

Supporting Information for

An organocatalytic method for the synthesis of some novel xanthene derivatives by intramolecular Friedel-Crafts reaction

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1. General Information

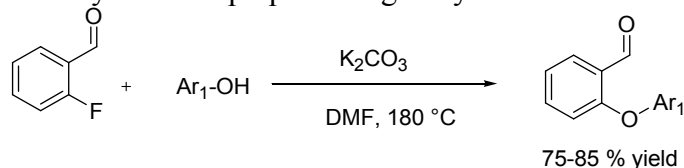
The majority of the chemicals used in this work were commercially available from Merck or Aldrich. CH₃CN was purchased from Merck with catalog number 114291. It has 99.8% purity and wasn't dried for extra. The starting carbinols **1a-1u** were prepared by Ullmann coupling of 2-fluorobenzaldehyde and substituted phenols and then Grignard reaction of 2-arenoxybenzaldehydes and some arylmagnesium bromides. All substrates were purified by crystallization or column chromatography and were characterized by IR, ¹H-NMR, ¹³C-NMR, elemental analysis and GC-MS. All novel products were characterized by IR, ¹H-NMR, ¹³C-NMR, elemental analysis and GC-MS. The reactions were monitored by TLC using silica gel plates and the products were purified by flash column chromatography on silica gel (Merck; 230–400 mesh), eluting with hexane-ethyl acetate (v/v 9:1). NMR spectra were recorded at 500 MHz for ¹H and 125 MHz for ¹³C using Me₄Si as the internal standard in CDCl₃. GC-MS were recorded on Shimadzu/ QP2010 Plus. IR spectra were recorded on a Mattson 1000 spectrometer.

2. Synthesis of *N*-triflylphosphoramidate (3g): Diphenylphosphochloridate (1.1 mL, 5.3 mmol, 1 equiv.) was dissolved in DCM (20 mL). Triethylamine (5.1 mL, 36.8 mmol, 7 equiv.) was added at 0 °C. DMAP (1.28 g, 10.5 mmol, 2 equiv.) and trifluoromethanesulfonamide TfNH₂ (940 mg, 6.3 mmol, 1.2 equiv.) were added to the reaction mixture at 0 °C. The cold bath was removed and the reaction mixture was stirred for 2 hours at room temperature, then heated at reflux for 1 hour. The conversion of the phosphochloridate was monitored by ³¹P NMR spectroscopy: disappearance of the signal for the starting material at 7.2 ppm and appearance of a new singlet at –12.9 ppm. DCM (15 mL) was then added and the organic layer was washed with water (20 mL). The organic layer was washed with hydrochloric acid (37%) until no traces of triethylamine and DMAP were observed in the ¹H NMR spectrum. The organic layer was then dried over Na₂SO₄, filtered and the solvent was removed under vacuum. The resulting white solid was dissolved in DCM and cooled to –30 °C to give white crystals 0.89 g, Yield = 60%, m.p. = 93–94 °C.

3. General procedure for reduction of the Ullmann coupling:¹

To a solution of DMF (10 mL) containing 2- fluorobenzaldehyde (5.0 mmol) and phenol (5.0 mmol) was added K₂CO₃ (5.0 mmol) and the reaction mixture was stirred for 2 hours at 180 °C under an nitrogen atmosphere. It was cooled to room temperature and after usual workup and concentration, the product was purified over silica gel.

Thus, 2-arenoxybenzaldehydes were prepared in good yields with 75-85% (Scheme 1).

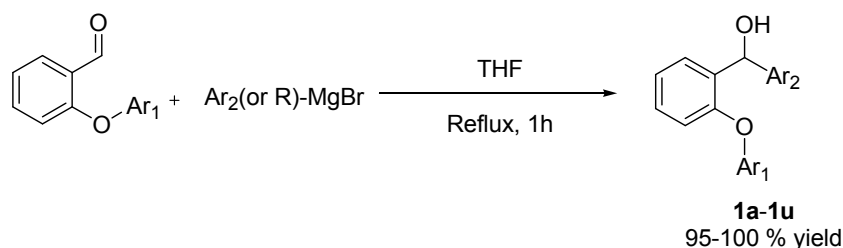


Scheme 1. The Ullmann type reaction of 2-fluorobenzaldehyde and hydroxy aryls.

4. General procedure for Grignard reaction:

For grignard solution, to Mg (2 mmol) was added bromo substrates (1.2 mmol) in dry THF and the mixture was heated under reflux and N_2 for 0.5-1 h then cooled to room temperature. 2-arenoxybenzaldehydes (1 mmol) was solved in dry THF and cooled to $0\text{ }^\circ\text{C}$. Then grignard solution was added to aldehyde solution and stirred for 1 hours. The end of the reaction was quenched with saturated NH_4Cl solution, extracted ethyl acetate 3 times. After usual workup and concentration, the crude was purified over silica gel.

Diarylcarbinol compounds including arenoxy group were obtained with very high yields (95-100%) (Scheme 2).



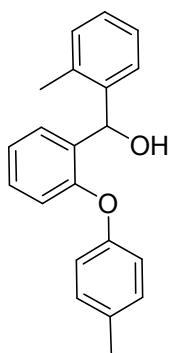
Scheme 2. The Grignard reaction of 2-arenoxybenzaldehyde.

5. General procedure for intramolecular Friedel Crafts cyclization:

To a stirred solution of a starting alcohol compound (**1a-1u**) (0.1 mmol) in dry CH_3CN (2.5 ml) was added *N*-triflylphosphoramidate (**3g**) (10 mol %) at room temperature and the reaction was stirred for 15 min. After the completion of the reaction as observed on TLC, the mixture was concentrated in vacuo and was extracted with ethylacetate. After usual reaction workup and concentration, the product was charged on silica gel.

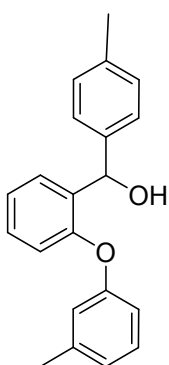
6.Experimental Characterization Data of 1a-1u and 2a-2u

o-Tolyl-(2-*p*-tolylloxy-phenyl)-methanol 1a:



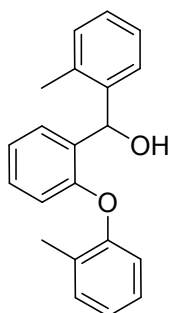
IR (KBr, cm^{-1}) ν 3417, 3018, 1584, 1216, 753, 669. **^1H NMR** (500 MHz, CDCl_3) δ 7.45 (d, $J = 5.0$ Hz, 1H), 7.17-6.94 (m, 8H), 6.75-6.72 (m, 3H), 6.29 (s, 1H), 2.42 (br s, 1H), 2.24 (s, 3H), 2.17 (s, 3H). **^{13}C NMR** (150MHz, CDCl_3) δ 155.9, 153.6, 139.5, 138.9, 134.4, 133.0, 129.2, 128.4, 127.7, 127.1, 126.3, 125.4, 124.9, 123.0, 122.4, 118.1, 117.5, 114.5, 66.8, 20.3, 18.1. **MS** (m/z) = 165, 195, 211, 239, 255, 271, 289, 304 (M^+). Anal. Calcd. for $\text{C}_{21}\text{H}_{20}\text{O}_2$: C, 82.86; H, 6.62. Found: C, 82.93; H, 6.73.

p-Tolyl-(2-*m*-tolylloxy-phenyl)-methanol 1b:



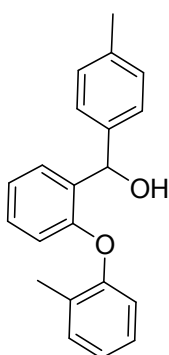
IR (KBr, cm^{-1}) ν 3425, 3019, 1615, 1582, 1220, 765, 682. **^1H NMR** (500 MHz, CDCl_3) δ 7.43 (d, $J = 10.0$ Hz, 1H), 7.20-7.01 (m, 7H), 6.81 (d, $J = 10.0$ Hz, 1H), 6.73 (d, $J = 10.0$ Hz, 1H), 6.63-6.58 (m, 2H), 6.08 (s, 1H), 2.23 (s, 3H), 2.20 (s, 3H). **^{13}C NMR** (150MHz, CDCl_3) δ 155.9, 153.1, 139.2, 138.8, 135.9, 133.9, 128.3, 127.9, 127.5, 126.7, 125.4, 123.0, 122.5, 118.2, 117.6, 114.6, 70.2, 20.2, 20.0. **MS** (m/z) = 168, 195, 211, 241, 259, 287, 302 ($\text{M}^+ - 2$). Anal. Calcd. for $\text{C}_{21}\text{H}_{20}\text{O}_2$: C, 82.86; H, 6.62. Found: C, 82.95; H, 6.76.

o-Tolyl-(2-*o*-tolylloxy-phenyl)-methanol 1c:



IR (KBr, cm^{-1}) ν 3420, 3016, 1580, 1225, 761, 672. **^1H NMR** (500 MHz, CDCl_3) δ 7.42 (d, $J = 10.0$ Hz, 1H), 7.20 (d, $J = 10.0$ Hz, 1H), 7.16-7.04 (m, 6H), 6.99-6.92 (m, 2H), 6.71 (d, $J = 5.0$ Hz, 1H), 6.54 (d, $J = 5.0$ Hz, 1H), 6.33 (s, 1H), 2.45 (br s, 1H), 2.20 (s, 3H), 2.03 (s, 3H). **^{13}C NMR** (150MHz, CDCl_3) δ 154.1, 153.0, 139.5, 134.5, 131.6, 130.4, 129.2, 128.7, 127.6, 127.0, 126.3, 126.1, 125.5, 124.9, 123.1, 121.5, 118.4, 114.9, 67.1, 18.1, 14.9. **MS** (m/z) = 165, 195, 211, 228, 271, 285, 304 (M^+). Anal. Calcd. for $\text{C}_{21}\text{H}_{20}\text{O}_2$: C, 82.86; H, 6.62. Found: C, 82.96; H, 6.75.

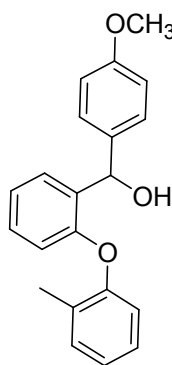
p-Tolyl-(2-*o*-tolylloxy-phenyl)-methanol 1d:



IR (KBr, cm^{-1}) ν 3507, 3025, 1685, 1582, 1235, 765, 682. **^1H NMR** (500 MHz, CDCl_3) δ 7.42 (d, $J = 10.0$ Hz, 1H), 7.22 (d, $J = 5.0$ Hz, 2H), 7.12 (d, $J = 10.0$ Hz, 1H), 7.06-6.94 (m, 6H), 6.66-6.64 (m, 1H), 6.48 (d, $J = 10.0$ Hz, 1H), 6.07 (s, 1H), 2.22 (s, 3H), 1.99 (s, 3H). **^{13}C NMR** (150MHz, CDCl_3) δ 153.6,

152.9, 139.3, 135.9, 132.4, 130.3, 128.8, 127.9, 127.5, 126.7, 126.1, 125.5, 123.0, 121.6, 118.4, 114.9, 70.6, 20.0, 14.9. **MS** (m/z) = 152, 181, 197, 211, 228, 255, 271, 285, 304 (M^+). Anal. Calcd. for $C_{21}H_{20}O_2$: C, 82.86; H, 6.62. Found: C, 82.93; H, 6.76.

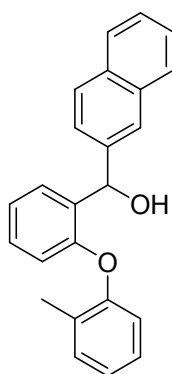
(4-Methoxy-phenyl)-(2-*o*-tolylloxy-phenyl)-methanol 1e:



IR (KBr, cm^{-1}) ν 3570, 3025, 2320, 1584, 1221, 760, 661. **1H NMR** (500 MHz, $CDCl_3$) δ 7.44 (d, J = 10.0 Hz, 1H), 7.23 (d, J = 5.0 Hz, 2H), 7.11 (d, J = 10.0 Hz, 1H), 7.06-6.92 (m, 4H), 6.73 (d, J = 10.0 Hz, 1H), 6.62 (d, J = 10.0 Hz, 1H), 6.48 (d, J = 10.0 Hz, 1H), 6.04 (s, 1H), 3.66 (s, 3H), 2.65 (br s, 1H), 1.98 (s, 3H). **^{13}C NMR** (150MHz, $CDCl_3$) δ 153.5, 152.9, 134.6, 132.6, 130.3, 128.7, 127.8, 126.9, 126.5, 126.1, 123.0, 121.5, 118.4, 114.9, 112.6, 70.2, 54.2, 14.9. **MS** (m/z) = 165, 195, 211, 239, 255, 271, 289, 304 (M^+). Anal.

Calcd. for $C_{21}H_{20}O_3$: C, 78.73; H, 6.29. Found: C, 78.87; H, 6.42.

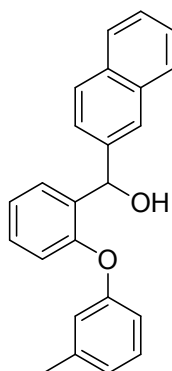
Naphthalen-2-yl-(2-*o*-tolylloxy-phenyl)-methanol 1f:



IR (KBr, cm^{-1}) ν 3430, 3017, 2321, 1590, 1223, 761, 672. **1H NMR** (500 MHz, $CDCl_3$) δ 8.03 (d, J = 10.0 Hz, 1H), 7.76 (d, J = 5.0 Hz, 1H), 7.71 (d, J = 5.0 Hz, 1H), 7.62 (d, J = 5.0 Hz, 1H), 7.40-7.31 (m, 4H), 7.15-7.04 (m, 3H), 6.89-6.86 (m, 1H), 6.79 (d, J = 10.0 Hz, 1H), 6.75-6.63 (m, 1H), 6.59 (d, J = 10.0 Hz, 1H), 6.28 (s, 1H), 2.74 (br s, 1H), 2.06 (s, 3H). **^{13}C NMR** (150MHz, $CDCl_3$) δ 153.8, 153.0, 137.1, 132.7, 131.6, 130.4, 128.7, 127.9, 127.6, 127.2, 126.2, 125.0, 124.4, 124.2, 123.2, 123.1, 122.8, 121.7, 118.2, 115.1, 67.0, 15.0. **MS** (m/z) = 165, 195, 231, 276, 307, 322, 341 ($M^{+}+1$). Anal. Calcd. for

$C_{24}H_{20}O_2$: C, 84.68; H, 5.92. Found: C, 84.62; H, 5.84.

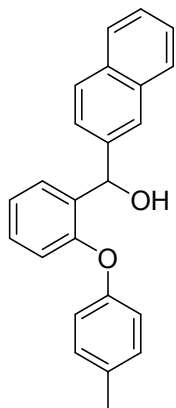
Naphthalen-2-yl-(2-*m*-tolylloxy-phenyl)-methanol 1g:



IR (KBr, cm^{-1}) ν 3429, 3021, 2362, 1591, 1357, 1225, 760, 661. **1H NMR** (500 MHz, $CDCl_3$) δ 7.93 (d, J = 10.0 Hz, 1H), 7.73 (d, J = 10.0 Hz, 1H), 7.68 (d, J = 10.0 Hz, 1H), 7.63 (d, J = 5.0 Hz, 1H), 7.39-7.28 (m, 4H), 7.14-7.07 (m, 3H), 6.91-6.88 (m, 1H), 6.82-6.81 (m, 1H), 6.71-6.69 (m, 2H), 6.21 (s, 1H), 2.59 (br s, 1H), 2.20 (s, 3H). **^{13}C NMR** (150MHz, $CDCl_3$) δ 156.0, 153.5, 138.9, 137.0, 133.0, 132.7, 128.4, 127.9, 127.7, 127.5, 127.1, 124.9, 124.4, 124.2, 123.1, 122.8, 122.6, 118.2, 117.6, 114.5, 66.8, 20.3. **MS** (m/z) = 165,

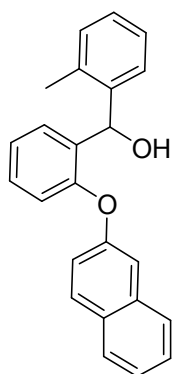
195, 207, 231, 253, 281, 307, 340 (M^+). Anal. Calcd. for $C_{24}H_{20}O_2$: C, 84.68; H, 5.92. Found: C, 84.63; H, 5.83.

Naphthalen-2-yl-(2-*p*-toloxy-phenyl)-methanol 1h:



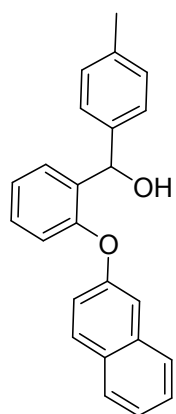
IR (KBr, cm^{-1}) ν 3440, 2942, 2365, 1617, 1585, 1453, 1241, 756, 691. **1H NMR** (500 MHz, $CDCl_3$) δ 7.95 (d, $J = 10.0$ Hz, 1H), 7.73-7.61 (m, 3H), 7.38-7.27 (m, 3H), 7.10-7.00 (m, 3H), 6.87-6.74 (m, 5H), 6.22 (s, 1H), 2.21 (s, 3H). **^{13}C NMR** (150MHz, $CDCl_3$) δ 153.9, 153.5, 137.1, 132.7, 132.6, 132.0, 129.7, 129.2, 127.8, 127.7, 127.5, 127.1, 124.9, 124.4, 124.2, 123.1, 122.9, 122.2, 117.8, 116.9, 66.8, 19.6. **MS** (m/z) = 165, 195, 207, 231, 253, 281, 307, 322, 341 (M^++1). Anal. Calcd. for $C_{24}H_{20}O_2$: C, 84.68; H, 5.92. Found: C, 84.78; H, 6.01.

[2-(Naphthalen-2-yloxy)-phenyl]-*o*-tolyl-methanol 1i:



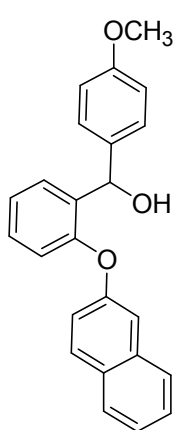
IR (KBr, cm^{-1}) ν 3574, 3019, 2363, 1593, 1460, 1216, 758, 669. **1H NMR** (500 MHz, $CDCl_3$) δ 7.73-7.70 (m, 2H), 7.57 (d, $J = 10.0$ Hz, 1H), 7.44 (d, $J = 10.0$ Hz, 1H), 7.37-7.27 (m, 3H), 7.18-7.00 (m, 7H), 6.83 (d, $J = 10.0$ Hz, 1H), 6.32 (s, 1H), 2.17 (s, 3H). **^{13}C NMR** (150MHz, $CDCl_3$) δ 153.8, 153.4, 139.5, 134.4, 133.3, 133.2, 129.3, 128.8, 127.8, 127.2, 126.6, 126.4, 126.0, 125.5, 124.9, 123.7, 122.8, 118.5, 117.9, 112.7, 66.9, 18.1. **MS** (m/z) = 165, 181, 202, 231, 253, 281, 307, 340 (M^+). Anal. Calcd. for $C_{24}H_{20}O_2$: C, 84.68; H, 5.92. Found: C, 84.73; H, 5.97.

[2-(Naphthalen-2-yloxy)-phenyl]-*p*-tolyl-methanol 1j:



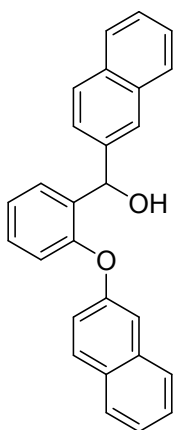
IR (KBr, cm^{-1}) ν 3450, 2930, 2360, 1596, 1455, 1230, 756, 667. **1H NMR** (500 MHz, $CDCl_3$) δ 7.71-7.63 (m, 2H), 7.54-7.49 (m, 2H), 7.36-7.28 (m, 2H), 7.19 (d, $J = 10.0$ Hz, 2H), 7.15-7.02 (m, 4H), 6.99 (d, $J = 5.0$ Hz, 2H), 6.79 (d, $J = 10.0$ Hz, 1H), 6.07 (s, 1H), 2.18 (s, 3H). **^{13}C NMR** (150MHz, $CDCl_3$) δ 153.8, 152.9, 139.1, 136.0, 134.1, 133.2, 128.9, 128.8, 127.9, 127.7, 126.8, 126.6, 126.0, 125.5, 123.6, 122.9, 118.5, 118.1, 114.0, 112.6, 70.3, 20.0. **MS** (m/z) = 160, 202, 231, 276, 307, 322, 341 (M^++1). Anal. Calcd. for $C_{24}H_{20}O_2$: C, 84.68; H, 5.92. Found: C, 84.63; H, 5.85.

(4-Methoxy-phenyl)-[2-(naphthalen-2-yloxy)-phenyl]-methanol 1k:³



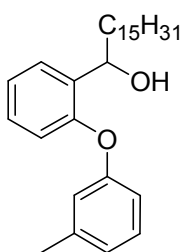
IR (KBr, cm^{-1}) ν 3549, 2930, 2362, 1595, 1450, 1239, 755, 669. **¹H NMR** (500 MHz, CDCl_3) δ 7.72-7.68 (m, 2H), 7.55-7.52 (m, 2H), 7.36-7.29 (m, 2H), 7.22 (d, J = 10.0 Hz, 2H), 7.17-7.08 (m, 2H), 7.03-7.01 (m, 2H), 6.80 (d, J = 10.0 Hz, 1H), 6.71 (d, J = 5.0 Hz, 2H), 6.05 (s, 1H), 3.63 (s, 3H). **¹³C NMR** (150MHz, CDCl_3) δ 157.8, 153.8, 152.8, 134.4, 134.3, 133.2, 129.0, 128.8, 127.6, 126.8, 126.6, 126.0, 125.5, 123.6, 123.0, 118.4, 118.1, 113.8, 112.6, 112.5, 70.0, 54.1. **MS** (m/z) = 165, 181, 202, 231, 253, 281, 307, 340 (M^+). Anal. Calcd. for $\text{C}_{24}\text{H}_{20}\text{O}_3$: C, 80.88; H, 5.66. Found: C, 80.95; H, 5.73.

Naphthalen-2-yl-[2-(naphthalen-2-yloxy)-phenyl]-methanol 1l:



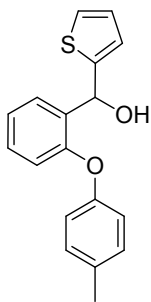
IR (KBr, cm^{-1}) ν 3436, 3018, 2362, 1597, 1487, 1463, 1216, 754. **¹H NMR** (500 MHz, CDCl_3) δ 7.97 (d, J = 10.0 Hz, 1H), 7.74-7.64 (m, 5H), 7.58 (d, J = 10.0 Hz, 1H), 7.40-7.27 (m, 5H), 7.23 (d, J = 10.0 Hz, 1H), 7.17-7.12 (m, 2H), 6.99-6.96 (m, 1H), 6.89-6.87 (m, 2H), 6.27 (s, 1H), 2.58 (br s, 1H). **¹³C NMR** (150MHz, CDCl_3) δ 153.9, 153.2, 137.1, 133.3, 133.2, 132.7, 129.6, 129.1, 128.9, 128.0, 127.8, 127.6, 127.2, 126.7, 126.0, 125.5, 125.0, 124.4, 124.2, 123.7, 123.2, 123.0, 122.8, 118.5, 118.1, 112.6, 66.8. **MS** (m/z) = 179, 202, 218, 231, 250, 281, 300, 326, 358, 374 ($M^+ - 2$). Anal. Calcd. for $\text{C}_{27}\text{H}_{20}\text{O}_2$: C, 86.14; H, 5.36. Found: C, 86.20; H, 5.48.

1-(2-*m*-Tolyloxy-phenyl)-hexadecan-1-ol 1m:



IR (KBr, cm^{-1}) ν 3373, 3044, 2945, 2853, 1868, 1483, 1402, 779, 698. **¹H NMR** (500 MHz, CDCl_3) δ 7.41 (d, J = 10.0 Hz, 1H), 7.14-7.11 (m, 2H), 7.07-7.04 (m, 1H), 6.84 (d, J = 10.0 Hz, 1H), 6.77 (d, J = 10.0 Hz, 1H), 6.73-6.71 (m, 1H), 6.70-6.68 (m, 1H), 4.90 (t, J = 7.5 Hz, 1H), 2.25 (s, 3H), 1.75-1.70 (m, 2H), 1.21-1.16 (m, 26H), 0.81 (t, J = 7.5 Hz, 3H). **¹³C NMR** (150MHz, CDCl_3) δ 156.2, 152.9, 138.9, 134.6, 128.4, 127.2, 126.3, 122.9, 122.6, 118.0, 117.8, 114.3, 68.8, 36.8, 30.9, 28.6, 28.6, 28.6, 28.5, 28.5, 28.4, 28.3, 24.8, 21.6, 20.3, 13.0. **MS** (m/z) = 165, 181, 197, 223, 237, 281, 299, 327, 406 ($M^+ - \text{H}_2\text{O}$). Anal. Calcd. for $\text{C}_{29}\text{H}_{44}\text{O}_2$: C, 82.02; H, 10.44. Found: C, 81.91; H, 10.52.

Thiophen-2-yl-(2-*p*-tolyloxy-phenyl)-methanol 1n:

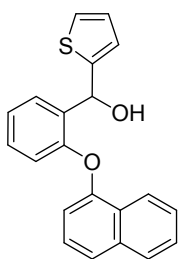


IR (KBr, cm^{-1}) ν 3381, 3051, 2826, 1857, 1481, 1395, 875, 723, 590. **^1H NMR** (500 MHz, CDCl_3) δ 7.58 (dd, $J_1 = 1.5$ Hz, $J_2 = 8.0$ Hz, 1H), 7.28-7.22 (m, 2H), 7.15-7.12 (m, 3H), 6.95-6.92 (m, 2H), 6.86-6.84 (m, 2H), 6.81 (dd, $J_1 = 1.5$ Hz, $J_2 = 8.0$ Hz 1H), 6.38 (s, 1H), 3.02 (br s, 1H), 2.35 (s, 3H).

^{13}C NMR (150MHz, CDCl_3) δ 154.8, 154.2, 147.8, 133.5, 133.2, 130.3, 130.2, 129.0, 129.1, 127.6, 126.5, 124.8, 124.5, 123.2, 119.1, 117.7, 68.4, 20.7.

MS (m/z) = 195, 211, 245, 263, 277, 296 (M^+). Anal. Calcd. for $\text{C}_{18}\text{H}_{16}\text{O}_2\text{S}$: C, 72.94; H, 5.44; S, 10.82. Found: C, 72.73; H, 5.51; S, 10.76.

[2-(Naphthalen-1-yloxy)-phenyl]-thiophen-2-yl-methanol 1o:

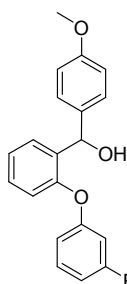


IR (KBr, cm^{-1}) ν 3413, 3054, 2846, 1849, 1485, 1391, 1125, 876, 738, 596.

^1H NMR (500 MHz, CDCl_3) δ 7.84 (m, 2H), 7.69 (d, $J = 8.0$ Hz, 2H), 7.50-7.42 (m, 2H), 7.32-7.18 (m, 6H), 6.96-6.91 (m, 2H), 6.43 (s, 1H), 2.97 (br s, 1H). **^{13}C NMR** (150MHz, CDCl_3) δ 154.6, 154.1, 147.7, 134.3, 134.2, 130.3, 129.9, 129.2, 127.8, 127.7, 127.2, 126.6, 126.6, 124.9, 124.8, 124.6, 123.9, 119.7, 118.8, 114.17, 68.1. **MS** (m/z) = 128, 133, 207, 231, 247, 281, 314 ($\text{M}^+ - \text{H}_2\text{O}$).

Anal. Calcd. for $\text{C}_{21}\text{H}_{16}\text{O}_2\text{S}$: C, 75.88; H, 4.85; S, 9.65. Found: C, 75.62; H, 4.96; S, 9.75.

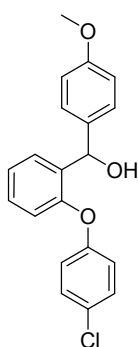
[2-(3-Bromo-phenoxy)-phenyl]-(4-methoxy-phenyl)-methanol 1p:



IR (KBr, cm^{-1}) ν 3456, 3057, 2861, 1853, 1453, 1392, 1154, 806, 759. **^1H NMR** (500 MHz, CDCl_3) δ 7.65 (dd, $J_1 = 2.0$ Hz, $J_2 = 7.5$ Hz, 1H), 7.29-7.11 (m, 6H), 6.91 (t, $J = 2.0$ Hz, 1H), 6.87-6.77 (m, 4H), 6.06 (s, 1H), 3.79 (s, 3H), 2.44 (br s, 1H). **^{13}C NMR** (150MHz, CDCl_3) δ 159.1, 159.1, 152.9, 135.6, 135.2, 130.6, 128.8, 127.9, 127.6, 126.0, 124.6, 122.8, 121.2, 119.5, 116.8, 116.0, 114.8, 113.7, 70.9, 55.2. **MS** (m/z) = 128, 152, 163, 180, 242, 259, 272,

287, 335, 366, 384 (M^+). Anal. Calcd. for $\text{C}_{20}\text{H}_{17}\text{BrO}_3$: C, 62.35; H, 4.45; Br, 20.74. Found: C, 61.91; H, 4.62; Br, 20.32.

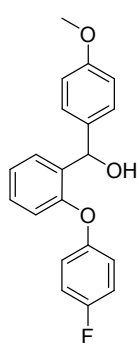
[2-(4-Chloro-phenoxy)-phenyl]-(4-methoxy-phenyl)-methanol 1r:



IR (KBr, cm^{-1}) ν 3389, 3052, 2863, 1874, 1456, 1421, 1251, 761, 659. **^1H NMR** (500 MHz, CDCl_3) δ 7.62 (dd, $J_1 = 2.0$ Hz, $J_2 = 7.5$ Hz, 1H), 7.29-7.17 (m, 6H), 6.84-6.75 (m, 5H), 6.08 (s, 1H), 3.79 (s, 3H), 2.53 (br s, 1H). **^{13}C NMR** (150MHz, CDCl_3) δ 158.9, 155.8, 153.4, 135.3, 129.6, 129.6, 127.9,

127.8, 124.2, 119.5, 118.9, 116.0, 114.8, 113.7, 70.9, 55.3. **MS** (m/z) = 168, 181, 211, 228, 233, 255, 281, 291, 321, 340(M^+). Anal. Calcd. for $C_{20}H_{17}ClO_3$: C, 70.49; H, 5.03; Cl, 10.40. Found: C, 69.95; H, 5.31; Cl, 10.22.

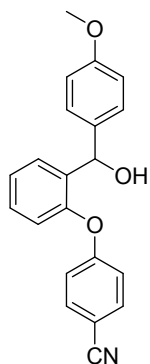
[2-(4-Fluoro-phenoxy)-phenyl]-(4-methoxy-phenyl)-methanol **1s**



IR (KBr, cm^{-1}) ν 3421, 3062, 2841, 1868, 1450, 1402, 1250, 1085, 781, 693. **1H NMR** (500 MHz, $CDCl_3$) δ 7.64 (d, J = 6.5 Hz, 1H), 7.35 (d, J = 7.5 Hz, 2H), 7.27-7.20 (m, 2H), 7.03-7.01 (m, 2H), 6.90-6.81 (m, 5H), 6.17 (s, 1H), 3.84 (s, 3H), 2.72 (s, 1H). **^{13}C NMR** (150MHz, $CDCl_3$) δ 171.3, 159.8, 158.9, 156.8, 154.4, 152.8, 135.6, 134.8, 128.7, 127.9, 127.6, 123.7, 120.2, 120.1, 118.0, 116.4, 116.2, 113.8, 71.1, 55.3. **MS** (m/z) = 135, 152, 181, 199, 215, 228, 275, 291, 305, 324 (M^+). Anal. Calcd. for $C_{20}H_{17}FO_3$: C, 74.06; H, 5.28; F, 5.86.

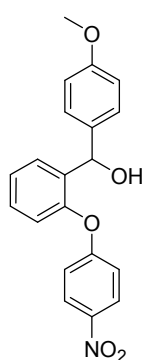
Found: C, 74.36; H, 5.31; F, 5.63.

4-{2-[Hydroxy-(4-methoxy-phenyl)-methyl]-phenoxy}-benzonitrile **1t**



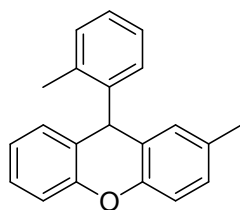
IR (KBr, cm^{-1}) ν 3386, 3053, 2825, 2241, 1873, 1452, 1190, 903, 725. **1H NMR** (500 MHz, $CDCl_3$) δ 7.81-7.79 (m, 1H), 7.54 (d, J = 9.0 Hz, 2H), 7.38-7.33 (m, 2H), 7.22 (d, J = 8.5 Hz, 2H), 6.97-6.96 (m, 1H), 6.84 (d, J = 9.0 Hz, 2H), 6.79 (d, J = 9.0 Hz, 2H), 6.02 (s, 1H), 3.80 (s, 3H), 2.46 (br s, 1H). **^{13}C NMR** (150MHz, $CDCl_3$) δ 161.3, 159.1, 151.4, 136.4, 134.9, 134.0, 129.0, 128.0, 127.8, 125.7, 120.7, 118.8, 117.4, 113.8, 105.6, 70.7, 55.3. **MS** (m/z) = 108, 135, 152, 165, 181, 206, 222, 282, 315, 331 (M^+). Anal. Calcd. for $C_{21}H_{17}NO_3$: C, 76.12; H, 5.17; N, 4.23. Found: C, 75.92; H, 5.24, N, 4.37.

(4-Methoxy-phenyl)-[2-(4-nitro-phenoxy)-phenyl]-methanol **1u**



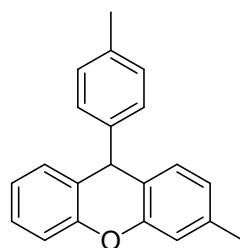
IR (KBr, cm^{-1}) ν 3452, 3072, 2827, 1886, 1552, 1432, 1353, 1106, 885, 752. **1H NMR** (500 MHz, $CDCl_3$) δ 7.55-7.47 (m, 1H), 7.17-7.09 (m, 7H), 6.81-6.76 (m, 3H), 6.61-6.56 (m, 1H), 5.93 (s, 1H), 3.76 (s, 3H), 2.74 (br s, 1H). **^{13}C NMR** (150MHz, $CDCl_3$) δ 158.9, 158.8, 153.9, 153.6, 135.4, 135.3, 134.6, 128.7, 128.7, 127.8, 127.7, 123.59, 118.1, 117.9, 113.6, 71.2, 55.3. **MS** (m/z) = 135, 165, 181, 197, 223, 281, 316, 330, 351 (M^+). Anal. Calcd. for $C_{20}H_{17}NO_5$: C, 68.37; H, 4.88; N, 3.99. Found: C, 68.25; H, 4.92; N, 3.65.

2-Methyl-9-o-tolyl-9H-xanthene **2a**:



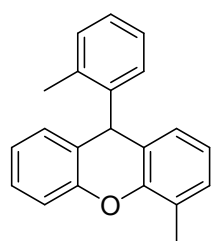
IR (KBr, cm^{-1}) ν 3021, 1607, 1482, 1218, 761, 672. **^1H NMR** (500 MHz, CDCl_3) δ 7.09-7.07 (m, 5H), 7.00-6.98 (m, 1H), 6.90-6.88 (m, 2H), 6.83-6.76 (m, 2H), 6.58-6.57 (m, 1H), 5.43 (s, 1H), 2.15 (s, 3H), 2.10 (s, 3H). **^{13}C NMR** (150MHz, CDCl_3) δ 150.0, 147.8, 142.7, 134.8, 131.3, 130.1, 130.0, 128.3, 128.2, 127.4, 126.6, 125.8, 125.3, 121.8, 115.2, 114.9, 40.3, 19.6, 19.0. **MS** (m/z) = 195, 239, 255, 271, 286 (M^+). Anal. Calcd. for $\text{C}_{21}\text{H}_{18}\text{O}$: C, 88.08; H, 6.34. Found: C, 88.01; H, 6.43.

3-Methyl-9-*p*-tolyl-9H-xanthene 2b:



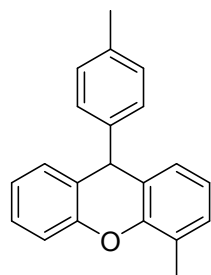
IR (KBr, cm^{-1}) ν 3016, 2381, 1593, 1481, 1215, 792, 671. **^1H NMR** (500 MHz, CDCl_3) δ 7.12-7.03 (m, 1H), 7.01-6.95 (m, 6H), 6.89-6.83 (m, 3H), 6.71-6.69 (m, 1H), 5.10 (s, 1H), 2.24 (s, 3H), 2.20 (s, 3H). **^{13}C NMR** (150MHz, CDCl_3) δ 150.0, 149.8, 142.8, 136.7, 135.0, 128.6, 128.3, 127.2, 126.6, 123.1, 122.0, 115.7, 115.4, 42.6, 20.0, 19.9. **MS** (m/z) = 195, 239, 255, 271, 286 (M^+). Anal. Calcd. for $\text{C}_{21}\text{H}_{18}\text{O}$: C, 88.08; H, 6.34. Found: C, 88.00; H, 6.24.

4-Methyl-9-*o*-tolyl-9H-xanthene 2c:



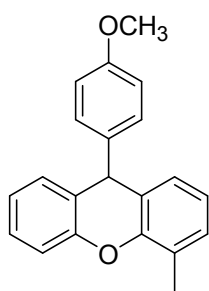
IR (KBr, cm^{-1}) ν 2375, 1606, 1480, 1240, 781, 675. **^1H NMR** (500 MHz, CDCl_3) δ 7.11-7.08 (m, 6H), 6.95 (d, J = 10.0 Hz, 1H), 6.84-6.81 (m, 1H), 6.78-6.71 (m, 2H), 6.61 (d, J = 5.0 Hz, 1H), 5.45 (s, 1H), 2.34 (s, 3H), 2.14 (s, 3H). **^{13}C NMR** (150MHz, CDCl_3) δ 150.0, 148.1, 142.6, 134.8, 130.0, 128.0, 126.6, 125.7, 125.6, 125.3, 124.3, 123.2, 122.6, 121.9, 121.4, 115.3, 40.4, 19.0, 15.0. **MS** (m/z) = 195, 239, 255, 271, 286 (M^+). Anal. Calcd. for $\text{C}_{21}\text{H}_{18}\text{O}$: C, 88.08; H, 6.34. Found: C, 88.02; H, 6.43.

4-Methyl-9-*p*-tolyl-9H-xanthene 2d:



IR (KBr, cm^{-1}) ν 2385, 1603, 1485, 1255, 754, 695. **^1H NMR** (500 MHz, CDCl_3) δ 7.11-7.06 (m, 2H), 7.03-6.98 (m, 4H), 6.98-6.85 (m, 2H), 6.82-6.76 (m, 3H), 5.11 (s, 1H), 2.34 (s, 3H), 2.19 (s, 3H). **^{13}C NMR** (150MHz, CDCl_3) δ 150.2, 148.3, 137.8, 128.4, 128.2, 127.9, 126.5, 126.0, 124.6, 123.9, 123.3, 122.0, 121.5, 115.5, 113.0, 54.1, 42.7, 14.9. **MS** (m/z) = 195, 255, 271, 286 (M^+). Anal. Calcd. for $\text{C}_{21}\text{H}_{18}\text{O}$: C, 88.08; H, 6.34. Found: C, 88.03; H, 6.44.

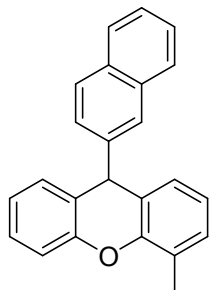
9-(4-Methoxy-phenyl)-4-methyl-9H-xanthene 2e:



IR (KBr, cm^{-1}) ν 2357, 1605, 1482, 1260, 770, 698. **^1H NMR** (500 MHz, CDCl_3) δ 7.22-7.34 (m, 2H), 7.03-6.98 (m, 4H), 6.89-6.85 (m, 2H), 6.82-6.76 (m, 3H), 5.11 (s, 1H), 2.34 (s, 3H), 2.19 (s, 3H). **^{13}C NMR** (150MHz, CDCl_3) δ 150.2, 148.3, 142.6, 135.0, 128.4, 128.3, 128.0, 127.1, 126.6, 126.0, 122.0, 121.5, 115.5, 43.2, 19.9, 15.0. **MS** (m/z) = 195, 256, 271, 302 (M^+). Anal. Calcd. for $\text{C}_{21}\text{H}_{18}\text{O}_2$: C, 83.42; H, 6.00. Found: C, 83.53; H,

5.92.

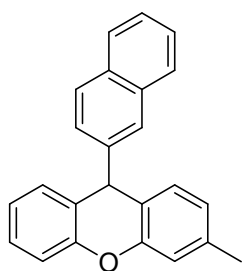
4-Methyl-9-naphthalen-2-yl-9H-xanthene 2f:



IR (KBr, cm^{-1}) ν 3020, 2362, 1592, 1453, 1215, 768, 685. **^1H NMR** (500 MHz, CDCl_3) δ 8.06-8.01 (m, 1H), 7.78 (d, $J = 10.0$ Hz, 1H), 7.69 (d, $J = 10.0$ Hz, 1H), 7.36-7.29 (m, 4H), 7.16-7.04 (m, 3H), 6.78-6.74 (m, 2H), 6.67-6.60 (m, 2H), 5.93 (s, 1H), 2.39 (s, 3H). **^{13}C NMR** (150MHz, CDCl_3) δ 149.9, 148.0, 133.4, 130.1, 128.1, 127.9, 127.8, 126.7, 125.6, 125.0, 124.5, 124.4, 123.7, 123.1, 122.0, 121.4, 115.4, 40.1, 15.0. **MS** (m/z) =

195, 215, 245, 276, 307, 322 (M^+). Anal. Calcd. for $\text{C}_{24}\text{H}_{18}\text{O}$: C, 89.41; H, 5.63. Found: C, 89.32; H, 5.52.

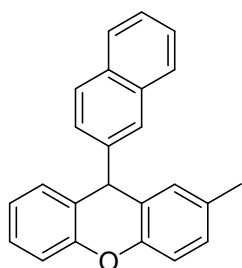
3-Methyl-9-naphthalen-2-yl-9H-xanthene 2g:



IR (KBr, cm^{-1}) ν 3021, 2365, 1570, 1218, 762, 673. **^1H NMR** (500 MHz, CDCl_3) δ 7.76 (d, $J = 10.0$ Hz, 1H), 7.71-7.67 (m, 2H), 7.62-7.54 (m, 1H), 7.48-7.41 (m, 1H), 7.36-7.27 (m, 4H), 7.06-7.00 (m, 3H), 6.66-6.64 (m, 1H), 6.57-6.55 (m, 1H), 5.89 (s, 1H), 2.21 (s, 3H). **^{13}C NMR** (150MHz, CDCl_3) δ 149.8, 149.5, 138.1, 136.9, 128.1, 127.8, 127.5, 126.7, 125.0, 124.3, 124.0, 123.0, 121.9, 120.4, 115.7, 115.4, 113.4, 40.1,

20.0. **MS** (m/z) = 195, 245, 276, 322 (M^+). Anal. Calcd. for $\text{C}_{24}\text{H}_{18}\text{O}$: C, 89.41; H, 5.63. Found: C, 89.52; H, 5.68.

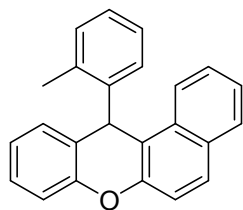
2-Methyl-9-naphthalen-2-yl-9H-xanthene 2h:



IR (KBr, cm^{-1}) ν 3040, 2362, 1530, 1476, 1263, 781, 694. **^1H NMR** (500 MHz, CDCl_3) δ 8.03-8.02 (m, 1H), 7.77 (d, $J = 10.0$ Hz, 1H), 7.67 (d, $J = 10.0$ Hz, 1H), 7.35-7.29 (m, 4H), 7.06-7.03 (m, 2H), 6.97-6.96 (m, 1H),

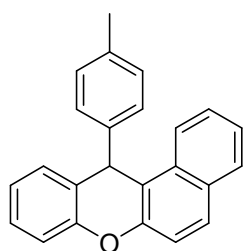
6.89-6.87 (m, 1H), 6.77-6.76 (m, 1H), 6.73-6.70 (m, 1H), 6.58-6.57 (m, 1H), 5.89 (s, 1H), 1.99 (s, 3H). ^{13}C NMR (150MHz, CDCl_3) δ 149.8, 147.6, 133.4, 131.4, 130.1, 128.3, 128.1, 128.0, 127.6, 126.7, 125.1, 124.5, 124.4, 123.5, 121.8, 115.3, 115.1, 39.9, 19.5. MS (m/z) = 195, 231, 276, 307, 322 (M^+). Anal. Calcd. for $\text{C}_{24}\text{H}_{18}\text{O}$: C, 89.41; H, 5.63. Found: C, 89.55; H, 5.74.

12-*o*-Tolyl-12*H*-benzo[*a*]xanthene 2i:³



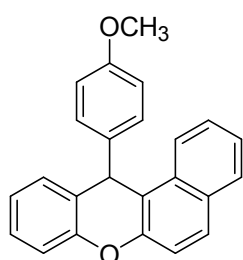
IR (KBr, cm^{-1}) ν 2935, 2356, 1618, 1591, 1476, 1243, 796, 695. ^1H NMR (500 MHz, CDCl_3) δ 7.70-7.67 (m, 3H), 7.31-7.28 (m, 2H), 7.25-7.20 (m, 2H), 7.12-7.02 (m, 4H), 6.92-6.89 (m, 3H), 5.99 (s, 1H), 2.61 (s, 3H). ^{13}C NMR (150MHz, CDCl_3) δ 148.9, 148.4, 144.0, 132.5, 130.0, 129.7, 128.4, 128.0, 127.9, 127.5, 126.6, 127.5, 125.6, 125.3, 122.9, 122.5, 122.0, 116.8, 115.5, 114.9, 37.3, 19.0. MS (m/z) = 231, 232, 276, 307, 322 (M^+). Anal. Calcd. for $\text{C}_{24}\text{H}_{18}\text{O}$: C, 89.41; H, 5.63. Found: C, 89.35; H, 5.68.

12-*p*-Tolyl-12*H*-benzo[*a*]xanthene 2j:³



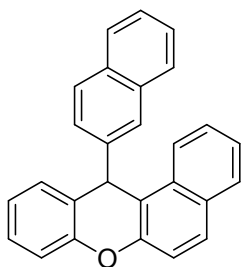
IR (KBr, cm^{-1}) ν 3051, 2372, 1486, 1445, 1261, 743, 699. ^1H NMR (500 MHz, CDCl_3) δ 7.85 (d, J = 10.0 Hz, 1H), 7.70-7.67 (m, 2H), 7.34-7.30 (m, 2H), 7.28-7.23 (m, 2H), 7.12-7.06 (m, 4H), 6.96-6.92 (m, 1H), 6.90-6.89 (m, 2H), 5.69 (s, 1H), 2.10 (s, 3H). ^{13}C NMR (150MHz, CDCl_3) δ 149.1, 148.3, 142.5, 134.9, 130.6, 129.8, 128.4, 128.2, 127.9, 126.5, 126.1, 125.6, 124.0, 123.0, 122.6, 122.0, 116.9, 115.6, 114.9, 40.5, 19.8. MS (m/z) = 231, 250, 276, 322 (M^+). Anal. Calcd. for $\text{C}_{24}\text{H}_{18}\text{O}$: C, 89.41; H, 5.63. Found: C, 89.48; H, 5.71.

12-(4-Methoxy-phenyl)-12*H*-benzo[*a*]xanthene 2k:²



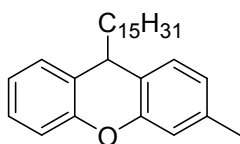
IR (KBr, cm^{-1}) ν 3019, 2361, 1591, 765, 676. ^1H NMR (500 MHz, CDCl_3) δ 7.85 (d, J = 5.0 Hz, 1H), 7.70-7.67 (m, 2H), 7.35-7.24 (m, 4H), 7.14-7.06 (m, 4H), 6.96-6.93 (m, 1H), 6.63-6.61 (m, 2H), 5.67 (s, 1H), 3.56 (s, 3H). ^{13}C NMR (150MHz, CDCl_3) δ 157.0, 149.2, 148.3, 137.8, 130.6, 129.8, 128.2, 127.9, 127.5, 127.2, 126.5, 125.6, 124.1, 123.0, 122.6, 122.0, 116.9, 115.6, 115.0, 113.1, 54.0, 40.0. MS (m/z) = 202, 211, 231, 263, 323, 338 (M^+). Anal. Calcd. for $\text{C}_{24}\text{H}_{18}\text{O}_2$: C, 85.18; H, 5.36. Found: C, 85.13; H, 5.46.

12-Naphthalen-2-yl-12*H*-benzo[*a*]xanthene 2l:



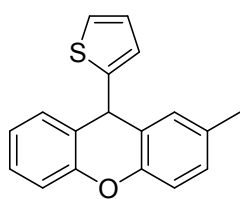
IR (KBr, cm^{-1}) ν 3022, 2358, 1597, 1296, 785, 694. **^1H NMR** (500 MHz, CDCl_3) δ 8.77 (d, $J = 10.0$ Hz, 1H), 7.77 (d, $J = 10.0$ Hz, 1H), 7.70-7.64 (m, 3H), 7.58 (d, $J = 10.0$ Hz, 1H), 7.49-7.44 (m, 2H), 7.34 (d, $J = 10.0$ Hz, 1H), 7.30 (d, $J = 5.0$ Hz, 1H), 7.18-7.03 (m, 6H), 6.79-6.76 (m, 1H), 5.87 (s, 1H). **^{13}C NMR** (150MHz, CDCl_3) δ 148.6, 142.4, 133.0, 130.9, 129.7, 129.3, 128.3, 128.0, 127.4, 126.6, 126.0, 125.9, 125.7, 125.1, 124.4, 123.9, 122.98, 122.3, 122.0, 121.7, 116.9, 115.7, 115.2, 34.8. **MS** (m/z) = 231, 250, 281, 300, 342, 358 (M^+). Anal. Calcd. for $\text{C}_{27}\text{H}_{18}\text{O}$: C, 90.47; H, 5.06. Found: C, 90.39; H, 5.15.

3-Methyl-9-pentadecyl-9*H*-xanthene 2m:



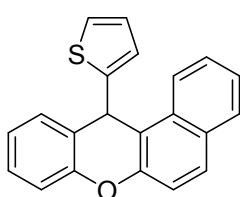
IR (KBr, cm^{-1}) ν 3015, 2371, 1612, 1591, 1286, 749, 662. **^1H NMR** (500 MHz, CDCl_3) δ 7.46 (d, $J = 5.0$ Hz, 1H), 7.08-7.05 (m, 1H), 7.01-6.98 (m, 1H), 6.80-6.77 (m, 2H), 6.55 (d, $J = 15.0$ Hz, 1H), 6.21-6.15 (m, 1H), 3.22 (t, $J = 7.5$ Hz, 1H), 2.23 (s, 3H), 1.35-1.30 (m, 2H), 1.24-1.18 (m, 26H), 0.80 (t, $J = 7.5$ Hz, 3H). **^{13}C NMR** (150MHz, CDCl_3) δ 157.0, 152.1, 138.7, 131.8, 128.2, 126.7, 125.5, 122.8, 122.3, 119.0, 117.4, 113.7, 32.3, 30.9, 28.6, 28.6, 28.6, 28.5, 28.3, 28.1, 21.6, 20.3, 13.0. **MS** (m/z) = 195, 223, 237, 281, 349, 377, 406 (M^+). Anal. Calcd. for $\text{C}_{29}\text{H}_{42}\text{O}$: C, 85.66; H, 10.41. Found: C, 85.60; H, 10.50.

2-Methyl-9-thiophen-2-yl-9*H*-xanthene 2n:



IR (KBr, cm^{-1}) ν 3043, 2362, 1616, 1585, 1271, 1136, 749, 642. **^1H NMR** (500 MHz, CDCl_3) δ 7.30-7.25 (m, 2H), 7.18-7.16 (m, 2H), 7.09-7.06 (m, 4H), 6.93 (dd, $J_1 = 3.5$ Hz, $J_2 = 5.5$ Hz, 1H), 6.84-6.83 (m, 1H), 5.54 (s, 1H), 2.33 (s, 3H). **^{13}C NMR** (150MHz, CDCl_3) δ 151.2, 150.3, 148.9, 132.7, 132.6, 129.67, 129.5, 129.0, 128.2, 126.6, 124.8, 124.7, 123.9, 123.5, 123.1, 39.7, 20.8. **MS** (m/z) = 131, 139, 165, 189, 195, 218, 245, 263, 278 (M^+). Anal. Calcd. for $\text{C}_{18}\text{H}_{14}\text{OS}$: C, 77.66; H, 5.07; S, 11.52. Found: C, 77.54; H, 5.20; S, 11.36.

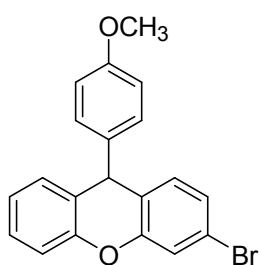
12-Thiophen-2-yl-12*H*-benzo[*a*]xanthene 2o:



IR (KBr, cm^{-1}) ν 3037, 2356, 1603, 1496, 1367, 1221, 961, 749, 613. **^1H NMR** (500 MHz, CDCl_3) δ 8.08 (d, $J = 8.5$ Hz, 1H), 7.86 (d, $J = 8.0$ Hz, 1H), 7.84 (d, $J = 8.5$ Hz, 1H), 7.56-7.52 (m, 2H), 7.46-7.43 (m, 2H), 7.33-7.24 (m, 2H), 7.18 (dd, $J_1 = J_2 = 7.5$ Hz, 1H), 7.05 (dd, $J_1 = 1.5$ Hz,

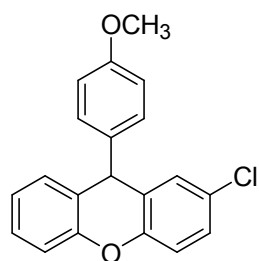
$J_2 = 5.0$ Hz, 1H), 6.81-6.76 (m, 2H), 6.16 (s, 1H). **^{13}C NMR** (150MHz, CDCl_3) δ 150.8, 149.9, 149.4, 131.6, 130.8, 129.3, 129.3, 128.7, 128.6, 128.1, 128.0, 126.9, 126.7, 124.4, 124.3, 124.2, 123.9, 123.8, 122.8, 118.1, 116.8, 115.7, 36.6. **MS** (m/z) = 140, 157, 187, 202, 231, 255, 281, 314 (M^+). Anal. Calcd. for $\text{C}_{21}\text{H}_{14}\text{OS}$: C, 80.22; H, 4.49; S, 10.20. Found: C, 79.98; H, 4.65; S, 10.35.

3-Bromo-9-(4-methoxy-phenyl)-9H-xanthene 2p:



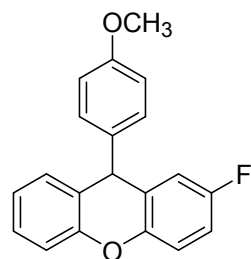
IR (KBr, cm^{-1}) ν 2359, 1612, 1475, 1286, 778, 623. **^1H NMR** (500 MHz, CDCl_3) δ 7.33 (d, $J = 2.0$ Hz, 1H), 7.25-7.19 (m, 2H), 7.14-7.11 (m, 3H), 7.07-7.01 (m, 2H), 6.92 (dd, $J_1 = 1.0$ Hz, $J_2 = 8.0$ Hz, 1H), 6.87-6.84 (m, 2H), 5.17 (s, 1H), 3.79 (s, 3H). **^{13}C NMR** (150MHz, CDCl_3) δ 158.5, 151.6, 150.6, 138.3, 131.0, 129.7, 129.4, 129.4, 128.8, 128.77, 128.0, 126.3, 123.9, 123.6, 120.6, 119.7, 116.5, 114.2, 55.2, 43.1. **MS** (m/z) = 152, 163, 180, 213, 243, 259, 272, 287, 335, 366 (M^+). Anal. Calcd. for $\text{C}_{20}\text{H}_{15}\text{BrO}_2$: C, 65.41; H, 4.12; Br, 21.76. Found: C, 65.23; H, 4.36; Br, 21.52.

2-Chloro-9-(4-methoxy-phenyl)-9H-xanthene 2r:



IR (KBr, cm^{-1}) ν 3022, 2386, 1653, 1453, 1391, 1186, 853, 725, 618. **^1H NMR** (500 MHz, CDCl_3) δ 7.76 (dd, $J_1 = 1.5$ Hz, $J_2 = 8.0$ Hz, 1H), 7.17-7.13 (m, 4H), 6.80 (dd, $J_1 = 1.0$ Hz, $J_2 = 8.0$ Hz, 1H), 6.76-6.73 (m, 2H), 6.60-6.56 (m, 3H), 5.31 (s, 1H), 3.77 (s, 3H). **^{13}C NMR** (150MHz, CDCl_3) δ 158.8, 156.2, 153.0, 134.7, 134.5, 133.7, 133.7, 133.2, 129.4, 129.4, 128.6, 128.0, 124.6, 119.0, 118.8, 113.5, 74.0, 55.2. **MS** (m/z) = 121, 152, 180, 215, 243, 291, 307, 322 (M^+). Anal. Calcd. for $\text{C}_{20}\text{H}_{15}\text{ClO}_2$: C, 74.42; H, 4.68; Cl, 10.98. Found: C, 74.21; H, 4.74; Cl, 10.82.

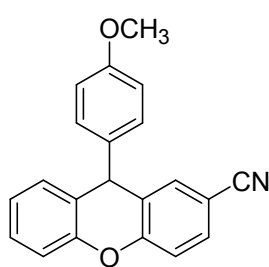
2-Fluoro-9-(4-methoxy-phenyl)-9H-xanthene 2s:



IR (KBr, cm^{-1}) ν 3026, 2346, 1634, 1487, 1406, 1180, 783, 661. **^1H NMR** (500 MHz, CDCl_3) δ 7.38-7.28 (m, 2H), 7.28-7.22 (m, 3H), 7.17-7.12 (m, 2H), 7.04-7.00 (m, 1H), 6.93-6.90 (m, 2H), 6.82 (dd, $J_1 = 3.0$ Hz, $J_2 = 8.5$ Hz, 1H), 5.25 (s, 1H), 3.85 (s, 3H). **^{13}C NMR** (150MHz, CDCl_3) δ 159.4, 158.6, 157.5, 151.0, 147.2, 138.1, 133.7, 129.6, 129.4, 128.0, 123.8, 123.4, 119.7, 117.7, 116.5, 115.6, 114.9, 114.3, 55.2, 43.8. **MS** (m/z) = 122,

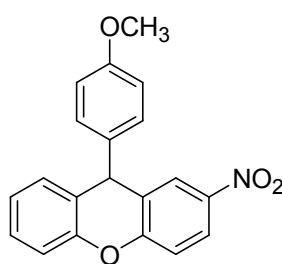
137, 153, 170, 199, 211, 229, 275, 291, 306 (M^+). Anal. Calcd. for $C_{20}H_{15}FO_2$: C, 78.42; H, 4.94; F, 6.20. Found: C, 78.20; H, 5.07; F, 6.35.

9-(4-Methoxy-phenyl)-9H-xanthene-2-carbonitrile 2t:



IR (KBr, cm^{-1}) ν 3042, 2242, 1598, 1403, 1352, 1021, 796, 681. **1H NMR** (500 MHz, $CDCl_3$) δ 7.39 (dd, $J_1 = 2.0$ Hz, $J_2 = 8.5$ Hz, 1H), 7.27 (d, $J = 2.0$ Hz, 1H), 7.20-7.14 (m, 2H), 7.09 (d, $J = 8.5$ Hz, 1H), 7.07 (d, $J = 7.5$ Hz, 1H), 7.02-7.99 (m, 2H), 6.96-6.94 (m, 1H), 6.78-6.75 (m, 2H), 5.12 (s, 1H), 3.71 (s, 3H). **^{13}C NMR** (150MHz, $CDCl_3$) δ 158.8, 154.1, 150.1, 137.4, 134.5, 133.9, 131.8, 129.8, 129.5, 128.3, 126.3, 124.2, 123.7, 118.8, 117.7, 116.6, 114.5, 113.7, 106.6, 55.3, 42.9. **MS** (m/z) = 151, 177, 206, 236, 268, 282, 313 (M^+). Anal. Calcd. for $C_{21}H_{15}NO_2$: C, 80.49; H, 4.82; N, 4.47. Found: C, 80.12; H, 5.16; N, 4.74.

9-(4-Methoxy-phenyl)-2-nitro-9H-xanthene 2u:



IR (KBr, cm^{-1}) ν 3085, 2822, 1893, 1543, 1421, 1343, 1108, 887, 763. **1H NMR** (500 MHz, $CDCl_3$) δ 7.43-7.40 (m, 2H), 7.23-7.18 (m, 1H), 7.10-7.15 (m, 2H), 7.07-7.00 (m, 2H), 6.88 (dd, $J_1 = 12.5$ Hz, $J_2 = 8.5$ Hz, 2H), 6.80 (dd, $J_1 = 15.0$ Hz, $J_2 = 9.0$ Hz, 2H), 5.16 (s, 1H), 3.78 (s, 3H). **^{13}C NMR** (150MHz, $CDCl_3$) δ 158.8, 158.2, 150.8, 148.2, 148.0, 138.3, 129.4, 129.3, 128.4, 128.4, 128.3, 127.6, 125.2, 124.7, 123.2, 116.3, 114.0, 113.6, 55.2, 43.6. **MS** (m/z) = 105, 180, 226, 241, 288, 303, 319, 333 (M^+). Anal. Calcd. for $C_{20}H_{15}NO_4$: C, 72.06; H, 4.54; N, 4.20. Found: C, 71.86; H, 4.98; N, 4.76.

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3. Dada, R.; Singh, G.; Pareek, A.; Kausar, S.; Yaragorla, S. *Tetrahedron Lett.* **2016**, *57*, 3729.

NMR Spectra of all the reported compounds:

