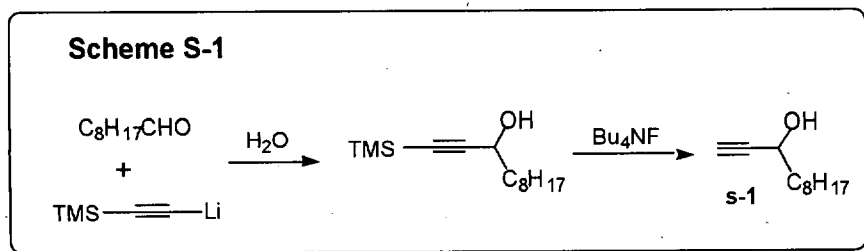


(1) Experimental procedures for synthesis of 3-benzyl but-1-ynyl ethers

(a) Synthesis of undec-1-yn-3-ol (s-1). To a THF solution (100 mL) of nonanyl aldehyde (3.0 g, 21.1 mmol) was added TMS-C \equiv C-Li (23.2 mmol) at -78°C , and the mixture was stirred for 4 h before quenched with water (10 mL). The solution was concentrated to ca. 10 mL and extracted with diethyl ether. The ether extract was concentrated, and passed through a short silica column to afford a colorless oil (4.2 g, 17.5 mmol). To a THF solution of this oil (3.0 g, 12.5 mol) was added Bu₄NF (18.7 mL, 18.7 mmol), and the mixture was stirred at 25°C for 8 h. Workup of the solution afforded alcohol **s-1** (1.97 g, 11.8 mmol, 94 %) as a colorless oil. IR(neat, cm^{-1}): 3375(br, s), 2947(m), 2203 w), 1602 (w); ^1H NMR (400 MHz, CDCl_3): δ 0.84 (3 H, t, $J = 7.2$ Hz), 1.26 (10 H, m), 1.41 (2 H, m), 1.66 (2 H, m), 2.24 (1 H, br s), 2.42 (1 H, d, $J = 2.0$ Hz), 4.32 (1 H, t, $J = 6.4$ Hz); ^{13}C NMR (100 MHz, CDCl_3): δ 14.0, 22.6, 25.0, 29.16, 29.2, 29.4, 31.8, 37.6, 72.7, 85.0; HRMS calcd for $\text{C}_{11}\text{H}_{20}\text{O}$: 168.1514, found 168.1511.

(b) Synthesis and spectral data of (1-octyl-prop-2-ynyloxymethyl)-benzene (1d).

To a THF solution of alcohol **s-1** (1.0 g, 6.0 mmol) was added NaH (290 mg, 7.1 mmol) at 23°C , and the mixture was stirred for 6 h before addition of benzyl bromide (1.22 g, 7.1 mmol). The solution was stirred for 8 h and quenched with water. Workup of the solution afforded the benzyl ether **1d** as a colorless oil. (1.32 g,

5.1 mmol, 86 %). IR(neat, cm^{-1}): 2932(m), 2203(w), 1609(w); ^1H NMR (400 MHz, CDCl_3): δ 0.90 (3 H, t, $J = 6.4$ Hz), 1.29 (10 H, m), 1.49 (2 H, m), 1.80 (2 H, m), 2.50 (1 H, t, $J = 1.6$ Hz), 4.10 (1 H, t, $J = 6.8$ Hz), 4.68 (2 H, ABq, $J = 11.6$ Hz), 7.29-7.42 (5 H, m); ^{13}C -NMR (100 MHz, CDCl_3): δ 14.0, 22.6, 25.1, 29.2, 29.21, 29.4, 31.8, 35.6, 68.4, 70.4, 73.6, 82.9, 127.6, 127.9, 128.3, 137.8; HRMS calcd for $\text{C}_{18}\text{H}_{26}\text{O}$: 258.1984, found 258.1976.

(2) Experimental procedures for catalytic reactions. Synthesis of undeca-1,3-diene

(2). A long tube containing $\text{TpRu}(\text{PPh}_3)(\text{CH}_3\text{CN})_2\text{PF}_6$ (47 mg, 0.062 mmol) was dried vacuo for 2 h before it was charged with benzyl ether **1d** (200 mg, 0.77 mmol) and 1,2-dichloro-ethane (0.5 mL). The mixture was heated at 80°C for 12 h before cooling to room temperature. The solution was concentrated and eluted through a silica column (hexane/diether=5/1) to afford diene **2** (98 mg, 0.64 mmol, 83%) and benzaldehyde (67 mg, 0.62 mmol, 81%, E/Z=6.0) respectively. IR (neat, cm^{-1}): 2967(m), 1658(w), 1604(w); ^1H NMR (400 MHz, CDCl_3): E-isomer. δ 0.89 (3 H, t, $J = 6.8$ Hz), 1.21-1.42 (10 H, m), 2.09 (2 H, q, $J = 7.4$ Hz), 4.96 (1 H, d, $J = 10.0$ Hz), 5.09 (1 H, d, $J = 16.8$ Hz), 5.72 (1 H, dt, $J = 15.2$ Hz, 6.8 Hz), 6.05 (1 H, m), 6.32 (1 H, dt, $J = 17.2$ Hz, 10.0 Hz), Z-isomer (selected peaks) δ 2.20 (2H, m), 5.18 (1H, d, $J = 16.8$ Hz), 5.44 (1H, m), 6.64 (1H, m), the remaining peaks were masked by those of E-isomer; ^{13}C NMR (100 MHz, CDCl_3): E-isomer δ 14.1, 22.6, 27.7, 29.2, 29.2, 31.8, 32.6, 114.5, 130.8, 135.6, 137.4; HRMS calcd for $\text{C}_{11}\text{H}_{20}$: 152.1565, found 152.1559.

Spectral data for 1-(1-Ethynyl-nonyloxymethyl)-4-methoxy-benzene (1e) IR (neat, cm^{-1}): 2921(m), 2204(w), 1601(w); ^1H NMR (300 MHz, CDCl_3): δ 0.87 (3H, t, $J = 7.0$ Hz),

1.25 (10 H, m), 1.43 (2H, m), 1.75 (2 H, m), 2.45 (1 H, t, $J = 2.0$ Hz), 3.79 (3 H, s), 4.03 (1 H, t, $J = 6.8$ Hz), 4.58 (2 H, ABq, $J = 11.3$ Hz), 6.87 (2 H, d, $J = 7.5$ Hz), 7.28 (2H, d, $J = 7.4$ Hz); ^{13}C NMR (75 MHz, CDCl_3): δ 14.1, 22.6, 25.2, 29.2, 29.4, 31.8, 35.6, 55.2, 68.0, 70.1, 73.6, 83.1, 113.7, 129.6, 129.9, 159.2. HRMS calcd for $\text{C}_{19}\text{H}_{28}\text{O}_2$ 288.2089, found 288.2086.

Spectral data for (1-Octyl-hept-2-ynyloxy)-benzene (1g) IR (neat, cm^{-1}): 2921(m), 2204(w), 1601(w); ^1H NMR (400 MHz, CDCl_3): δ 0.90 (6 H, m), 1.25 (10 H, m), 1.47 (6 H, m), 1.69 (2 H, m), 2.24 (2H, td, $J = 6.8, 1.6$ Hz), 4.04 (1H, br t, $J = 6.8$ Hz), 4.62 (2H, AB q, $J = 11.6$ Hz), 7.32-7.42 (5H, m); ^{13}C NMR (100 MHz): δ 13.6, 14.1, 18.4, 21.9, 22.7, 25.4, 29.2, 29.3, 29.5, 30.9, 31.9, 36.1, 69.0, 70.2, 79.2, 86.4, 127.5, 128.0, 128.3. HRMS calcd for $\text{C}_{22}\text{H}_{34}\text{O}$, 314.2610; found 314.2558.

Spectral data for Tridecyl-prop-2-ynyloxymethyl)-benzene (3). IR (neat, cm^{-1}): 2925(m), 2204(w), 1601(w); ^1H NMR (400 MHz, CDCl_3): δ 0.90 (3 H, t, $J = 6.8$ Hz), 1.21-1.38 (20 H, m), 1.48 (2 H, m), 1.80 (2 H, m), 2.48 (1 H, d, $J = 2.0$ Hz), 4.08 (1 H, td, $J = 6.6$ Hz, 2.0 Hz), 4.67 (2 H, AB q, $J = 12.0$ Hz), 7.29-7.42 (5 H, m); ^{13}C NMR(100 MHz, CDCl_3): δ 14.1, 22.6, 25.2, 29.2, 29.3, 29.4, 29.4, 29.6, 31.8, 35.6, 68.4, 70.4, 73.6, 82.9, 127.6, 127.9, 128.3, 137.8. HRMS calcd for $\text{C}_{23}\text{H}_{36}\text{O}$: 328.2766, found 328.2757.

Spectral data for 1-[2-(benzyloxy)-3-butynyl]benzene (4). IR (neat, cm^{-1}): 2924(m), 2202(w), 1604(w); ^1H NMR (400 MHz, CDCl_3): δ 2.52 (1 H, d, $J = 2.4$ Hz), 3.12 (2 H, m), 4.32 (1 H, td, $J = 2.0$ Hz, 6.8 Hz), 4.70 (2 H, ABq, $J = 12$ Hz), 7.22-7.39 (10 H, m); ^{13}C NMR(100 MHz, CDCl_3): δ 42.2, 69.5, 70.6, 74.7, 82.4, 126.7, 127.7, 127.8, 128.3, 128.4, 129.7, 137.1, 137.7; HRMS calcd for $\text{C}_{17}\text{H}_{16}\text{O}$: 236.1201, found 236.1203.

Spectral data for 1-[2-(benzyloxy)-1-methyl-3-butynyl]benzene (5). IR (neat, cm^{-1}): 2931(m), 2207(w), 1608(w); ^1H NMR (400 MHz, CDCl_3): δ 1.44 (3 H, d, $J = 7.2$ Hz), 2.42 (1 H, t, $J = 0.8$ Hz), 3.13 (1 H, m), 4.18 (1 H, d, $J = 4.0$ Hz), 4.67 (2 H, ABq, $J = 12.0$ Hz), 7.22-7.42 (10 H, m); ^{13}C NMR (100 MHz, CDCl_3): δ 16.7, 44.7, 70.6, 73.2, 74.9, 81.8, 126.6, 127.5, 127.7, 128.0, 128.1, 128.3, 137.8, 142.8; HRMS calcd for $\text{C}_{18}\text{H}_{18}\text{O}$: 250.1358, found 250.1356.

Spectral data for 1-(benzyloxy)-4-(tert-butyl)-1-(1-ethynyl)cyclohexane (6). Isomeric ratio (2.8:1); IR (neat, cm^{-1}): 2928(m), 2202(w), 1602(w); ^1H NMR (400 MHz, CDCl_3): major diastereomer, δ 0.87 (9 H, s), 1.02 (1H, t, $J = 9.1$ Hz), 1.46-1.28 (4 H, m), 1.77 (2 H, m), 2.21 (2 H, m), 2.48 (1 H, s), 4.69 (2 H, s), 7.15-7.42 (5 H, m), minor diastereomer δ 4.56 (2 H, s), 6.92 (2H, d, $J = 5.0$ Hz), 7.08 (2 H, d, $J = 5.0$ Hz), the remaining peaks were masked with those of major diastereomer; ^{13}C NMR (100 MHz, CDCl_3): δ 24.4, 27.5, 37.8, 47.4, 65.8, 72.1, 74.8, 75.2, 84.7, 127.6, 128.2, 131.4, 139.2; HRMS calcd for $\text{C}_{19}\text{H}_{26}\text{O}$: 270.1984, found 270.1988.

Spectral data for 1-[5-(benzyloxy)-1,6-heptadiynyl]benzene (7). IR (neat, cm^{-1}): 2928(m), 2201(w), 1605(w); ^1H NMR (400 MHz, CDCl_3): δ 2.18 (2 H, m), 2.62 (1 H, d, $J = 2.0$ Hz), 2.71 (2 H, m), 4.44 (1 H, td, $J = 5.2$ Hz, 2.4 Hz), 4.81 (2 H, ABq, $J = 12.0$ Hz), 7.28-7.58 (10 H, m); ^{13}C NMR (100 MHz, CDCl_3): δ 5.5, 34.7, 67.0, 70.7, 74.3, 81.1, 82.2, 88.7, 123.7, 127.6, 127.7, 127.9, 128.1, 128.3, 131.5, 137.65; HRMS calcd for $\text{C}_{20}\text{H}_{18}\text{O}$: 274.1358, found 274.1355.

Spectral data for (E)-5-(benzyloxy)-1-phenyl-1-hepten-6-yne (8). IR (neat, cm^{-1}): 2203(w), 1642(w), 1601(w); ^1H NMR (400 MHz, CDCl_3): δ 2.00 (2 H, m), 2.43 (2 H, q, J

= 7.2 Hz), 2.54 (1 H, d, $J = 2.0$ Hz), 4.19 (1 H, t, $J = 6.4$ Hz), 4.71 (2 H, ABq, $J = 12.0$ Hz), 6.22 (1 H, m), 6.42 (1 H, d, $J = 16$ Hz), 7.25-7.37 (5 H, m); ^{13}C NMR(100 MHz, CDCl_3): δ 28.6, 35.2, 67.6, 70.5, 74.1, 82.6, 125.9, 126.914, 127.7, 128.0, 128.2, 128.4, 129.4, 130.6, 137.6, 137.7; HRMS calcd for $\text{C}_{20}\text{H}_{20}\text{O}$: 276.1514, found 276.1511.

Spectral data for 1-[3-(benzyloxy)-4-pentynyl]-2-indanone (9). IR(neat, cm^{-1}):

2967(m), 2201(w), 1701(s); ^1H NMR (400 MHz, CDCl_3): δ 1.81 (2 H, m), 2.00 (2 H, m), 2.48 (1 H, d, $J = 2.4$ Hz), 3.05 (1 H, s), 3.56 (2 H, m), 4.07 (1 H, m), 4.61 (2 H, AB q, $J = 12.0$ Hz), 7.2-7.5 (9 H, m); ^{13}C NMR(100 MHz, CDCl_3): δ 29.6, 34.7, 40.5, 45.9, 67.8, 70.6, 74.6, 81.9, 124.5, 125.0, 127.4, 127.8, 128.0, 129.0, 135.1, 137.4, 142.6, 217.2; HRMS calcd for $\text{C}_{21}\text{H}_{20}\text{O}_2$: 304.1463, found 304.1461.

Spectral data for 2-[4-(benzyloxy)-5-hexynyl]-1,3-dioxolane (10). IR (neat, cm^{-1}):

2885(m), 2203(w); ^1H NMR (400 MHz, CDCl_3): δ 1.59-1.85 (6 H, m), 2.47 (1 H, d, $J = 2$ Hz), 3.81-3.95 (4 H, m), 4.08 (1 H, td, $J = 6.8$ Hz, 1.6 Hz), 4.66 (2 H, ABq, $J = 11.6$ Hz), 4.85 (1 H, t, $J = 4.4$ Hz), 7.26-7.37 (5 H, m); ^{13}C NMR (100 MHz, CDCl_3): δ 19.7, 33.4, 35.7, 64.7, 68.2, 70.5, 73.9, 82.6, 104.3, 127.6, 127.6, 128.3, 137.8; HRMS calcd for $\text{C}_{16}\text{H}_{20}\text{O}_3$: 260.1412., found 260.1409.

Spectral data for 4-[3-(benzyloxy)-4-pentynyl]-2,2-dimethyl-5-phenyl-1,3-dioxolane

(11). IR (neat, cm^{-1}): 2996(m), 2205(w), 1602(w); ^1H NMR (400 MHz, CDCl_3): δ 1.48-1.53 (6 H, m), 1.74-1.97 (4 H, m), 2.44 (1 H, dd, $J = 8.4, 1.6$ Hz), 3.77 (1 H, m), 4.07 (1 H, m), 4.54 (1 H, dd, $J = 8.8, 2.8$ Hz), 4.61 (2 H, m), 7.23-7.39 (5 H, m); ^{13}C NMR (100 MHz, CDCl_3): δ 26.7, 26.84, 26.9, 27.4, 31.8, 31.9, 67.8, 68.1, 70.4, 74.0, 74.1, 82.5, 82.6,

82.9, 83.2, 108.7, 126.7, 127.7, 127.9, 128.2, 128.3, 128.5, 137.8, 137.9; HRMS calcd for $C_{23}H_{26}O_3$: 350.1882, found 350.1877.

Spectral data for 9-[3-(benzyloxy)-4-pentynyl]-9H-fluorene (12). IR (neat, cm^{-1}):

2968(m), 2204(w); 1H NMR (400 MHz, $CDCl_3$): δ 1.50 (2 H, m), 2.21-2.45 (3 H, m), 3.98 (1 H, t, $J = 6.4$ Hz), 4.04 (1 H, t, $J = 5.2$ Hz), 4.58 (2 H, ABq, $J = 11.6$ Hz), 7.20-7.80 (13 H, m); ^{13}C NMR (100 MHz, $CDCl_3$): δ 28.0, 31.0, 46.8, 68.4, 70.4, 74.0, 82.5, 119.8, 123.7, 127.1, 127.6, 127.9, 130.2, 141.1, 146.8, 148.7; HRMS calcd for $C_{25}H_{22}O$: 338.1671, found 338.1660.

Spectral data for N1-allyl-N1-[3-(benzyloxy)-4-pentynyl]-4-methyl-1-

benzenesulfonamide (13). IR (neat, cm^{-1}): 2970(m), 2201(w), 1653(w), 1602(w); 1H -NMR (400 MHz, $CDCl_3$): δ 1.99 (2 H, q, $J = 6.8$ Hz), 2.39 (3 H, s), 2.47 (1 H, d, $J = 2.0$ Hz), 3.27 (2 H, m), 3.76 (2 H, m), 4.15 (1 H, td, $J = 6.0, 2.0$ Hz), 4.60 (2 H, ABq, $J = 11.6$ Hz), 5.12 (2 H, m), 5.60 (1 H, m), 7.28 (7 H, m), 7.67 (2 H, d, $J = 8.4$ Hz); ^{13}C NMR (100 MHz, $CDCl_3$): 21.5, 34.5, 43.6, 51.2, 65.9, 70.6, 74.4, 81.9, 119.0, 127.2, 127.7, 128.0, 128.4, 129.7, 133.1, 136.8, 137.6, 143.2; HRMS calcd for $C_{28}H_{25}NO$: 383.1555, found 383.1553.

Spectral data for 3-9-[3-(benzyloxy)-4-pentynyl]-9H-9-fluorenylpropanenitrile (14).

IR (neat, cm^{-1}): 2967(m), 2247(m), 2200(w); 1H NMR (400 MHz, $CDCl_3$): δ 1.04 (2 H, m), 1.47 (2 H, m), 2.24 (2 H, m), 2.40 (3 H, m), 3.79 (1 H, td, $J = 6.4$ Hz, 2.4 Hz), 4.48 (2 H, ABq, $J = 12.0$ Hz), 7.2-7.78 (13 H, m); ^{13}C NMR (100 MHz, $CDCl_3$): δ 12.1, 29.7, 34.8, 35.9, 53.7, 68.1, 70.3, 74.1, 82.3, 119.6, 120.2, 122.8, 127.7, 128.0, 128.3, 137.6, 141.2, 146.8; HRMS calcd for $C_{28}H_{25}NO$: 391.1936, found 391.1928.

Spectral data for (3E)-1,3-hexadecadiene (15). E/Z=5.6; IR (neat, cm^{-1}): 2968(m), 1654(w), 1603(w); ^1H NMR (400 MHz, CDCl_3): E-isomer, δ 0.89 (3 H, t, $J = 6.8$ Hz), 1.21-1.42 (20 H, m), 2.08 (2 H, q, $J = 5.4$ Hz), 4.96 (1 H, d, $J = 8.8$ Hz), 5.08 (1 H, d, $J = 17.0$ Hz), 5.72 (1 H, dt, $J = 14.8$ Hz, 7.4 Hz), 6.04 (1 H, m), 6.32 (1 H, dt, $J = 17.2, 8.7$ Hz); Z-isomer (selected peaks) δ 2.19 (2 H, m), 5.18 (1H, d, $J = 16.6$ Hz), 5.24 (1H, m), 6.63 (1H, m), the remaining peaks were masked by those of E-isomer; ^{13}C NMR (100 MHz, CDCl_3): E-isomer, δ 14.1, 22.7, 27.7, 29.2, 29.4, 29.5, 29.6, 29.7, 31.9, 32.6, 114.5, 130.8, 135.6, 137.4; HRMS calcd for $\text{C}_{16}\text{H}_{30}$: 222.2347, found 222.2348.

Spectral data for 1-[(1E)-1,3-butadienyl]benzene (16). IR (neat, cm^{-1}): 2973(m), 1650(w), 1605(w); ^1H NMR (400 MHz, CDCl_3): δ 5.18 (1 H, dd, $J = 10.1, 1.0$ Hz), 5.34 (1 H, dd, $J = 16.8, 1.2$ Hz), 6.54 (2 H, m), 6.79 (1 H, d, $J = 15.6, 10.0$ Hz), 7.21-7.42 (5 H, m); ^{13}C NMR (100 MHz, CDCl_3): δ 117.5, 125.7, 126.4, 127.6, 128.6, 129.8, 132.8, 137.4; HRMS calcd for $\text{C}_{10}\text{H}_{10}$: 130.0783, found 130.0782.

Spectral data for 1-[(1E)-1-methyl-1,3-butadienyl]benzene (17). E/Z=5.6, IR (neat, cm^{-1}): 2970(m), 1672(w), 1604(w); ^1H NMR (400 MHz, CDCl_3): E-isomer, δ 2.27 (3 H, s), 5.27 (1 H, d, $J = 10.0$ Hz), 5.40 (1 H, d, $J = 16.4$ Hz), 6.55 (1 H, d, $J = 10.8$ Hz), 6.842 (1 H, m), 7.21-7.59 (5 H, m), Z-isomer (selected peaks), δ 2.20 (3H, s), 5.02 (1H, d, $J = 10.0$ Hz), 6.21 (1H, d, 10.0 Hz), 6.25 (1H, m), the remaining peaks were masked by E-isomer; ^{13}C NMR (100 MHz, CDCl_3): δ 16.0, 117.6, 125.7, 126.3, 127.5, 128.6, 129.1, 133.8, 143.0; HRMS calcd for $\text{C}_{11}\text{H}_{12}$: 144.0939, found 144.0943.

Spectral data for 4-(*tert*-butyl)-1-vinyl-1-cyclohexene (18). IR (neat, cm^{-1}): 2969(m), 1653(w), 1601(w); ^1H NMR (400 MHz, CDCl_3): δ 0.88 (9 H, s), 1.89 (2 H, m), 2.12 (2 H, m), 2.31 (2 H, m), 4.88 (1 H, d, $J = 10.8$ Hz), 5.04 (1 H, d, $J = 17.6$ Hz), 5.74 (1 H, m), 6.34 (1 H, dd, $J = 17.6, 10.8$ Hz); ^{13}C NMR (100 MHz, CDCl_3): δ 23.6, 25.1, 27.2, 29.7, 32.2, 44.3, 109.7, 129.9, 135.9, 139.7; HRMS calcd for $\text{C}_{12}\text{H}_{20}$: 164.1565, found 164.1561.

Spectral data for 1-[(4*E*)-4,6-heptadien-1-ynyl]benzene (19). $E/Z=7.6$, IR(neat, cm^{-1}): 1642(w), 1601(w); ^1H NMR (400 MHz, CDCl_3): E-isomer, δ 3.22 (2 H, d, $J = 5.2$ Hz), 5.04 (1 H, d, $J = 9.2$ Hz), 5.19 (1 H, d, $J = 16.0$ Hz), 5.74 (1 H, m), 6.36 (1 H, m), 7.21-7.43 (5 H, m), Z-isomer (selected peaks), δ 3.32 (2H, d, $J = 5.2$ Hz), 5.24 (1H, d, $J = 16.8$ Hz), 5.52 (1H, m), 6.62 (1H, m), the remaining peaks were masked by those of E-isomer; ^{13}C NMR (100 MHz, CDCl_3): E-isomer, δ 22.5, 82.6, 86.6, 116.5, 123.7, 127.7, 128.2, 128.2, 131.6, 132.4, 136.4; HRMS calcd for $\text{C}_{13}\text{H}_{12}$: 168.0939, found 168.0927.

Spectral data for 1-[(1*E*,4*E*)-1,4,6-heptatrienyl]benzene (20) $E/Z=8.0$, IR (neat, cm^{-1}): 1648(w), 1604(w); ^1H NMR (400 MHz, CDCl_3): E-isomer, δ 3.02 (2 H, t, $J = 6.4$ Hz), 5.03 (1 H, d, $J = 10$ Hz), 5.16 (1 H, d, $J = 16.8$ Hz), 5.81 (1 H, m), 6.20 (2 H, m), 6.37 (2 H, m), 7.21-7.43 (5 H, m), Z-isomer (selected peaks), 3.16 (2 H, t, $J = 6.4$ Hz), 5.24 (1H, d, $J = 16.6$ Hz), 5.58 (1H, m), 6.70 (1H, m), the remaining peaks were masked by those of E-isomer; ^{13}C NMR (100 MHz, CDCl_3): E-isomer, δ 35.6, 115.5, 125.9, 126.9, 127.9, 128.4, 130.9, 131.9, 132.3, 136.8, 137.5.; HRMS calcd for $\text{C}_{13}\text{H}_{14}$: 170.1096, found 170.1094.

Spectral data for 1-[(2*E*)-2,4-pentadienyl]-2-indanone (21). $E/Z=7.1$, IR(neat, cm^{-1}): 2985(M), 1702(S); ^1H NMR (400 MHz, CDCl_3): E-isomer, δ 2.56 (2 H, m), 2.74 (2 H, m),

3.55 (3 H, m), 4.96 (1 H, d, $J = 10.0$ Hz), 5.07 (1 H, d, $J = 16.8$ Hz), 5.59 (1 H, m), 6.06 (1 H, m), 6.22 (1 H, td, $J = 10.4$ Hz, 6.4 Hz), 7.20-7.50 (4 H, m), Z-isomer (selected peaks), δ 5.18 (1H, d, $J = 16.6$ Hz), 5.38 (1H, m), 5.60 (1H, m), the remaining peaks were masked by those of E-isomer; ^{13}C NMR (100 MHz, CDCl_3): E-isomer, δ 30.4, 34.5, 43.3, 52.8, 116.2, 124.5, 124.8, 127.5, 128.5, 128.8, 130.1, 130.9, 133.9, 217.2. HRMS calcd for $\text{C}_{14}\text{H}_{14}\text{O}$: 198.1045, found, 198.1042.

Spectral data for 2-[(3E)-3,5-hexadienyl]-1,3-dioxolane (22). E/Z=6.3, IR (neat, cm^{-1}): 2880 (m), 1653 (w), 1601 (w); ^1H NMR (600 MHz, CDCl_3): E-isomer, δ 1.69 (2 H, t, $J = 4.5$ Hz), 2.16 (2 H, $J = 4.5$ Hz, m), 3.72 (2 H, m), 3.90 (2 H, m), 4.81 (1 H, m), 4.91 (1 H, d, $J = 9.6$ Hz), 5.04 (1 H, d, $J = 18$ Hz), 5.66 (1 H, m), 6.02 (1 H, m), 6.24 (1 H, m), Z-isomer (selected peaks), 1.62 (2 H, t, $J = 4.5$ Hz), 2.25 (2 H, t, $J = 4.5$ Hz), 5.18 (1H, d, $J = 16.8$ Hz), 5.50 (1H, m), 5.98 (1H, m), 6.60 (1H, m) the remaining peaks were masked by those of E-isomer, ^{13}C NMR (125 MHz, CDCl_3): E-isomer δ 26.9, 33.3, 64.9, 103.9, 115.1, 131.5, 134.1, 137.1; HRMS calcd for $\text{C}_9\text{H}_{14}\text{O}_2$: 154.0994, found 154.0991.

Spectral data for 2,2-dimethyl-4-[(2E)-2,4-pentadienyl]-5-phenyl-1,3-dioxolane (23) E/Z= 8.4, IR (neat, cm^{-1}): 2902(m), 1605(w); ^1H NMR (600 MHz, CDCl_3): E-isomer, δ 1.49 (3 H, s), 1.55 (3 H, s), 2.43 (2 H, m), 3.83 (1 H, m), 4.58 (1 H, d, $J = 6.4$ Hz), 4.97 (1 H, d, $J = 10.0$ Hz), 5.09 (1 H, d, $J = 16.8$ Hz), 5.68 (1 H, m), 6.10 (1 H, m), 6.26 (1 H, m), 7.31 (5 H, m), Z-isomer (selected peaks), δ 2.50 (1H, m), 3.78 (1H, m), 4.50 (1 H, d, $J = 6.4$ Hz), 5.20 (1H, d, $J = 16.8$ Hz), 5.50 (1H, m), 6.58 (1H, m), the remaining peaks were masked by those of E-isomer; ^{13}C NMR (125 MHz, CDCl_3): E-isomer, δ 27.0, 27.3, 34.1, 82.5, 108.8, 115.8, 126.8, 128.3, 128.5, 129.6, 133.6, 136.808, 137.7; HRMS calcd for $\text{C}_{16}\text{H}_{20}\text{O}_2$: 244.1463, found 244.1461.

Spectral data for 9-[(2E)-2,4-pentadienyl]-9H-fluorene (24). E/Z=5.0, IR (neat, cm^{-1}): 2968 (m), 1653(w); ^1H NMR (400 MHz, CDCl_3): E-isomer, δ 2.70 (2 H, t, $J = 6.8$ Hz), 3.97 (1 H, t, $J = 6.4$ Hz), 4.95 (1 H, d, $J = 10.4$ Hz), 5.06 (1 H, d, $J = 16.8$ Hz), 5.68 (1 H, m), 6.05 (1 H, dd, $J = 10.6, 10.0$ Hz), 6.25 (1 H, m), 7.2-7.8 (8 H, m); Z-isomer, 2.86 (2 H, t, $J = 6.8$ Hz), 5.18 (1H, d, $J = 16.8$ Hz), 5.40 (1H, m), 5.99 (1H, dd, $J = 10.6, 10.0$ Hz),), the remaining peaks were masked by those of E-isomer, ^{13}C NMR (100 MHz, CDCl_3): E-isomer, δ 36.5, 47.1, 115.5, 119.8, 124.6, 126.8, 127.0, 131.9, 133.3, 136.8, 140.9, 146.8; HRMS calcd for $\text{C}_{18}\text{H}_{16}$: 232.1252, found 232.1255.

Spectral data for N1-allyl-N1-[(2E)-2,4-pentadienyl]-4-methyl-1-benzene-sulfonamide (25). E/Z=6.5, IR (neat, cm^{-1}): 2970 (m), 1658 (w), 1600 (w); ^1H NMR (400 MHz, CDCl_3): E isomer, δ 2.41 (3 H, s), 3.77 (2 H, d, $J = 6.0$ Hz), 3.81 (2 H, d, $J = 6.8$ Hz), 5.10 (4 H, m), 5.43 (1 H, td, $J = 15.2, 6.8$ Hz), 5.59 (1 H, m), 6.06 (1 H, m), 6.21 (1 H, td, $J = 17.2, 10.0$ Hz), 7.27 (2 H, d, $J = 8.0$ Hz), 7.68 (2 H, d, $J = 8.4$ Hz), Z-isomer (selected peaks), 3.98 (2H, d, $J = 6.0$ Hz), 5.20 (1H, d, $J = 16.8$ Hz), 6.50 (1H, m), the remaining peaks were masked by those of E-isomer; ^{13}C NMR (100 MHz, CDCl_3): E-isomer, δ 21.5, 48.6, 49.4, 117.8, 118.9, 127.2, 127.7, 129.7, 132.7, 132.9, 134.7, 135.8, 143.2.; HRMS calcd for $\text{C}_{18}\text{H}_{16}$: 277.1136, found 277.1125.

Spectral data for 3-9-[(2E)-2,4-pentadienyl]-9H-9-fluorenylpropanenitrile (26). E/Z = 9.1, IR (neat, cm^{-1}): 2985 (m), 2248 (m); ^1H NMR (400 MHz, CDCl_3): E-isomer, δ 1.47 (2 H, t, $J = 8.0$ Hz), 2.43 (2 H, t, $J = 8.2$ Hz), 2.65 (2 H, d, $J = 8.0$ Hz), 4.889 (1 H, d, $J = 10.0$ Hz), 4.99 (1 H, d, $J = 16.8$ Hz), 5.23 (1 H, m), 5.89 (1 H, m), 6.060 (1 H, m), 7.20-7.80 (8H, m), Z-isomer (selected peaks) 3.92 (2H, d, $J = 6.0$ Hz), 5.06 (1H, d, $J = 16.8$

Hz), 6.45 (1H, m), the remaining peaks were masked by those of E-isomer; ^{13}C NMR (100 MHz, CDCl_3): E-isomer, δ 12.1, 34.4, 43.0, 53.9, 116.0, 120.2, 123.1, 127.6, 127.8, 127.9, 128.6, 134.6, 136.5, 140.8, 147.0; HRMS calcd for $\text{C}_{21}\text{H}_{19}\text{N}$: 285.1517, found 285.1513.

Spectral data for 3-Ethynyl-isochroman (27). IR (neat, cm^{-1}): 2966(m), 2245(m), 2201(w); ^1H NMR (400 MHz, CDCl_3): δ 2.47 (1 H, d, $J = 2.4$ Hz), 3.04 (2 H, m), 2.67 (1 H, m), 4.88 (2 H, ABq, $J = 15.2$ Hz), 7.0-7.2 (4 H, m); ^{13}C -NMR (100 MHz, CDCl_3): δ 34.1, 64.1, 66.1, 73.7, 81.8, 124.1, 126.3, 126.5, 128.7, 131.3, 133.6.

Spectral data for 2-Buta-1,3-dienyl-benzaldehyde (28). E/Z = 7.8, IR (neat, cm^{-1}): 2983 (m), 2245 (m); ^1H NMR (300 MHz, CDCl_3): E-isomer, δ 5.27 (1 H, d, $J = 10.4$ Hz), 5.40 (1 H, d, $J = 16.2$ Hz), 6.63 (1 H, m), 6.74 (1 H, dd, $J = 16.4, 10.6$ Hz), 7.3-7.6 (4 H, m), 7.79 (1 H, d, $J = 7.6$ Hz), 10.26 (1 H, s), Z-isomer (selected peaks) 5.22 (1H, d, $J = 10.0$ Hz), 6.49 (1H, m), 7.89 (1H, d, $J = 7.6$ Hz), the remaining peaks were masked by those of E-isomer; ^{13}C NMR (75 MHz, CDCl_3): E-isomer, δ 119.5, 126.9, 127.6, 128.5, 132.0, 132.7, 133.6, 134.7, 137.0, 139.5, 192.4; HRMS calcd for $\text{C}_{11}\text{H}_{10}\text{O}$: 158.0732, found 158.0731.