Supporting Information Belonging to the Manuscript Entitled:

A New Family of "Clicked" Estradiol-Based Low-Molecular-Weight Gelators Having Highly Symmetry-Dependent Gelation Ability

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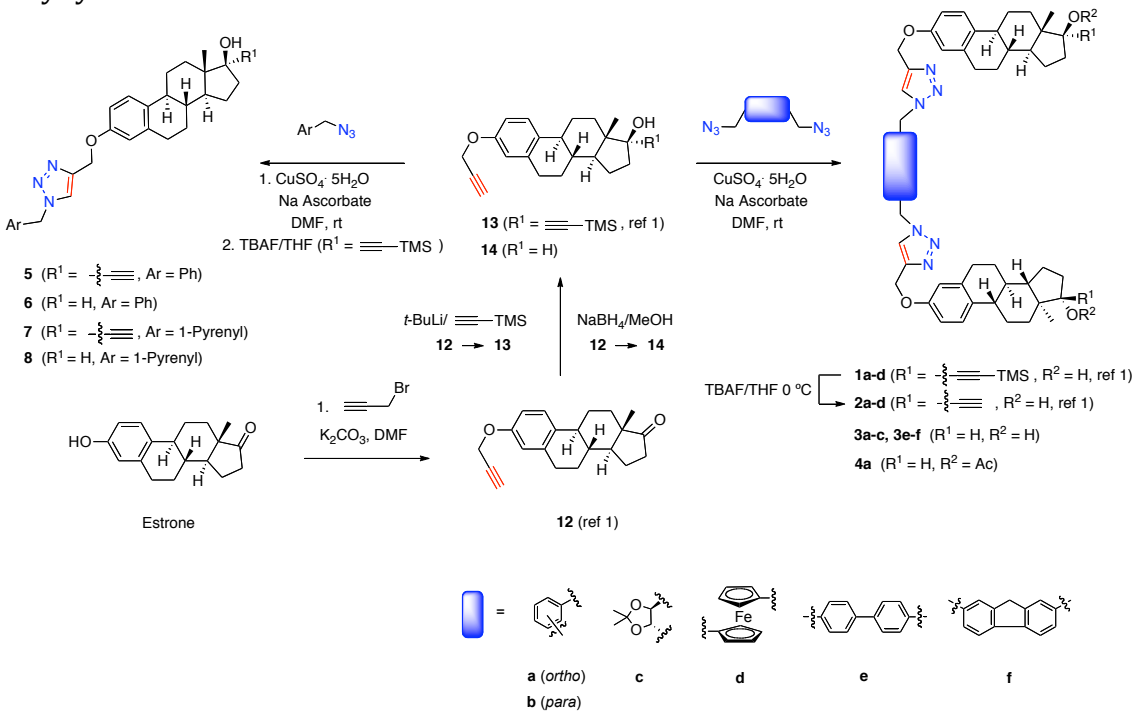
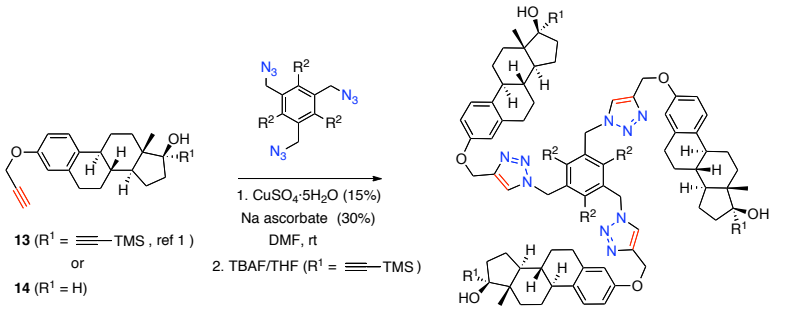
a) General procedures.

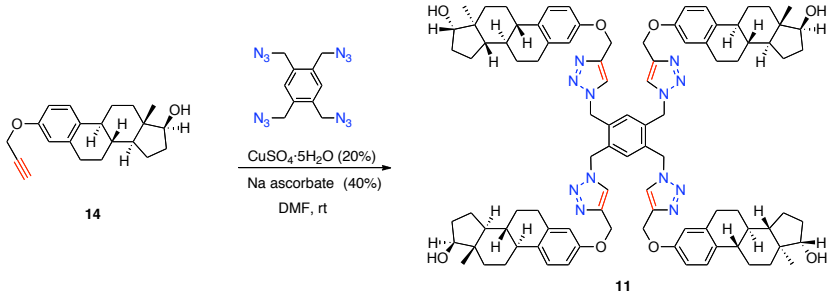
Flame-dried glassware and standard Schlenk techniques were used for moisture sensitive reactions. DMF and THF were dried by passage through solvent purification columns containing activated alumina. Other solvents were HPLC grade and were used without further purification. All reagents were obtained from commercial sources and used without further purification, unless noted otherwise. Flash column chromatography was performed using silica gel (Merk, nº 9385,230-400 mesh). Identification of the products was made by TLC (60 F_{254} Merk). UV light (λ = 254 nm) was used to develop the plates. ^{1}H and ^{13}C NMR spectra were recorded at 300, 400 or 500 MHz (^{1}H NMR) and at 75 or 100 MHz (^{13}C NMR) using $CDCl_3$ and DMSO-d_6 as solvents with the residual solvent signal as the internal reference ($CDCl_3$, 7.25 and 77.0 ppm), and (DMSO-d_6, 2.50 and 39.5 ppm). The following abbreviations are used to describe peak patterns when appropriate: s (singlet), d (doublet), t (triplet), q (quadruplet), m (multiplet), and *br* (broad). Mass spectra were recorded using the electronic impact (EI) technique with ionization energy of 70 eV, atmospheric pressure chemical ionization (APCI), or electrospray (ESI) chemical ionization techniques in its positive mode, unless noted otherwise. IR spectra were obtained on a Perkin-Elmer 681 spectrophotometer. Optical rotations were measured on a 241 MC polarimeter using a sodium lamp. Melting points were determined on a Koffler block.

b) Scheme S1 The synthetic approach to monomeric and dimeric estradiol and ethynyl estradiol-based structures



c) Scheme S2 The synthetic approach to trimeric and tetrameric estradiol-based structures





d)

1. Safety in the Handling of Sodium Azide and other Azides.

Note: Although we have not experienced any problem in handling these compounds, some organic azides have been reported as both explosive and toxic and therefore precaution should be taken.

The organic azides used throughout this work have been prepared by a facile and practical method that provides highly pure products and eliminates the hazards associated with distillation of azides. See: S. G. Alvarez and M. T. Alvarez *Synthesis* 1997, 413-414)

For a review on organic azides, see: S. Bräse, C. Gil, K. Knepper and V. Zimmermann *Angew. Chem*. Int. Ed. 2005, **44**, 5188–5240.

"*Sodium azide is toxic (LD_{50} oral (rats) = 27 mg kg^{-1}) and can be absorbed through the skin. It decomposes explosively upon heating to above 275 ºC. Sodium azide reacts vigorously with CS_2, bromine, nitric acid, dimethyl sulfate, and a series of heavy metals, including copper and lead. In reaction with water or Brønsted acids the highly toxic and explosive hydrogen azide is released. It has been reported that sodium azide form explosive di- and triazidomethane with CH_2Cl_2 and $CHCl_3$, respectively. Heavy-metal azides that are highly explosive under pressure or shock are formed when solutions of NaN_3 or HN_3 vapors come into contact with heavy metals or their salts. Heavy-metal azides can accumulate under certain circumstances, for example, in metal pipelines and on the metal components of*

diverse equipment (rotary evaporators, freezedrying equipment, cooling traps, water baths, waste pipes), and thus lead to violent explosions. Some organic and other covalent azides are classified as toxic and highly explosive, and appropriate safety measures must be taken at all times."

2. Preparation of 2,7-bis(azidomethyl)-9*H*-fluorene.

A mixture of 2,7-bis(bromomethyl)-9*H*-fluorene[5] (210.0 mg, 0.596 mmol, 1.0 equiv.) and NaN_3 (96.9 mg, 1.490 mmol, 2.50 equiv) in DMSO (25 mL) was stirred at room temperature for 20 hours. The reaction was quenched with water at 0 ºC and allowed to reach room temperature. The mixture was extracted with AcOEt and the organic extracts were washed with water (twice) and once with brine. The organic layer was dried over Na_2SO_4, filtered and the solvent was removed under *vacuum.* Finally the resulting crude was purified by column chromatography (hexanes/AcOEt 200:1 to 50:1) yielding pure 2,7-bis(azidomethyl)-9*H*-fluorene as white solid (126.4 mg, 77%).

2,7-bis(azidomethyl)-9*H*-fluorene: white solid; m.p. 73-75 °C; IR (KBr) ν_{max} 2962, 2915, 2105, 1631, 1471, 1439, 1421, 1397, 1330, 1262, 1110, 817 cm^{-1}; ^{1}HNMR (300 MHz, $CDCl_3$) δ 7.78 (d, *J* = 7.8 Hz, 2H, Ar), 7.50 (*br* s, 2H, Ar), 7.33 (*br* d, *J* = 7.8 Hz, 2H, Ar), 4.41 (s, 4H, CH_2N), 3.92 (s, 2H, CH_2Ar); ^{13}CNMR (75 MHz, $CDCl_3$) δ 144.0 (2C, Ar), 141.3 (2C, Ar), 134.1 (2C, Ar), 127.2 (2CH, Ar), 125.0 (2CH, Ar), 120.3 (2CH, Ar), 55.1 ($2CH_2N$), 36.8 (CH_2Ar). MS (EI) *m/z* (relative intensity) 276 $[M]^+$ (72), 248 (6), 234 (100), 206 (70), 192 (18).

e) Preparation of 3-*O*-Propargyl estradiol (**14**): To a solution of 3-*O*-Propargyl estrone (**12**)[1] (525 mg, 1.70 mmol, 1.0 equiv) in 30 mL of MeOH, $NaBH_4$ (257 mg, 6.80 mmol, 4.0 equiv) was added in portions. After 4 h of reaction, quenching with water and evaporation of the solvents under reduced pressure, the resulting crude was purified (SiO_2, hexanes/AcOEt 10:1 to 7:3) yielding pure **14** as a white solid (501 mg, 95%).

3-*O*-Propargyl estradiol (**14**): White solid; m.p. 109-110 °C; $[\alpha]_D^{30}$ +63.23 (*c* 1.705, $CHCl_3$); IR (KBr) ν_{max} 3583, 3436, 3289, 2951, 2866, 2912, 2121, 1605, 1497, 1451, 1382, 1309, 1260, 1223, 1162, 1127, 1071, 1029 cm^{-1}; ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.23 (d, *J* = 8.4 Hz, 1H, H-1), 6.78 (dd, *J* = 8.4, 2.7 Hz, 1H, H-2), 6.70 (d, *J* = 2.7 Hz, 1H, H-4), 4.66 (d, *J* = 2.4 Hz, 2H, CH_2O), 3.73 (t, *J* = 8.4 Hz, 1H, H-17), 2.86 (m, 2H), 2.51 (t, *J* = 2.4 Hz, 1H, C≡CH), 2.36-2.28 (m, 1H), 2.24-2.06 (m, 2H), 1.99-1.85 (m, 2H), 1.75-1.66 (m, 1H), 1.56-1.15 (m, 8H), 0.78 (s, 3H, H-18); ^{13}C NMR (75 MHz, $CDCl_3$) δ 155.4 (C, C-3), 138.1 (C, C-5), 133.6 (C, C-10), 126.3 (CH, C-1), 114.9 (CH, C-4), 112.2 (CH, C-2), 81.8 (CH, C-17), 78.9 (C*sp*, C≡C), 75.2 (C*sp*, C≡CH), 55.7 (CH_2, CH_2O), 50.0 (CH, C-14), 43.9 (CH, C-9), 43.2 (C, C-13), 38.7 (CH, C-8), 36.7 (CH_2, C-12), 30.6 (CH_2, C-16), 29.8 (CH_2, C-6), 27.2 (CH_2, C-7), 26.3 (CH_2, C-11), 23.1 (CH_2, C-15), 11.0 (CH_3, C-18); HRMS (ESI) *m/z* 310.1934 ($C_{21}H_{26}O_2$ requires 310.1933).

f) Preparation of "click" compounds 1a-d,[1] 2a-d,[1] 3a-c, 3e-f, 4a, 5-8, 9a-b,[2] 10 and 11.

General Procedure for the synthesis of "click" compounds. A mixture of the requisite organic azide[1] (1.0 equiv), the requisite alkyne (1.00-1.50 per equiv of N_3), sodium (*L*)-ascorbate (0.20-0.80 equiv) and $CuSO_4{\cdot}5H_2O$ (0.10-0.40 equiv) in DMF was stirred under Ar at rt for the period of time specified below. The reaction was quenched with water at 0 °C (slightly exothermic) and allowed to reach rt. The mixture was extracted with AcOEt three times and the combined organic extracts were washed with water (twice) and once with brine. The organic layer was dried over Na_2SO_4, filtered and the solvent was removed under *vacuum* to afford the corresponding reaction products, which were purified through a short pad of SiO_2.

Preparation of Compound 3a. A mixture of 1,2-bis(azidomethyl)benzene[1] (52.0 mg, 0.276 mmol, 1.0 equiv), 3-*O*-propargyl estradiol (**14**) (257.0 mg, 0.828 mmol, 3.0 equiv), sodium (*L*)-ascorbate (21.8 mg, 0.110 mmol, 0.4 equiv) and $CuSO_4{\cdot}5H_2O$ (13.7 mg, 0.055 mmol, 0.2 equiv) in DMF (10 mL) yielded, after 3 h of reaction and purification (SiO_2, hexanes/AcOEt 1:3 to AcOEt), pure **3a** as a white solid (199.1 mg, 89%).

Compound 3a: White solid; m.p. 118-120 °C; $[\alpha]_D^{30}$ +47.63 (*c* 0.865, $CHCl_3$); IR (KBr) ν_{max} 3430, 2925, 2867, 1608, 1498, 1465, 1280, 1251, 1232, 1133, 1053, 1017 cm^{-1}; ^1H NMR (300 MHz, $CDCl_3$) δ 7.49 (s, 2H, N_3C=CH), 7.40-7.36 (m, 2H, Ar), 7.27-7.25 (m, 2H, Ar), 7.11 (d, *J* = 8.4 Hz, 2H, H-1), 6.74 (dd, *J* = 8.4, 2.7 Hz, 2H, H-2), 6.67 (d, *J* = 2.7 Hz, 2H, H-4), 5.62 (s, 4H, CH_2N), 5.13 (s, 4H, CH_2O), 3.72 (t, *J* = 8.4 Hz, 2H, H-17), 2.80 (m, 4H), 2.31-2.26 (m, 2H), 2.20-2.05 (m, 4H), 1.96-1.83 (m, 4H), 1.71 (m, 4H), 1.54-1.12 (m, 14H), 0.77 (s, 6H, H-18); ^{13}C NMR (75 MHz, $CDCl_3$) δ 156.0 (2C, C-3), 145.0 (2C, N_3C=CH), 138.1 (2C, C-5), 133.3 (2C, Ar), 133.1 (2C, C-10), 130.4 (2CH, Ar), 129.8 (2CH, Ar), 126.3 (2CH, C-1), 122.8 (2CH, N_3C=CH), 114.7 (2CH, C-4), 112.2 (2CH, C-2), 81.8 (2CH, C-17), 62.0 ($2CH_2$), 51.2 ($2CH_2$), 50.0 (2CH, C-14), 43.9 (2CH, C-9), 43.2 (2C, C-13), 38.7 (2CH, C-8), 36.7 ($2CH_2$, C-12), 30.5 ($2CH_2$, C-16), 29.7 ($2CH_2$, C-6), 27.2 ($2CH_2$, C-7), 26.3 ($2CH_2$, C-11), 23.1 ($2CH_2$, C-15), 11.0 ($2CH_3$, C-18); HRMS (ESI) *m/z* 808.4665 ($C_{50}H_{60}N_6O_4$ requires 808.4676).

Preparation of Compound 3b. A mixture of 1,4-bis(azidomethyl)benzene[1] (43.9 mg, 0.233 mmol, 1.0 equiv), 3-*O*-propargyl estradiol (**14**) (217.4 mg, 0.700 mmol, 3.0 equiv), sodium (*L*)-ascorbate (18.4 mg, 0.093 mmol, 0.4 equiv) and $CuSO_4{\cdot}5H_2O$ (11.7 mg, 0.047 mmol, 0.2 equiv) in DMF (10 mL) yielded, after 3 h of reaction and purification (SiO_2, hexanes/AcOEt 1:3 to AcOEt), pure **3b** as a white solid (178.2 mg, 95%).

Compound 3b: White solid; m.p. 150-152 °C; $[\alpha]_D^{27}$ +37.33 (*c* 0.225, DMSO); IR (KBr) ν_{max} 3436, 3143, 2925, 2868, 1609, 1574, 1497, 1465, 1383, 1335, 1281, 1252, 1155, 1133, 1053, 1016 cm^{-1}; ^1H NMR (300 MHz, DMSO-d_6) δ 8.22 (s, 2H, N_3C=CH), 7.32 (m, 4H, Ar), 7.15 (d, *J* = 8.4 Hz, 2H, H-1), 6.74 (dd, *J* = 8.4, 2.4 Hz, 2H, H-2), 6.68 (d, *J* = 2.4 Hz, 2H, H-4), 5.58 (s, 4H, CH_2N), 5.04 (s, 4H, CH_2O), 4.49 (d, *J* = 4.8 Hz, 2H, OH), 3.52 (m, 2H), 2.75 (m, 4H), 2.26-2.22 (m, 2H), 2.12-2.04 (m, 2H), 1.94-1.76 (m, 6H), 1.62-1.53 (m, 2H), 1.44-1.05 (m, 14H), 0.66 (s, 6H, H-18); ^{13}C NMR (75 MHz, DMSO-d_6) δ 155.8 (2C, C-3), 143.0 (2C, N_3C=CH), 137.4 (2C, C-5), 136.0 (2C, Ar), 132.6 (2C, C-10), 128.4 (4CH, Ar), 126.1 (2CH, C-1), 124.4 (2CH, N_3C=CH), 114.4 (2CH, C-4), 112.2 (2CH, C-2), 80.0 (2CH, C-17), 61.0 ($2CH_2$), 52.4 ($2CH_2$), 49.5 (2CH, C-14), 43.5 (2CH, C-9), 42.8 (2C, C-13), 38.5 (2CH, C-8), 36.6 ($2CH_2$, C-12), 29.9 ($2CH_2$, C-16), 29.2 ($2CH_2$, C-6), 26.8 ($2CH_2$, C-7), 26.0 ($2CH_2$, C-

11), 22.8 ($2CH_2$, C-15), 11.2 ($2CH_3$, C-18); HRMS (ESI) *m/z* 808.4669 ($C_{50}H_{60}N_6O_4$ requires 808.4676).

Preparation of Compound 3c. A mixture of (4*S*,5*S*)-4,5-bis(azidomethyl)-2,2-dimethyl-1,3-dioxolane[1] (27.6 mg, 0.130 mmol, 1.0 equiv), 3-*O*-propargyl estradiol (**14**) (100.9 mg, 0.325 mmol, 2.5 equiv), sodium (*L*)-ascorbate (10.3 mg, 0.052 mmol, 0.4 equiv) and $CuSO_4{\cdot}5H_2O$ (6.5 mg, 0.026 mmol, 0.2 equiv) in DMF (8 mL) yielded, after 3 h of reaction and purification (SiO_2, hexanes/AcOEt 1:3 to AcOEt), pure **3c** as a white solid (100.3 mg, 93%).

Compound 3c: White solid; m.p. 122-124 °C; $[\alpha]_D^{27}$ +22.50 (*c* 0.160, DMSO); IR (KBr) ν_{max} 3436, 2925, 2868, 1609, 1498, 1464, 1382, 1251, 1134, 1053 cm^{-1}; ^1H NMR (300 MHz, $CDCl_3$) δ 7.71 (s, 2H, N_3C=CH), 7.18 (d, *J* = 8.6 Hz, 2H, H-1), 6.76 (dd, *J* = 8.6, 2.6 Hz, 2H, H-2), 6.68 (d, *J* = 2.6 Hz, 2H, H-4), 5.18 (s, 4H, CH_2O), 4.55 (s, 4H, CH_2N), 3.97 (*br* s, 2H, 2OCH), 3.72 (t, *J* = 8.4 Hz, 2H, H-17), 2.81 (m, 4H), 2.35-2.20 (m, 2H), 2.22-2.03 (m, 4H), 1.99-1.79 (m, 4H), 1.76-1.13 (m, 18H), 1.13 (s, 6H), 0.76 (s, 6H, H-18); ^{13}C NMR (75 MHz, $CDCl_3/CD_3OD$) δ 155.6 (2C, C-3), 144.3 (2C, N_3C=CH), 137.9 (2C, C-5), 133.3 (2C, C-10), 126.1 (2CH, C-1), 124.7 (2CH, N_3C=CH), 114.5 (2CH, C-4), 111.9 (2CH, C-2), 110.4 (C, $O_2C(CH_3)_2$), 81.1 (2CH, C-17), 75.2 (2CH, OCH), 61.3 ($2CH_2$), 49.9 ($2CH_2$), 49.7 (2CH, C-14), 43.7 (2CH, C-9), 42.9 (2C, C-13), 38.5 (2CH, C-8), 36.4 ($2CH_2$, C-12), 29.6 ($2CH_2$, C-16), 29.5 ($2CH_2$, C-6), 26.9 ($2CH_2$, C-7), 26.3 ($2CH_3$), 26.0 ($2CH_2$, C-11), 22.8 ($2CH_2$, C-15), 10.7 ($2CH_3$, C-18); HRMS (ESI) *m/z* 832.4890 ($C_{49}H_{64}N_6O_6$ requires 832.4887).

Preparation of Compound 3e. A mixture of 4,4'-bis(azidomethyl)biphenyl[4] (47.8 mg, 0.181 mmol, 1.0 equiv), 3-*O*-propargyl estradiol (**14**) (140.6 mg, 0.453 mmol, 2.5 equiv), sodium (*L*)-ascorbate (14.3 mg, 0.072 mmol, 0.4 equiv) and $CuSO_4{\cdot}5H_2O$ (9.0 mg, 0.036 mmol, 0.2 equiv) in DMF (8 mL) yielded, after 20 h of reaction and purification (SiO_2, hexanes/AcOEt 1:3 to AcOEt), pure **3e** as a white solid (138.2 mg, 86%).

Compound 3e: White solid; m.p. 167-169 °C; $[\alpha]_D^{27}$ +33.66 (*c* 0.205, DMSO); IR (KBr) ν_{max} 3411, 2919, 2855, 1608, 1500, 1468, 1450, 1310, 1254, 1234, 1134, 1056 cm^{-1}; ^1H NMR (300 MHz, $CDCl_3/CD_3OD$) δ 7.55 (s, 2H, N_3C=CH), 7.46 (d, *J* = 8.2 Hz, 4H, Ar), 7.24 (d overlapped, *J* = 8.2 Hz, 4H, Ar), 7.07 (d, *J* = 8.5 Hz, 2H, H-1), 6.63 (dd, *J* = 8.5, 2.4 Hz, 2H, H-2), 6.56 (d, *J* = 2.4 Hz, 2H, H-4), 5.46 (s, 4H, CH_2N), 5.03 (s, 4H, CH_2O), 3.73 (d overlapped, *J* = 4.1 Hz, 2H, OH), 3.57 (t, *J* = 8.5 Hz, 2H, H-17), 2.70 (m, 4H), 2.19-2.14 (m, 2H), 2.08-1.89 (m, 4H), 1.85-1.72 (m, 4H), 1.56 (ddd, *J* = 11.8, 10.7, 2.8 Hz, 2H), 1.44-1.00 (m, 14H), 0.64 (s, 6H, H-18); ^{13}C NMR (75 MHz, $CDCl_3/CD_3OD$) δ 155.7 (2C, C-3), 144.7 (2C, N_3C=CH), 140.6 (2C, Ar), 138.0 (2C, C-5), 133.6 (2C, Ar), 133.3 (2C, C-10), 128.4 (4CH, Ar), 127.5 (4CH, Ar), 126.2 (2CH, C-1), 122.8 (2CH, N_3C=CH), 114.5 (2CH, C-4), 112.0 (2CH, C-2), 81.2 (2CH, C-17), 61.6 ($2CH_2$), 53.7 ($2CH_2$), 49.8 (2CH, C-14), 43.7 (2CH, C-9), 42.9 (2C, C-13), 38.6 (2CH, C-8), 36.4 ($2CH_2$, C-12), 29.7 ($2CH_2$, C-16), 29.5 ($2CH_2$, C-6), 27.0 ($2CH_2$, C-7), 26.1 ($2CH_2$, C-11), 22.8 ($2CH_2$, C-15), 10.7 ($2CH_3$, C-18); HRMS (ESI) *m/z* 884.4983 ($C_{56}H_{64}N_6O_4$ requires 884.4989).

Preparation of Compound 3f. A mixture of 2,7-bis(azidomethyl)-9*H*-fluorene (70.0 mg, 0.253 mmol, 1.0 equiv), 3-*O*-propargyl estradiol (**14**) (196.5 mg, 0.633 mmol, 2.5 equiv), sodium (*L*)-ascorbate (20.0 mg, 0.101 mmol, 0.4 equiv) and $CuSO_4{\cdot}5H_2O$ (12.7 mg, 0.051 mmol, 0.2 equiv) in DMF (8 mL) yielded, after 20 h of

reaction and purification (SiO_2, hexanes/AcOEt 1:3 to AcOEt/MeOH 50:1), pure **3f** as a white solid (168.0 mg, 74%).

Compound 3f: White solid; m.p. 142-144 °C; $[\alpha]_D^{27}$ +40.38 (*c* 0.260, DMSO); IR (KBr) ν_{max} 3435, 2924, 2867, 1609, 1498, 1471, 1311, 1280, 1252, 1134, 1053, 1017 cm^{-1}; ^1H NMR (300 MHz, $CDCl_3$) δ 7.76 (d, *J* = 7.8 Hz, 2H, Ar), 7.54 (s, 2H, N_3C=CH), 7.43 (s, 2H, Ar), 7.31 (d, *J* = 7.8 Hz, 2H, Ar), 7.16 (d, *J* = 8.6 Hz, 2H, H-1), 6.73 (dd, *J* = 8.6, 2.5 Hz, 2H, H-2), 6.67 (d, *J* = 2.5 Hz, 2H, H-4), 5.58 (s, 4H, CH_2N), 5.15 (s, 4H, CH_2O), 3.85 (s, 2H, CH_2), 3.71 (t, *J* = 8.4 Hz, 2H, H-17), 2.79 (m, 4H), 2.33-2.22 (m, 2H), 2.20-2.02 (m, 4H), 1.96-1.80 (m, 4H), 1.73-1.10 (m, 18H), 0.75 (s, 6H, H-18); ^{13}C NMR (75 MHz, $CDCl_3/CD_3OD$) δ 155.7 (2C, C-3), 144.6 (2C, N_3C=CH), 144.1 (2C, Ar), 141.3 (2C, Ar), 137.9 (2C, C-5), 133.3 (2C, C-10), 133.0 (2C, Ar), 126.9 (2CH, Ar), 126.1 (2CH, C-1), 124.8 (2CH, Ar), 122.7 (2CH, N_3C=CH), 120.4 (2CH, Ar), 114.5 (2CH, C-4), 111.9 (2CH, C-2), 81.2 (2CH, C-17), 61.6 ($2CH_2$), 54.2 ($2CH_2$), 49.7 (2CH, C-14), 43.7 (2CH, C-9), 42.9 (2C, C-13), 38.5 (2CH, C-8), 36.5 (CH_2), 36.4 ($2CH_2$, C-12), 29.6 ($2CH_2$, C-16), 29.5 ($2CH_2$, C-6), 26.9 ($2CH_2$, C-7), 26.0 ($2CH_2$, C-11), 22.8 ($2CH_2$, C-15), 10.7 ($2CH_3$, C-18); HRMS (ESI) *m/z* 896.4986 ($C_{57}H_{64}N_6O_4$ requires 896.4989).

Acetylation of 3a to afford Compound 4a. A mixture of dimer **3a** (90.0 mg, 0.111 mmol, 1.0 equiv) and Ac_2O (1.13 g, 11.07 mmol, 100 equiv) in pyridine (5 mL) was stirred at 50 °C for 5 h. The solvent was removed under *vacuum* and the crude obtained was purified through a short pad of SiO_2 (hexanes/AcOEt 1:1 to 2:3) yielding pure **4a** as a white solid (93.1 mg, 94%).

Compound 4a: White solid; m.p. 113-115 °C; $[\alpha]_D^{28}$ +27.59 (*c* 0.145, $CHCl_3$); IR (KBr) ν_{max} 2927, 2871, 1733, 1608, 1576, 1498, 1456, 1373, 1249, 1132, 1047 cm^{-1}; ^1H NMR (300 MHz, $CDCl_3$) δ 7.49 (s, 2H, N_3C=CH), 7.40-7.37 (m, 2H, Ar), 7.28-7.24 (m, 2H, Ar), 7.17 (d, *J* = 8.7 Hz, 2H, H-1), 6.74 (dd, *J* = 8.7, 2.4 Hz, 2H, H-2), 6.68 (*br* s, 2H, H-4), 5.62 (s, 4H, CH_2N), 5.13 (s, 4H, CH_2O), 4.68 (t, *J* = 8.4 Hz, 2H, H-17), 2.82 (m, 4H), 2.29-2.15 (m, 6H), 2.05 (s, 6H, $2CH_3$), 1.89-1.86 (m, 4H), 1.78-1.69 (m, 2H), 1.60-1.26 (m, 14H), 0.82 (s, 6H, H-18); ^{13}C NMR (75 MHz, $CDCl_3$) δ 171.2 (2CO), 156.0 (2C, C-3), 145.1 (2C, N_3C=CH), 138.0 (2C, C-5), 133.2 (4C, Ar + C-10), 130.5 (2CH, Ar), 129.8 (2CH, Ar), 126.4 (2CH, C-1), 122.8 (2CH, N_3C=CH), 114.7 (2CH, C-4), 112.2 (2CH, C-2), 82.7 (2CH, C-17), 62.0 ($2CH_2$), 51.2 ($2CH_2$), 49.8 (2CH, C-14), 43.8 (2CH, C-9), 42.9 (2C, C-13), 38.5 (2CH, C-8), 36.9 ($2CH_2$, C-12), 29.7 ($2CH_2$, C-6), 27.5 ($2CH_2$, C-16), 27.1 ($2CH_2$, C-7), 26.1 ($2CH_2$, C-11), 23.2 ($2CH_2$, C-15), 21.1 ($2CH_3$), 12.0 ($2CH_3$, C-18); HRMS (ESI) *m/z* 892.4872 ($C_{54}H_{64}N_6O_6$ requires 892.4887).

Preparation of Compound TMS-5. A mixture of azidomethylbenzene (85.5 mg, 0.642 mmol, 1.0 equiv), bis-alkyne **13**[1] (261.0 mg, 0.642 mmol, 1.0 equiv), sodium (*L*)-ascorbate (50.9 mg, 0.257 mmol, 0.4 equiv) and $CuSO_4{\cdot}5H_2O$ (32.0 mg, 0.128 mmol, 0.2 equiv) in DMF (10 mL) yielded, after 75 min of reaction and purification (SiO_2, hexanes/AcOEt 4:1 to 1:1), pure **TMS-5** as a white solid (228.7 mg, 66%).

Compound TMS-5: White solid; m.p. 63-65 °C; $[\alpha]_D^{21}$ -13.57 (*c* 0.280, $CHCl_3$); IR (KBr) ν_{max} 3430, 2932, 2871, 2159, 1608, 1498, 1456, 1280, 1250, 1123, 1049, 1018 cm^{-1}; ^1H NMR (300 MHz, $CDCl_3$) δ 7.51 (s, 1H, N_3C=CH), 7.39-7.36 (m, 3H, Ar), 7.29-7.28 (m, 2H, Ar), 7.21 (d, *J* = 8.7 Hz, 1H, H-1), 6.76 (dd, *J* = 8.7, 2.4 Hz, 1H, H-2), 6.69 (d, *J* = 2.4 Hz, 1H, H-4), 5.53 (s, 2H, CH_2N), 5.16 (s, 2H, CH_2O), 2.82 (m, 2H),

2.37-2.26 (m, 2H), 2.18 (*br* t, *J* = 13.8 Hz, 1H), 2.05-1.63 (m, 7H), 1.53-1.26 (m, 4H), 0.87 (s, 3H, H-18), 0.17 (s, 9H, TMS); ^{13}C NMR (75 MHz, $CDCl_3$) δ 156.1 (C, C-3), 145.0 (C, N_3C=CH), 138.1 (C, C-5), 134.5 (C, Ar), 133.1 (C, C-10), 129.1 (2CH, Ar), 128.8 (CH, Ar), 128.1 (2CH, Ar), 126.4 (CH, C-1), 122.4 (CH, N_3C=CH), 114.7 (CH, C-4), 112.2 (CH, C-2), 109.5 (C*sp*, C≡C), 90.0 (C*sp*, C≡C), 80.1 (C, C-17), 62.1 (CH_2), 54.2 (CH_2), 49.6 (CH, C-14), 47.2 (C, C-13), 43.7 (CH, C-9), 39.4 (CH, C-8), 38.9 (CH_2, C-12), 32.8 (CH_2, C-16), 29.8 (CH_2, C-6), 27.2 (CH_2, C-7), 26.4 (CH_2, C-11), 22.8 (CH_2, C-15), 12.8 (CH_3, C-18), 0.02 ($3CH_3$, TMS); HRMS (ESI) *m/z* 539.2973 ($C_{33}H_{41}N_3O_2Si$ requires 539.2968).

Desilylation of TMS-5 to afford Compound 5. A solution of nBu$_4$NF$*$3H$_2$O (64.4 mg, 0.204 mmol, 1.1 equiv) in THF (2 mL) was added dropwise to a solution of **TMS-5** (100.0 mg, 0.185 mmol, 1.0 equiv) in THF (4 mL) at 0 °C. The resulting mixture was stirred for 30 min at the same temperature. The solvent was removed under *vacuum* and the reaction mixture was filtered through a short pad of silica gel (AcOEt 1:1 to AcOEt) to yield terminal alkyne **5** as a white solid (77.0 mg, 89%).

Compound 5: White solid; m.p. 159-161 °C; $[\alpha]_D^{23}$ +5.00 (*c* 0.320, $CHCl_3$); IR (KBr) ν_{max} 3436, 2924, 2866, 1614, 1498, 1456, 1279, 1254, 1122, 1051 cm^{-1}; ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.52 (s, 1H, N_3C=CH), 7.39-7.36 (m, 3H, Ar), 7.29-7.26 (m, 2H, Ar), 7.20 (d, *J* = 8.4 Hz, 1H, H-1), 6.76 (dd, *J* = 8.4, 2.4 Hz, 1H, H-2), 6.69 (d, *J* = 2.4 Hz, 1H, H-4), 5.52 (s, 2H, CH_2N), 5.16 (s, 2H, CH_2O), 2.82 (m, 2H), 2.60 (s, 1H, C≡CH), 2.38-2.29 (m, 2H), 2.22 (*br* t, *J* = 14.1 Hz, 1H), 2.07-1.66 (m, 7H), 1.54-1.26 (m, 4H), 0.88 (s, 3H, H-18); ^{13}C NMR (75 MHz, $CDCl_3$) δ 156.1 (C, C-3), 145.0 (C, N_3C=CH), 138.1 (C, C-5), 134.5 (C, Ar), 133.2 (C, C-10), 129.1 (2CH, Ar), 128.8 (CH, Ar), 128.1 (2CH, Ar), 126.4 (CH, C-1), 122.2 (CH, N_3C=CH), 114.7 (CH, C-4), 112.2 (CH, C-2), 87.5 (C*sp*, C≡C), 79.8 (C, C-17), 74.0 (C*sp*, C≡CH), 62.2 (CH_2), 54.2 (CH_2), 49.4 (CH, C-14), 47.1 (C, C-13), 43.5 (CH, C-9), 39.3 (CH, C-8), 39.0 (CH_2, C-12), 32.7 (CH_2, C-16), 29.8 (CH_2, C-6), 27.2 (CH_2, C-7), 26.3 (CH_2, C-11), 22.8 (CH_2, C-15), 12.7 (CH_3, C-18) ; HRMS (ESI) *m/z* 467.2575 ($C_{30}H_{33}N_3O_2$ requires 467.2573).

Preparation of Compound 6. A mixture of azidomethylbenzene (50.1 mg, 0.376 mmol, 1.0 equiv), 3-*O*-propargyl estradiol (**14**) (175.1 mg, 0.564 mmol, 1.5 equiv), sodium (*L*)-ascorbate (14.9 mg, 0.075 mmol, 0.2 equiv) and $CuSO_4$·5H$_2$O (9.5 mg, 0.038 mmol, 0.1 equiv) in DMF (10 mL) yielded, after 2 h of reaction and purification (SiO_2, hexanes/AcOEt 7:3 to 1:1), pure **6** as a white solid (150.6 mg, 90%).

Compound 6: White solid; m.p. 159-161 °C; $[\alpha]_D^{28}$ +48.33 (*c* 0.240, $CHCl_3$); IR (KBr) ν_{max} 3431, 3131, 2927, 2870, 1605, 1498, 1462, 1383, 1312, 1279, 1252, 1231, 1128, 1051, 1015 cm^{-1}; ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.52 (s, 1H, N_3C=CH), 7.38-7.36 (m, 3H, Ar), 7.29-7.26 (m, 2H, Ar), 7.19 (d, *J* = 8.4 Hz, 1H, H-1), 6.76 (dd, *J* = 8.4, 2.7 Hz, 1H, H-2), 6.69 (d, *J* = 2.7 Hz, 1H, H-4), 5.52 (s, 2H, CH_2N), 5.15 (s, 2H, CH_2O), 3.73 (t, *J* = 8.4 Hz, 1H, H-17), 2.83 (m, 2H), 2.32-2.27 (m, 1H), 2.21-2.05 (m, 2H), 1.96-1.85 (m, 2H), 1.69 (m, 2H), 1.55-1.13 (m, 7H), 0.77 (s, 3H, H-18); ^{13}C NMR (75 MHz, $CDCl_3$) δ 156.0 (C, C-3), 144.9 (C, N_3C=CH), 138.1 (C, C-5), 134.4 (C, Ar), 133.2 (C, C-10), 129.1 (2CH, Ar), 128.7 (CH, Ar), 128.1 (2CH, Ar), 126.3 (CH, C-1), 122.5 (CH, N_3C=CH), 114.7 (CH, C-4), 112.2 (CH, C-2), 81.8 (CH, C-17), 62.1 (CH_2), 54.2 (CH_2), 50.0 (CH, C-14), 43.9 (CH, C-9), 43.2 (C, C-13), 38.7 (CH, C-8), 36.7 (CH_2, C-12), 30.5 (CH_2, C-16), 29.7 (CH_2, C-6), 27.2 (CH_2, C-7), 26.2 (CH_2, C-11), 23.1 (CH_2,

C-15), 11.0 (CH_3, C-18); HRMS (ESI) *m/z* 443.2576 ($C_{28}H_{33}N_3O_2$ requires 443.2573).

Preparation of Compound 7. A mixture of 1-azidomethylpyrene[3] (102.2 mg, 0.397 mmol, 1.0 equiv), bis-alkyne **13**[1] (242.3 mg, 0.596 mmol, 1.5 equiv), sodium (*L*)-ascorbate (31.5 mg, 0.159 mmol, 0.4 equiv) and $CuSO_4{\cdot}5H_2O$ (19.7 mg, 0.079 mmol, 0.2 equiv) in DMF (20 mL) was stirred under Ar at rt for 20 h. After quenching with water, the mixture was extracted with AcOEt and the organic extracts were washed with water (twice) and once with brine. The organic layer was dried over Na_2SO_4, filtered and the solvent was removed under *vacuum*. The resulting crude mixture was dissolved, without further purification, in THF (20 mL) at 0 °C and then a solution of nBu$_4$NF$*$3H$_2$O (207.0 mg, 0.656 mmol, 1.65 equiv) in THF (5 mL) was added dropwise. The reaction crude was stirred for 30 min at the same temperature. The solvent was removed under *vacuum* and the reaction mixture was purified (SiO_2, hexanes/AcOEt 7:3 to 1:2) to yield **7** as a white solid (217.5 mg, 93%).

Compound 7: White solid; m.p. 118-120 °C; $[\alpha]_D^{27}$ +0.92 (*c* 0.65, $CHCl_3$); IR (KBr) ν_{max} 3435, 2930, 2868, 1607, 1497, 1455, 1234, 1051 cm^{-1}; ^{1}H NMR (300 MHz, $CDCl_3$) δ 8.23-8.00 (m, 8H), 7.92 (d, *J* = 7.8 Hz, 1H), 7.35 (s, 1H), 7.09 (d, *J* = 8.6 Hz, 1H, H-1), 6.65 (dd, *J* = 8.6, 2.7 Hz, 1H, H-2), 6.58 (d, *J* = 2.7 Hz, 1H, H-4), 6.21 (s, 2H, CH_2N), 5.06 (s, 2H, CH_2O), 2.70 (m, 2H), 2.59 (s, 1H, C≡CH), 2.37-2.24 (m, 2H), 2.17-2.08 (m, 1H), 2.05-1.61 (m, 7H), 1.47-1.19 (m, 4H), 0.84 (s, 3H, H-18); ^{13}C NMR (75 MHz, $CDCl_3$) δ 156.0 (C, C-3), 144.8 (C, N_3C=CH), 137.9 (C, C-5), 133.1 (C, C-10), 132.1 (C, Ar), 131.1 (C, Ar), 130.5 (C, Ar), 129.3 (C, Ar), 129.1 (CH, Ar), 128.3 (CH, Ar), 127.7 (CH, Ar), 127.2 (CH, Ar), 126.6 (C, Ar), 126.4 (CH, Ar), 126.3 (CH, C-1), 125.9 (CH, Ar), 125.8 (CH, Ar), 125.0 (C, Ar), 124.9 (CH, Ar), 124.4 (C, Ar), 122.5 (CH, N_3C=CH), 121.9 (CH, Ar), 114.7 (CH, C-4), 112.2 (CH, C-2), 87.5 (C*sp*, C≡C), 79.8 (C, C-17), 74.0 (C*sp*, C≡CH), 62.1 (CH_2), 52.5 (CH_2), 49.4 (CH, C-14), 47.1 (C, C-13), 43.4 (CH, C-9), 39.3 (CH, C-8), 38.9 (CH_2, C-12), 32.7 (CH_2, C-16), 29.6 (CH_2, C-6), 27.1 (CH_2, C-7), 26.3 (CH_2, C-11), 22.7 (CH_2, C-15), 12.6 (CH_3, C-18); HRMS (ESI) *m/z* 591.2886 ($C_{40}H_{37}N_3O_2$ requires 591.2886).

Preparation of Compound 8. A mixture of 1-(azidomethyl)pyrene[3] (100.0 mg, 0.389 mmol, 1.0 equiv), 3-*O*-propargyl estradiol (**14**) (181.0 mg, 0.583 mmol, 1.5 equiv), sodium (*L*)-ascorbate (30.9 mg, 0.156 mmol, 0.4 equiv) and $CuSO_4{\cdot}5H_2O$ (19.5 mg, 0.078 mmol, 0.2 equiv) in DMF (20 mL) yielded, after 20 h of reaction and purification (SiO_2, hexanes/AcOEt 7:3 to 1:3), pure **8** as a white solid (201.3 mg, 91%).

Compound 8: White solid; m.p. 104-106 °C; $[\alpha]_D^{28}$ +34.50 (*c* 0.200, $CHCl_3$); IR (KBr) ν_{max} 3436, 2924, 2863, 1607, 1498, 1251, 1053, 847 cm^{-1}; ^{1}H NMR (300 MHz, $CDCl_3$) δ 8.23-8.00 (m, 8H), 7.92 (d, *J* = 7.8 Hz, 1H), 7.35 (s, 1H), 7.08 (d, *J* = 8.6 Hz, 1H, H-1), 6.65 (dd, *J* = 8.6, 2.5 Hz, 1H, H-2), 6.58 (d, *J* = 2.5 Hz, 1H, H-4), 6.21 (s, 2H, CH_2N), 5.05 (s, 2H, CH_2O), 3.69 (t, *J* = 8.4 Hz, 1H, H-17), 2.71 (m, 2H), 2.24-2.16 (m, 1H), 2.11-2.03 (m, 2H), 1.93-1.86 (m, 1H), 1.82-1.75 (m, 1H), 1.70-1.55 (m, 2H), 1.52-1.06 (m, 7H), 0.73 (s, 3H, H-18); ^{13}C NMR (75 MHz, $CDCl_3$) δ 156.0 (C, C-3), 144.8 (C, N_3C=CH), 137.9 (C, C-5), 133.2 (C, C-10), 132.1 (C, Ar), 131.1 (C, Ar), 130.5 (C, Ar), 129.3 (C, Ar), 129.0 (CH, Ar), 128.3 (CH, Ar), 127.7 (CH, Ar), 127.2 (CH, Ar), 126.6 (C, Ar), 126.4 (CH, Ar), 126.2 (CH, C-1), 125.9 (CH, Ar), 125.8 (CH, Ar), 125.0 (C, Ar), 124.9 (CH, Ar), 124.4 (C, Ar), 122.5 (CH, N_3C=CH), 121.9 (CH, Ar),

114.8 (CH, C-4), 112.2 (CH, C-2), 81.8 (C, C-17), 62.1 (CH_2), 52.4 (CH_2), 50.0 (CH, C-14), 43.8 (CH, C-9), 43.2 (C, C-13), 38.7 (CH, C-8), 36.6 (CH_2, C-12), 30.5 (CH_2, C-16), 29.6 (CH_2, C-6), 27.1 (CH_2, C-7), 26.2 (CH_2, C-11), 23.1 (CH_2, C-15), 11.0 (CH_3, C-18); HRMS (ESI) *m/z* 567.2885 ($C_{38}H_{37}N_3O_2$ requires 567.2886).

Preparation of Compound 10. A mixture of 1,3,5-tris(azidomethyl)benzene[2] (41.8 mg, 0.172 mmol, 1.0 equiv), 3-*O*-propargyl estradiol (**14**) (213.6 mg, 0.688 mmol, 4.0 equiv), sodium (*L*)-ascorbate (20.4 mg, 0.103 mmol, 0.6 equiv), and $CuSO_4{\cdot}5H_2O$ (13.0 mg, 0.052 mmol, 0.3 equiv), in DMF (10 mL) yielded, after 3 h of reaction and purification (SiO_2, AcOEt to AcOEt/MeOH 100:1), pure **10** as a white solid (165.7 mg, 82%).

Compound 10: White solid; m.p. 154-156 °C; $[\alpha]_D^{30}$ +50.28 (*c* 0.905, $CHCl_3$); IR (KBr) ν_{max} 3435, 2924, 2866, 1609, 1498, 1466, 1280, 1251, 1232, 1133, 1052, 1017 cm^{-1}; ^1H NMR (300 MHz, $CDCl_3$) δ 7.56 (s, 3H, N_3C=CH), 7.18 (d, *J* = 8.4 Hz, 3H, H-1), 7.13 (s, 3H, Ar), 6.74 (dd, *J* = 8.4, 2.4 Hz, 3H, H-2), 6.68 (d, *J* = 2.4 Hz, 3H, H-4), 5.45 (s, 6H, CH_2N), 5.14 (s, 6H, CH_2O), 3.72 (t, *J* = 8.4 Hz, 3H, H-17), 2.80 (m, 6H), 2.31-2.25 (m, 3H), 2.19-2.06 (m, 6H), 2.04-1.83 (m, 6H), 1.73-1.66 (m, 6H), 1.53-1.15 (m, 21H), 0.76 (s, 9H, H-18); ^{13}C NMR (75 MHz, $CDCl_3$) δ 156.0 (3C, C-3), 145.2 (3C, N_3C=CH), 138.1 (3C, C-5), 136.8 (3C, Ar), 133.3 (3C, C-10), 127.5 (3CH, Ar), 126.4 (3CH, C-1), 122.8 (3CH, N_3C=CH), 114.7 (3CH, C-4), 112.1 (3CH, C-2), 81.8 (3CH, C-17), 61.9 ($3CH_2$), 51.3 ($3CH_2$), 50.0 (3CH, C-14), 43.9 (3CH, C-9), 43.2 (3C, C-13), 38.7 (3CH, C-8), 36.6 ($3CH_2$, C-12), 30.5 ($3CH_2$, C-16), 29.7 ($3CH_2$, C-6), 27.1 ($3CH_2$, C-7), 26.2 ($3CH_2$, C-11), 23.1 ($3CH_2$, C-15), 11.0 ($3CH_3$, C-18); HRMS (ESI) *m/z* 1173.6746 ($C_{72}H_{87}N_9O_6$ requires 1173.6779).

Preparation of Compound 11. Compound **11** was synthesized by using a slightly modified procedure. A mixture of 1,2,4,5-tetrakis(azidomethyl)benzene[2] (52.5 mg, 0.176 mmol, 1.0 equiv), 3-*O*-propargyl estradiol (**14**) (273.2 mg, 0.880 mmol, 5.0 equiv), sodium (*L*)-ascorbate (27.9 mg, 0.141 mmol, 0.8 equiv) and $CuSO_4{\cdot}5H_2O$ (17.5 mg, 0.070 mmol, 0.4 equiv) in DMF (20 mL) was stirred under Ar at rt for 3 hours. The solvent was removed under *vacuum* and the crude obtained was purified through a short pad of SiO_2 (AcOEt to $CHCl_3$/^{i}PrOH 5:1), yielding pure **11** as a white solid (229.6 mg, 85%).

Compound 11: White solid; m.p. 172-174 °C; $[\alpha]_D^{27}$ +37.69 (*c* 0.390, DMSO); IR (KBr) ν_{max} 3435, 2924, 2867, 1609, 1498, 1466, 1281, 1251, 1232, 1134, 1053, 1018 cm^{-1}; ^1H NMR (300 MHz, DMSO-d_6) δ 8.08 (s, 4H, N_3C=CH), 7.12 (d, *J* = 8.7 Hz, 4H, H-1), 6.90 (s, 2H, Ar), 6.71 (*br* d, *J* = 8.7 Hz, 4H, H-2), 6.66 (*br* s, 4H, H-4), 5.76 (s, 8H, CH_2N), 5.02 (s, 8H, CH_2O), 4.50 (d, *J* = 4.8 Hz, 4H, OH), 3.51 (m, 4H), 2.71 (m, 8H), 2.25-2.21 (m, 4H), 2.08 (m, 4H), 1.86-1.75 (m, 12H), 1.57 (m, 4H), 1.38-1.07 (m, 28H), 0.65 (s, 12H, H-18); ^{13}C NMR (75 MHz, DMSO-d_6) δ 155.8 (4C, C-3), 143.4 (4C, N_3C=CH), 137.5 (4C, C-5), 134.8 (4C, Ar), 132.6 (4C, C-10), 130.1 (2CH, Ar), 126.1 (4CH, C-1), 124.5 (4CH, N_3C=CH), 114.4 (4CH, C-4), 112.0 (4CH, C-2), 80.0 (4CH, C-17), 61.0 ($4CH_2$), 49.5 (4CH + $4CH_2$, C-14 + CH_2), 43.5 (4CH, C-9), 42.8 (4C, C-13), 38.5 (4CH, C-8), 36.6 ($4CH_2$, C-12), 29.9 ($4CH_2$, C-16), 29.2 ($4CH_2$, C-6), 26.8 ($4CH_2$, C-7), 26.0 ($4CH_2$, C-11), 22.8 ($4CH_2$, C-15), 11.2 ($4CH_3$, C-18); HRMS (ESI) *m/z* 1538.8833 ($C_{94}H_{114}N_{12}O_8$ requires 1538.8883).

g) Gelation experiments and estimation of gel-to-sol phase transition temperature (T_{gel}): In a typical gelation experiment a weighed amount of

estradiol-based compounds and a mixture of the requisite organic solvent/H_2O were placed in a screw-capped vial, which was heated with a heat-gun until the solid was completely dissolved. The resulting clear solution was removed immediately from the heat and cooled to room temperature over 20 minutes. Gelation was considered to have occurred when a homogeneous substance was obtained, which exhibit no gravitational flow. Partial gels were judged after being kept undisturbed at room temperature for 1 day. The gels that tolerate different proportion of organic solvent/water can be stored for months without showing a sign of decomposition. For the determination of the melting points a steel ball (175 mg) was placed on the top of the gel and the vial was sealed. A series of these samples was placed in a stirred oil bath, which was slowly heated (typically 2-4 °C/min), while the position of the steel balls were observed and the temperature was simultaneously monitored with the aid of a thermocouple in one of the vials. The melting of a particular sample was taken as the temperature at which the steel ball reached the bottom of the vial.

Gelation ability of "click" compounds in different organic solvent/water mixtures.

Table 1

Solvent/Compound*	**1b**	**2a**	**2b**	**2c**	**2d**	**3a**	**3b**	**3e**	**3f**
Acetone	S	PG	P	S	S	P	P	PG	P
Tetrahydrofuran	S	S	S	S	S	S	S	S	S
Dioxane	-	PG	S	S	S	S	P	PG	PG
Dimethylformamide	P	G	P	G	S	G**	G	OG	G
Dimethylacetamide	P	G	G	PG	S	PG	G	OG	G
Methanol	P	P	P	P	P	P	PG	-	P
Dimethylsulfoxide	P	G	G	P	P	G	G	OG	G
N-methylpyrrolidone	P	G	G	S	S	G**	P	G	G
Acetic acid	P	PG	PG	-	P	PG	P	OG	P
Ethanol	P	PG	P	-	P	PG	PG	-	P
Pyridine	-	PG	S	-	S	S	S	-	G
2-propanol	P	-	P	-	P	PG	PG	-	P

G gel formed at room temperature; P precipitate; S solution; PG partial gel; WG weak gel; OG opaque gel
*Gelator Concentrations: 7 mg mL^{-1} (Organic Solvent/H_2O 5/2 v/v)
**Gelator Concentrations: 6 mg mL^{-1} (Organic Solvent/H_2O 5/4 v/v)

Table 2

Solvent/Compound*	**7**	**9b**	**10**	**11**
Acetone	S	P	P	PG
Tetrahydrofuran	S	S	S	PG
Dioxane	S	S	S	G
Dimethylformamide	S	P	PG	G**
Dimethylacetamide	S	P	PG	G**
Methanol	P	P	P	P
Dimethylsulfoxide	P	P	P	G**
N-methylpyrrolidone	S	S	S	G**

Acetic acid	P	P	P	G
Ethanol	P	P	P	PG
Pyridine	S	S	S	G
2-propanol	P	P	P	PG

G gel formed at room temperature; P precipitate; S solution; PG partial gel; WG weak gel; OG opaque gel.
*Gelator Concentrations: 7 mg mL^{-1} (Organic Solvent/H_2O 5/2 v/v)
**Gelator Concentrations: 1 mg mL^{-1} (Organic Solvent/H_2O 5/2 v/v)

h) References

[1] P. Ramírez-López, M. C. de la Torre, H. E. Montenegro, M. Asenjo, M A. Sierra, *Org. Lett.* 2008, **10**, 3555.

[2] H. E. Montenegro, P. Ramírez-López, M. C. de la Torre, M. Asenjo, M. A. Sierra, *Chem. Eur. J.* 2010, **16**, 3798.

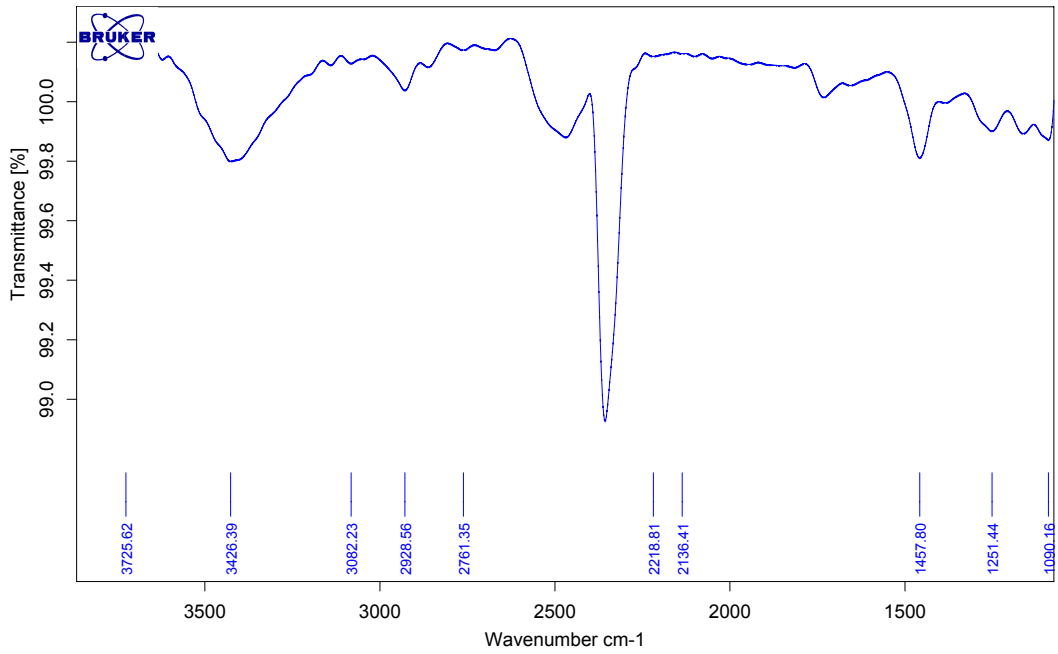
[3] S. Y. Park, J. H. Yoon, C. S. Hong, R. Souane, J. S. Kim, S. E. Matthews, J. Vicens, *J. Org. Chem.* 2008, **73**, 8212.

[4] J. R. Thomas, X. Liu, P. J. Hergenrother, *J. Am. Chem. Soc.* 2005, **127**, 12434.

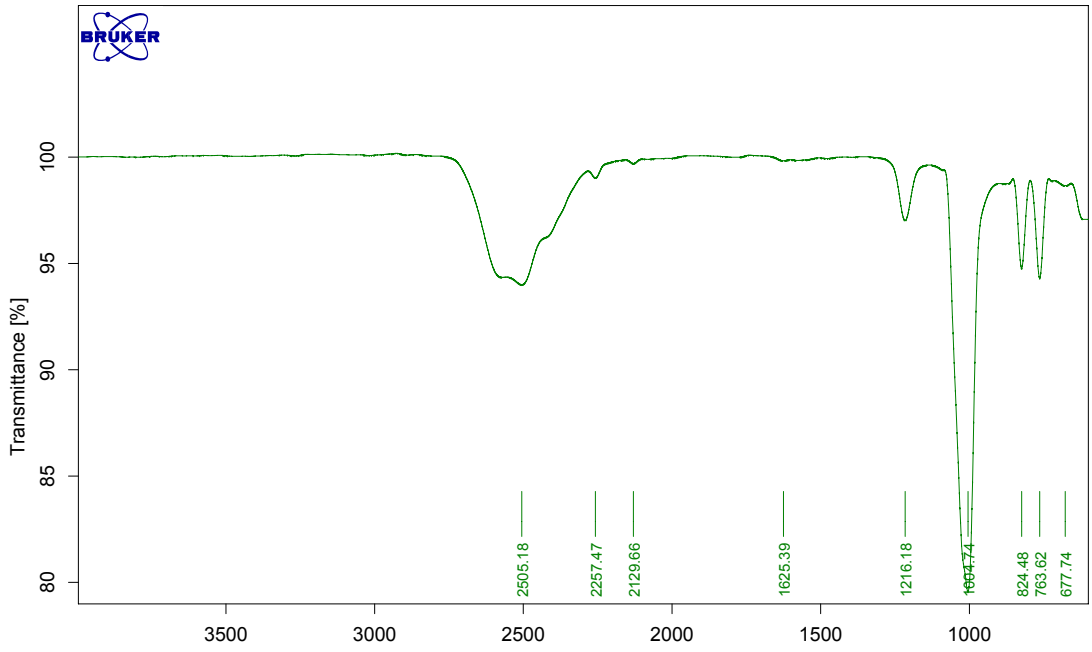
[5] M. W. Haenel, H. Irngartinger, C. Krieger, *Chem*. *Ber*. 1985, **118**, 144.

i) ATR-IR spectrum of 3a/DMSO-d_6/D_2O gel.

IR spectra of gels were obtained by depositing the gel on an attenuated total reflectance (ATR) plate and recording the spectrum directly. The presence of hydrogen bonded OH groups in the gel state is corroborated by the ATR-IR spectrum of **3a**/DMSO-d_6/D_2O (3/1 v/v) gel, after subtraction of the solvent-based background, which showed a broad band at 3424 cm^{-1}. The spectrum of the solvent mixture (3/1 DMSO-d_6/D_2O) is shown below.



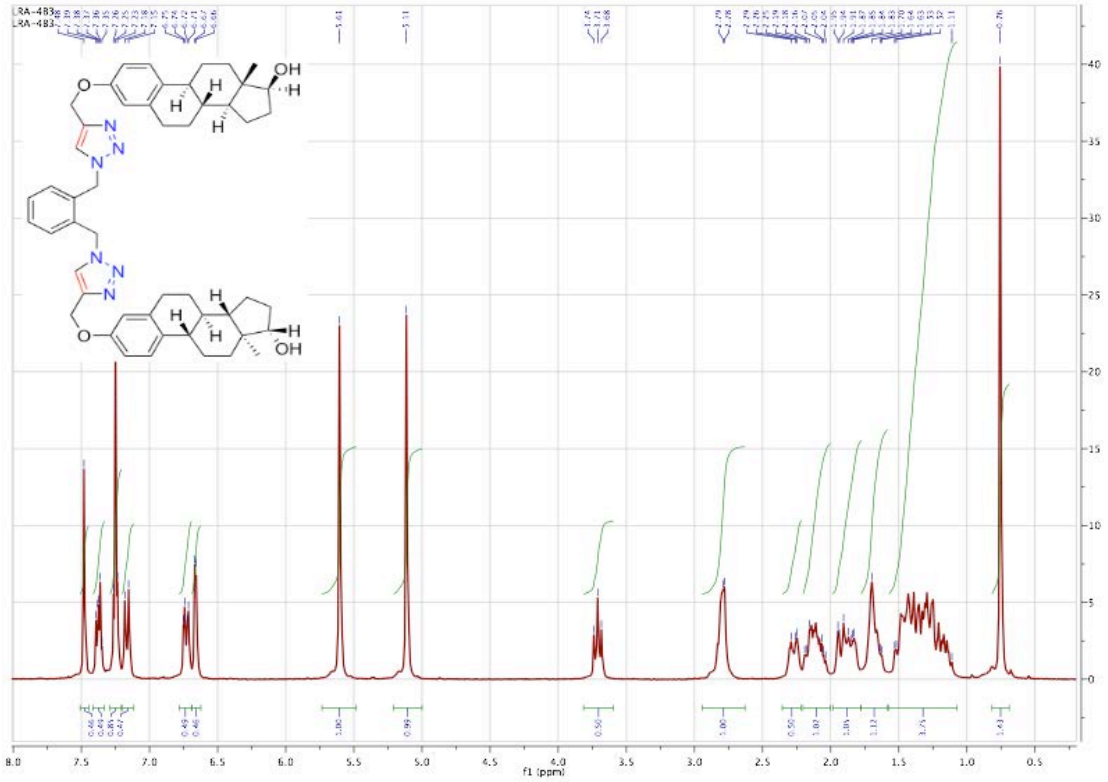
ATR-IR spectrum of **3a**/DMSO-d_6/D_2O (3/1 v/v) gel

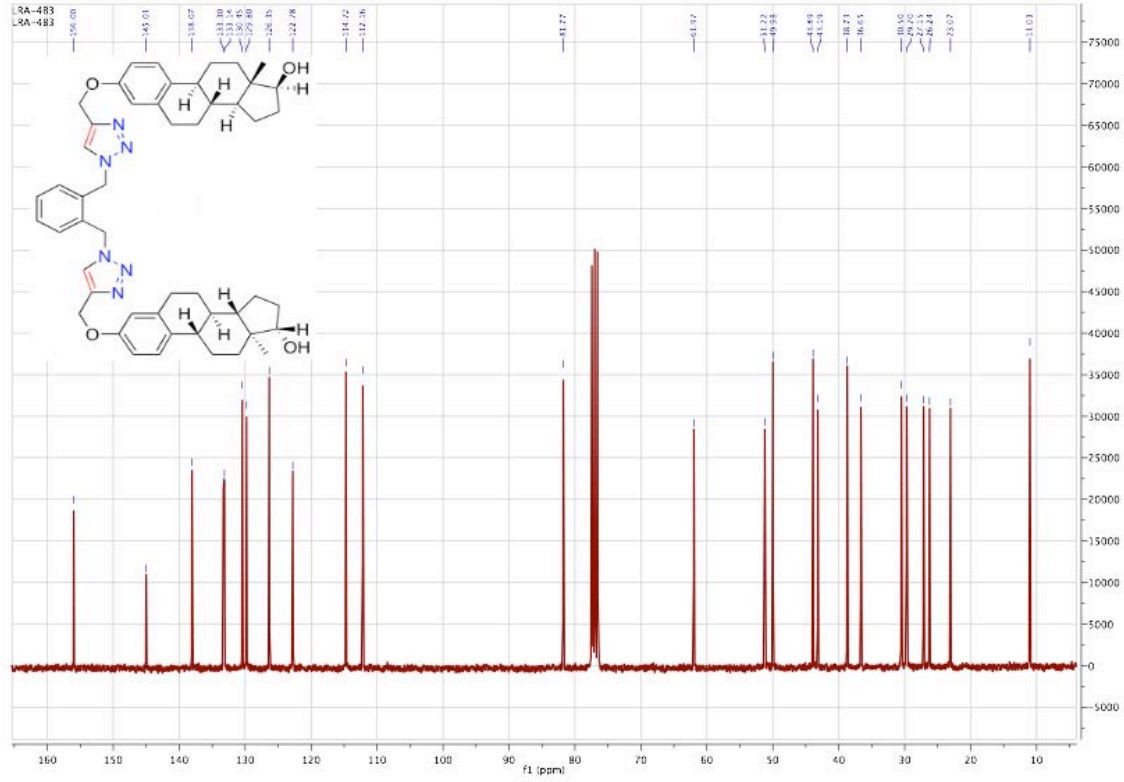


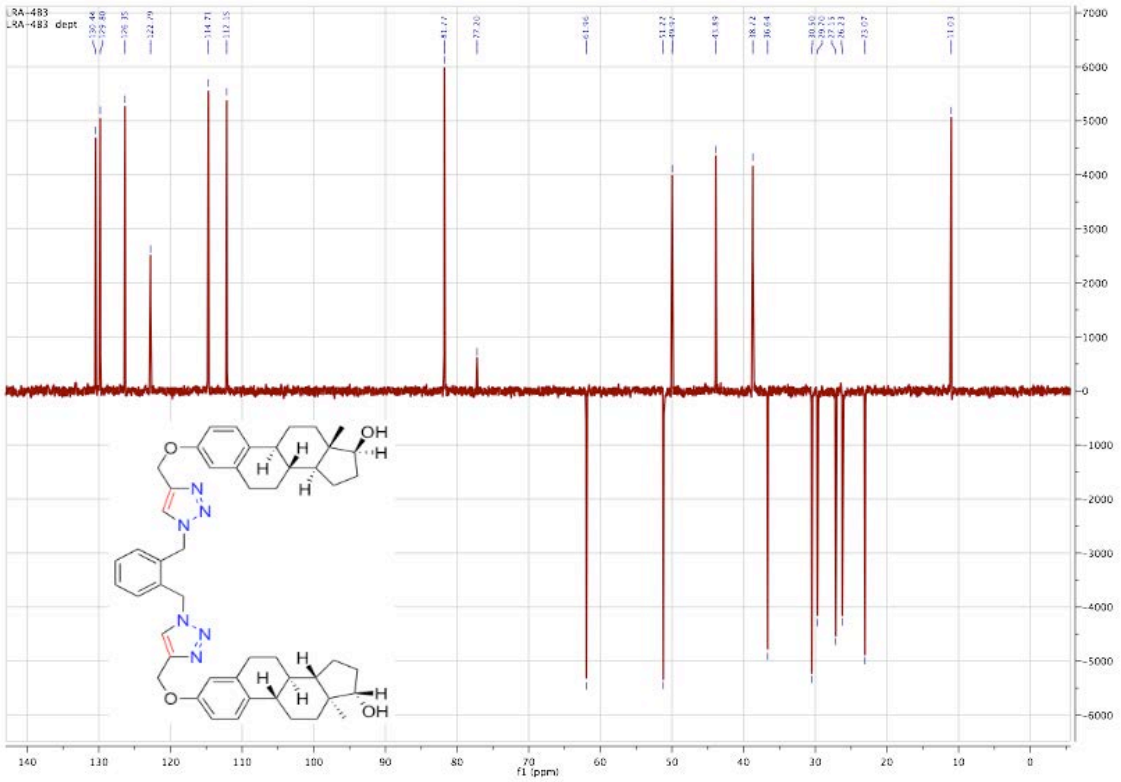
ATR-IR spectrum of DMSO-d_6/D_2O (3/1 v/v)

i) ^{1}H RMN, DEPT and ^{13}C NMR spectra for **3a-c**, **3e-f**, **4a**, **5-8**, **10**, **11** and **14**.

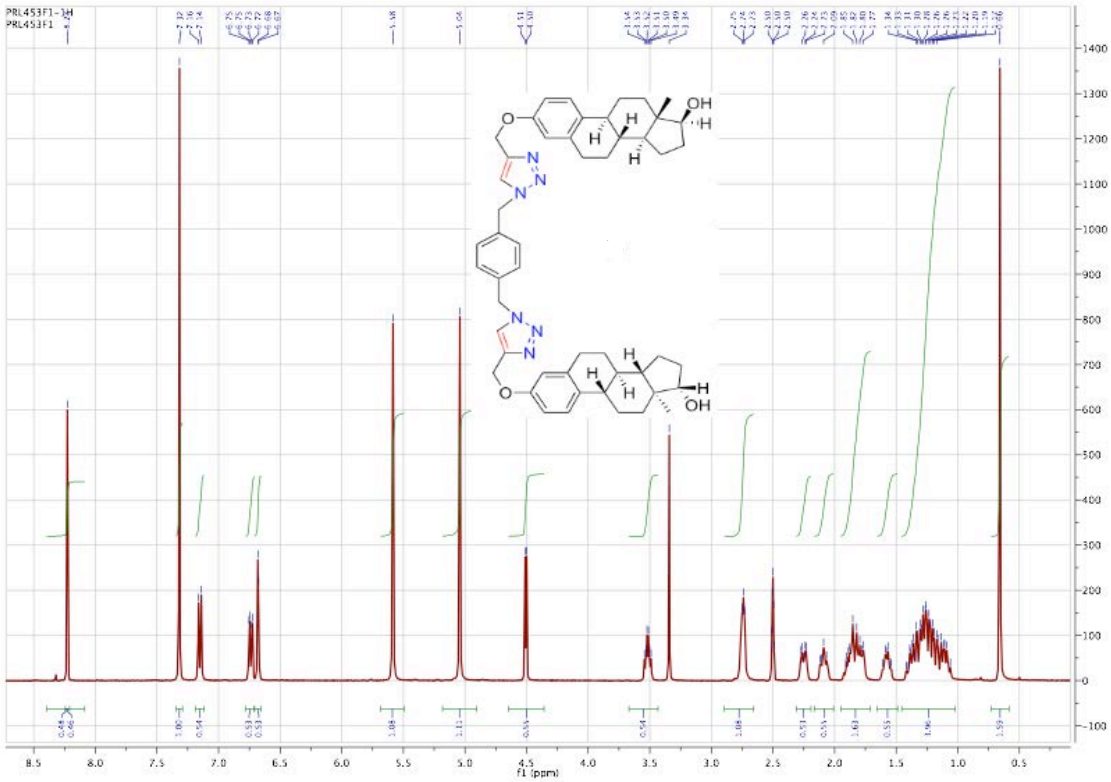
Compound 3a

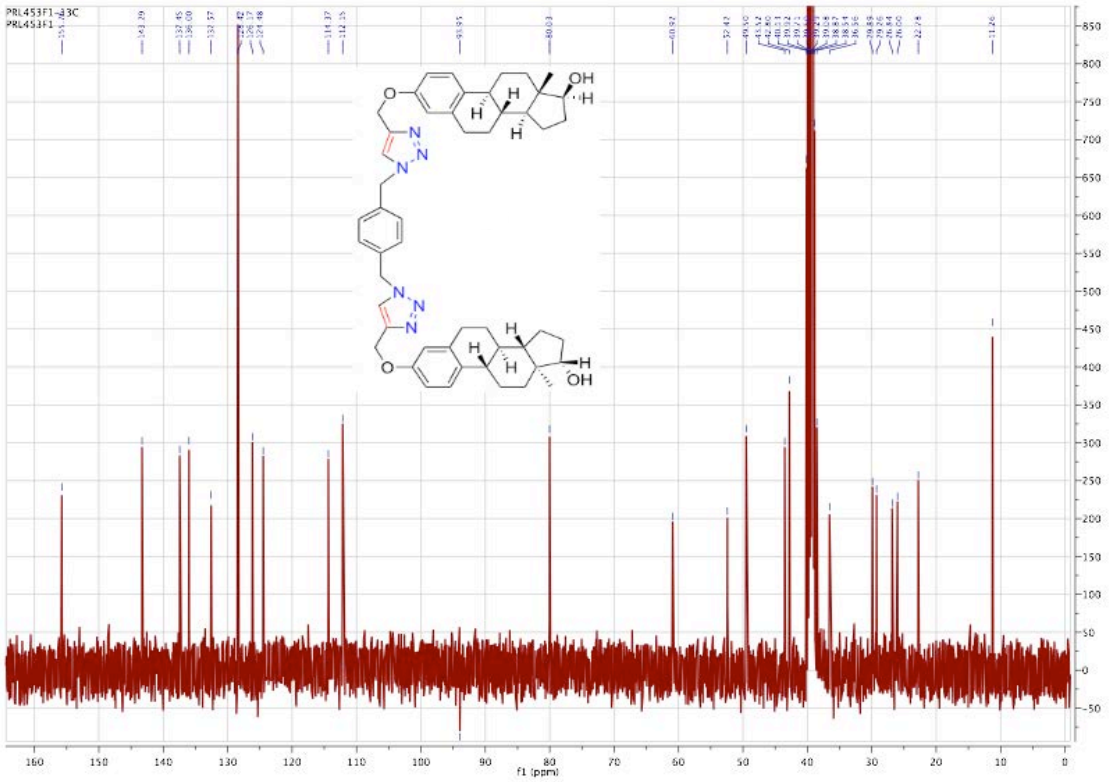


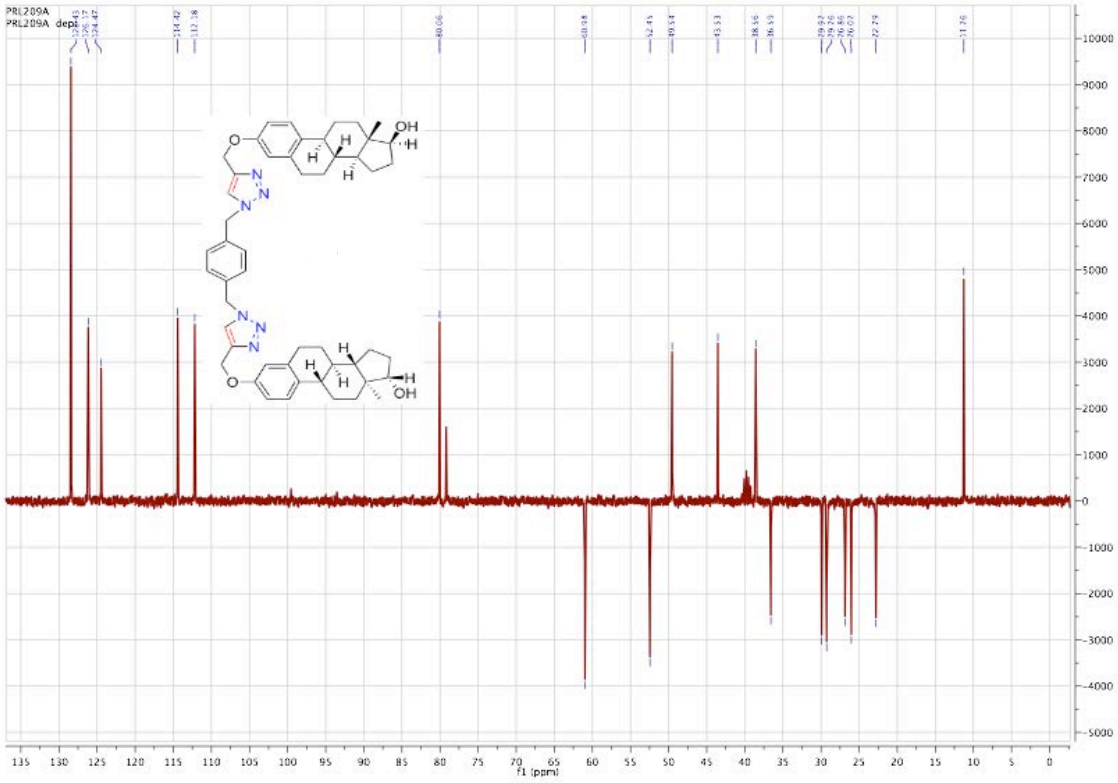




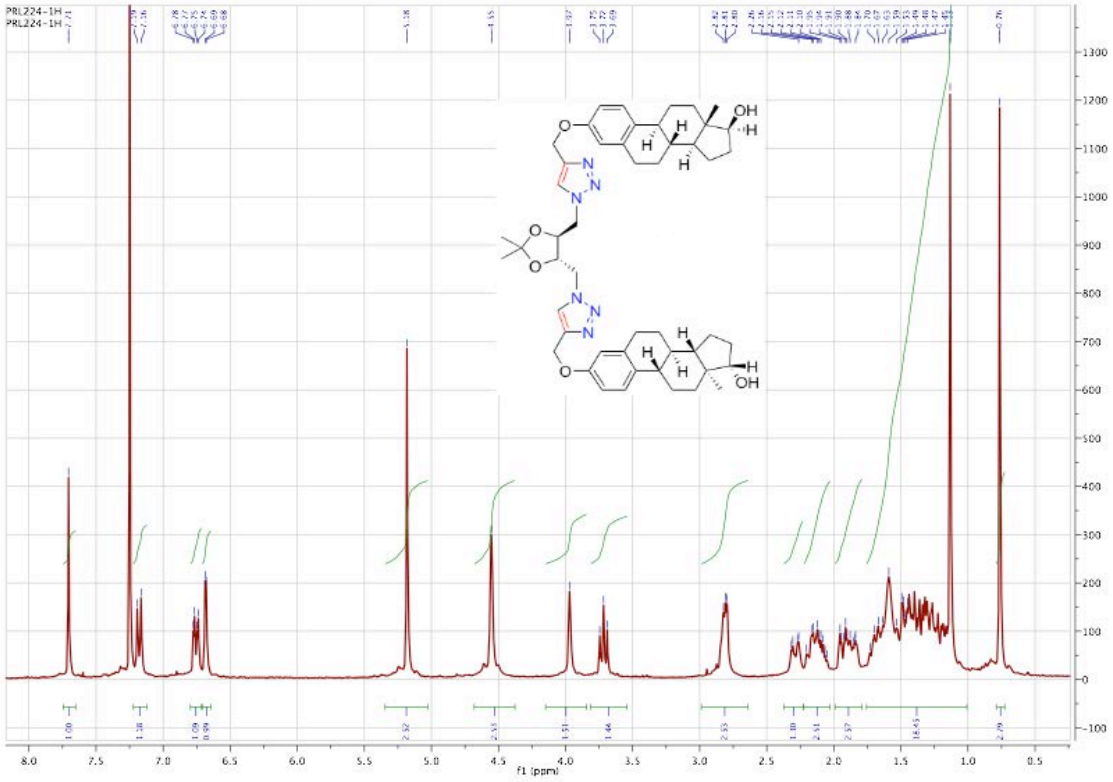
Compound 3b

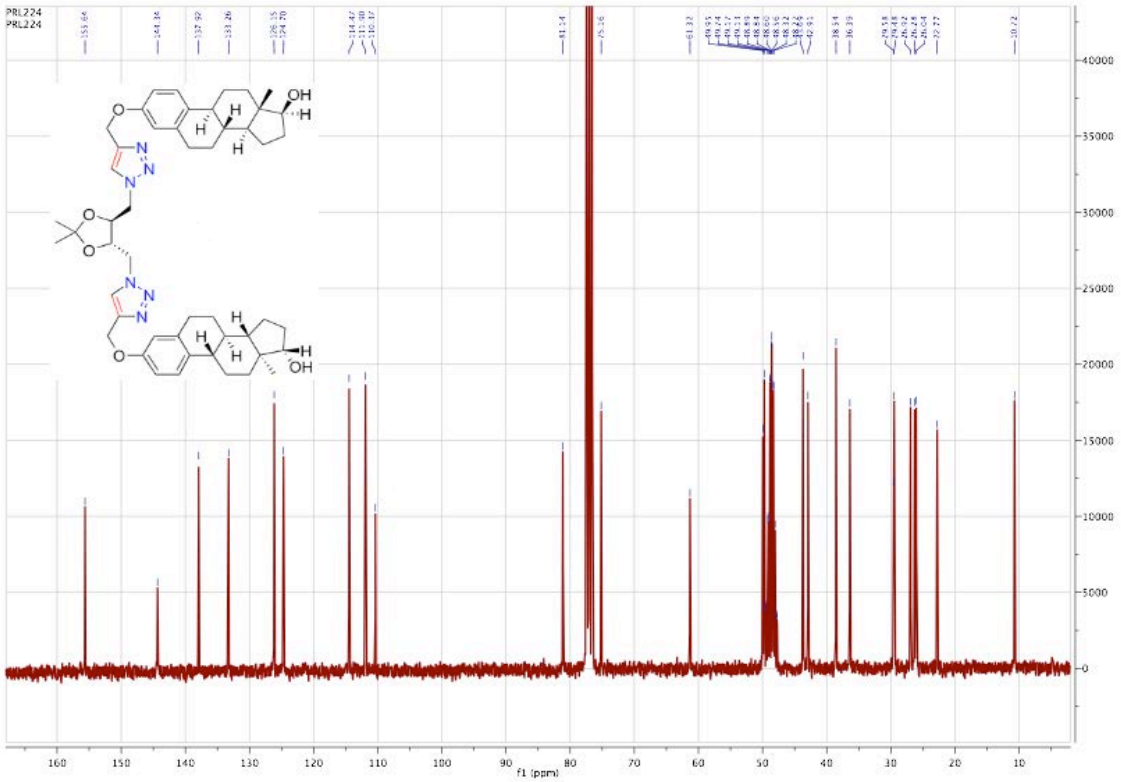


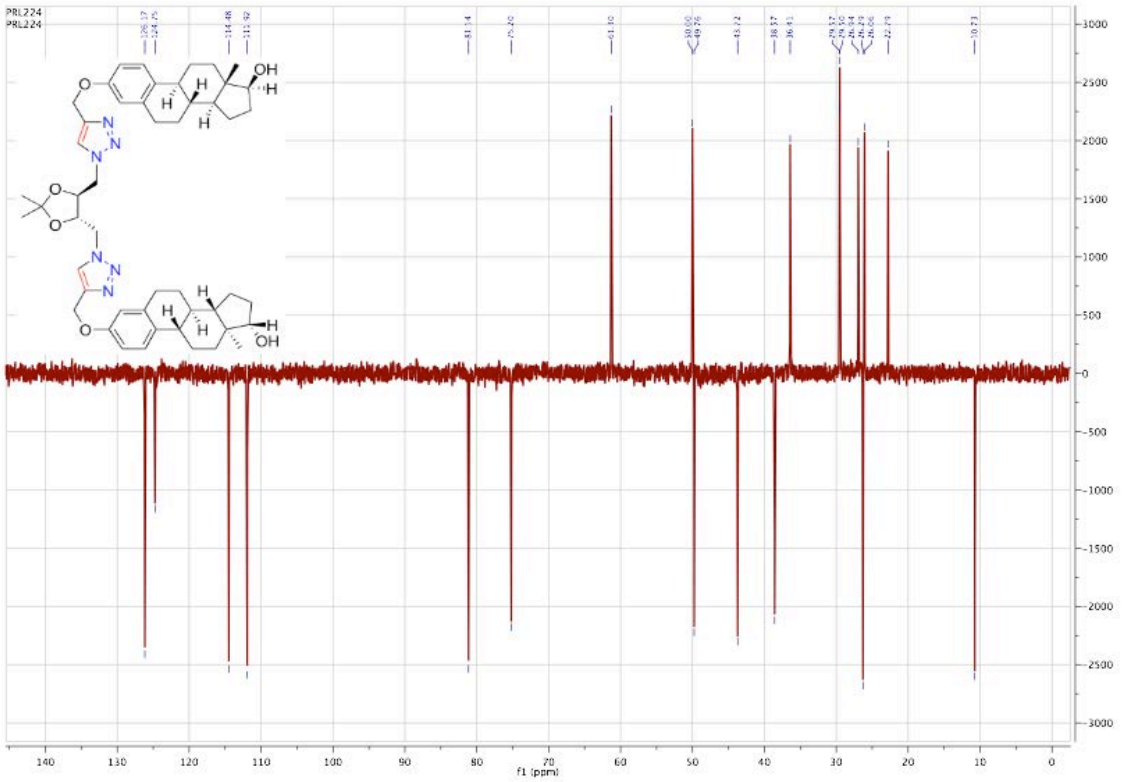




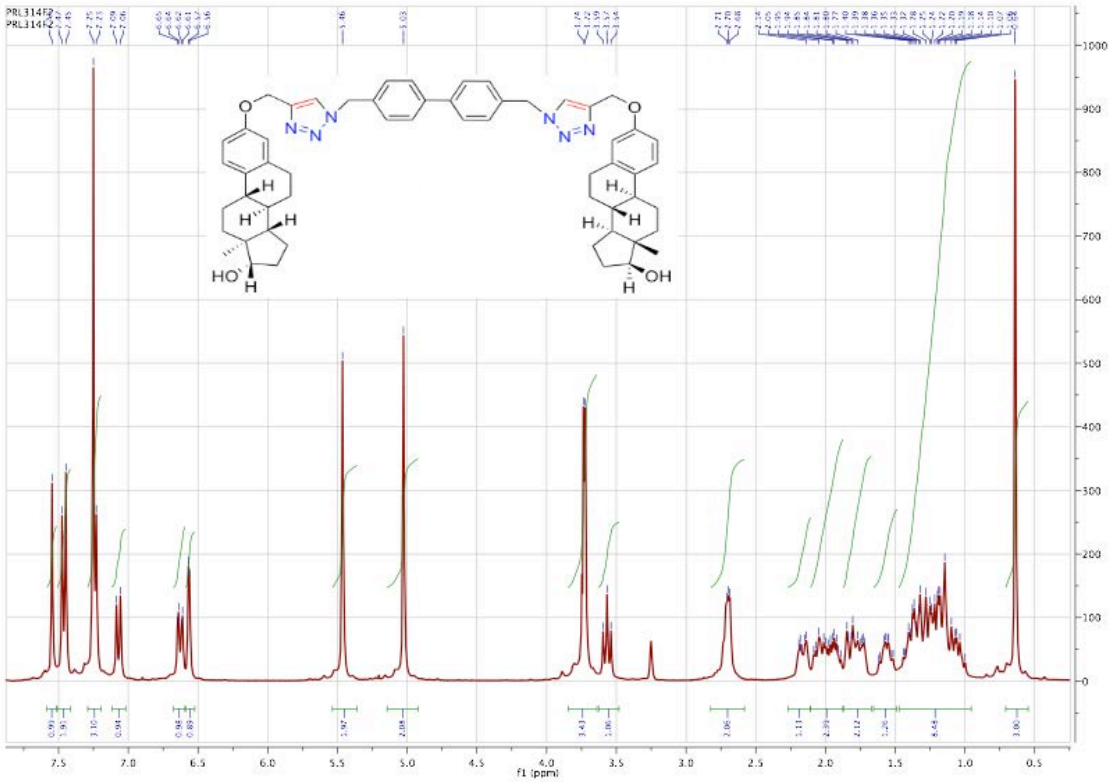
Compound 3c

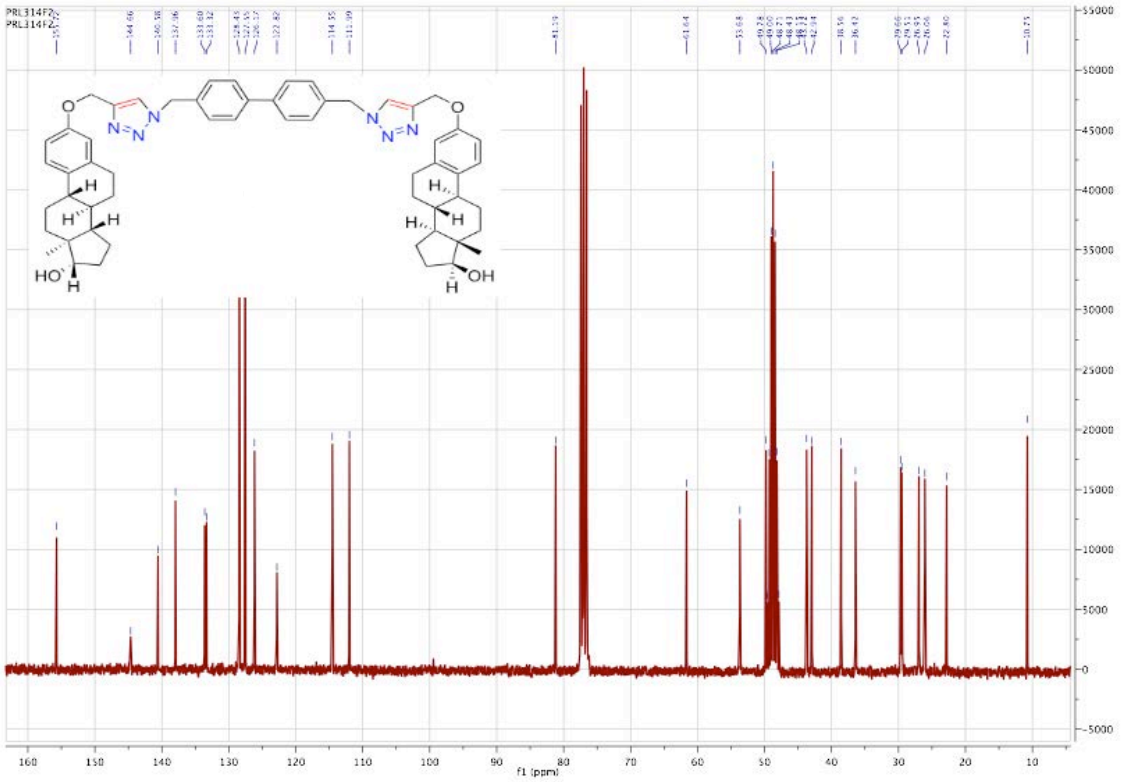


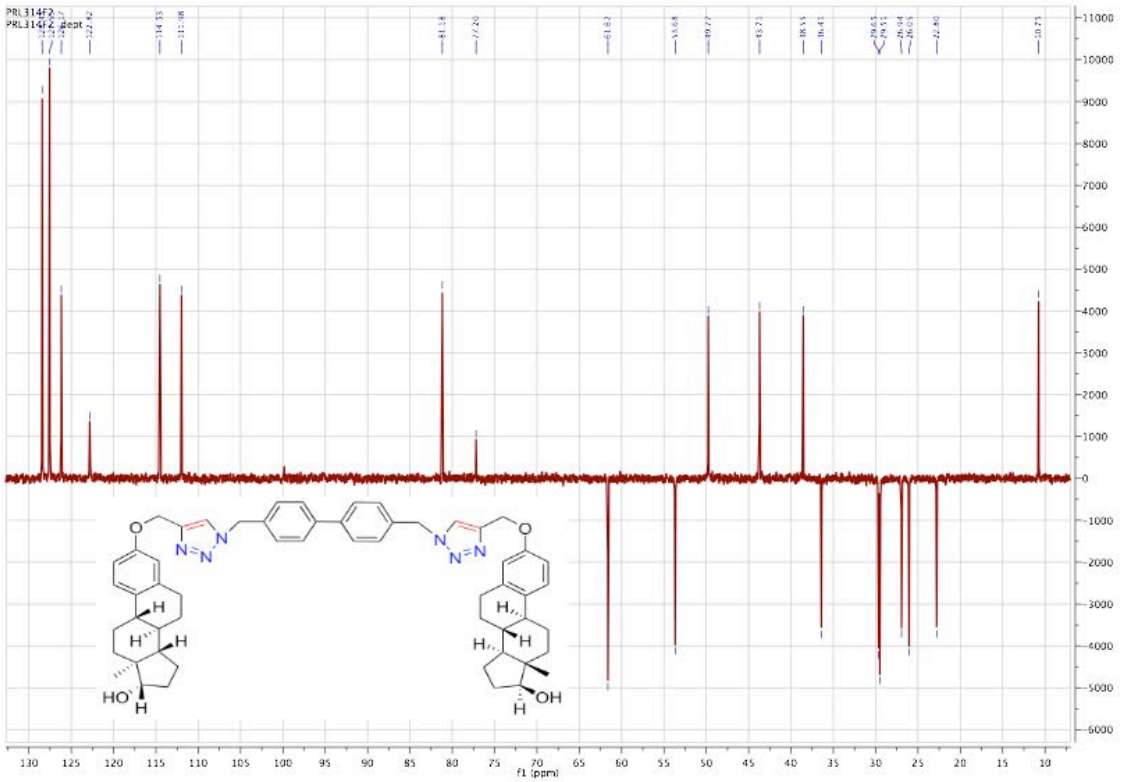




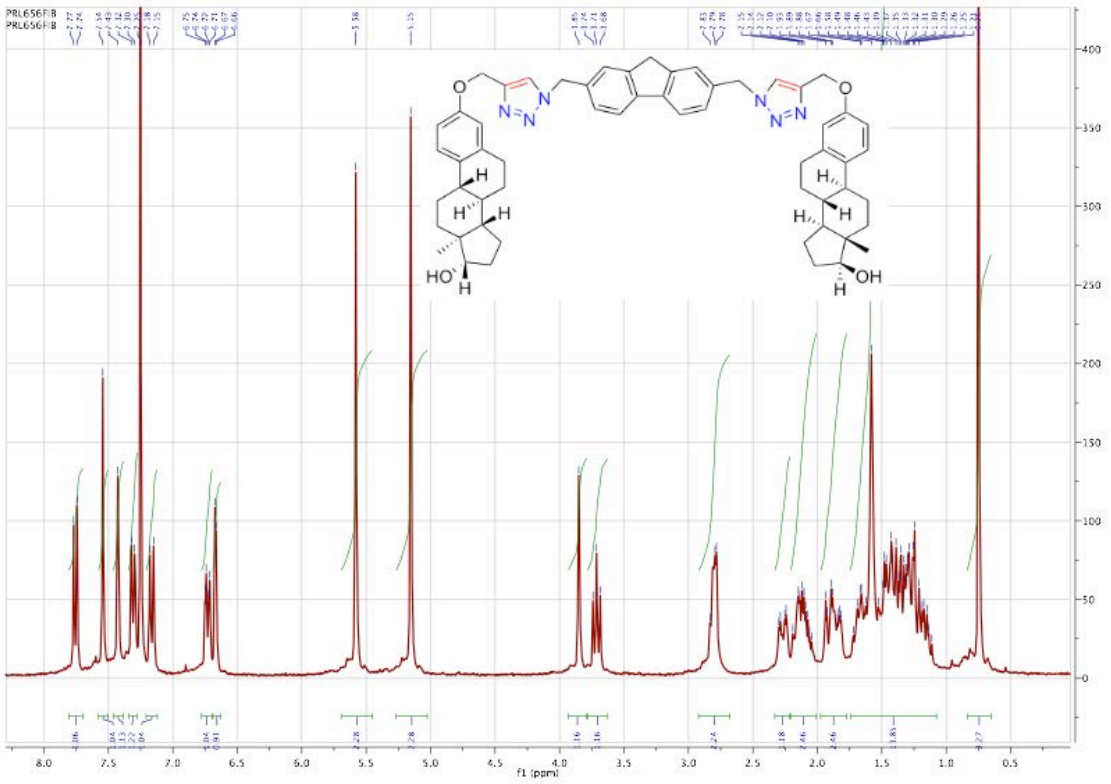
Compound 3e

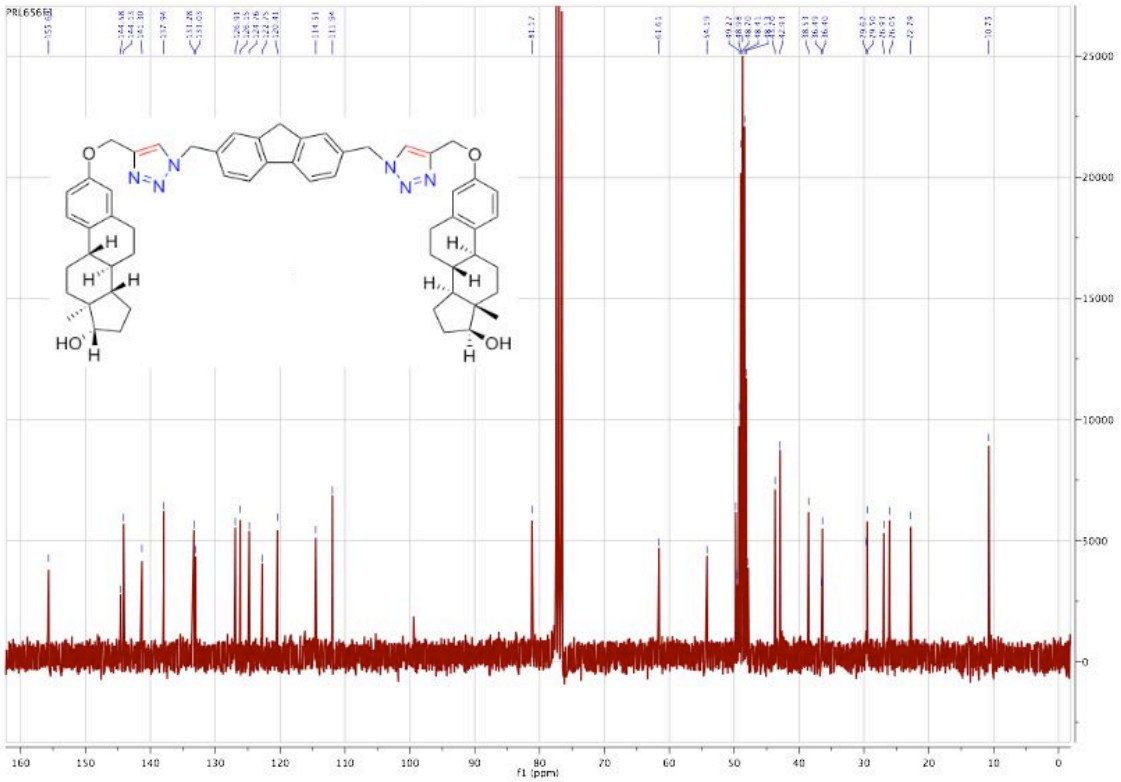


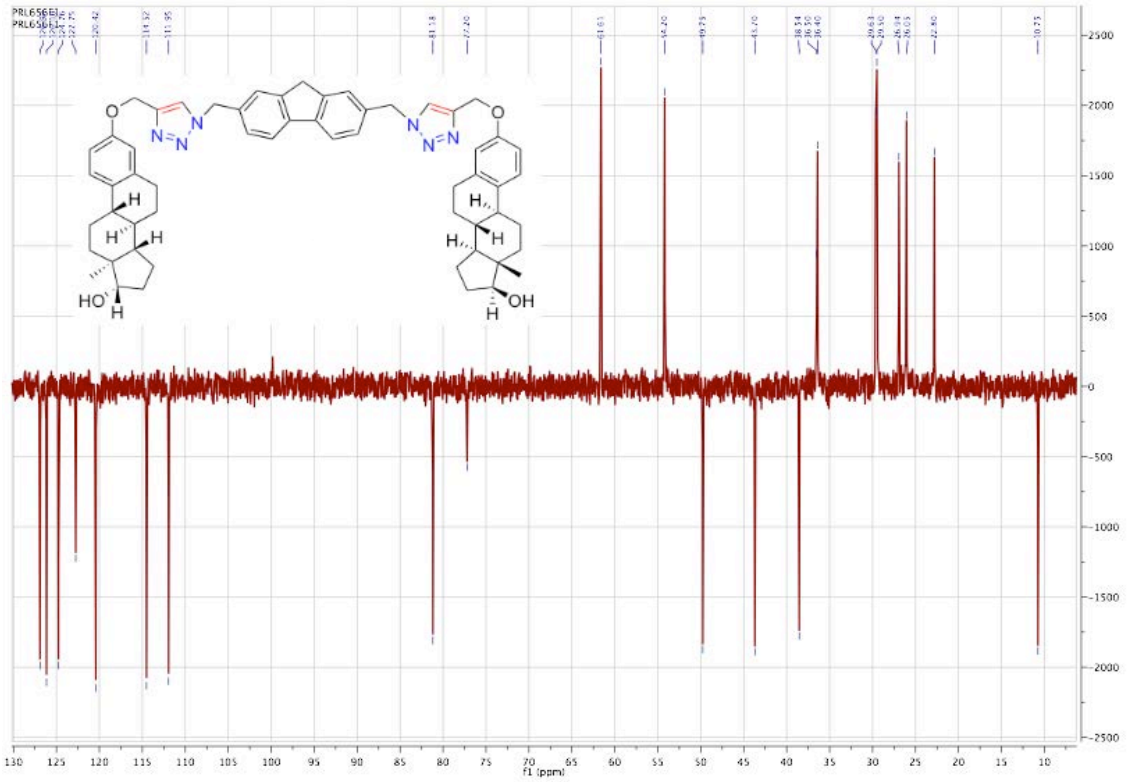




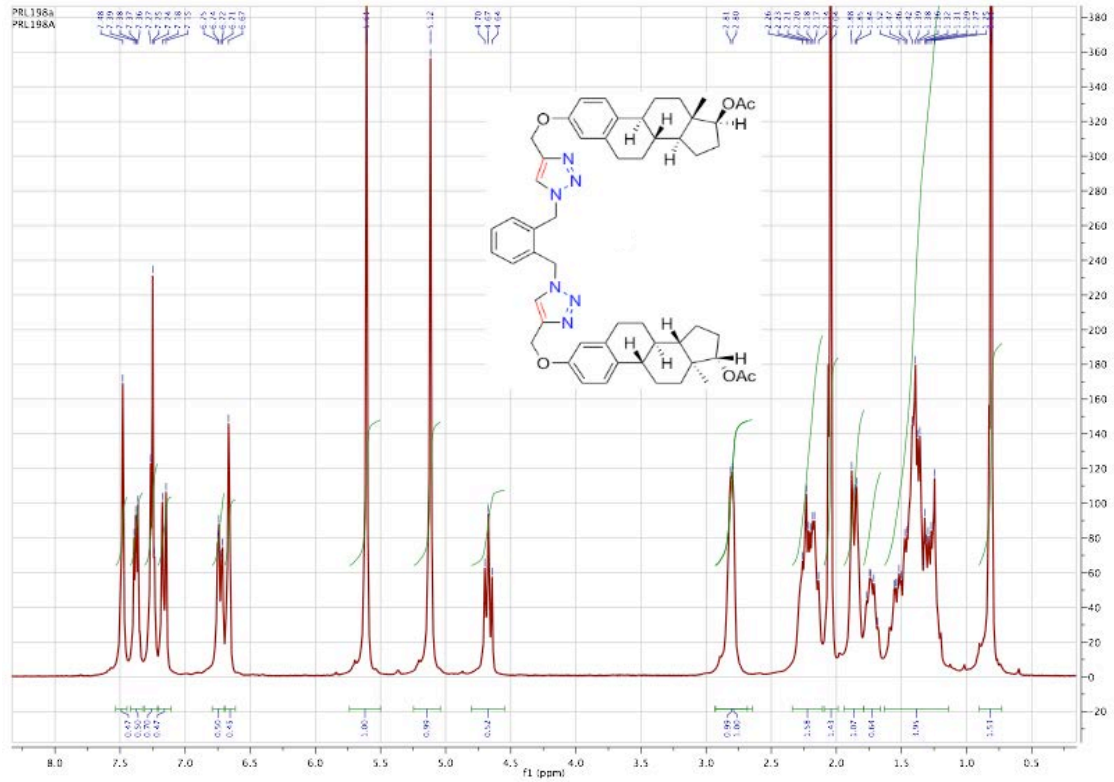
Compound 3f

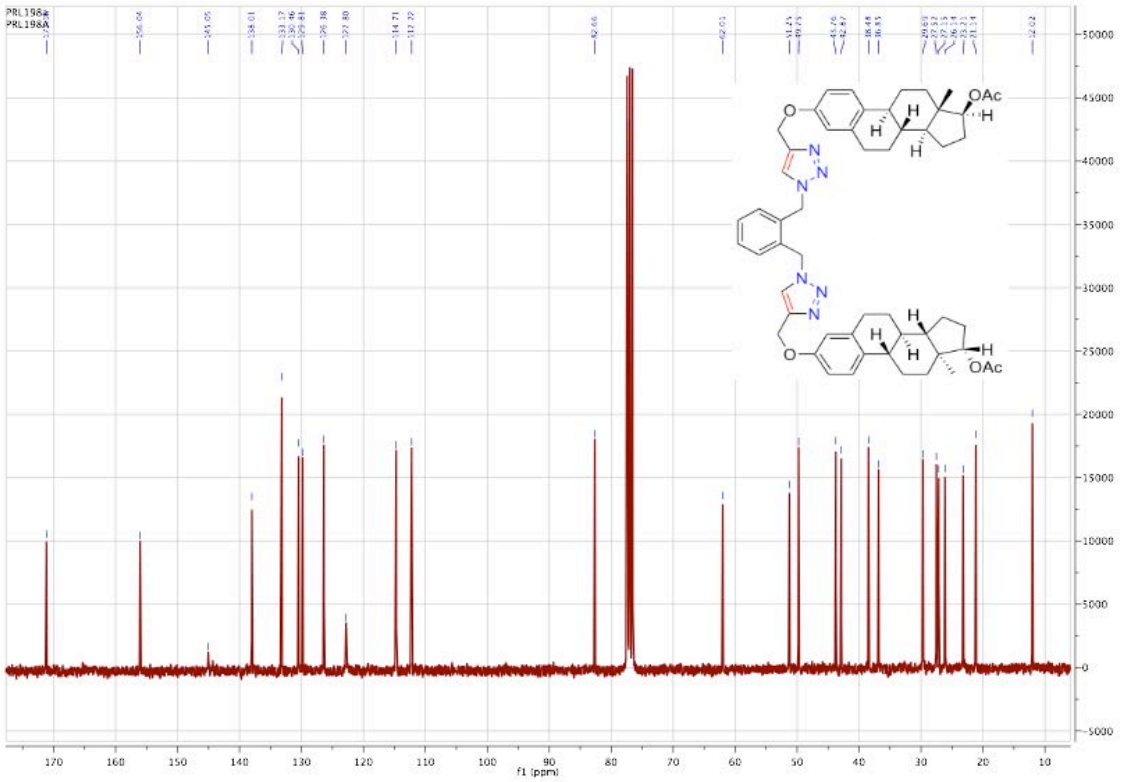


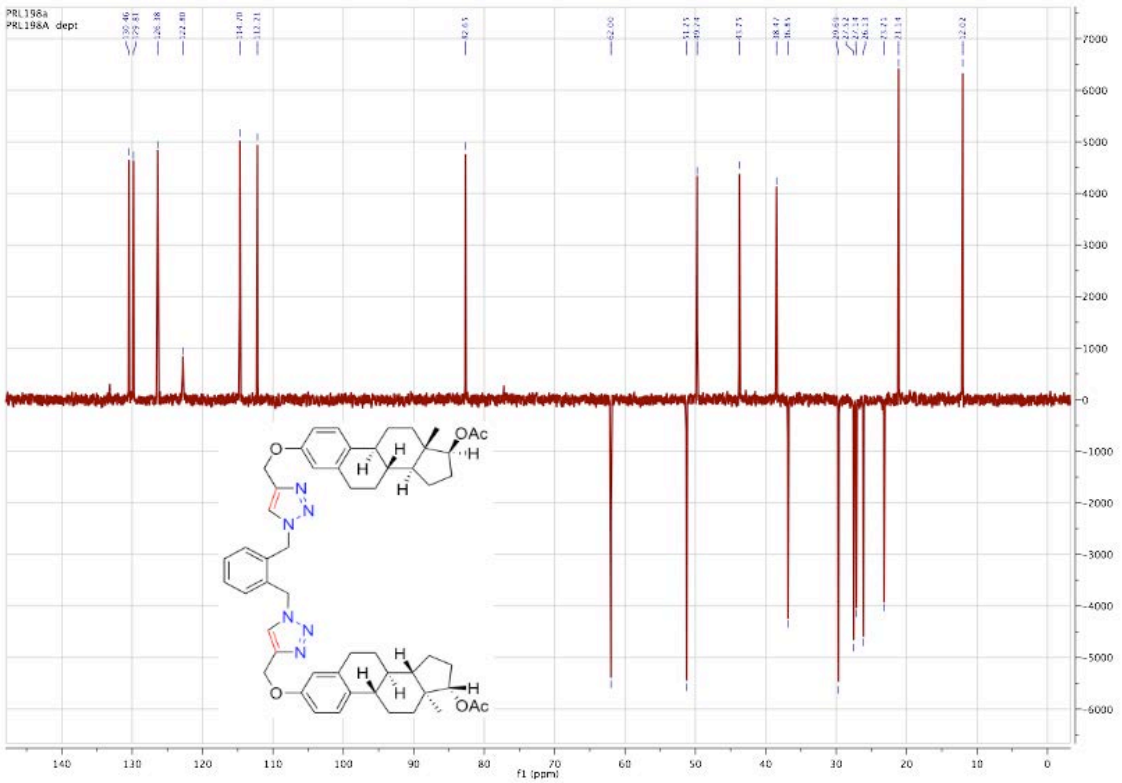




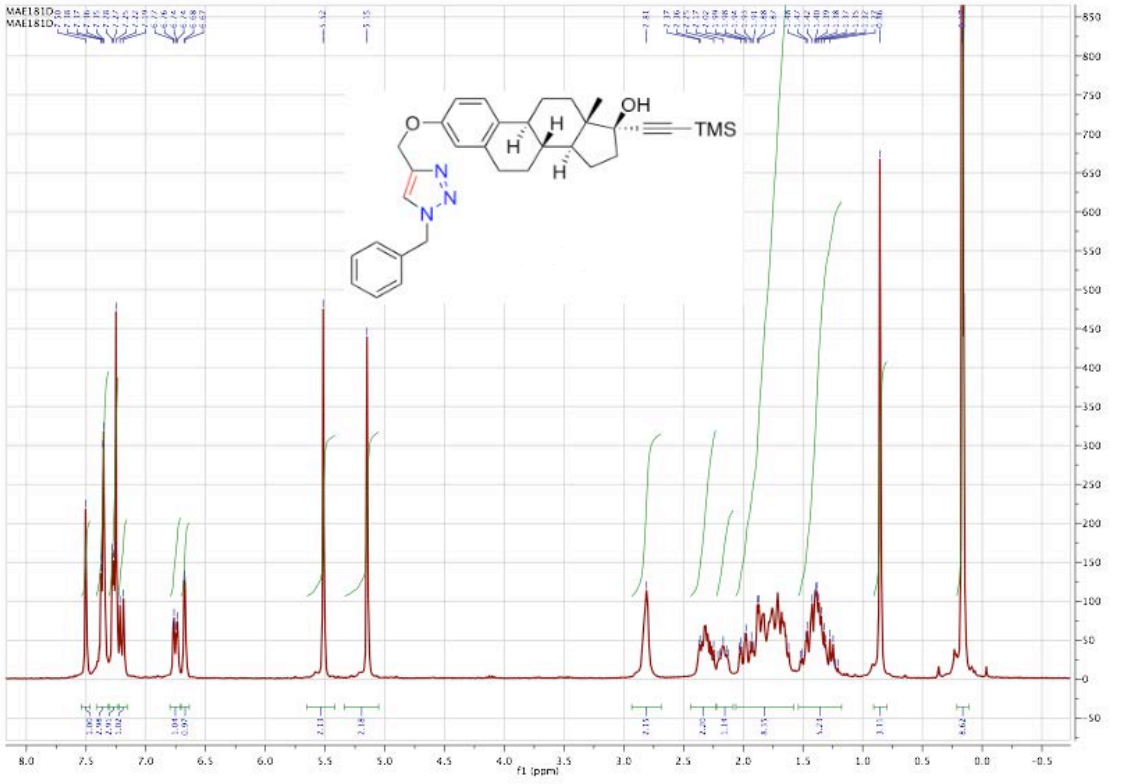
Compound 4a

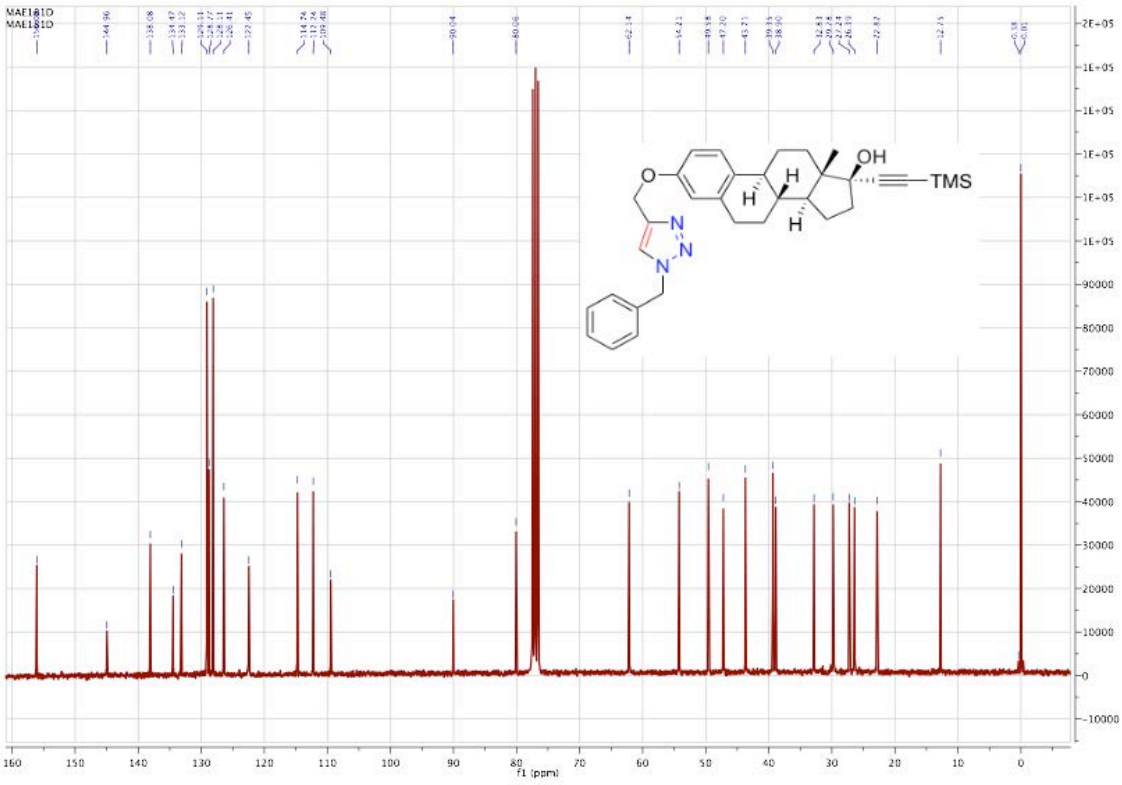


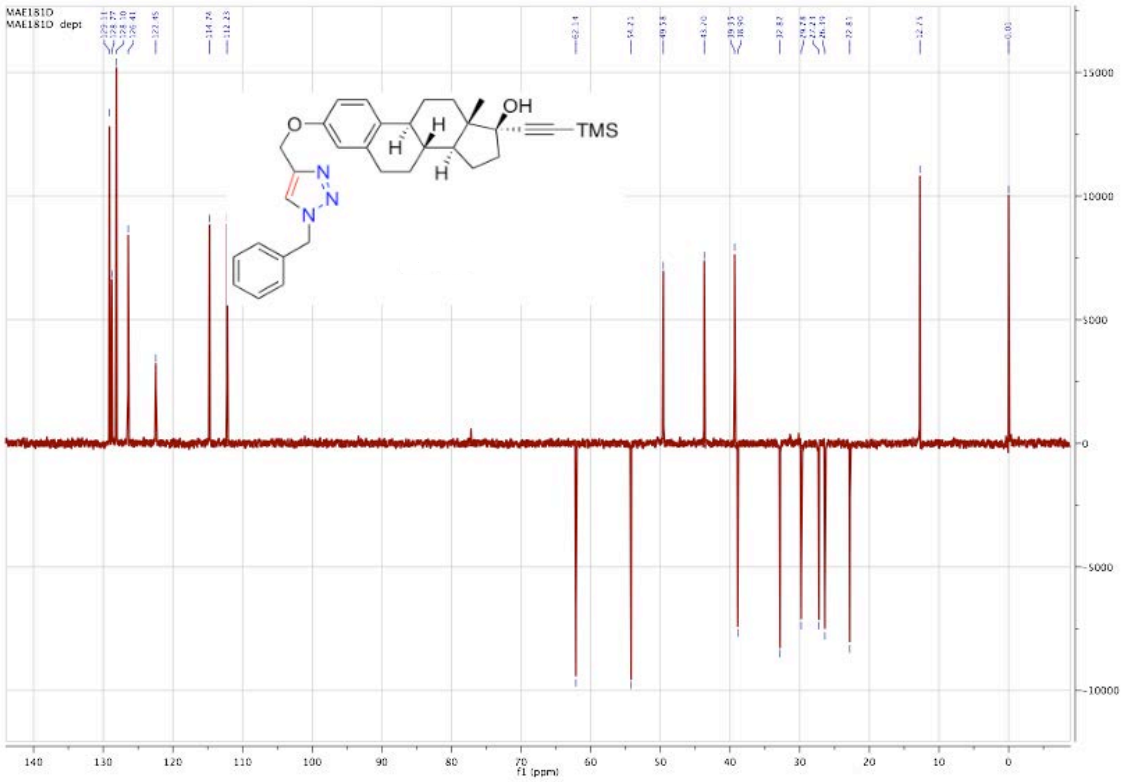




Compound TMS-5



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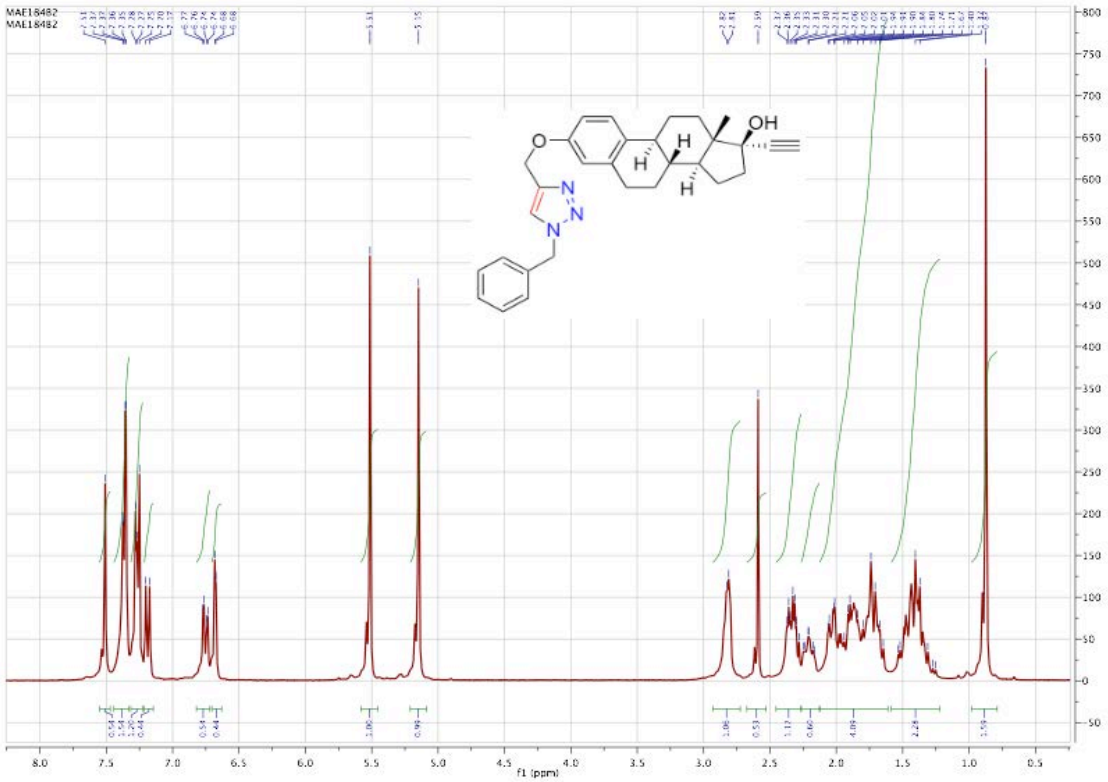
MAE181D dept
OH
TMS
f1 (ppm)

Compound 5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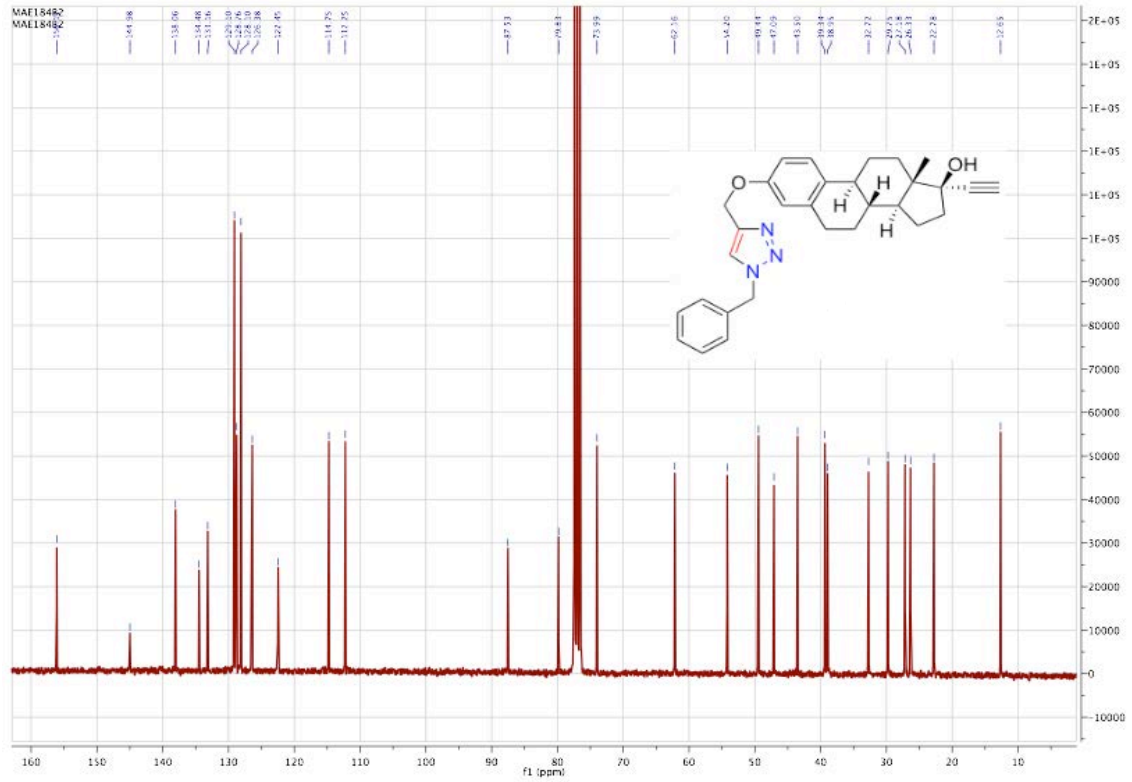

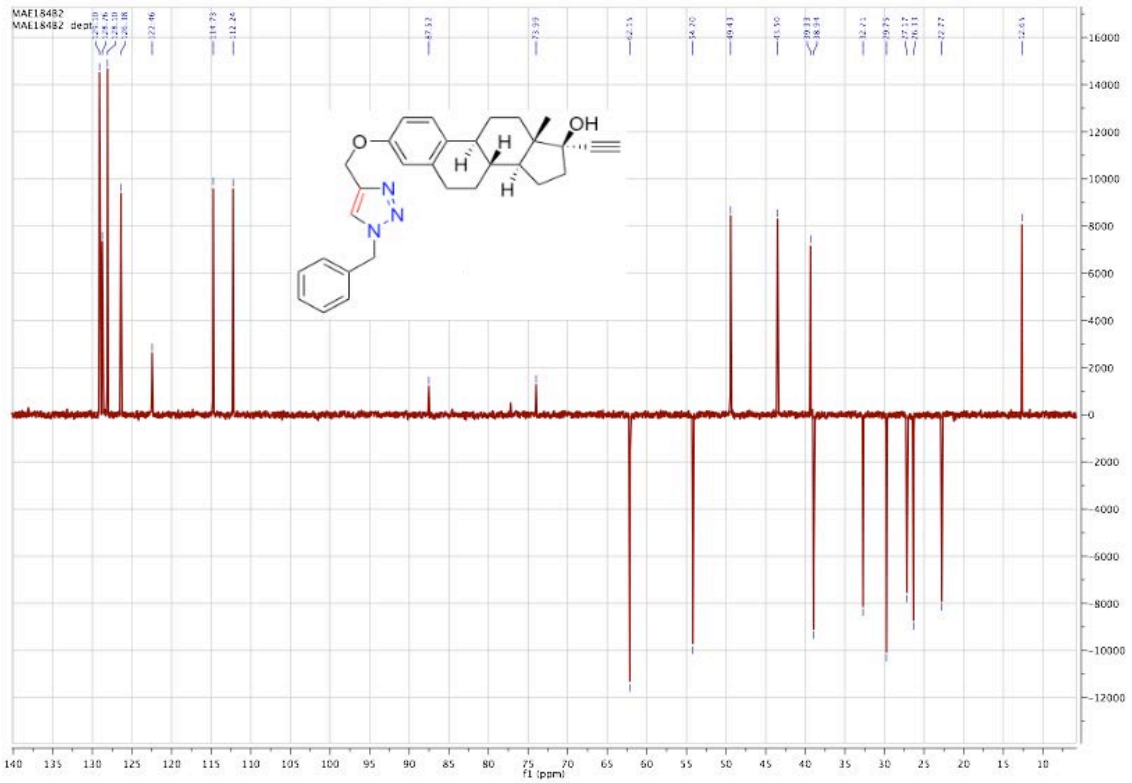

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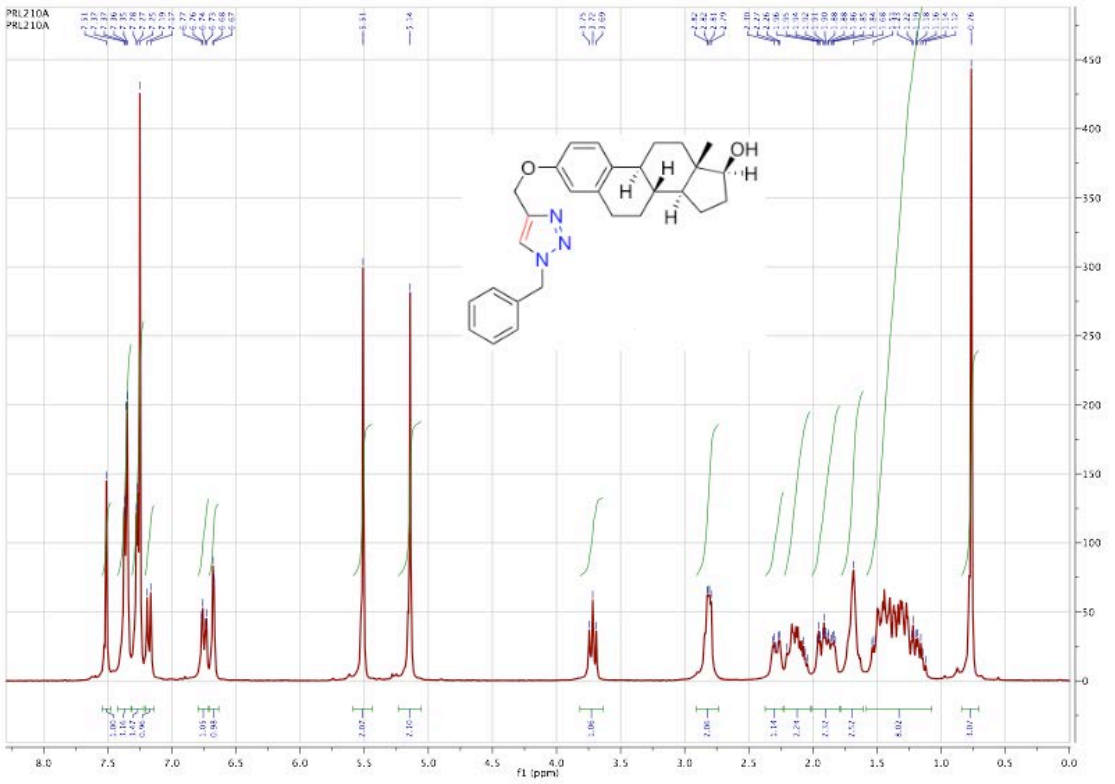

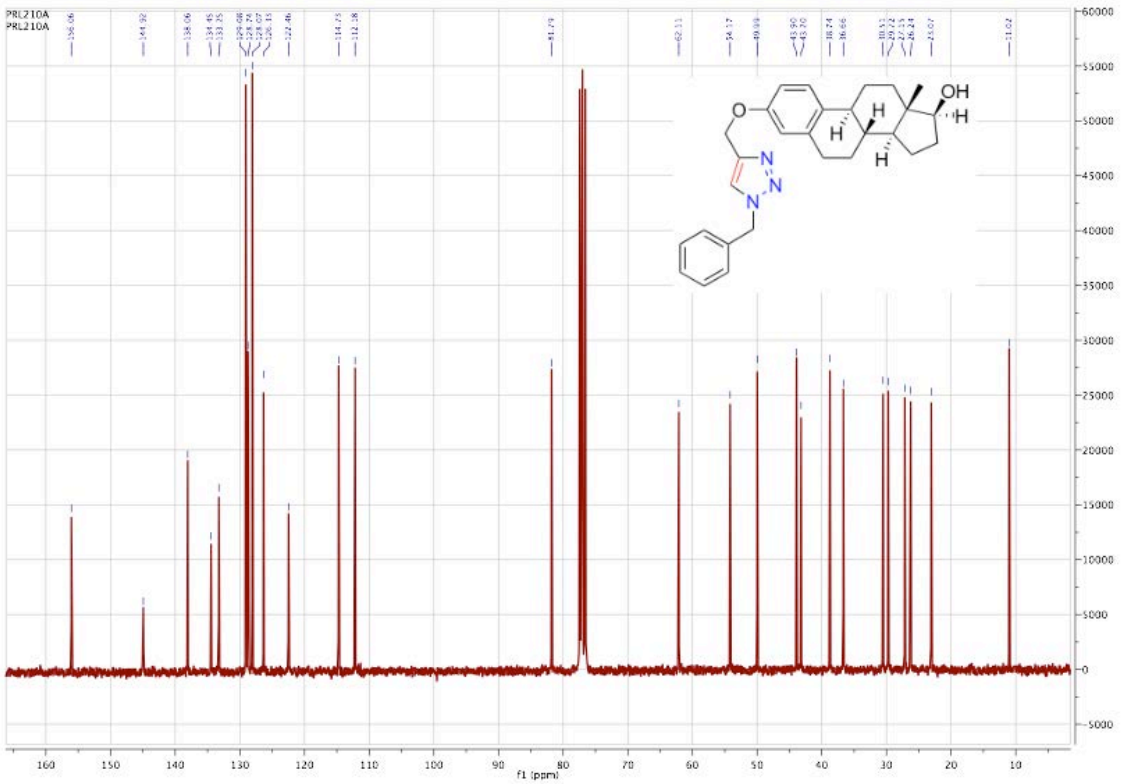

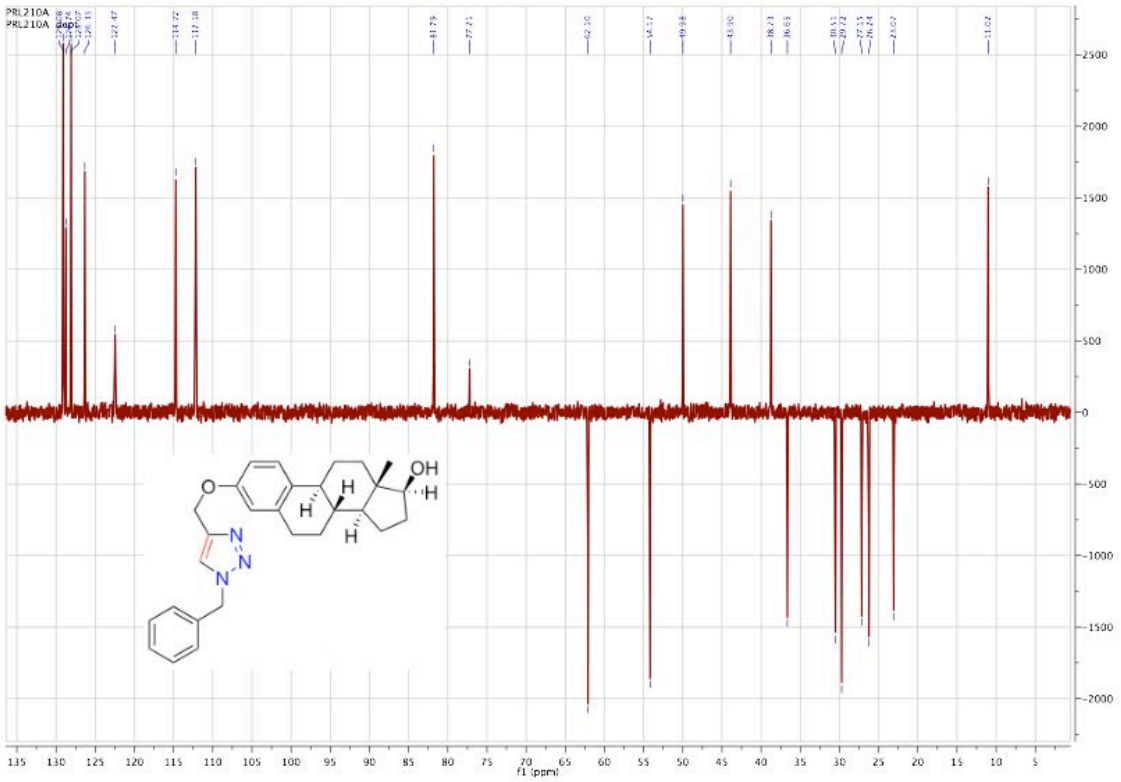

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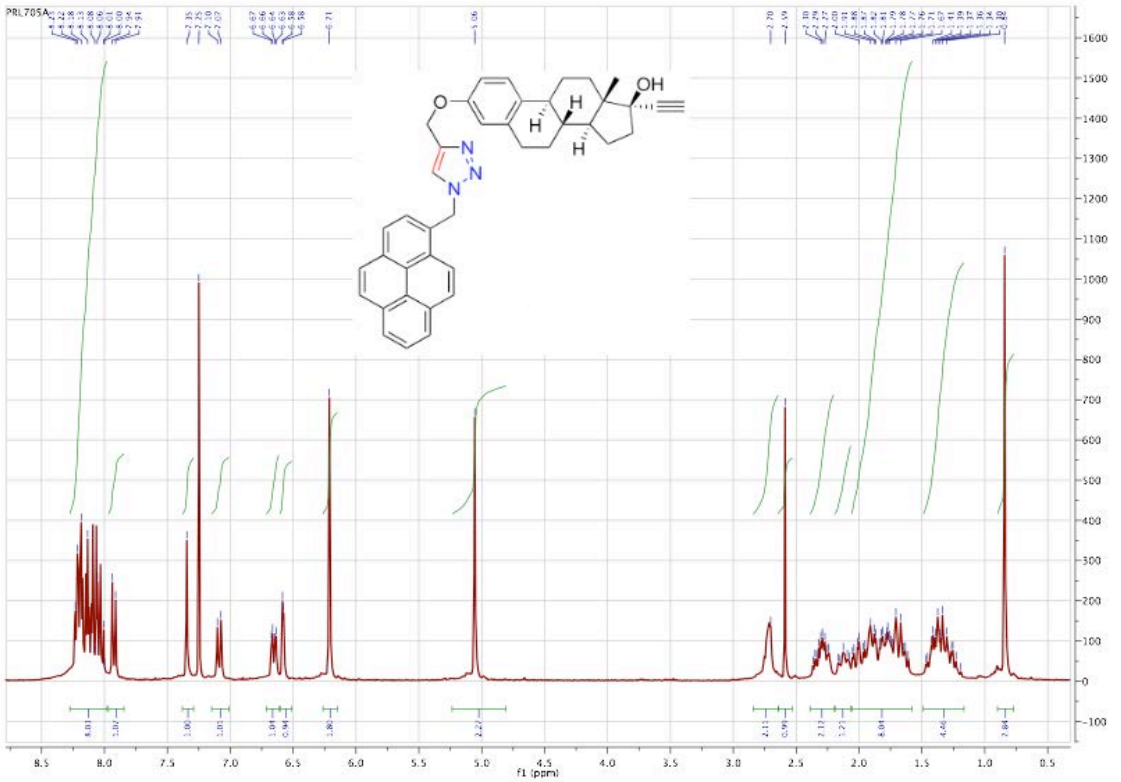
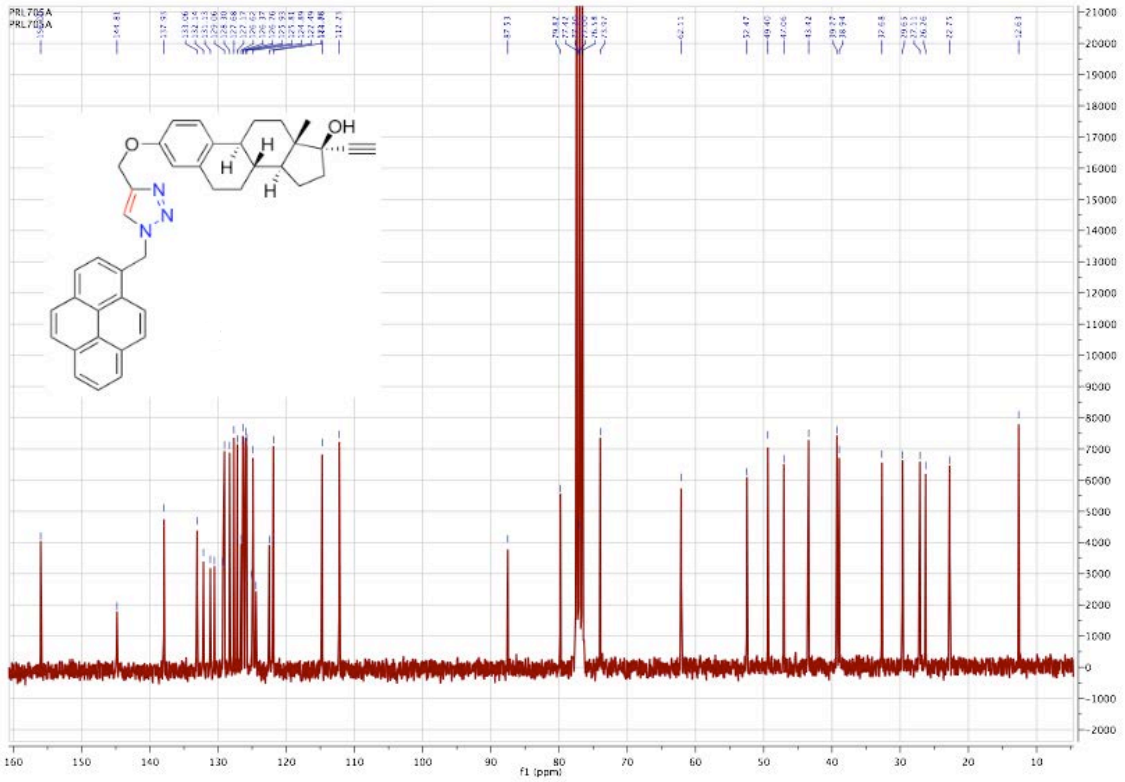
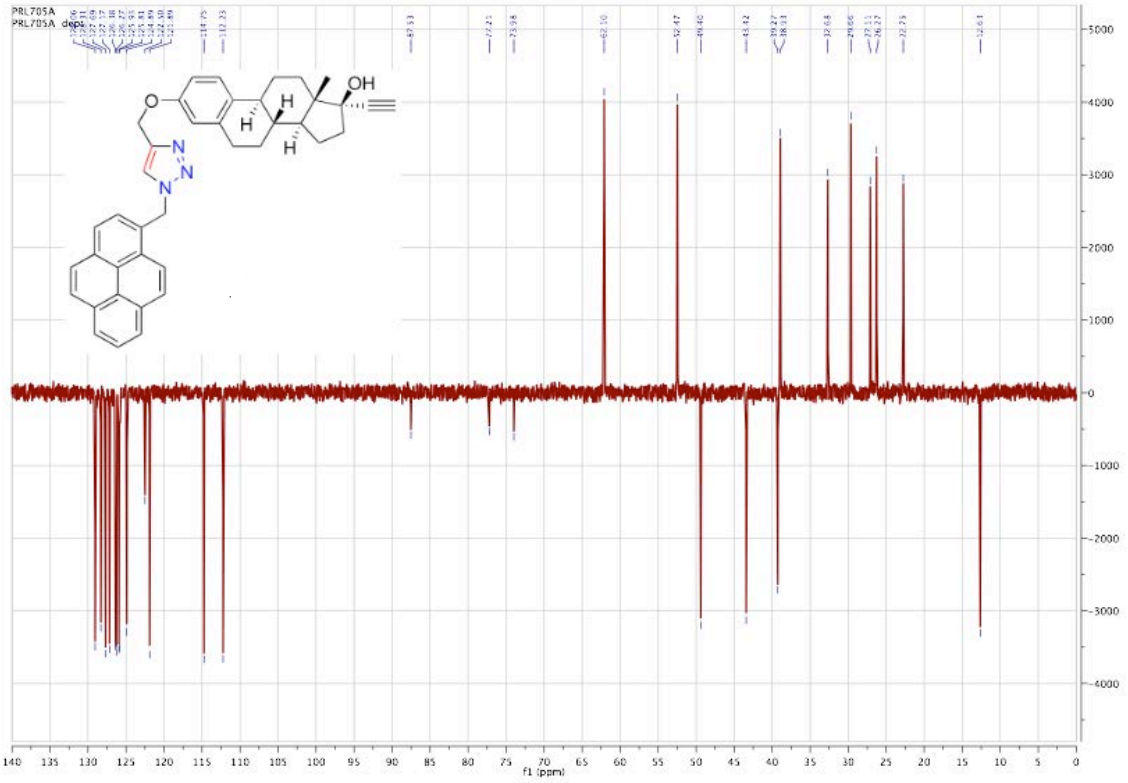
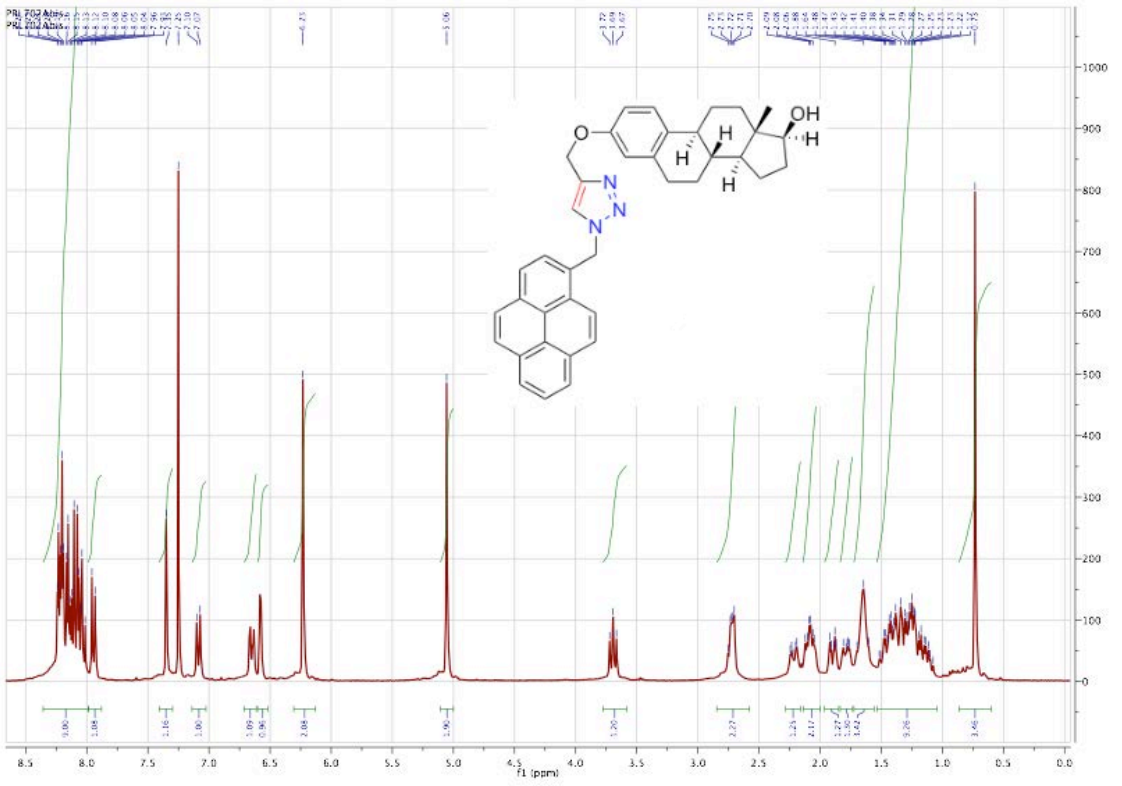
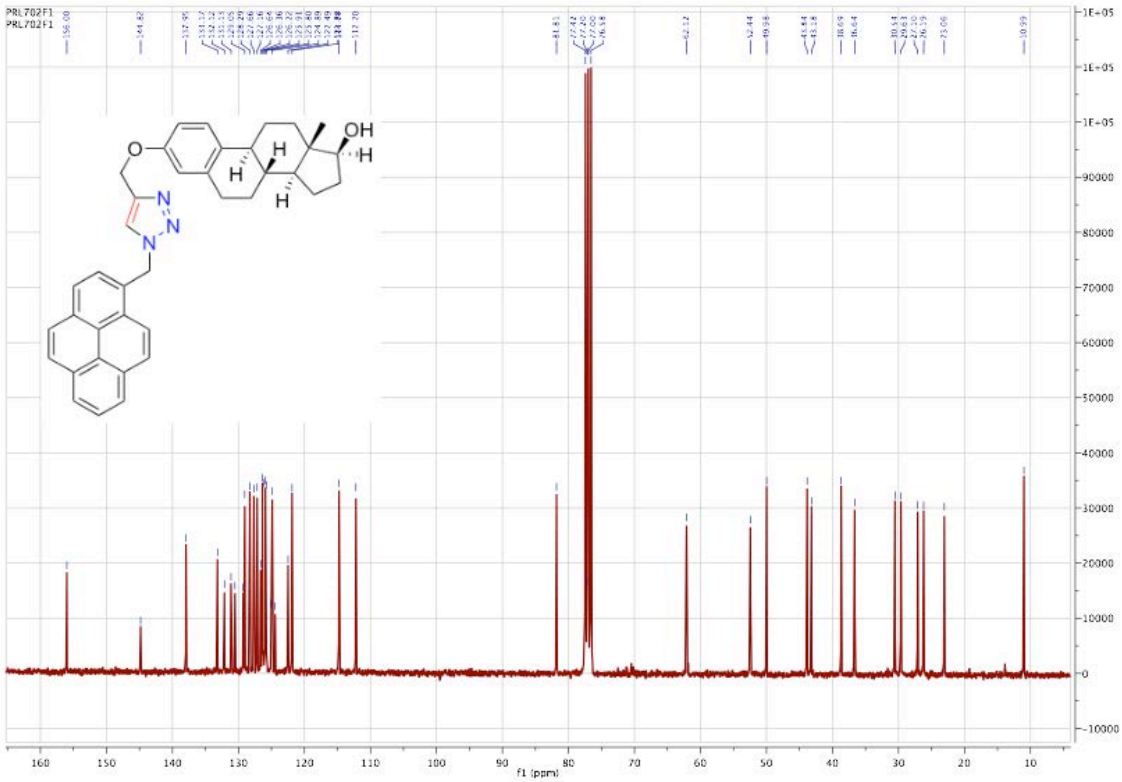


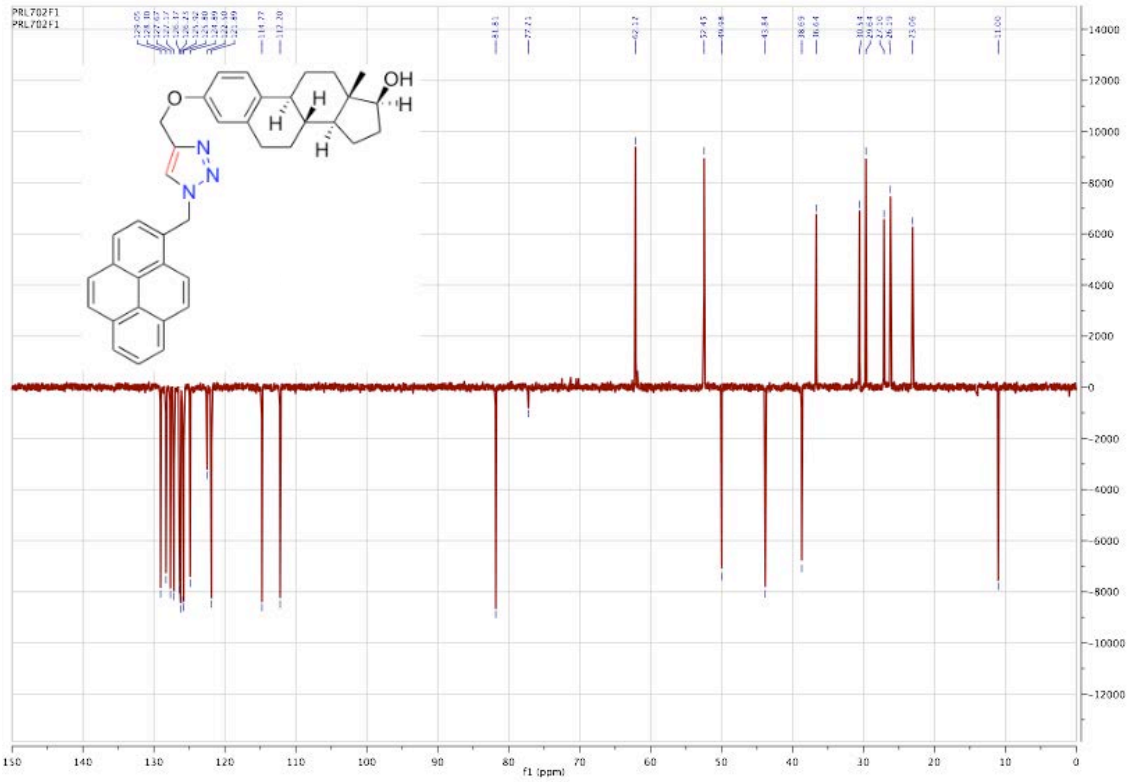




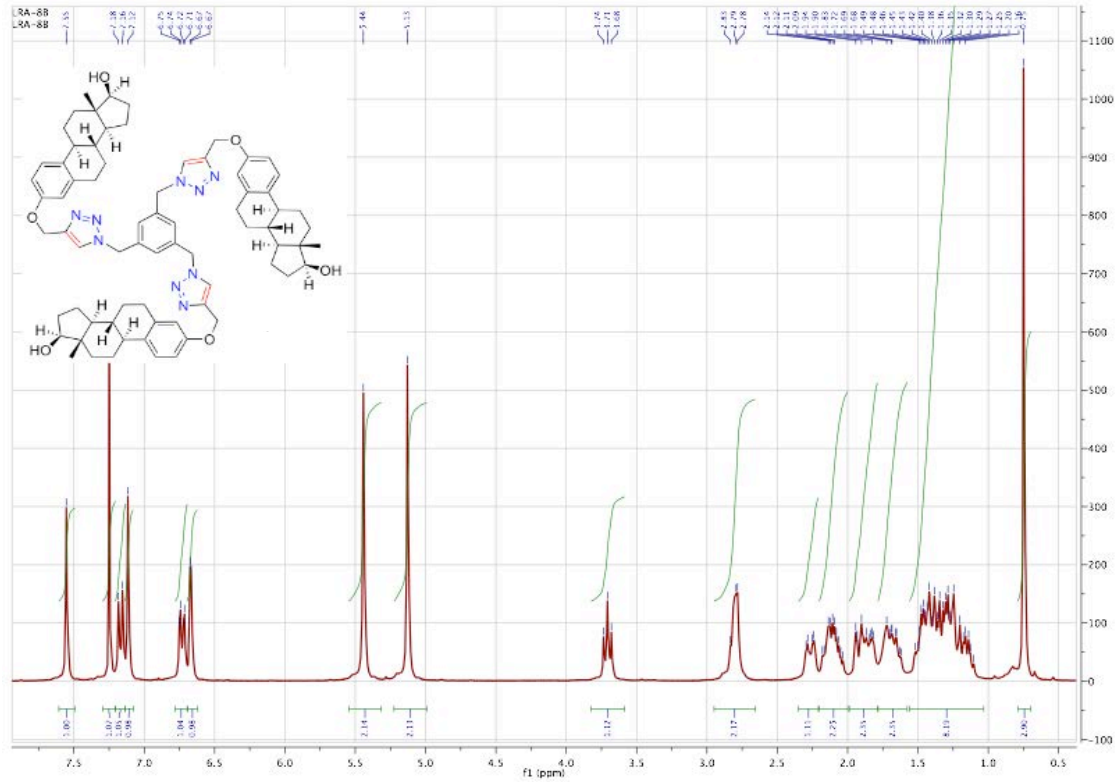
Compound 8

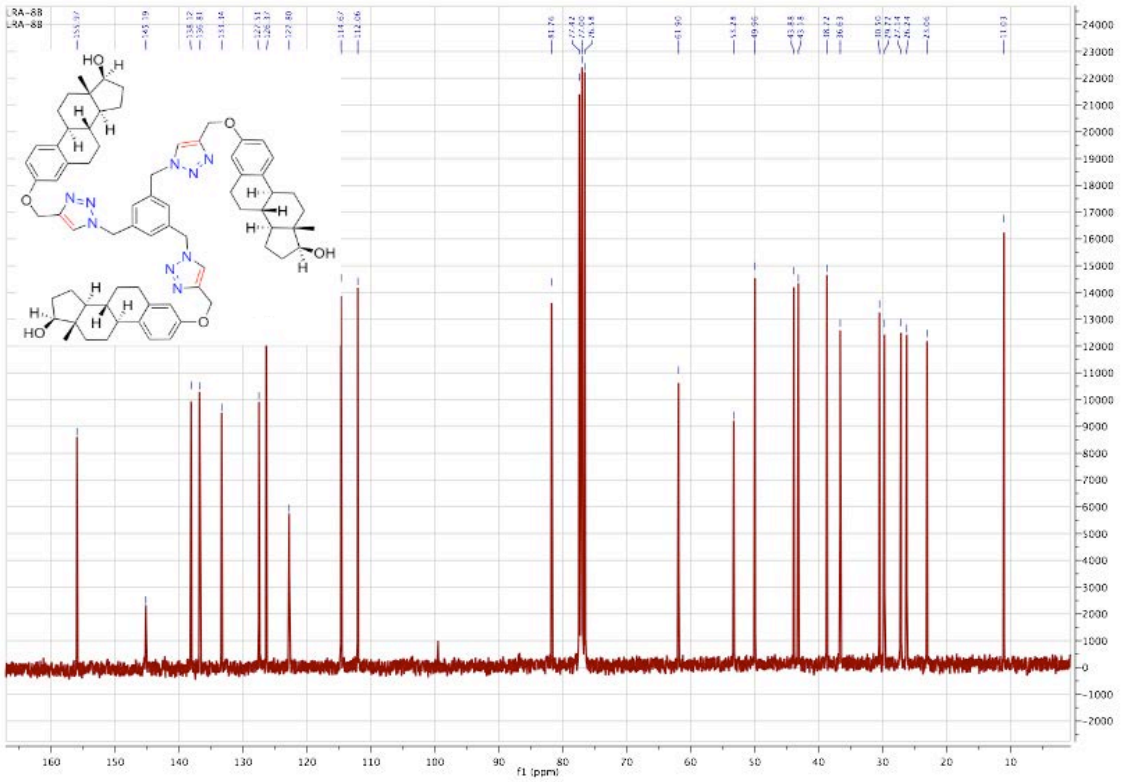


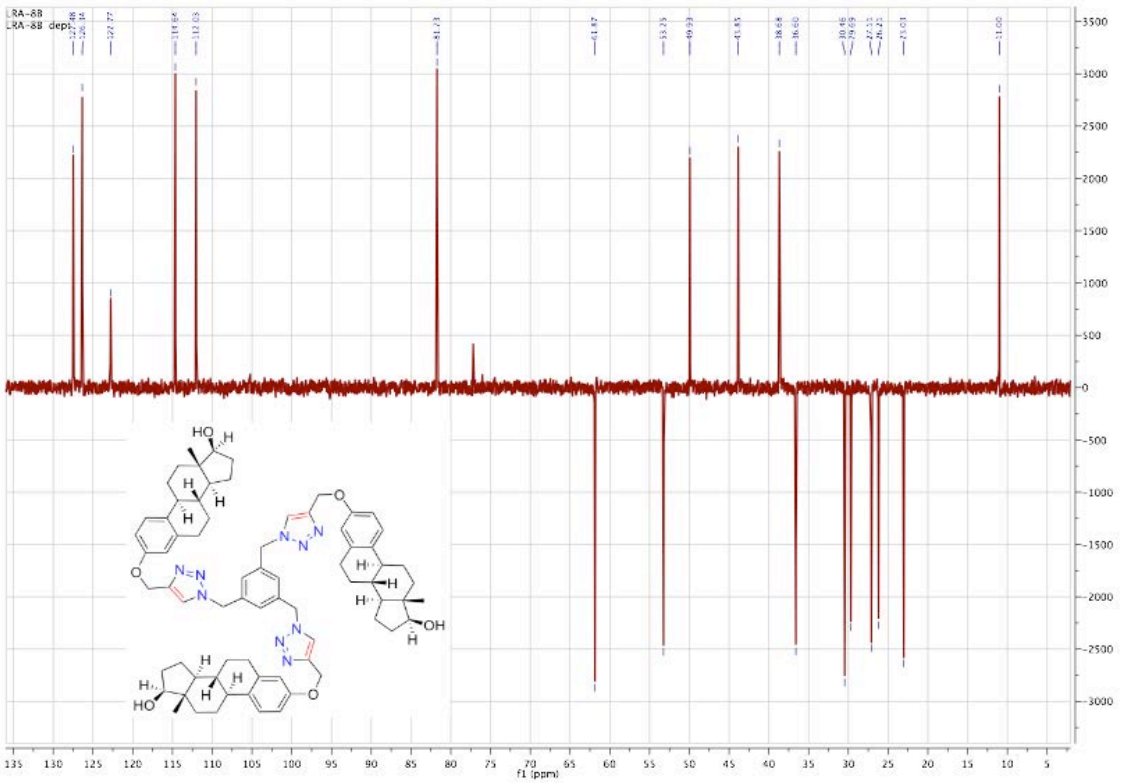




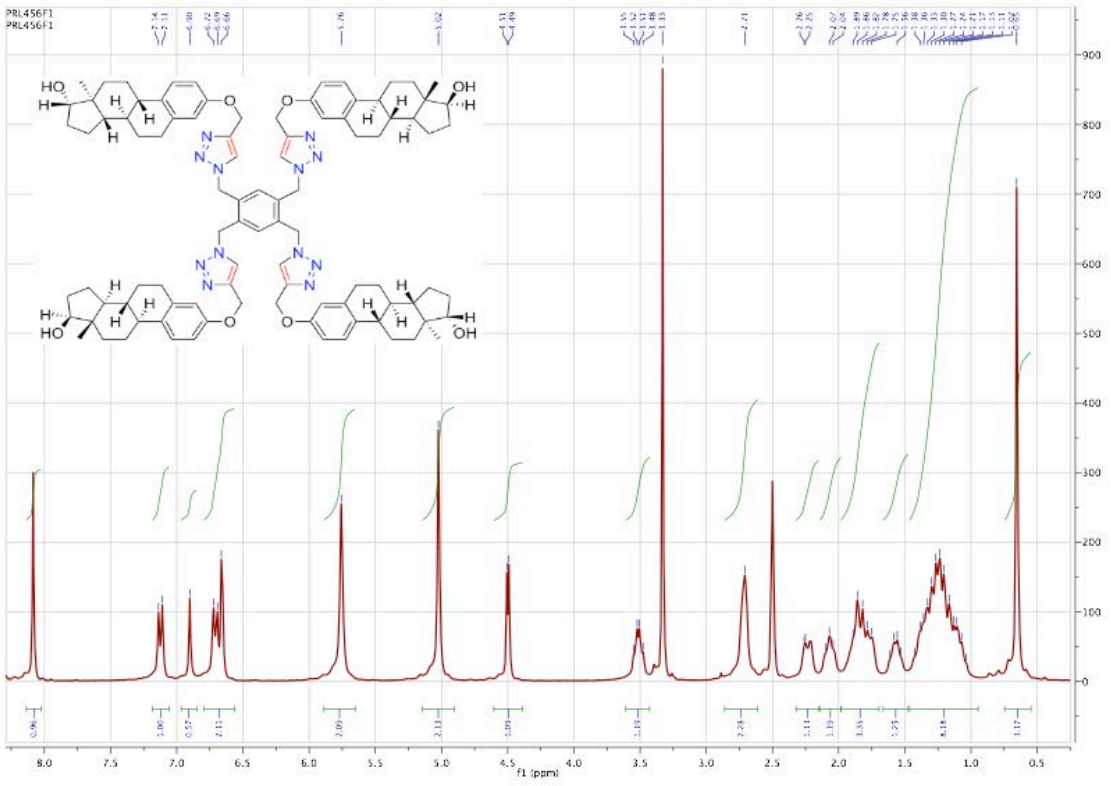
Compound 10

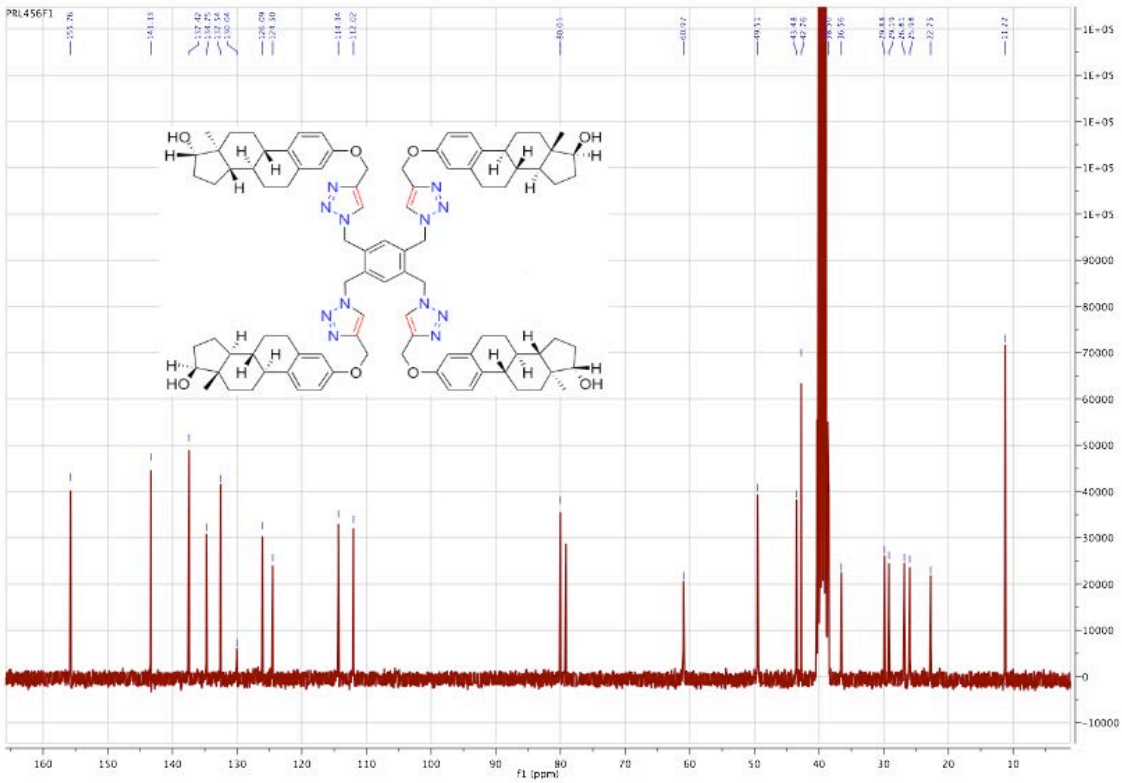


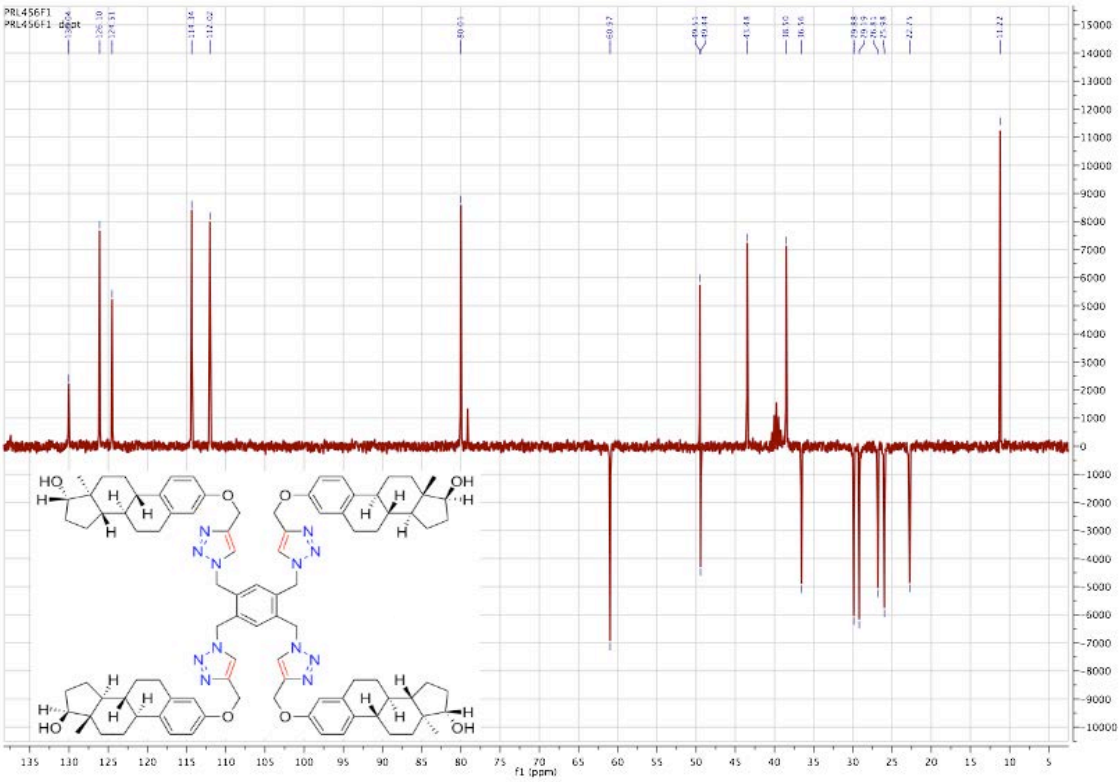




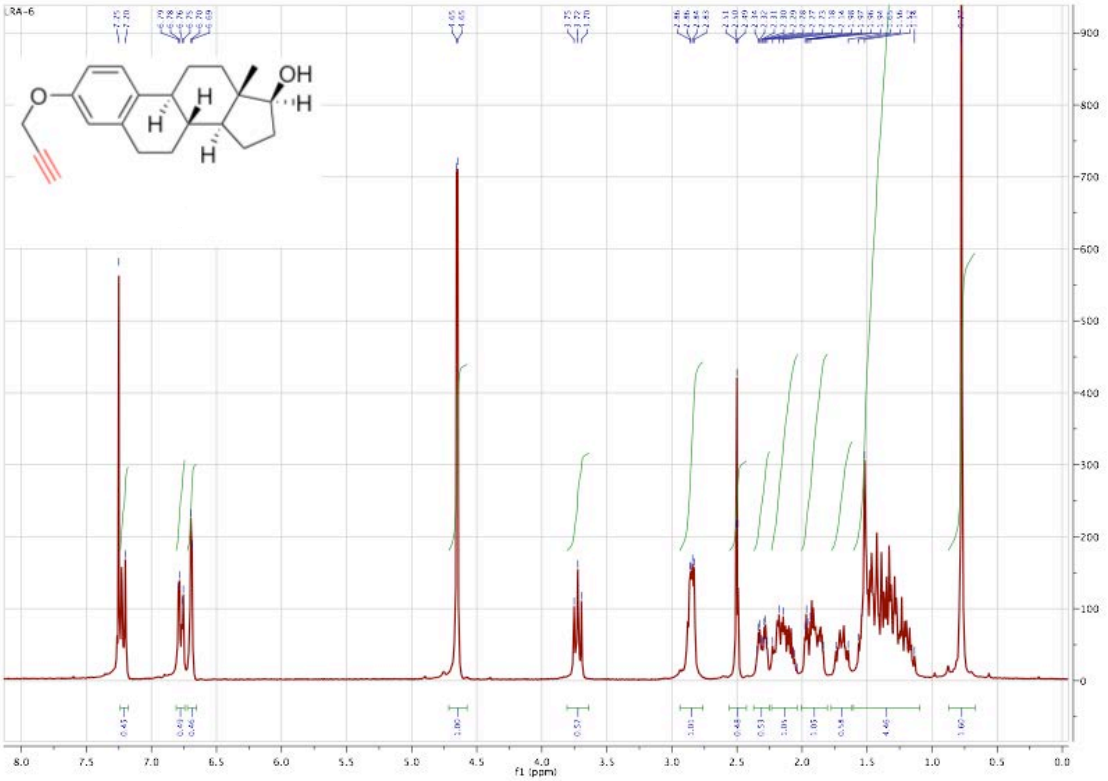
Compound 11

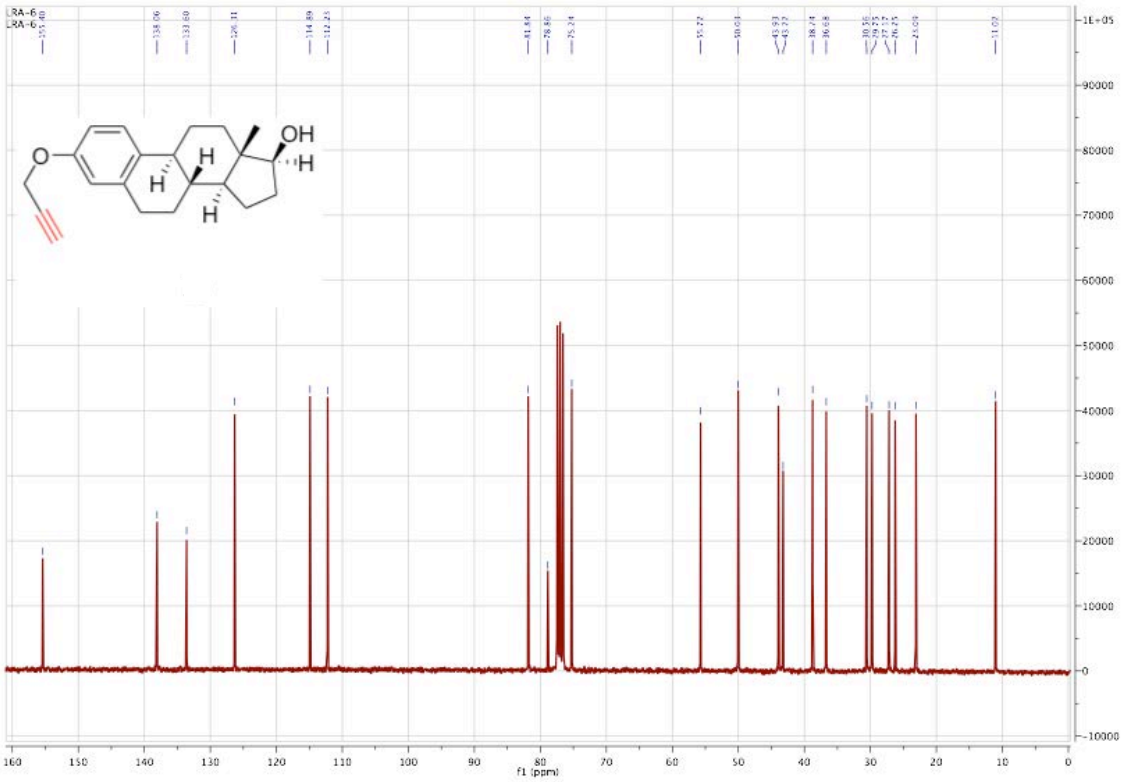


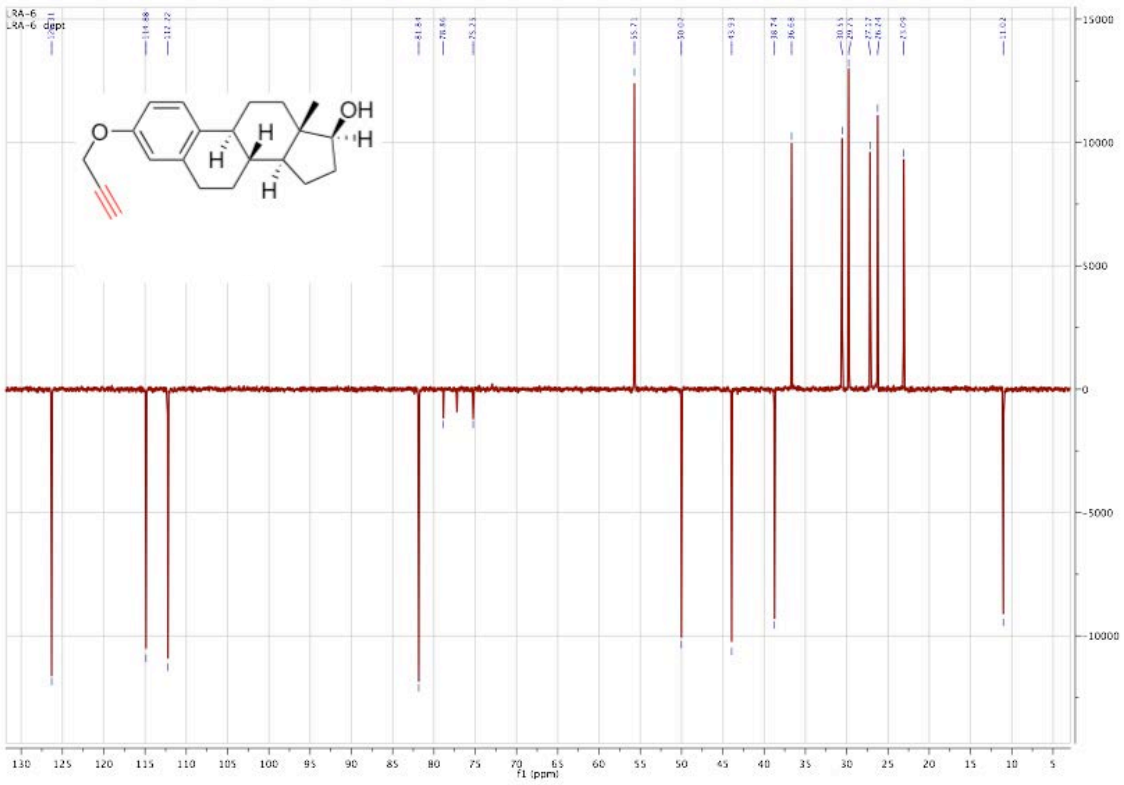




Compound 14



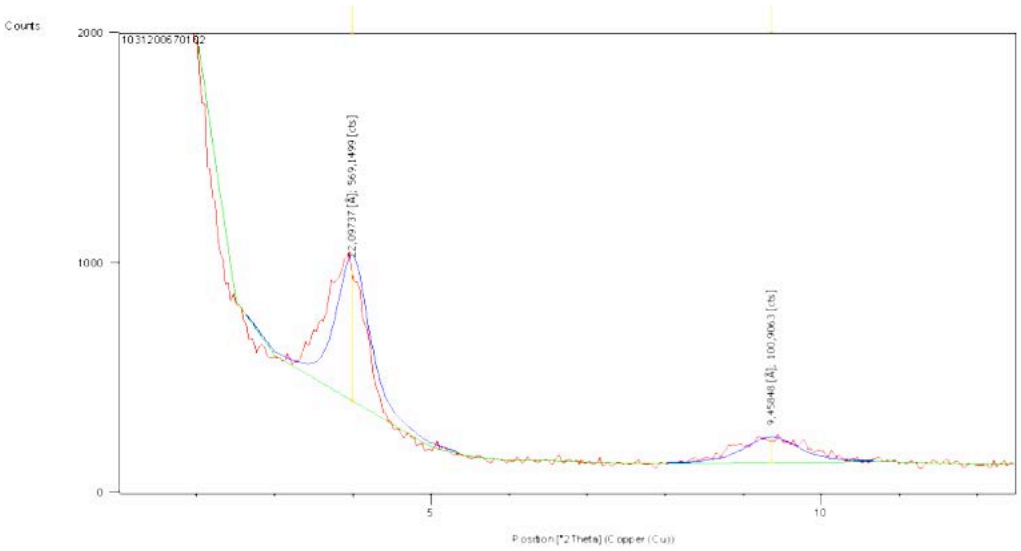




k) Powder X-ray diffraction (XRD) patterns of the xerogels of 3a and 11.

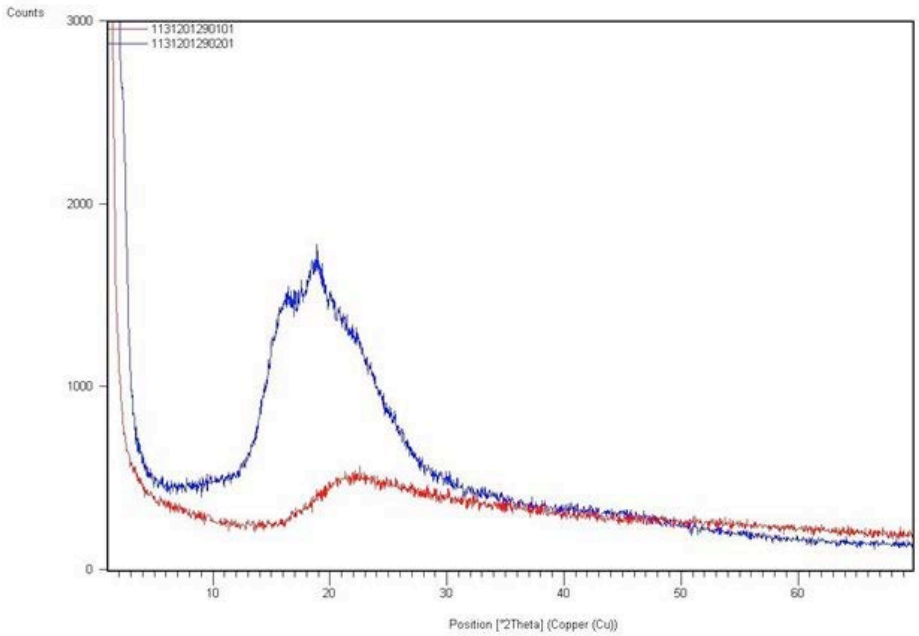
Powder X-ray diffraction (XRD) patterns were recorded with a Panalytical X'Pert PRO difractometer, using a Cu monochromatic radiation (45 kV 40 mA), equipped with a Ni filter tube and a rapid X'Celerator detector.

Powder XRD patterns of the xerogel of **3a** showed two small diffraction peaks, corresponding to 22.09 and 9.46 Å interplanar spacings. In order to check the structure stability of the so obtained xerogel, XRD patterns were measured at room temperature before and after drying the gel samples. In both cases, similar patterns were observed, indicating that the sample kept the same average structure during the process.



XRD patterns of the xerogel of **3a**.

Powder XRD patterns of the xerogel of **11** showed two small diffraction peaks, corresponding to 5.54 and 4.67 Å interplanar spacings. In order to check the structure stability of the so obtained xerogel, XRD patterns were measured at room temperature before (red line) and after drying (blue line) the gel samples. In both cases, similar patterns were observed, indicating that the sample kept the same average structure during the process, although diffraction peaks appear as the gel is dried, indicating a short order range in the sample.



XRD patterns of the xerogel of **11**.

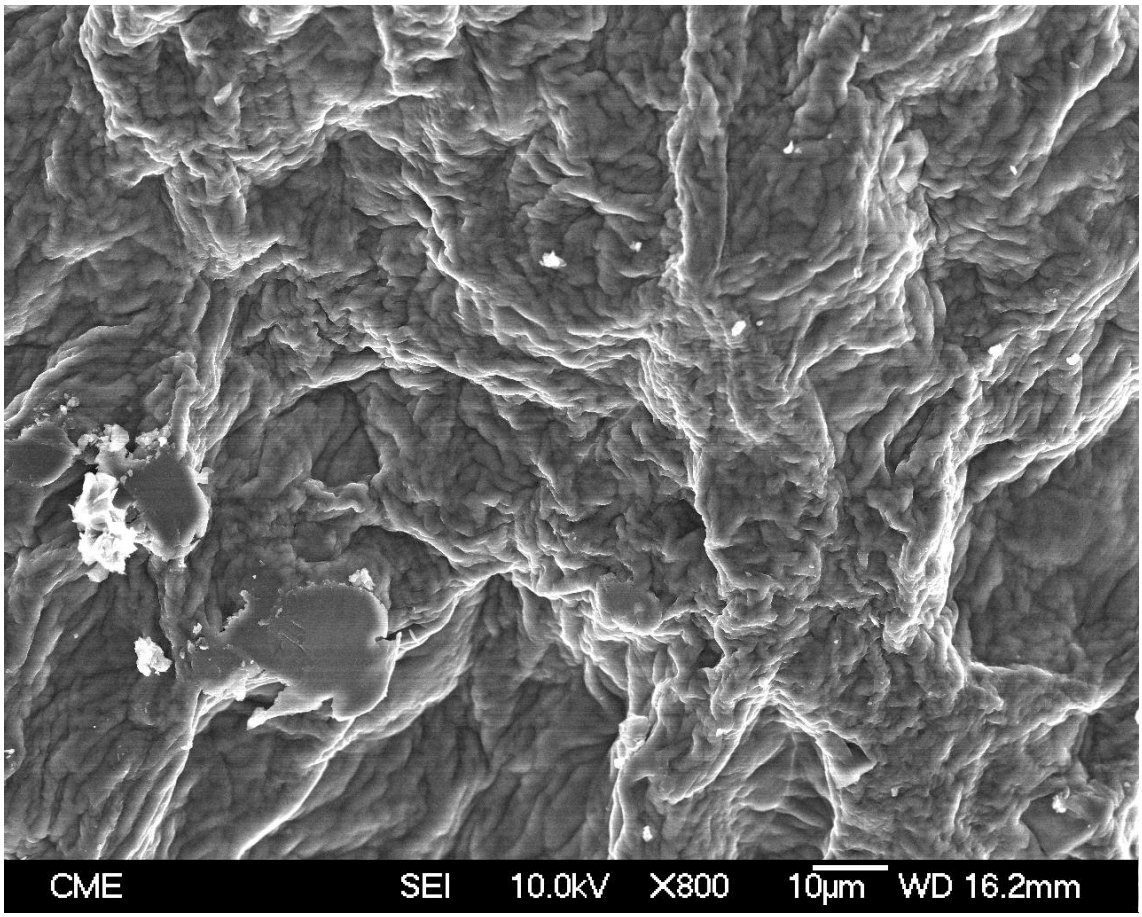
l) Scanning electron microscopy (SEM) and transmission electron microscopy (TEM).

Both morphology and chemical composition of the xerogel were observed by Scanning Electron Microscopy (SEM) and Energy Dispersive X-ray Spectroscopy (EDS), in a JEOL 6400 Electron Microscope, equipped with an Oxford-LINK Pentafet System. The nanostructure of the fibers was studied by Selected Area Electron Diffraction (SAED) and High Resolution Transmission Electron Microscopy (HRTEM) in a JEOL 300 FEG electron microscope. Inverse Fast Fourier Transform (IFFT) images were obtained by windowing the Fast Fourier Transform (FFT) patterns calculated from the experimental HRTEM images. EDS studies were also performed in this microscope by using an Oxford model ISIS analyzer.

1. Preparation of Gel samples for SEM.

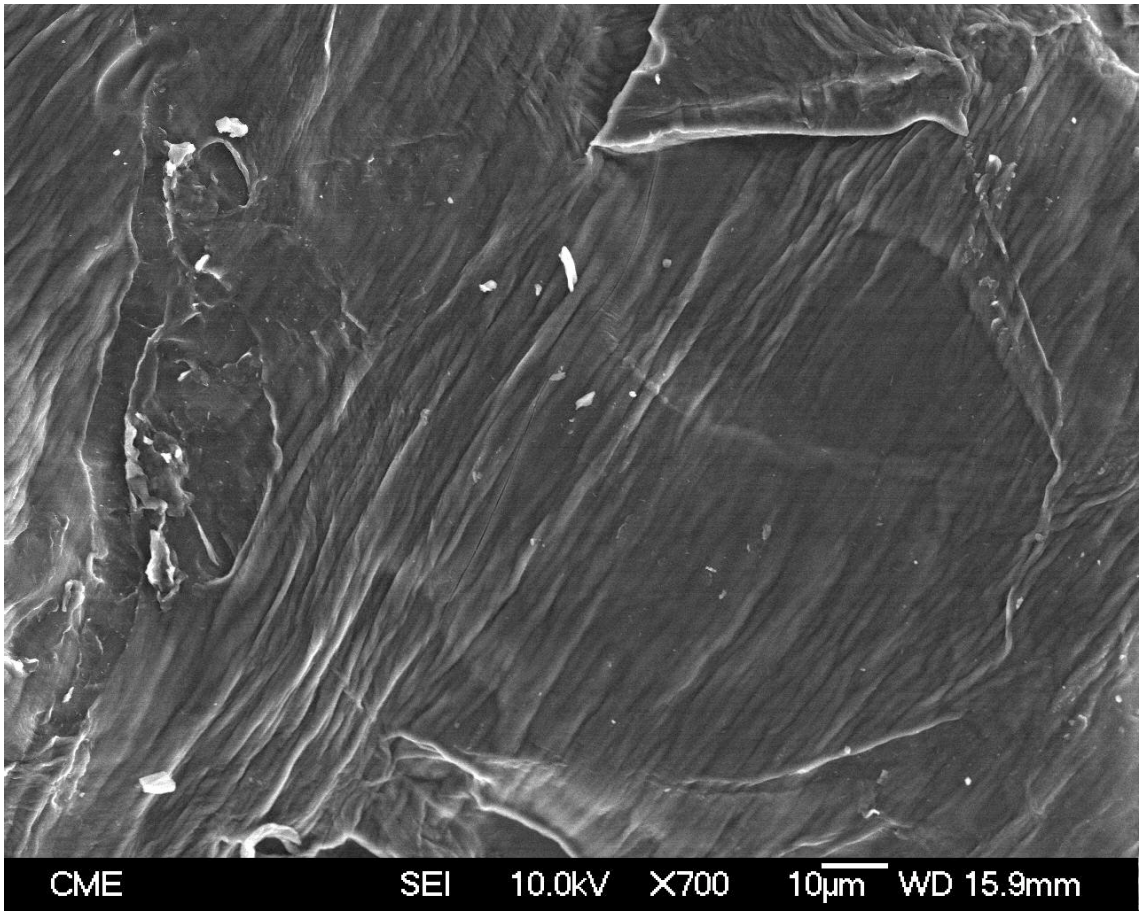
To remove nonvolatile solvents the gel samples were washed firstly with benzene and then with MeOH several times and dried under reduced pressure. Xerogel samples for SEM observations were dispersed in MeOH, after that they were placed onto a substrate and coated by carbon, to be made more conductive and reducing the effects of charging, e.g. glaring on the sample.

2. SEM image of the xerogel of **3a** (0.6 wt%)/DMSO/H_2O (v/v 7:3)



The scanning electron microscopy (SEM) image of the xerogel of compound **3a** reveals micrometer-sized complex fibrous structures. Such fibrous morphology is composed of entangled bundles of fibres. According to the obtained information from micrograph in figure 2a-b (see manuscript), these fibre bundles could be possibly formed through aggregation of thinner fibres that have a tendency to form right-handed twisted ribbon morphology.

3. SEM image of the xerogel of **11** (0.8 wt%)/DMSO/H_2O (v/v 4:1)



The xerogel of compound **11** is formed by a largely gross one-dimensional fibrous structure as shown above. This close-packed arrangement is composed of parallel bundles of very long fibres that are about 2.5-3 μm wide.

m) Crystal data and structure refinement for 3b.

A colorless lath of 0.38 x 0.10 x 0.04 mm size was obtained by evaporation of a $CHCl_3$/MeOH/hexane solution. The crystal was measured at 120(2) K on a Oxford Gemini S diffractometer using graphite-monochromated Mo-Ka radiation (l = 0.71073 Å) and w scan mode. The structure was solved by direct methods and all non hydrogen atoms refined anisotropically on F^2 in space group P1 (SHELXS-97 and SHELXL-97, G.M. Sheldrick, University of Göttingen, 1997). Hydrogen atoms were included using a *riding* model. Hydroxyl groups hydrogen atom positions are consistent with a *tandem type hydrogen bond* and disordered due to the close approach for the two hydrogens (Intermolecular distance H1···H2 2.05 Å) (G.A. Jeffrey, An introduction to hydrogen bonding, Oxford University Press, 1997). The crystal presents solvent accessible voids of 643 $Å^3$ arranged into channels along the *a* axis (PLATON-SQUEEZE, A.L. Spek, J.Appl.Cryst., 2003, 36, 7-13). Two $CHCl_3$ molecules with a 100% occupancy level were found within the asymmetric unit voids. Additionally, residual electron density in the voids was tentatively identified as two CH_3Cl molecules with a 50% occupancy level. The electron density solvent assignment (184 electrons per unit cell corresponding to 3 $CHCl_3$ molecules) is in good agreement with the recovered number of electrons in the solvent accessible volume as found using PLATON-SQUEEZE program (182 electrons per unit cell). Badly-behaving chloroform molecules with most of the scattering power (Cl atoms) could be the reason for very unequal components of the anisotropic parameters U and low bond precision on C-C bonds. Solvent CH_3Cl molecules were refined with appropriate similarity restraints (command SAME). Disordered atom U value components were restrained to be equal (commands DELU, SIMU, ISOR). Local ring geometry of aromatic groups was also restrained (commands FLAT, SAME). The programs use neutral atom scattering factors, Df' and Df" and absorption coefficients from International Tables for Crystallography (International Tables for Crystallography, Kluwer Academic Publishers: Dordrecht, The Netherlands, 1992; *Vol. C*, Tables 6.1.1.4 (pp 500-502), 4.2.6.8 (pp 219-222), and 4.2.4.2 (pp 193-199)).

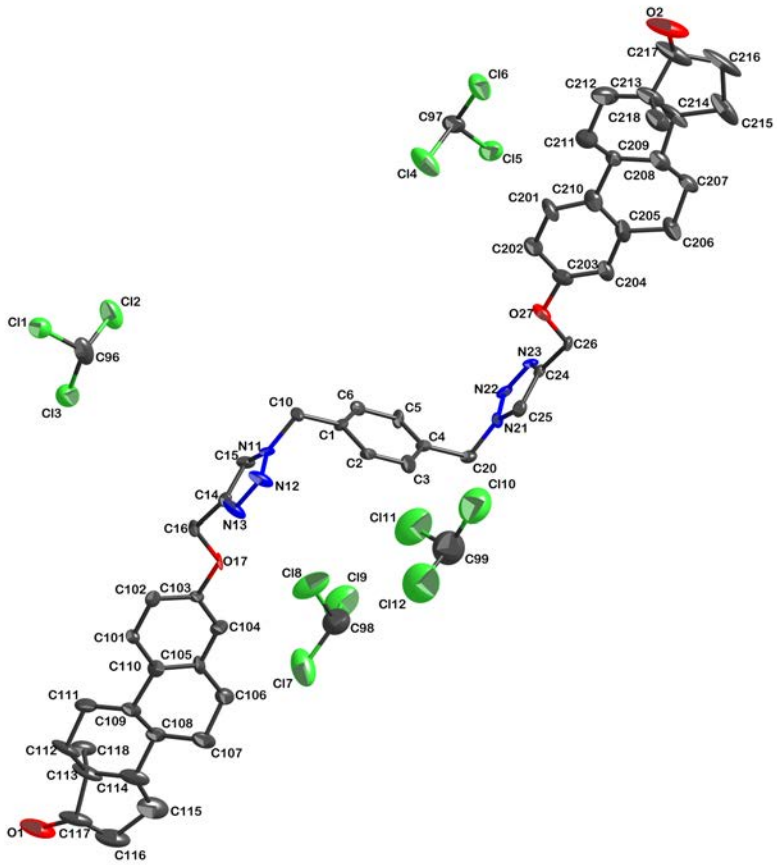


Figure 1. X-ray thermal ellipsoid plot of **3b**·3$CHCl_3$ (50% probability level) with the labeling scheme (hydrogen atoms have been omitted for clarity).

n) Crystal packing views for 3b showing relative orientation of molecules within one layer.

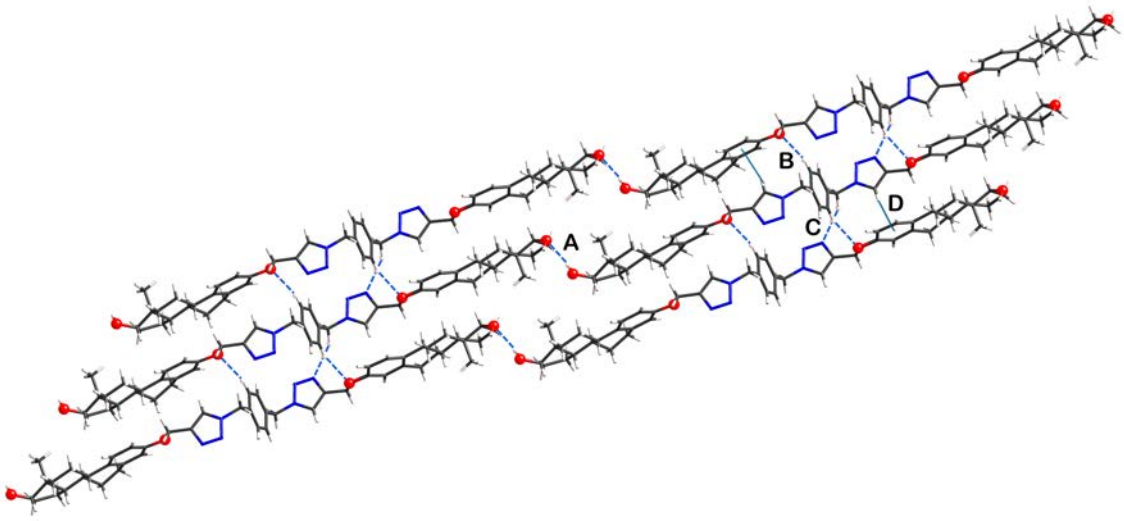


Figure 2. Crystal packing views showing relative orientation of molecules within one layer and O-H···O (A), C(benzene)-H···O (B), C(methylene)-H···N (C) and C(triazole)-H···π (D) interactions

o) Hydrogen bonds and contacts for 3b·3CHCl$_3$

Intermolecular hydrogen bonds (X-H…Y) and contacts (X…Y) lengths and angles for 3b·3CHCl$_3$ [Å and °].

X-H...Y/ X...Y	d(X-H)	d(H...Y)	d(X...Y)	<(XHY)/<(CXY)
Linear chains				
O(1)-H(1)...O(2)#1	0.84	2.21	2.843(13)	132.0
O(2)-H(2)...O(1)#2	0.84	2.50	2.843(13)	105.9
Molecular layers				
C(3)-H(3)...O(27)#3	0.95	2.53	3.444(13)	161.7
C(20)-H(20A)...N(23)#3	0.99	2.63	3.504(13)	147.3
C(25)-H(25)...C(202)#3	0.95	3.08	3.909(16)	146.6
C(25)-H(25)...C(203)#3	0.95	2.76	3.674(16)	160.7
C(25)-H(25)...C(204)#3	0.95	2.76	3.683(17)	164.7
C(25)-H(25)...C(205)#3	0.95	3.02	3.871(16)	149.5
C(109)-H(109)...C(103)#3	1.00	2.83	3.804(14)	164.8
C(109)-H(109)...C(102)#3	1.00	3.19	4.116(14)	154.7
C(114)-H(114)...C(103)#3	1.00	3.09	4.015(15)	154.6
C(114)-H(114)...C(104)#3	1.00	2.84	3.798(15)	160.8
C(114)-H(114)...C(105)#3	1.00	3.05	3.999(14)	158.3
C(6)-H(6)...O(17)#4	0.95	2.54	3.456(12)	163.0
C(10)-H(10A)...N(13)#4	0.99	2.60	3.452(14)	144.8
C(15)-H(15)...C(101)#4	0.95	3.00	3.804(16)	143.6
C(15)-H(15)...C(102)#4	0.95	2.74	3.638(16)	158.3
C(15)-H(15)...C(103)#4	0.95	2.72	3.652(16)	167.7
C(15)-H(15)...C(104)#4	0.95	3.02	3.889(16)	153.3
C(209)-H(209)...C(203)#4	1.00	2.94	3.927(16)	170.9
C(209)-H(209)...C(202)#4	1.00	3.38	4.335(16)	159.3
C(214)-H(214)...C(203)#4	1.00	3.27	4.201(18)	155.5
C(214)-H(214)...C(204)#4	1.00	2.93	3.877(17)	159.1
C(214)-H(214)...C(205)#4	1.00	3.11	4.055(16)	157.4
Layers assembly				
C(16)-H(16A)...N(23)#5	0.99	2.56	3.551(13)	175.1
C(26)-H(26B)...N(13)#6	0.99	2.64	3.627(14)	173.8
Solvent contacts				

C(96)-H(96)...N(22)	1.00	2.41	3.393(15)	168.9
C(97)-H(97)...N(12)#7	1.00	2.54	3.534(16)	174.6
C(99)-H(99)...O(2)#8	1.00	2.53	3.41(3)	146.5
Cl(7)...Cl(11)#9			3.415 (14)	
C(98)-Cl(7)…Cl11#9				97.7(7)
Cl7…Cl(11)#9-C99#9				165.3(7)

Symmetry transformations used to generate equivalent atoms: #1 x-4, y-1, z+1; #2 x+4, y+1, z-1; #3 x-1, y, z; #4 x+1, y, z; #5 x-2, y-1, z; #6 x+2, y+1, z; #7 x+1, y+1, z; #8 x-2, y, z; #9 x-1, y+1, z.

π··· π stacking of triazole rings in the layers assembly

Centroids distance ring(N11-N12-N13-C14-C15)···ring(N21-N22-N23-C24-C25)#10: 3.664 Å

Dihedral angle ring(N11-N12-N13-C14-C15)···ring(N21-N22-N23-C24-C25)#5: 0.3(5)º

Shortest contacts ring(N11-N12-N13-C14-C15)···ring(N21-N22-N23-C24-C25)#5 (Å):

3.4975 (0.0116) N11 - C24#10
3.5441 (0.0124) N11 - C25#10
3.5953 (0.0142) N12 - C25#10
3.4820 (0.0117) C14 - N21#10
3.5556 (0.0131) C15 - N21#10
3.6016 (0.0133) C15 - N22#10

Symmetry transformation used to generate equivalent atoms: #10 x-1, y-1, z.