6H), 7.41-739 \\
&(m, 1H), 7.37-7.34 (t, J = 7.5 Hz, 2H), 7.31-7.28 (t, J = 7.5 Hz, 1H), 5.03-5.01 (d, J = \\
&10.5 Hz, 1H), 4.92-4.90 (d, J = 10.5 Hz, 1H); \(^{13}\)C NMR (125 MHz, CDCl\(_3\)) \delta: 164.6, \\
142.3, 139.7, 133.3, 132.7, 132.6, 130.7, 129.8, 128.6, 128.5 (2), 128.4, 128.3, \\
127.9, 127.6, 126.5, 126.4, 126.3, 125.0, 124.2, 84.5, 39.3.; HRMS \(m/z\) (ESI) calcd
for C\(_{25}\)H\(_{20}\)BrO\(_2\) ([M+H\(^+\)]\(^+\)) 431.0647, found 431.0657.

**1-Bromo-2-(p-tolyl)propan-2-yl benzoate (4laa):**

\[
\begin{align*}
&131.6 \text{ mg, 79\% yield; Colorless oil; } ^{1}\text{H NMR (500 MHz, CDCl}\(_3\)) \delta: \\
&8.10-8.09 (d, J = 7.5 Hz, 2H), 7.60-7.58 (t, J = 7.5 Hz, 1H), \\
&7.47-7.44 (t, J = 7.5 Hz, 2H), 7.30-7.28 (d, J = 8.5 Hz, 2H), \\
&7.18-7.16 (d, J = 8.5 Hz, 2H), 4.04-4.02 (d, J = 10.5 Hz, 1H), \\
&3.84-3.79 (d, J = 10.5 Hz, 1H), 2.33 (s, 3H), 2.10 (s, 3H); \(^{13}\)C NMR (125 MHz, \\
CDCl\(_3\)) \delta: 164.7, 138.7, 137.7, 133.0, 130.8, 129.7, 129.3, 128.4, 124.7, 81.6, 42.0,
24.0, 21.1; HRMS m/z (ESI) calcd for C_{17}H_{17}BrNaO_{2} ([M+Na]^+) 355.0310, found 355.0301.

1-Bromo-2-(thiophen-2-yl)propan-2-yl benzoate (4maa):

94.6 mg, 60% yield; Yellow solid; \(^1\)H NMR (500 MHz, CDCl\(_3\)) \(\delta\): 8.13-8.12 (d, \(J = 7.0\) Hz, 2H), 7.63-7.60 (t, \(J = 7.5\) Hz, 1H), 7.49-7.46 (t, \(J = 7.75\) Hz, 2H), 7.25-7.24 (m, 1H), 6.99-6.98 (m, 2H), 3.79-3.77 (d, \(J = 10.5\) Hz, 1H), 3.70-3.68 (d, \(J = 10.5\) Hz, 1H), 1.7 (s, 3H); \(^{13}\)C NMR (125 MHz, CDCl\(_3\)) \(\delta\): 172.0, 148.7, 133.7, 130.2, 129.3, 128.4 (2), 126.9, 124.8, 123.4, 72.4, 45.7, 28.5; HRMS m/z (ESI) calcd for C\(_{14}\)H\(_{14}\)BrSO\(_2\) ([M+H]^+) 324.9898, found 324.9903.

2-Bromo-1-phenylpropyl benzoate (4naa):

83.0 mg, 52% yield; Colorless oil; \(^1\)H NMR (500 MHz, CDCl\(_3\)) \(\delta\): 8.16-8.14 (d, \(J = 7.5\) Hz, 2H), 7.62-7.59 (t, \(J = 7.5\) Hz, 1H), 7.50-7.47 (t, \(J = 7.5\) Hz, 2H), 7.46-7.45 (d, \(J = 7.5\) Hz, 2H), 7.40-7.37 (t, \(J = 7.5\) Hz, 2H), 7.36-7.33 (t, \(J = 7.5\) Hz, 1H), 6.22-6.21 (d, \(J = 5.0\) Hz, 1H), 4.55-4.50 (m, 1H), 1.77-1.75 (d, \(J = 5\) Hz, 3H); \(^{13}\)C NMR (125 MHz, CDCl\(_3\)) \(\delta\): 165.1, 137.0, 133.3, 129.8, 128.5 (2), 128.4, 128.4, 127.0, 78.7, 50.2, 20.9; HRMS m/z (ESI) calcd for C\(_{16}\)H\(_{16}\)BrO\(_2\) ([M+H]^+) 319.0334, found 319.0339.

2-Bromo-1-(4-methoxyphenyl)ethyl benzoate (4oaa):

100.6 mg, 60% yield; Colorless oil; \(^1\)H NMR (500 MHz, CDCl\(_3\)) \(\delta\): 8.13-8.11 (d, \(J = 7.5\) Hz, 2H), 7.60-7.57 (t, \(J = 7.5\) Hz, 1H), 7.48-7.45 (t, \(J = 7.5\) Hz, 2H), 7.40-7.38 (d, \(J = 8.5\) Hz,
2H), 6.93-6.91 (d, $J = 8.5$ Hz, 2H), 3.84-3.81 (m, 1H), 3.80 (s, 3H), 3.72-3.69 (m, 1H); $^{13}$C NMR (125 MHz, CDCl$_3$) $\delta$: 165.5, 159.9, 133.3, 129.8, 128.5, 128.0, 114.1, 75.2, 55.3, 34.6; HRMS $m/z$ (ESI) calcd for C$_{16}$H$_{16}$BrO$_3$ ([M+H]$^+$) 334.0283, found 334.0290.

2-Bromo-1-(4-ethoxyphenyl)ethyl benzoate (4paa):

![Chemical Structure](image)

96.0 mg, 55% yield; White solid; mp 148.4-150.3 °C (uncorrected); $^1$H NMR (500 MHz, CDCl$_3$) $\delta$: 8.11-8.09 (m, 2H), 7.58-7.55 (t, $J = 7.5$ Hz, 1H), 7.46-7.43 (t, $J = 7.5$ Hz, 2H), 7.37-7.35 (d, $J = 8.5$ Hz, 2H), 6.89-6.87 (d, $J = 8.5$ Hz, 2H), 6.17-6.15 (m, 1H), 4.03-3.99 (m, 2H), 3.82-3.78 (m, 1H), 3.70-3.67 (m, 1H), 1.41-1.38 (t, $J = 7.0$ Hz, 3H); $^{13}$C NMR (125 MHz, CDCl$_3$) $\delta$: 165.4, 159.3, 133.2, 129.8, 129.7, 129.6, 128.4, 127.9, 114.6, 75.1, 63.4, 34.5, 14.7; HRMS $m/z$ (ESI) calcd for C$_{17}$H$_{17}$BrNaO$_3$ ([M+Na]$^+$) 371.0259, found 371.0250.

2-Bromo-1-(p-tolyl)ethyl benzoate (4qaa):

![Chemical Structure](image)

86.2 mg, 54% yield; Colorless oil; $^1$H NMR (500 MHz, CDCl$_3$) $\delta$: 8.12-8.10 (d, $J = 7.5$ Hz, 2H), 7.60-7.57 (t, $J = 7.5$ Hz, 1H), 7.48-7.45 (t, $J = 7.5$ Hz, 2H), 7.34-7.33 (d, $J = 8.0$ Hz, 2H), 7.20-7.19 (d, $J = 8.0$ Hz, 2H), 6.19-6.16 (m, 1H), 3.82-3.79 (m, 1H), 3.73-3.69 (m, 1H), 2.35 (s, 3H); $^{13}$C NMR (125 MHz, CDCl$_3$) $\delta$: 165.5, 138.8, 134.8, 133.3, 129.8, 129.5, 128.5, 126.5, 75.3, 34.5, 21.3; HRMS $m/z$ (ESI) calcd for C$_{16}$H$_{16}$BrO$_2$ ([M+H]$^+$) 319.0334, found 319.0338.

2-Bromo-1-(4-chlorophenyl)ethyl benzoate (4raa):
84.2 mg, 50% yield; Yellow oil; $^1$H NMR (500 MHz, CDCl$_3$) δ: 8.12-8.10 (d, $J$ = 7.5 Hz, 2H), 7.62-7.59 (t, $J$ = 7.5 Hz, 1H), 7.49-7.46 (t, $J$ = 7.5 Hz, 2H), 7.40-7.39 (d, $J$ = 8.5 Hz, 2H), 7.37-7.36 (d, $J$ = 8.5 Hz, 2H), 6.19-6.16 (m, 1H), 3.80-3.77 (m, 1H), 3.73-3.70 (m, 1H); $^{13}$C NMR (125 MHz, CDCl$_3$) δ: 165.4, 136.2, 134.8, 133.5, 129.8, 129.0, 128.6, 128.0, 74.6, 34.3; HRMS m/z (ESI) calcd for C$_{15}$H$_{13}$BrClO$_2$ ([M+H]$^+$) 338.9787, found 338.9790.

2-Bromo-1-(3-methoxyphenyl)ethyl benzoate (4saa):

95.5 mg, 57% yield; Colorless oil; $^1$H NMR (500 MHz, CDCl$_3$) δ: 8.13-8.11 (d, $J$ = 8.0 Hz, 2H), 7.60-7.57 (t, $J$ = 7.5 Hz, 1H), 7.48-7.47 (t, $J$ = 7.5 Hz, 2H), 7.31-7.28 (t, $J$ = 7.5 Hz, 1H), 7.03-7.02 (d, $J$ = 7.5 Hz, 1H), 6.98 (s, 1H), 6.88-6.86 (m, 1H), 6.19-6.17 (m, 1H), 3.81-3.77 (m, 4H), 3.73-3.70 (m, 1H); $^{13}$C NMR (125 MHz, CDCl$_3$) δ: 165.2, 159.6, 139.1, 133.2, 129.7 (2), 129.5, 128.3, 118.7, 113.8, 112.2, 75.3, 55.1, 34.3; HRMS m/z (ESI) calcd for C$_{16}$H$_{16}$BrO$_3$ ([M+H]$^+$) 335.0283, found 335.0290.

2-Bromocyclohexyl benzoate (4taa):

107.6 mg, 76% yield; Colorless oil; $^1$H NMR (500 MHz, CDCl$_3$) δ: 8.08-8.07 (d, $J$ = 8.0 Hz, 2H), 7.58-7.55 (t, $J$ = 8.0 Hz, 1H), 7.46-7.43 (t, $J$ = 8.0 Hz, 2H), 5.15-5.11 (m, 1H), 4.18-4.13 (m, 1H), 2.43-2.39 (m, 1H), 2.29-2.26 (m, 1H), 1.98-1.91 (m, 1H), 1.83-1.75 (m, 2H), 1.56-1.48 (m, 2H), 1.42-1.34 (m, 1H); $^{13}$C NMR (125 MHz, CDCl$_3$) δ: 165.5, 133.0, 132.1, 130.5, 129.5, 129.0, 128.4, 127.7, 127.1, 126.7, 125.0, 123.3, 121.5, 112.8, 111.2, 109.8, 108.0, 105.0, 63.7, 63.2, 34.0, 29.3.
130.2, 129.7, 128.3, 76.3, 52.6, 35.5, 31.0, 25.4, 23.2; HRMS \( m/z \) (ESI) calcd for C\(_{13}\)H\(_{16}\)BrO\(_2\) ([M+H\(^+\)]) 283.0334, found 283.0338.

**2-Bromocycloheptyl benzoate (4uaa):**

![Chemical structure image]

101.0 mg, 68% yield; Colorless oil; \(^1\)H NMR (500 MHz, CDCl\(_3\)) \( \delta \): 8.07-8.06 (d, \( J = 7.5 \) Hz, 2H), 7.58-7.55 (t, \( J = 7.5 \) Hz, 1H), 7.47-7.44 (t, \( J = 7.5 \) Hz, 2H), 5.38-5.34 (m, 1H), 4.39-4.35 (m, 1H), 2.36-2.30 (m, 1H), 2.18-2.11 (m, 1H), 2.07-2.02 (m, 1H), 1.87-1.76 (m, 3H), 1.65-1.64 (m, 2H); \(^{13}\)C NMR (125 MHz, CDCl\(_3\)) \( \delta \): 165.4, 133.0, 130.2, 129.6, 128.3, 80.4, 56.3, 34.8, 30.8, 27.4, 24.5, 22.1; HRMS \( m/z \) (ESI) calcd for C\(_{14}\)H\(_{17}\)BrNaO\(_2\) ([M+Na\(^+\)]) 319.0310, found 319.0316.

**2-bromo-1-((8R,9S,13S,14S)-13-methyl-17-oxo-7,8,9,11,12,13,14,15,16,17-decahydro-6H-cyclopenta[a]phenanthren-3-yl)ethyl benzoate (4vaa):**

![Chemical structure image]

117.9 mg, 49% yield; White solid; mp 153.1-155.3 °C (uncorrected); \(^1\)H NMR (500 MHz, CDCl\(_3\)) \( \delta \): 8.13-7.12 (m, 2H), 7.63-7.60 (t, \( J = 7.5 \) Hz, 1H), 7.49-7.46 (t, \( J = 7.5 \) Hz, 2H), 7.31-7.29 (m, 1H), 7.20-7.17(m, 1H), 7.13-7.11 (m, 1H), 5.13-5.10 (m, 1H), 4.08-4.01 (m, 2H), 2.94-2.92 (m, 2H), 2.54-2.49 (m, 1H), 2.43-2.39 (m, 1H), 2.32-2.27 (m, 1H), 2.19-2.12 (m, 1H), 2.09-2.01 (m, 2H), 2.00-1.96 (m, 1H), 1.67-1.59 (m, 2H), 1.57-1.51 (m, 2H), 1.46-1.42 (m, 2H), 0.91 (s, 3H); \(^{13}\)C NMR (125 MHz, CDCl\(_3\)) \( \delta \): 220.8, 171.8, 140.9 (2), 137.0 (2), 135.8 (2), 133.6, 130.1, 129.3, 128.4, 128.1, 128.0, 125.8 (2), 124.8, 124.6, 51.0 (2), 50.4, 47.8,
44.3, 37.8 (2), 35.7, 34.9, 34.8, 31.4, 29.2 (2), 26.2, 25.4, 21.5, 13.7; HRMS m/z (ESI) calcd for C_{27}H_{30}BrO_3 ([M+H]^+) 481.1378, found 481.1373.

1-bromodecan-2-yl benzoate (4wa)

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

75.2 mg, 48% yield; Colorless oil; \textsuperscript{1}H NMR (500 MHz, CDCl\textsubscript{3}) \(\delta\): 8.08-8.07 (d, \(J = 8.5\) Hz, 2.0H), 7.60-7.56 (m, 2.0H), 7.48-7.44 (m, 2.0H), 7.27-7.23 (m, 0.60H), 4.56-4.54 (m, 0.8H), 4.29-4.24 (m, 0.40H), 3.65-3.62 (m, 1.2H), 1.99-1.78 (m, 2.0H), 1.60-1.56 (m, 1.0H), 1.39-1.32 (m, 2.0H), 1.31-1.21 (m, 9.0H), 0.89-0.85 (m, 3.0H); C NMR (125 MHz, CDCl\textsubscript{3}) \(\delta\) : 166.0 (2), 133.2, 133.1, 129.9, 129.7, 129.6, 128.4 (2), 72.9, 68.2, 51.7, 35.2, 34.4, 32.5, 31.8 (2), 29.3 (2), 29.2, 28.9, 27.2, 25.1, 22.6, 14.1 (2); HRMS m/z (ESI) calcd for C_{17}H_{26}BrO_2 ([M+H]^+) 341.1116, found 341.1121.

**E) References**

2-bromo-1,1-diphenylethyl benzoate (4aaa)
2-bromo-1,1-diphenylethyl 4-methylbenzoate (4aba)
2-bromo-1,1-diphenylethyl 4-cyanobenzoate (4aca)
2-bromo-1,1-diphenylethyl 3-methoxybenzoate (4ada)
2-bromo-1,1-diphenylethyl 3-methylbenzoate (4aea)
2-bromo-1,1-diphenylethyl 3-chlorobenzoate (4afa)
2-bromo-1,1-diphenylethyl 2-methylbenzoate (4aga)
2-bromo-1,1-diphenylethyl 2-bromobenzoate (4aha)
2-bromo-1,1-diphenylethyl 2,3,4,5,6-pentafluorobenzoate (4aia)
2-bromo-1,1-diphenylethyl 1-naphthoate (4aja)
2-bromo-1,1-diphenylethyl thiophene-2-carboxylate (4aka)
2-bromo-1,1-diphenylethyl cinnamate (4ala)
2-bromo-1,1-diphenylethyl adamantane-1-carboxylate (4ama)
2-bromo-1,1-diphenylethyl cyclohexanecarboxylate (4ana)
2-bromo-1,1-diphenylethyl cyclopentanecarboxylate (4aoa)
2-bromo-1,1-diphenylethyl tetrahydrofuran-2-carboxylate (4apa)
2-bromo-1,1-diphenylethyl (tert-butoxycarbonyl)glycinate (4aea)
2-bromo-1,1-diphenylethyl N-(tert-butoxycarbonyl)-N-methylglycinate (4ara)
2-bromo-1,1-diphenylethyl N-(tert-butoxycarbonyl)-N-ethylglycinate (4asa)
2-bromo-1,1-di-p-tolylethyl benzoate (4baa)
2-bromo-1,1-bis(4-chlorophenyl)ethyl benzoate (4caa)
2-bromo-1,1-bis(4-fluorophenyl)ethyl benzoate (4daa)
2-bromo-1-phenyl-1-(p-tolyl)ethyl benzoate (4eaa)
2-bromo-1-(4-bromophenyl)-1-phenylethyl benzoate (4faa)
2-bromo-1-(4-chlorophenyl)-1-phenylethyl benzoate (4gaa)
2-bromo-1-(4-fluorophenyl)-1-phenylethyl benzoate (4haa)
2-bromo-1-phenyl-1-(m-tolyl)ethyl benzoate (4iaa)
2-bromo-1-(naphthalen-2-yl)-1-phenylethyl benzoate (4k aa)
1-bromo-2-(p-tolyl)propan-2-yl benzoate (4laa)
1-bromo-2-(thiophen-2-yl)propan-2-yl benzoate (4maa)
2-bromo-1-phenylpropyl benzoate (4naa)

\[ \text{structure image} \]
2-bromo-1-(4-methoxyphenyl)ethyl benzoate (4oaa)
2-bromo-1-(4-ethoxyphenyl)ethyl benzoate (4paa)

![Chemical Structure]

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2-bromo-1-(p-tolyl)ethyl benzoate (4qaa)
2-bromo-1-(4-chlorophenyl)ethyl benzoate (4raa)
2-bromo-1-(3-methoxyphenyl)ethyl benzoate (4saa)
2-bromocyclohexyl benzoate (4taa)
2-bromocycloheptyl benzoate (4uaa)
2-bromo-1-((8R,9S,13S,14S)-13-methyl-17-oxo-7,8,9,11,12,13,14,15,16,17-decahydronaphthalen-3-yl)ethyl benzoate (4vaa)