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Platinum and Gold-Catalyzed Oxidative Cyclization of 2-Ethenyl-1-(prop-2'-yn-1'-ol)benzenes to Naphthyl Aldehydes and Ketones: Catalytic Oxidation of Metal-Alkylidene Intermediates Using H₂O and H₂O₂.

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Contents:

- (1) Theoretic calculation for oxygenation of platinum-carbenoids with water----- S2.
- (2) Experimental procedures for the metal-catalyzed cyclization, cyclopropanation and measurement of hydrogen evolution----- S2-S3
- (3) Spectral data for compounds **1-42**----- S3-S19

(1) Theoretic calculation:

The relative energies are based on HF/LANL2DZdp level theory using the Gaussian 98 program. The optimized geometries for reactants and products were fully optimized. The zero-point energy contribution was not included.

Reference S1. Gaussian 98: M. J. Frisch, G. W. Trucks, H. B. Schlegel, P. M. W. Gill, B. G. Johnson, M. A. Robb, J. R. Cheeseman, T. Keith, G. A. Peterson, J. A. Montgomery, K. Raghavachari, M. A. Al-Laham, V. G. Zakrzewski, J. V. Ortiz, J. B. Foresman, J. Ciolowski, B. B. Stefanov, A. Nanayarkara, M. Challacombe, C. Y. Peng, P. Y. Ayala, W. Chen, M. W. Wong, J. L. Andres, E. S. Replogle, R. Gomperts, R. L. Martin, D. J. Fox, J. S. Binkley, D. J. Defrees, J. Baker, J. P. Stewart, M. Head-Gordon, C. Gonzalez and J. A. Pople, Gaussian, Inc., Pittsburgh PA, 1999.

(2) Experimental procedure.

(a) General remarks: Unless otherwise noted, all reactions were carried out under nitrogen atmosphere in oven-dried glassware using standard syringe, cannula and septa apparatus. Diethyl ether, tetrahydrofuran and hexane were dried with sodium benzophenone and distilled before use. Dichloromethane was dried over CaH₂ and distilled before use. All the ¹H NMR and ¹³C NMR were recorded in in CDCl₃ solution.

(b) Experimental procedure for Gold-catalyzed Oxidative cyclization

To a solution of alcohol **1** (230 mg, 1.33 mmol) and AuClEt₃ (21.5 mg, 0.066 mmol) in 5 ml of DCE, was added H₂O₂ (136 mg, 4 mmol). After the reaction mixture was stirred at 70 °C for 4h, the resulting solution was added with water (7 ml), extracted with ether twice. The combined extracts were dried over MgSO₄ and purified on a silical column (hexane-AcOEt 9:1) to give aldehyde **2** (181 mg, 1.07 mmol, 80%) as colorless liquid.

(c) Representative procedure for PtCl₂-catalyzed cyclization.

A long tube containing PtCl₂ (5.8 mg, 0.021 mmol) was evacuated and charged with CO. After repeating this procedure twice, the tube was charged with propargylic alcohol **4** (100 mg, 0.43 mmol), 1.6 ml THF and water (157 mg, 8.77 mmol). The resulting mixture was stirred at 25 °C for 5 h. The solution was concentrated, and filtered through a small MgSO₄ bed. After removal of the solvent under reduced pressure, the residue was

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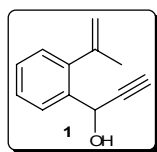
purified on a silica column (hexane-EtOAc 98:2) to give the olefin **5** (77.5 mg, 3.69 mmol, 84%) and ketone **31** (6 mg, 0.026 mmol, 6 %) as a colorless liquid.

(d) Representative procedure for PtCl₂ catalyzed cyclopropanation: A long tube containing PtCl₂ (11.4 mg, 0.043 mmol) was evacuated and backfilled with CO. After repeating the procedure twice, it was charged with propargylic alcohol **1** (150 mg, 0.87 mmol) and 3 ml dry THF. After immediate addition of styrene (907 mg, 8.72 mmol) the reaction mixture was left for stirring at room temperature for 3 h. After removal of the solvent under reduced pressure the residue was purified on silica column (hexane) to obtain the cyclopropane derivative (**3**) (175 mg, 0.68 mmol, 78%) as 9:1 *trans-cis* mixture.

(e) Measurement of Hydrogen Evolvement in the PtCl₂-Catalysis. The volume of along reaction tubing was determined to have a volume 27 mL, which was charged with PtCl₂ (8.7 mg) before it was evacuated in vacuo. This reaction vessel was charged with CO, and to this vessel was added alcohol **1** (150 mg, 0.64 mmol), water (235 mg, 13.1 mmol) and 3 ml dry THF. The mixture was stirred at 25 °C for 5 h, and the gas sample was taken with a gas-tight syringe (1.5 mL). This gas sample was injected to a G.C. (China Chromatograph, model 8700T) and equipped with a MS-5Å column (5 feet) using a TCD-detector. The calibration factor of the H₂-signal was determined through an injection of a 0.5 mL H₂. The 1.5-ml sample was analyzed to have the amount of H₂ ca. 0.010 mmol. This measurement was repeated twice, which appeared to have ca. 15% error between the two trials. Notably, at long reaction period ca. 12 h, the amount of H₂ was rapidly dropped to be 0.003 mmol with the same 1.5-ml amount. After the H₂-measurement, the solution was concentrated and eluted through a short column to afford aldehyde **2** in 75% yield (110 mg, 0.48 mmol).

(3) Spectral data for the Compounds 1-41:

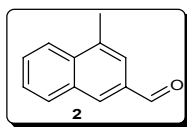
Spectral data for 1-(2-Isopropenyl-phenyl)-prop-2-ynyl-1-ol (**1**)



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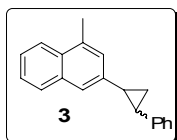
IR (neat, cm^{-1}): 3665 (m), 3312 (s), 2161(w), 1678 (m); ^1H NMR (400 MHz, CDCl_3): δ 7.48 (d, $J = 7.6$ Hz, 1 H), 7.34~7.26 (m, 2 H), 7.15 (d, $J = 7.6$ Hz, 1 H), 5.60 (s, 1H), 5.27 (s, 1 H), 4.95 (s, 1H), 2.60 (s, 1 H), 2.08 (s, 3 H); ^{13}C NMR (100 MHz, CDCl_3): δ 144.0, 142.6, 137.0, 128.3, 128.0, 127.5, 127.0, 116.2, 84.4, 74.3, 61.5, 25.3; HRMS calcd. for $\text{C}_{12}\text{H}_{12}\text{O}$: 172.0888; found 174.0884.

Spectral data for 4-Methyl-naphthalene-2-carbaldehyde (2)



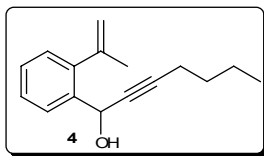
IR (neat, cm^{-1}) 2856 (w), 2741 (w), 1689 (s); ^1H NMR (400 MHz, CDCl_3): δ 10.07 (s, 1H), 8.13 (s, 1 H), 8.00~7.95 (m, 2 H), 7.75 (s, 1 H), 7.64 (t, 1 H, $J = 7.6$ Hz), 7.55 (t, 1 H, $J = 7.6$ Hz), 2.68 (s, 3 H); ^{13}C NMR (100 MHz, CDCl_3): δ 192.3, 135.7, 133.6, 133.2(x2), 132.6, 130.1, 128.9, 126.6, 124.3, 12.7, 19.2. HRMS calcd for $\text{C}_{12}\text{H}_{10}\text{O}$ ($[\text{M} + \text{H}]^+$): 170.0732; found 170.0729.

Spectral data for 1-methyl-3-(2-phenylcyclopropyl)naphthalene (3):



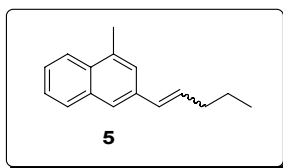
IR(neat, cm^{-1}): 3089 (m), 3071 (m); ^1H NMR (600 MHz, CDCl_3): (*trans*:*cis* = 9:1), major *trans* isomer, δ 7.87~7.85 (m, 1 H), 7.67~7.65 (m, 1 H), 7.42~7.38 (m, 2 H), 7.30 (s, 1 H), 7.08~7.05 (m, 2 H), 7.02~7.01 (m, 3 H), 6.94(s, 1 H), 2.61~2.56(m, 2 H), 2.52(s, 3 H), 1.57~1.50 (m, 2 H), minor *cis*-isomer, δ 7.97~7.95 (m, 1 H), 7.80~7.789 (m, 1 H), 7.48~7.46 (m, 2 H), 7.34~7.31 (m, 1 H), 7.22~7.19 (m, 1 H), 2.69 (s, 1 H), the remaining peaks are overlapped with those of the major *trans*-isomer; ^{13}C NMR (100MHZ, CDCl_3): major *trans*-isomer; 138.3, 135.7, 133.4, 133.3, 131.1, 128.9, 128.6, 128.0, 127.6, 125.6, 125.5, 125.3, 124.8, 123.8, 24.5, 24.4, 19.1, 11.6; HRMS calcd for $\text{C}_{20}\text{H}_{18}$: 258.1409; found 258.1410.

Spectral data for 1-(2-Isopropenyl-phenyl)-hept-2-ynyl-1-ol (4)



IR (neat, cm^{-1}): 3645 (m), 2192 (w), 1622 (w); ^1H NMR (400 MHz, CDCl_3): δ 7.74 (d, $J = 7.2$ Hz, 1 H), 7.31~7.25 (m, 2 H), 7.14 (d, $J = 8.8$ Hz, 1 H), 5.66 (s, 1 H), 5.27 (s, 1 H), 4.96 (s, 1 H), 2.23 (t, $J = 7.2$ Hz, 2 H), 2.03 (s, 3 H), 1.52~1.40 (m, 2 H), 1.39~1.25 (m, 2 H), 0.90 (t, $J = 7.2$ Hz, 3 H); ^{13}C NMR (100 MHz, CDCl_3): δ 144.4, 142.3, 138.2, 127.7 (x2), 127.2, 127.0, 115.8, 86.7, 80.9, 61.6, 30.5, 25.7, 21.8, 18.4, 13.4; HRMS calcd for $\text{C}_{16}\text{H}_{20}\text{O}$: 228.1514; found 228.1510.

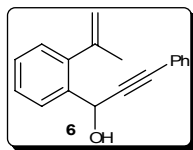
Spectral data for 1-methyl-3-(pent-1-enyl) naphthalene (5):



IR (neat, cm^{-1}): 1605 (m); ^1H NMR (600 MHz, CDCl_3): (*trans/cis* = 1.1), *trans*-isomer, δ 7.92~7.90 (m, 1 H), 7.77~7.75 (m, 1 H), 7.52 (s, 1 H), 7.47~7.44 (m, 2 H), 7.43 (s, 1 H), 6.50~6.48 (m, 1 H), 6.34 (dt, $J = 15.8, 7.0$ Hz, 1 H), 2.67 (s, 3 H), 2.39 (dq, $J = 7.0, 1.3$ Hz, 2 H), 1.55~1.47 (m, 2 H), 0.97 (t, $J = 7.3$ Hz, 3 H), *cis* isomer δ 7.94~7.93 (m, 1 H), 7.80~7.79 (m, 1 H), 7.57 (s, 1 H), 7.43~7.41 (m, 3 H), 5.72 (dt, $J = 11.6, 7.2$ Hz, 1 H), 0.94 (t, $J = 7.4$ Hz, 3 H), the remaining peaks are overlapped with those of the *trans* isomer; ^{13}C NMR (150 MHz, CDCl_3): δ (*cis* and *trans* mixture) 135.0, 134.9, 134.2, 133.9, 133.8, 133.5, 133.3, 131.9, 131.4, 131.1, 130.0, 129.0, 128.5, 128.4, 128.0, 125.8, 125.7, 125.6, 125.5, 125.2, 124.2, 123.9, 123.8 (two CH signals for two isomers), 35.2, 30.8, 23.2, 22.6, 19.4, 19.3, 13.8, 13.7; HRMS calcd for $\text{C}_{16}\text{H}_{18}$: 210.1409; found 210.1410.

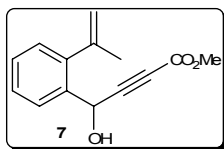
Spectral data for 1-2-(Isopropenyl-phenyl)-3-phenyl-prop-2-ynyl-1-ol (6)

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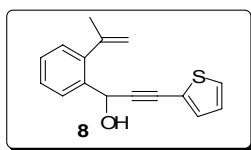
IR (neat, cm^{-1}): 3650 (m), 2228 (m), 1640 (w); ^1H NMR (400 MHz, CDCl_3): δ 7.82 (d, $J = 7.6$ Hz, 1 H), 7.44~7.42 (m, 2 H), 7.41~7.28 (m, 5 H), 7.19 (d, $J = 8.0$ Hz, 1 H), 5.90 (s, 1 H), 5.30 (s, 1H), 5.01 (s, 1 H), 2.13 (s, 3 H); ^{13}C NMR (100 MHz, CDCl_3): δ 144.0, 142.5, 137.5(x2), 131.5, 128.3(x2), 128.2, 128.1, 128.0, 127.9, 127.2, 122.5, 116.1, 89.7, 86.0, 62.0, 25.3; HRMS calcd for $\text{C}_{18}\text{H}_{16}\text{O}$: 248.1201; found 248.1198.

Spectral data for 4-Hydroxy-4-(2-isopropenyl-phenyl)-but-ynic acid methyl ester (7)



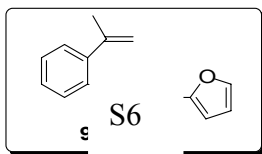
IR (neat, cm^{-1}): 3665 (m), 2216 (w), 1740 (s), 1626 (w); ^1H NMR (400 MHz, CDCl_3): δ 7.66 (d, $J = 9.2$ Hz, 1 H), 7.32~7.27 (m, 2 H), 7.15 (d, $J = 9.2$ Hz, 1 H), 5.77 (s, 1 H), 5.27 (s, 1 H), 4.93 (s, 1 H), 3.74 (s, 3 H), 2.60 (s, 3 H); ^{13}C NMR (100 MHz, CDCl_3): δ 153.8, 143.6, 142.5, 135.7, 128.4, 128.1, 127.8, 127.3, 116.4, 88.0, 74.0, 60.9, 52.6, 25.5; HRMS Calculated for $\text{C}_{14}\text{H}_{14}\text{O}_3$: 230.0943; found 230.0940.

Spectral data for 1-(2-prop-1-en-2-yl)phenyl-3-(thiophen-2-yl)prop-2-yn-1-ol (8):



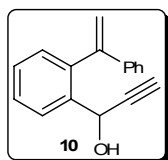
IR (neat, cm^{-1}): 3652 (m), 2235 (w), 1643 (w); ^1H NMR (400 MHz, CDCl_3): δ 7.80 (dd, $J = 7.4, 1.4$ Hz, 1 H), 7.36~7.28 (m, 2 H), 7.23 ~ 7.17 (m, 3 H), 6.95 (dd, $J = 5.00, 3.8$ Hz, 1 H), 5.91 (s, 1 H), 5.30 (s, 1 H), 5.01 (s, 1 H), 2.13 (s, 3 H); ^{13}C NMR (100 MHz, CDCl_3): δ 144.0, 142.5, 137.2, 132.2, 128.1, 128.0, 127.5, 127.3, 127.2, 126.8, 122.4, 116.2, 93.5, 79.4, 62.2, 25.4; HRMS calcd for $\text{C}_{16}\text{H}_{14}\text{OS}$: 254.0765; found 254.0767.

Spectral data for 3-(furan-2-yl)-1-(2-prop-1-en-2-yl)phenyl-prop-2-yn-1-ol (9):



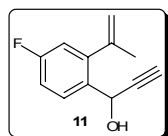
IR (neat, cm^{-1}): 3647 (m), 2238 (w), 1648 (w); ^1H NMR (400 MHz, CDCl_3): δ 7.76 (d, $J = 7.5$ Hz, 1 H), 7.35~7.29 (m, 3 H), 7.16 (dd, $J = 7.5, 1.4$ Hz, 1 H), 6.57 (d, $J = 3.3$ Hz, 1 H), 6.35 (dd, $J = 3.3, 1.8$, 1 H), 5.90 (s, 1 H), 5.28 (s, 1 H), 4.98 (s, 1 H), 2.10 (s, 3 H); ^{13}C NMR (100 MHz, CDCl_3): δ 143.8, 143.5, 142.4, 136.9, 136.4, 128.1, 127.8, 127.5, 127.2, 116.2, 115.4, 110.7, 94.0, 76.2, 62.0, 25.3; HRMS calcd for $\text{C}_{16}\text{H}_{14}\text{O}_2$: 238.0994; found 238.0996.

Spectral data for 1-[2-(Phenyl-vinyl)-phenyl-prop-2-ynyl-1-ol (10)



IR (neat, cm^{-1}): 3665 (m), 3312 (s), 2234(w), 1622 (w); ^1H NMR (400 MHz, CDCl_3): δ 7.84 (d, $J = 7.6$ Hz, 1 H), 7.44 (t, $J = 7.6$ Hz, 1 H), 7.34 (t, $J = 7.6$ Hz, 1 H), 7.30~7.28 (m, 5 H), 7.22 (d, $J = 7.6$ Hz, 1 H), 5.88 (s, 1 H), 5.57 (s, 1 H), 5.46 (s, 1 H), 2.53 (s, 1 H); ^{13}C NMR (100 MHz, CDCl_3): δ 146.9, 140.1, 139.9, 138.3, 130.3, 128.3, 128.2 (x2), 128.1, 127.8, 127.1, 126.5 (x2), 116.3, 83.9, 74.0, 61.1; HRMS calcd for $\text{C}_{17}\text{H}_{14}\text{O}$: 234.1045, found 234.1041.

Spectral data for 1-(4-Fluoro-2-isopropenyl-phenyl)-prop-2-ynyl-1-ol (11)

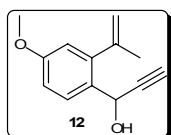


IR (neat, cm^{-1}): 3662(m), 3305(s), 2224(w), 1612(w); ^1H NMR (400 MHz, CDCl_3): δ 7.69 (dd, $J = 14.4, 5.6$ Hz, 1 H), 6.96 (t, $J = 6.0$ Hz, 1 H), 6.82 (dd, $J = 9.6, 2.4$ Hz, 1 H),

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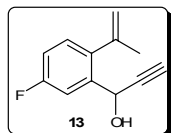
5.58 (s, 1 H), 5.24 (s, 1 H), 4.96 (s, 1 H), 2.56 (s, 1 H), 2.03 (s, 3 H); ^{13}C NMR (100 MHz, CDCl_3): δ 162.1(d, $J_{\text{CF}} = 245.7$ Hz), 144.7, 142.8, 133.1, 129.2 (d, $J_{\text{CF}} = 8.4$ Hz), 116.7 (x2), 114.4 (d, $J_{\text{CF}} = 30.6$ Hz), 84.3, 74.3, 60.6, 24.9; HRMS calcd for $\text{C}_{12}\text{H}_{11}\text{FO}$: 190.0794, found 190.0790.

Spectral data for 1-(2-Isopropenyl-4-methoxy-phenyl)-prop-2-ynyl-1-ol (12)



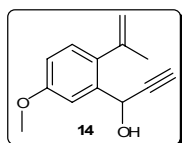
IR (neat, cm^{-1}): 3663 (m), 3315 (s), 2234 (m), 1622 (w), 1239 (s), 1034 (s); ^1H NMR (400 MHz, CDCl_3): δ 7.65 (d, $J = 8.8$ Hz, 1 H), 6.81 (d, $J = 8.8$ Hz, 1 H), 6.48 (s, 1 H), 5.66 (s, 1 H), 5.27 (s, 1 H), 4.96 (s, 1 H), 3.75 (s, 3 H), 2.56 (s, 1 H), 2.05 (s, 3 H); ^{13}C NMR (100 MHz, CDCl_3): δ 158.9, 143.9, 143.7, 129.6, 128.5, 115.9, 113.4 (x2), 84.7, 73.7, 60.5, 55.0, 25.0; HRMS calcd for $\text{C}_{13}\text{H}_{14}\text{O}_2$: 202.0994, found 202.0990.

Spectral data for 1-(5-Fluoro-2-isopropenyl-phenyl)-prop-2-ynyl-1-ol (13)



IR (neat, cm^{-1}): 3637(m), 3308(s), 2241(w),1619(w); ^1H NMR (400 MHz, CDCl_3): δ 7.43 (dd, $J = 10.0, 3.2$ Hz, 1 H), 7.10 (dd, $J = 8.4, 6.0$ Hz, 1 H), 6.96 (t, $J = 8.4$ Hz, 1 H), 5.60 (s, 1 H), 5.25 (s, 1 H), 4.92 (s, 1 H), 2.64 (s, 1 H), 2.04 (s, 3 H); ^{13}C NMR (100 MHz, CDCl_3): δ 161.8 (d, $J_{\text{CF}} = 244.2$ Hz), 143.0, 139.2 (d, $J_{\text{CF}} = 24.4$ Hz), 138.8 (d, $J_{\text{CF}} = 93.3$ Hz), 116.7 (x2), 115.2(d, $J_{\text{CF}} = 82.4$ Hz), 113.8(d, $J_{\text{CF}} = 88.8$ Hz), 83.9, 74.6, 60.9, 25.0; HRMS calcd for $\text{C}_{12}\text{H}_{11}\text{FO}$: 190.0794, found 190.0791.

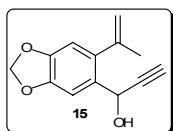
Spectral data for 1-(2-Isopropenyl-5-methoxy-phenyl)-prop-2-ynyl-1-ol (14)



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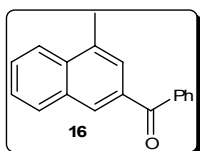
IR (neat, cm^{-1}): 3659(m), 3318(s), 2241(m), 1618(w), 1233(s), 1038(s); ^1H NMR (300 MHz, CDCl_3): δ 7.26 (dd, $J = 13.5, 2.4$ Hz, 1 H), 7.26 (d, $J = 8.5$ Hz, 1 H), 6.83 (dd, $J = 13.5, 2.4$ Hz, 1 H), 5.66 (s, 1 H), 5.24 (s, 1 H), 4.92 (s, 1 H), 3.82 (s, 3 H), 2.60 (s, 3 H), 2.05 (s, 1 H); ^{13}C NMR (100 MHz, CDCl_3): δ 158.6, 143.4, 129.0, 116.0, 114.1, 112.8, 112.3, 111.6, 84.5, 74.0, 61.0, 55.1, 25.3; HRMS calcd for $\text{C}_{13}\text{H}_{14}\text{O}_2$: 202.0994, found 202.0990.

Spectral data for 1-(6-Isopropenyl-benzo[1,3]dioxol-5-yl)-prop-2-ynyl-1-ol (15).



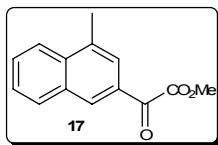
IR (neat, cm^{-1}): 3646 (m), 3325 (s), 2208 (w), 1612 (w); ^1H NMR (400 MHz, CDCl_3): δ 7.20 (s, 1 H), 6.59 (s, 1 H), 5.92 (s, 2 H), 5.59 (s, 1 H), 5.22 (s, 1 H), 4.93 (s, 1 H), 2.58 (s, 1 H), 2.02 (s, 3 H); ^{13}C NMR (100 MHz, CDCl_3): δ 147.4, 146.9, 143.5, 136.7, 130.6, 116.4, 107.7, 107.1, 101.2, 84.4, 74.1, 61.1, 25.3; HRMS calcd for $\text{C}_{13}\text{H}_{12}\text{O}_3$: 216.0786, found 216.0782.

Spectral data for (4-Methyl-naphthalen-2-yl)-phenyl-methanone (16)



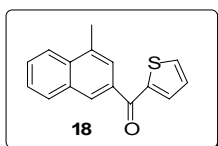
IR (neat, cm^{-1}): 1645(s); ^1H NMR (400 MHz, CDCl_3): δ 8.09 (s, 1 H), 8.04 (d, $J = 8.4$ Hz, 1 H), 7.90 (d, $J = 8.0$ Hz, 1 H), 7.85 (d, $J = 9.6$ Hz, 1 H), 7.80 (s, 1 H), 7.64~7.58 (m, 3 H), 7.48~7.43 (m, 3 H), 2.74 (s, 3 H); ^{13}C NMR (100 MHz, CDCl_3): δ 196.6, 137.7, 134.7, 134.3, 134.1, 131.9, 130.2 (x2), 129.7, 129.1, 128.4 (x2), 127.9, 126.5, 126.1, 125.7, 123.8, 19.0; HRMS calcd for $\text{C}_{18}\text{H}_{14}\text{O}$: 246.1045, found 246.1042.

Spectral data for (4-Methyl-naphthalen-2-yl)-oxo-acetic acidmethyl ester (17)



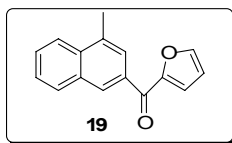
IR (neat, cm^{-1}): 1683 (s), 1135 (s); ^1H NMR (400 MHz, CDCl_3): δ 8.39 (s, 1 H), 8.01 (d, $J = 8.4$ Hz, 1 H), 7.96 (d, $J = 8.0$ Hz, 1 H), 7.86 (s, 1 H), 7.67 (t, $J = 8.4$ Hz, 1H), 7.56 (t, $J = 8.0$ Hz, 1 H), 4.01 (s, 3 H), 2.71 (s, 3 H); ^{13}C NMR (100 MHz, CDCl_3): δ 186.1, 164.2, 135.8, 132.4, 132.3, 130.7, 129.5, 129.3, 126.8 (x2), 124.2, 124.0, 52.7, 19.3; HRMS calcd for $\text{C}_{14}\text{H}_{12}\text{O}_3$: 228.0786, found 228.0783.

Spectral data for (1-methylnaphthalen-3-yl)(thiophen-2-yl)methanone (18).



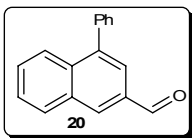
IR (neat, cm^{-1}): 1688 (s); ^1H NMR (400 MHz, CDCl_3): δ 8.23 (s, 1 H), 8.04 (d, $J = 8.4$ Hz, 1 H), 7.94 (d, $J = 8.1$ Hz, 1 H), 7.77 (s, 1 H), 7.73~7.71 (m, 2 H), 7.65~7.62 (m, 1 H), 7.55 (t, $J = 8.1$ Hz, 1 H), 7.18 (dd, $J = 4.9, 3.8$ Hz, 1 H), 2.75 (s, 3 H); ^{13}C NMR (150 MHz, CDCl_3): δ 188.3, 143.8, 135.2, 135.0, 134.7, 134.5, 134.0, 132.4, 130.0, 129.1, 128.0, 127.9, 126.5, 125.6, 124.2, 19.4; HRMS calcd for $\text{C}_{16}\text{H}_{12}\text{OS}$: 252.0609; found 252.0607.

Spectral data for (furan-2-yl)(1-methylnaphthalen-3-yl)methanone (19):



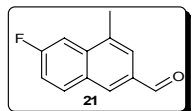
IR (neat, cm^{-1}): 1684(s); ^1H NMR (600 MHz, CDCl_3): δ 8.37 (s, 1 H), 8.03 (d, $J = 8.2$ Hz, 1 H), 7.96 (d, $J = 8.2$ Hz, 1 H), 7.84 (s, 1 H), 7.73 (d, $J = 3.1$ Hz, 1 H), 7.64 (t, $J = 8.2$ Hz, 1 H), 7.55 (t, $J = 8.2$ Hz, 1 H), 7.28 (d, $J = 3.2$ Hz, 1 H), 6.62~6.60 (m, 1 H), 2.74 (s, 3 H); ^{13}C NMR (150 MHz, CDCl_3) δ 182.4, 152.3, 146.9, 135.0, 134.5, 134.0, 132.0, 130.0, 129.3, 128.1, 126.3, 125.3, 124.0, 120.0, 112.0, 19.2; HRMS calcd for $\text{C}_{16}\text{H}_{12}\text{O}_2$: 236.0807; found 236.0806.

Spectral data for (4-Phenyl-naphthalen-2-carbaldehyde (20)



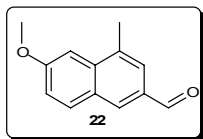
IR (neat, cm^{-1}): 2857 (w), 2746 (w), 1678 (s); ^1H NMR (400 MHz, CDCl_3): δ 10.1 (s, 1 H), 8.30 (s, 1 H), 8.05 (d, $J = 6.8$ Hz, 1 H), 7.94 (d, $J = 9.6$ Hz, 1 H), 7.89 (s, 1 H), 7.59-7.49 (m, 1 H), 7.48-7.43 (m, 6 H); ^{13}C NMR (100 MHz, CDCl_3): δ 192.1, 141.5, 139.5, 134.7, 133.7, 133.1, 133.1, 129.8 (x3), 129.1, 128.4, 127.7 (x3), 126.9, 123.6; HRMS calcd for $\text{C}_{17}\text{H}_{12}\text{O}$: 232.0888; found 232.0886.

Spectral data for 6-Fluoro-4-methyl-naphthalene-2-carbaldehyde (21)



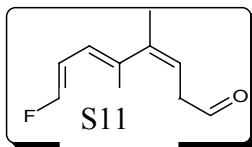
IR (neat, cm^{-1}): 2853 (w), 2740 (w), 1685 (s); ^1H NMR (400 MHz, CDCl_3): δ 10.0 (s, 1 H), 8.13 (s, 1 H), 7.96 (dd, $J = 8.8, 6.0$ Hz, 1 H), 7.70 (s, 1 H), 7.57 (d, $J = 10.4$ Hz, 1 H), 6.82 (t, $J = 8.8$ Hz, 1 H), 2.63 (s, 3 H); ^{13}C NMR (100 MHz, CDCl_3): δ 191.9, 162.5 (d, $J_{\text{CF}} = 250.0$ Hz), 137.2, 135.2, 133.2, 132.8(x2), 129.6, 123.8, 116.9 (d, $J_{\text{CF}} = 25.2$ Hz), 108.5 (d, $J_{\text{CF}} = 21.4$ Hz), 19.3; HRMS Calculated for $\text{C}_{12}\text{H}_9\text{FO}$: 188.0637; found 188.0634.

Spectral data for 6-Methoxy-4-methyl-naphthalene-2-carbaldehyde (22)



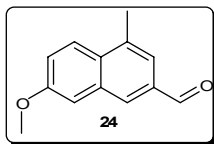
IR (neat, cm^{-1}): 2855 (w), 2734 (w), 1682 (s), 1246 (s), 1033 (s); ^1H NMR (400 MHz CDCl_3): δ 10.03 (s, 1 H), 8.10 (s, 1 H), 7.88 (d, $J = 9.2$ Hz, 1 H), 7.76 (s, 1 H), 7.22 (d, $J = 7.2$ Hz, 2 H), 3.96 (s, 3 H), 2.66 (s, 3 H); ^{13}C NMR (100 MHz, CDCl_3): δ 192.1, 160.2, 137.5, 134.1, 133.0, 131.8 (x2), 127.9, 123.6, 118.9, 103.2, 55.3, 19.5; HRMS calcd for $\text{C}_{13}\text{H}_{12}\text{O}_2$: 200.0837; found 200.0834.

Spectral data for 7-Fluoro-4-methyl-naphthalene-2-carbaldehyde (23)



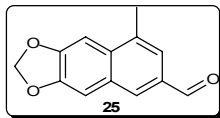
IR (neat, cm^{-1}): 2848 (w), 2737 (w), 1685 (s); ^1H NMR (300 MHz, CDCl_3): δ 10.09 (s, 1 H), 8.10 (s, 1 H), 8.01 (dd, $J = 9.3, 5.4$ Hz, 1 H), 7.72 (s, 1 H), 7.59 (dd, $J = 9.8, 2.6$ Hz, 1 H), 7.45 (t, $J = 8.7$ Hz, 1 H), 2.70 (s, 3 H); ^{13}C NMR (100 MHz, CDCl_3): δ 192.2, 160.8 (d, $J_{\text{CF}} = 246.4$ Hz), 135.9, 134.4, 132.6, 132.1, 126.9, 122.2, 118.7 (d, $J_{\text{CF}} = 24.5$ Hz), 116.7, 113.5 (d, $J_{\text{CF}} = 19.9$ Hz), 19.3; HRMS calcd for $\text{C}_{12}\text{H}_9\text{FO}$: 188.0637; found 188.0640.

Spectral data for 7-Methoxy-4-methyl-naphthalene-2-carbaldehyde (24)



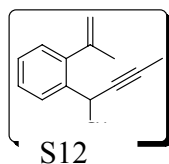
IR (neat, cm^{-1}): 2851 (w), 2729 (w), 1686 (s), 1248 (s), 1034 (s); ^1H NMR (400 MHz, CDCl_3): δ 10.0 (s, 1 H), 8.06 (s, 1 H), 7.91 (d, $J = 9.2$ Hz, 1 H), 7.62 (s, 1 H), 7.31~7.25 (m, 2 H), 3.93 (s, 3 H), 2.61 (s, 3 H); ^{13}C NMR (100 MHz, CDCl_3): δ 192.6, 158.0, 135.7, 134.2, 134.1, 131.8, 131.2, 125.9, 121.3, 121.1, 107.9, 55.4, 19.3; HRMS calcd for $\text{C}_{13}\text{H}_{12}\text{O}_2$: 200.0837, found 200.0834.

Spectral data for 8-methyl-naphtho[2,3-d][1,3]-dioxole-6-carbaldehyde (25)



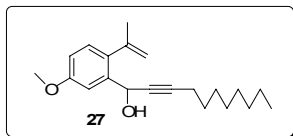
IR (neat, cm^{-1}): 2836 (w), 2727 (w), 1692 (s); ^1H NMR (CDCl_3 , 300 MHz): δ 10.03 (s, 1 H), 8.0 (s, 1 H), 7.65 (s, 1 H), 7.30 (s, 1 H), 7.29 (s, 1 H), 6.10 (s, 2 H), 2.62 (s, 3 H); ^{13}C NMR (100 MHz, CDCl_3): δ 192.3, 150.2, 147.9, 136.6, 134.4, 130.7, 122.5, 116.4, 105.6, 101.1, 101.0, 90.0, 19.7; HRMS calcd for $\text{C}_{13}\text{H}_{10}\text{O}_3$: 214.0630, found 214.0626.

Spectral data for 1-(2-isopropenyl-phenyl)-but-2-yn-1-ol (26)



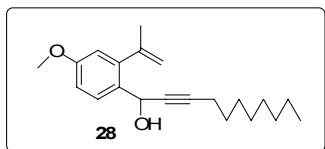
IR (neat, cm⁻¹): 3639 (m), 2236 (m), 1652 (w); ¹H NMR (400 MHz, CDCl₃): δ 7.72 (d, *J* = 7.6 Hz, 1 H), 7.32-7.23 (m, 2 H), 7.12 (d, *J* = 7.6 Hz, 1 H), 5.62 (s, 1 H), 5.24 (s, 1 H), 4.93 (s, 1 H), 2.08 (s, 3 H), 1.85 (s, 3 H); ¹³C NMR (100 MHz, CDCl₃): δ 144.0, 142.2, 138.1, 127.7 (x2), 127.3, 126.9, 115.8, 82.3, 80.0, 61.5, 25.2, 3.5; HRMS calcd for C₁₃H₁₄O: 186.1045, Found 186.1041.

Spectral data for 1-(5-methoxy-2-(prop-1-en-2-yl)phenyl)undec-2-yn-1-ol (27):



IR (neat, cm⁻¹): 3633 (m), 2152 (w), 1632 (w), 1235 (s), 1035 (s); ¹H NMR (400 MHz, CDCl₃): δ 7.28 (d, *J* = 2.8 Hz, 1 H), 7.03 (d, *J* = 8.4 Hz, 1 H), 6.79 (dd, *J* = 8.4, 2.8 Hz, 1 H), 5.61 (s, 1 H), 5.21 (s, 1 H), 4.91 (s, 1 H), 3.78 (s, 3 H), 2.20 (t, *J* = 7.0 Hz, 2 H), 2.04 (s, 3 H), 1.51~1.24 (m, 12 H), 0.86 (t, *J* = 5.6 Hz, 3 H); ¹³C NMR (100 MHz, CDCl₃): δ 158.5, 143.7, 139.5, 134.7, 128.8, 115.8, 113.9, 111.6, 86.8, 80.8, 61.6, 55.0, 31.7, 29.0, 28.9, 28.8, 28.4, 25.3, 22.5, 18.7, 13.9 HRMS calcd for C₂₁H₃₀O₂: 314.2246; found 314.2249.

Spectral data for 1-(4-methoxy-2-(prop-1-en-2-yl)phenyl)undec-2-yn-1-ol (28):

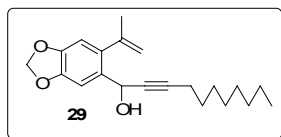


IR (neat, cm⁻¹): 3638 (m), 2155 (w), 1635(w), 1231(s) 1041 (s); ¹H NMR (400 MHz, CDCl₃): δ 7.67 (d, *J* = 8.4 Hz, 1 H), 6.84 (dd, *J*=8.4, 2.4, 1 H), 6.67 (d, *J* = 2.4 Hz, 1 H), 5.59 (s, 1 H), 5.25 (s, 1 H), 4.96 (s, 1 H), 3.79 (s, 3 H), 2.24 (t, *J* = 7.0 Hz, 2 H), 2.09 (s, 3 H), 1.50 (quin, *J* = 7.0 Hz, 2 H), 1.38~1.27(m, 10 H), 0.88 (t, *J* = 6.8 Hz, 3 H); ¹³C

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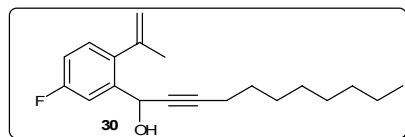
NMR (100MHz, CDCl₃): δ 158.9, 144.1, 143.9, 130.7, 128.6, 115.9, 113.0, 112.9, 86.8, 80.9, 61.4, 55.2, 31.7, 29.1, 29.0, 28.8, 28.5, 25.2, 22.6, 18.8, 14.0; HRMS calcd for C₂₁H₃₀O₂: 314.2246; found 314.2248.

1-(5-(prop-1-en-2-yl)benzo[d][1,3]dioxol-6-yl)undecundec-2-yn-1-ol (29):



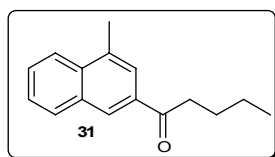
IR (neat, cm⁻¹): 3642 (m), 2141 (m), 1638 (w); ¹H NMR (400 MHz, CDCl₃): δ 7.21 (1 H), 6.59 (s, 1 H), 5.93 (s, 2 H), 5.56 (s, 1 H), 5.21 (s, 1 H), 4.92 (s, 1 H), 2.20 (t, *J* = 7.2 Hz, 2 H), 2.02 (s, 3 H), 1.48 (quin, *J* = 7.2 Hz, 2H), 1.34~1.25 (m, 10 H), 0.85 (t, *J* = 5.8 Hz, 3 H); ¹³C NMR (100 MHz, CDCl₃): δ 146.9, 146.6, 143.7, 136.2, 132.0, 116.0, 107.5, 107.2, 100.9, 86.6, 80.9, 61.3, 31.7, 29.1, 28.9, 28.8, 28.5, 25.2, 22.5, 18.6, 13.9; HRMS calcd for C₂₁H₂₈O₃: 328.2038; found 328.2039.

Spectral data for 1-(5-Fluoro-2-isopropenyl-pheynl)-undec-2-ynyl-1-ol (30)



IR (neat, cm⁻¹): 3647 (m), 2158 (m), 1656 (w); ¹H NMR (400 MHz, CDCl₃): δ 7.43 (dd, *J* = 10.0, 2.4 Hz, 1 H), 7.09 (dd, *J* = 8.4, 5.6 Hz, 1 H), 6.94 (t, *J* = 8.4 Hz, 1 H), 5.61 (s, 1 H), 5.26 (s, 1 H), 4.92 (s, 1 H), 2.19 (t, *J* = 7.2 Hz, 2 H), 2.05 (s, 3 H), 1.51~1.45 (m, 2 H), 1.35~1.32 (m, 2 H), 1.29~1.22 (m, 8 H), 0.85 (t, *J* = 7.2 Hz, 3 H); ¹³C NMR (100 MHz, CDCl₃): δ 161.8 (d, *J*_{CF} = 243.3 Hz), 143.2, 140.5, 138.1, 129.4, 116.3, 114.7 (d, *J*_{CF} = 20.6 Hz), 113.7 (d, *J*_{CF} = 22.2 Hz), 87.3, 80.3, 62.6, 31.7, 29.0, 28.9, 28.5, 27.7, 25.2, 22.5, 18.6, 13.9; HRMS calcd for C₂₀H₂₇FO: 302.2046, Found 302.2041.

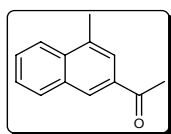
Spectral data for 1-(4-methyl-naphthalen-2-yl)-pentan-1-one (31)



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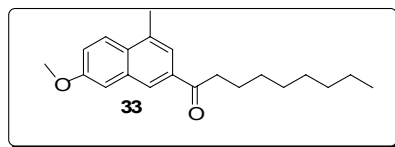
IR (neat, cm^{-1}): 1684 (s); ^1H NMR (400 MHz, CDCl_3): δ 8.29 (s, 1 H), 7.98 (d, $J = 8.4$ Hz, 1 H), 7.94 (d, $J = 8.0$ Hz, 1 H), 7.85 (s, 1 H), 7.60 (t, $J = 8.0$ Hz, 1 H), 7.52 (t, $J = 8.0$ Hz, 1 H), 3.06 (t, $J = 7.6$ Hz, 2 H), 2.7 (s, 3 H), 1.79-1.74 (m, 2 H), 1.46~1.40 (m, 2H), 0.96 (t, $J = 7.2$ Hz, 3 H); ^{13}C NMR (100 MHz, CDCl_3): δ 200.7, 134.9, 134.7, 134.0, 132.6, 130.1, 128.1, 126.7, 124.2, 124.0, 123.9, 39.2, 26.7, 22.4, 19.3, 13.9; HRMS calcd for $\text{C}_{16}\text{H}_{18}\text{O}$: 226.1358, Found 226.1360.

Spectral data for 1-(4-Methyl-naphthalene-2-yl)-ethanone (32)



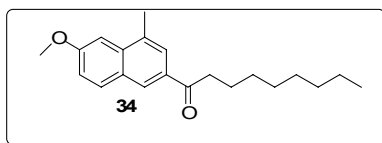
IR (neat, cm^{-1}): 1691 (s); ^1H NMR (400 MHz, CDCl_3): δ 8.30 (s, 1 H), 7.99-7.94 (m, 2 H), 7.86 (s, 1 H), 7.62 (t, $J = 8.4$ Hz, 1 H), 7.54 (t, $J = 8.0$ Hz, 1 H), 2.69 (s, 6 H); ^{13}C NMR (100 MHz, CDCl_3): δ 198.3, 135.0, 134.9, 134.1, 132.6, 130.2, 128.8, 128.3, 126.4, 124.1 (x2), 26.5, 19.3; HRMS calcd for $\text{C}_{13}\text{H}_{12}\text{O}$: 184.0888, Found 184.0886.

Spectral data for 1-(6-methoxy-1-methylnaphthalen-3-yl)nonane-1-one (33):



IR (neat, cm^{-1}): 1682 (s), 1240 (s), 1044 (s); ^1H NMR (400 MHz, CDCl_3): δ 8.20 (s, 1 H), 7.89 (d, $J = 9.2$ Hz, 1 H), 7.70 (s, 1 H), 7.27~7.26 (m, 2 H), 3.93 (s, 3 H), 3.04 (t, $J = 7.4$ Hz, 2 H), 2.67 (s, 3 H), 1.75 (quin, $J = 7.4$ Hz, 2 H), 1.39~1.23 (m, 10 H), 0.86 (t, $J = 6.2$ Hz, 3 H); ^{13}C NMR (150 MHz, CDCl_3): δ 200.9, 157.8, 134.8, 134.6, 134.1, 130.2, 127.0, 125.6, 122.4, 120.6, 107.8, 55.3, 38.6, 31.8, 29.5, 29.4, 29.1, 24.6, 22.6, 19.4, 14.0; HRMS calcd for $\text{C}_{21}\text{H}_{28}\text{O}_2$: 312.2089; found 312.2090.

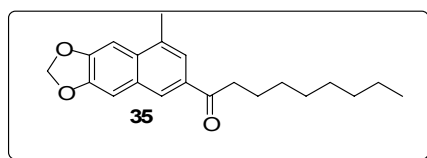
Spectral data for 1-(5-methyl-naphtho[2,3-d][1-3]dioxo-7-yl) nonane-1-one (34):



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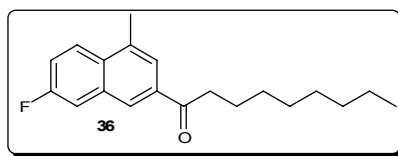
IR (neat, cm^{-1}): 1679 (s), 1237 (s), 1048(s); ^1H NMR (600 MHz, CDCl_3): δ 8.20 (s, 1 H), 7.84~7.82 (m, 2 H), 7.18~7.17 (m, 2 H), 3.94 (s, 3 H), 3.02 (t, $J = 7.3$ Hz, 2 H), 2.64 (s, 3 H), 1.77~1.74 (m, 2 H), 1.39~1.24 (m, 10 H), 0.87 (t, $J = 6.8$ Hz, 3 H); ^{13}C NMR (150 MHz, CDCl_3): δ 200.5, 159.6, 136.4, 133.3, 132.0, 131.7, 128.0, 127.8, 124.9, 118.7, 102.8, 55.3, 38.4, 31.8, 29.4 (2x CH_2), 29.1, 24.7, 22.6, 19.5, 14.0; HRMS calcd for $\text{C}_{21}\text{H}_{28}\text{O}_2$: 312.2089; found 312.2092.

Spectral data for 1-(5-methyl-naphtho[2,3-*d*][1-3]dioxo-7-yl) nonane-1-one (35):



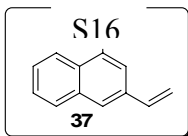
IR (neat, cm^{-1}): 1684 (s), 1247 (s), 1238 (s); ^1H NMR (400 MHz, CDCl_3): δ 8.13 (s, 1 H), 7.72 (s, 1 H), 7.27 (s, 1 H), 7.20 (s, 1 H), 6.07(s, 2 H), 3.01 (t, $J = 7.2$ Hz, 2 H), 2.60 (s, 3 H), 1.74 (quin, $J = 7.2$ Hz, 2 H), 1.48~1.13 (m, 10 H), 0.88 (t, $J = 6.0$ Hz, 3 H); ^{13}C NMR (150 MHz, CDCl_3): δ 200.6, 149.6, 147.8, 133.6, 132.8, 132.5, 129.7, 126.9, 123.5, 105.8, 101.4, 100.7, 38.5, 31.8, 29.4, 29.3, 29.1, 24.6, 22.6, 19.8, 14.0; HRMS calcd for $\text{C}_{21}\text{H}_{26}\text{O}_3$: 326.1882; found 326.1881.

Spectral data for 1-(7-Fluoro-4-methyl-naphthalen-2-yl)-nonan-1-one (36)



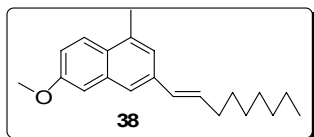
IR (neat, cm^{-1}): 1688 (s); ^1H NMR (400 MHz, CDCl_3): δ 8.20 (s, 1 H), 7.96 (dd, $J = 8.8$, 5.2 Hz, 1 H), 7.78 (s, 1 H), 7.52 (dd, $J = 6.8$, 2.8 Hz, 1 H), 7.35 (t, $J = 8.4$ Hz, 1 H), 3.03 (t, $J = 7.2$ Hz, 2 H), 2.68 (s, 3 H), 1.79-1.71 (m, 2 H), 1.40-1.26 (m, 10 H), 0.86 (t, $J = 6.8$ Hz, 3 H); ^{13}C NMR (100 MHz, CDCl_3): δ 200.5, 160.7 (d, $J_{\text{CF}} = 244.9$ Hz), 135.2, 133.8, 131.7, 127.2, 126.6, 123.7, 118.1 (d, $J_{\text{CF}} = 24.5$ Hz), 112.9 (d, $J_{\text{CF}} = 20.6$ Hz), 38.6, 31.8, 29.4x2, 29.3, 29.1, 24.4, 22.6, 19.5, 14.0; HRMS Calculated for $\text{C}_{20}\text{H}_{25}\text{FO}$: 300.1889, Found 300.1885.

Spectral data for 1-methyl-3-vinylnaphthalene (37):



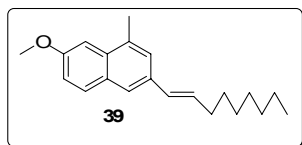
IR (neat, cm^{-1}): 1656 (w) ; ^1H NMR (400 MHz, CDCl_3): δ 7.94 (d, $J = 6.4$ Hz, 1 H), 7.80 (d, $J = 6.4$ Hz, 1 H), 7.60 (s, 1 H), 7.47~7.44 (m, 3 H), 6.84 (dd, $J = 17.6, 10.8$ Hz, 1 H), 5.85 (d, $J = 17.6$ Hz, 1 H), 5.31 (d, $J = 10.8$ Hz, 1 H), 2.66 (s, 3 H); ^{13}C NMR (150 MHz, CDCl_3) : δ 137.0, 134.5, 134.4, 133.7, 132.4, 128.6, 125.9, 125.7, 124.9, 124.0, 123.7, 113.8, 19.4; HRMS calcd for $\text{C}_{13}\text{H}_{12}$: 168.0939; found 168.0941.

Spectral data for 6-methoxy-1-methyl-3-((E)-non-1-enyl)naphthalene (38):



IR (neat, cm^{-1}): 1671 (w), 1239 (s), 1046 (s); ^1H NMR (400 MHz, CDCl_3): δ 7.80 (d, $J = 10.0$ Hz, 1 H), 7.47 (s, 1 H), 7.42 (s, 1 H), 7.12~7.07 (m, 2 H), 6.45 (d, $J = 15.6$ Hz, 1 H), 6.31 (td, $J = 15.6, 6.8$ Hz, 1 H), 3.9 (s, 3 H), 2.65 (s, 3 H), 2.23 (q, $J = 6.8$ Hz, 2 H), 1.49~1.27 (m, 10 H), 0.87 (t, $J = 6.8$ Hz, 3 H); ^{13}C NMR (150 MHz, CDCl_3) δ 157.5, 135.6, 135.2, 134.2, 131.4, 130.0, 127.3, 125.4, 123.0, 122.2, 117.5, 106.5, 55.2, 33.2, 31.8, 29.5, 29.3 (2x CH_2), 22.7, 19.3, 14.1; HRMS calcd for $\text{C}_{21}\text{H}_{28}\text{O}$: 296.2140; found 296.2143.

Spectral data for 7-methoxy-1-methyl-3-((E)-non-1-enyl)naphthalene (39):

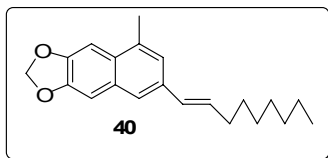


IR (neat, cm^{-1}): 1678 (w), 1233 (s), 1042 (s); ^1H NMR (400 MHz, CDCl_3): δ 7.68 (d, $J = 8.8$ Hz, 1 H), 7.47 (s, 1 H), 7.40 (s, 1 H), 7.16 (d, $J = 2.0$ Hz, 1 H), 7.11 (d, $J = 8.8$ Hz, 1 H), 6.46 (d, $J = 16.0$ Hz, 1 H), 6.29 (td, $J = 16.0, 6.8$ Hz, 1 H), 3.92 (s, 3 H), 2.62 (s, 3 H), 2.23 (q, $J = 6.8$ Hz, 2 H), 1.48 (quin, $J = 6.8$ Hz, 2 H), 1.34~1.28 (m, 8 H), 0.88 (t, $J =$

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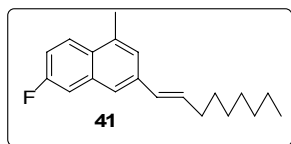
6.4 Hz, 3 H); ^{13}C NMR (150 MHz, CDCl_3): 157.4, 132.9 (x2), 132.8, 130.4, 129.9, 129.8, 129.2, 124.8, 123.6, 117.9, 103.0, 55.2, 33.2, 31.2, 29.5, 29.2 (x2), 22.7, 19.6, 14.1; HRMS calcd for $\text{C}_{21}\text{H}_{28}\text{O}$; 296.2140; found 296.2144.

Spectral data for 5-methyl-7-((*E*)-non-1-enyl)naphtha[2.3- α][1,3]dioxole (40):



IR (neat, cm^{-1}): 1673 (w), 1263 (s), 1242 (s); ^1H NMR (500 MHz, CDCl_3): δ 7.37 (s, 1 H), 7.27 (s, 1 H), 7.20 (s, 1 H), 7.05 (s, 1 H), 6.42 (d, $J = 16.0$ Hz, 1 H), 6.27 (td, $J = 16.0, 7.0$ Hz, 1 H), 6.00 (s, 2 H), 2.56 (s, 3 H), 2.22 (q, $J = 7.0$ Hz, 2 H), 1.48 (quin, $J = 7.0$ Hz, 2 H), 1.32~1.28 (m, 8 H), 0.88 (t, $J = 7.0$ Hz, 3 H); ^{13}C NMR (125 MHz, CDCl_3): δ 144.3, 147.3, 133.7, 133.3, 130.8, 130.7, 129.7, 128.6, 123.1, 123.0, 104.4, 100.9, 100.7, 33.1, 31.8, 29.5 (x2), 29.2, 22.7, 19.9, 14.1, HRMS calcd for $\text{C}_{21}\text{H}_{26}\text{O}_2$; 310.1933; found 310.1932.

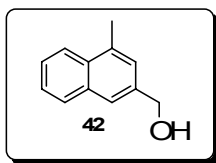
Spectral data for 6-fluoro-1-methyl-3-((*E*)-non-1-enyl)naphthalene (41):



IR (neat, cm^{-1}): 1661 (s); ^1H NMR (500 MHz, CDCl_3): δ 7.88 (dd, $J = 9.2, 5.6$ Hz, 1H), 7.45 ~ 7.36 (m, 3 H), 7.26 ~ 7.17 (m, 1 H), 6.47 (d, $J = 15.6$ Hz, 1 H), 6.36 (td, $J = 15.6, 6.8$ Hz, 1 H), 2.43 (s, 3 H), 2.28 (q, $J = 7.0$ Hz, 2 H), 1.49 (quin, $J = 7.0$ Hz, 2 H), 1.36 ~ 1.27 (m, 8 H), 0.89 (t, $J = 6.8$ Hz, 3 H), ^{13}C NMR (100 MHz, CDCl_3): δ 160.7 (d, $J_{\text{CF}} = 243.4$ Hz), 136.2, 134.9, 134.8, 134.4, 132.2, 129.5, 126.4, 123.5, 123.1, 115.1 (d, $J_{\text{CF}} = 24.5$ Hz), 111.3 (d, $J_{\text{CF}} = 19.9$ Hz), 33.2, 31.8, 29.4, 29.2 (x CH_2), 22.7, 19.5, 14.1, HRMS calcd for $\text{C}_{20}\text{H}_{25}\text{F}$; 284.1940; found 284.1944.

Spectral data for (1-methylnaphalen-3-yl)methanol (42):

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IR (neat, cm^{-1}): 3647 (m), 1056 (s); ^1H NMR (400 MHz, CDCl_3): δ 7.98~7.95 (m, 1 H), 7.65 (s, 1 H), 7.83~7.81 (m, 1 H), 7.52~7.46 (m, 2 H), 7.32 (s, 1 H), 4.80 (s, 2 H), 2.68 (s, 3 H); ^{13}C NMR (100 MHz, CDCl_3): δ 137.8, 134.6, 133.4, 131.9, 128.4, 125.8, 125.7, 125.6, 123.9, 123.7, 65.0, 19.2; HRMS calcd for $\text{C}_{12}\text{H}_{12}\text{O}$: 172.0888; found 172.0886.