Sequence Selective Formation of Synthetic H-Bonded Duplexes

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Supporting information

Synthesis

All the reagents and materials used in the synthesis of the compounds described below were bought from commercial sources, without prior purification. Thin layer chromatography was carried out using with silica gel 60F (Merck) on aluminium. Flash chromatography was carried out on silica gel 40 – 60 μm (BDH) or on an automated system (Combiflash Companion) using pre-packed cartridges of silica (50μ PuriFlash® Column). All NMR spectroscopy was carried out on either a Bruker AVI250, AVI400, DPX400, AVIII400 or DRX500 spectrometer using the residual solvent as the internal standard. All chemical shifts (δ) are quoted in ppm and coupling constants given in Hz. Splitting patterns are given as follows: s (singlet), d (doublet), t (triplet), m (multiplet). FT-IR spectra were measured on a PerkinElmer Spectrum 100 spectrometer. ES+ was carried out on a Micromass Platform spectrometer. Reactions were carried out at ambient temperature unless otherwise stated.

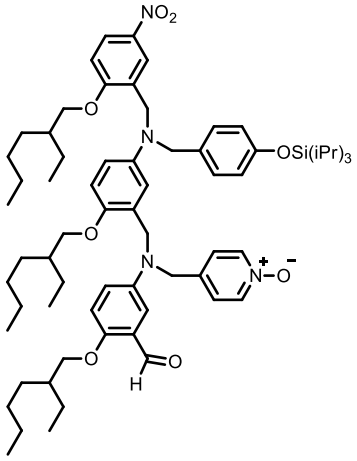
Scheme 1 in the main text shows sequential acetal deprotection and reductive amination steps. The intermediate aldehydes were also isolated and characterized, and these compounds are assigned compound numbers based on the parent acetal in the experimental details of the synthesis below, i.e. aldehyde **6a** is the compound obtained by deprotection of acetal **6**.

Synthesis of compounds **1**, **3**, **4**, **7**, **22** and **23** has been previously reported in:
Stross, A. E.; Iadevaia, G.; Hunter, C. A. *Chem. Sci.* **2016,** *7*, 94.

Synthesis of compound **2**, **5**, **9** and **24** has been previously reported in:
Stross, A. E.; Iadevaia, G.; Hunter, C. A. *Chem. Sci.* **2016,** *7*, 5686

Synthesis of compound **6** has been previously reported in Núñez-Villanueva D.; Iadevaia G.; Stross A.E.; Jinks M.A.; Swain J.A.; Hunter C.A., *J. Am. Chem. Soc*, **2017**, *139*, 6654.

Synthesis of 6a



6 (2.07 g, 1.79 mmol, 1 equiv.) was dissolved in $CHCl_3$ (10 mL) and concentrated aqueous acid (10 mL) was added with stirring. After 2 days the mixture was neutralised using aqueous $NaHCO_3$ and the organic portion separated from the aqueous part. The aqueous layer was washed with $CHCl_3$ (3 × 10 mL) before all organic fractions were washed with brine (1 × 10 mL) dried ($MgSO_4$) and the solvent removed using a rotary evaporator to yield a bright yellow oil (2.10 g, 95%) requiring no further purification.

^{1}H NMR (500 MHz, $CDCl_3$): δ_H = 10.44 (s, 1H), 8.10 (d, 2H, ^3J = 7.0), 8.04 (dd, 1H, ^3J = 9.0, ^4J = 3.0), 7.07 – 7.02 (m, 4H), 6.91 (d, 1H, ^4J = 3.0), 6.84 (d, 2H ^3J = 8.5), 6.79 (d, 1H, ^3J = 9.0), 6.74 (d, 2H, ^3J = 9.0), 6.68 (dd, 1H, ^3J = 9.0, ^4J = 3.0), 6.56 (dd, 1H, ^3J = 9.0, ^4J = 3.0), 6.26 (d, 1H, ^4J = 3.0), 4.49 – 4.42 (m, 6H), 4.14 (s, 2H), 3.94 – 3.87 (m, 4H), 3.78 (d, 2H, ^3J = 5.5), 1.82 – 1.72 (m, 2H), 1.71 – 1.63 (m, 1H), 1.60 – 1.19 (m, 27H), 1.10 (d, 18H, ^3J = 7.5), 1.01 – 0.83 (m, 18H);

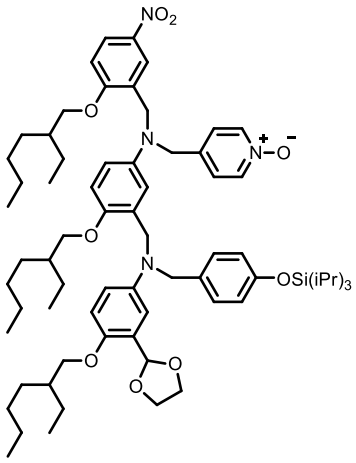
^{13}C NMR (101 MHz, $CDCl_3$): δ_C = 189.7, 161.5, 155.0, 154.6, 149.1, 142.5, 142.1, 141.3, 139.1, 138.5, 130.9, 128.4, 127.9, 125.5, 125.0, 124.2, 124.1, 123.0, 120.8, 120.0, 114.1, 113.0, 112.5, 112.0, 110.3, 110.2, 71.5, 71.4, 70.7, 55.4, 52.8, 50.4,

50.1, 39.6, 39.5, 39.2, 30.7, 30.6, 30.5, 29.1, 29.1, 29.0, 24.0, 24.0, 24.0, 23.0, 23.0, 17.9, 14.0, 12.6, 11.2, 11.2, 11.2;

HRMS (ES+): calculated for $C_{67}H_{99}N_4O_8Si$ 1115.7232, found 1115.7229;

FT-IR (thin film): ν_{max}/cm^{-1} 2957, 2927, 2865, 1682, 1609, 1592, 1505, 1464, 1338, 1262, 1226, 1166.

Synthesis of 8



5 (0.51 g, 0.82 mmol, 1 equiv.) and **1** (0.69 g, 1.2 mmol, 1.5 equiv.) were dissolved in $CHCl_3$ (3 mL) and $NaBH(OAc)_3$ (0.49 g, 2.3 mmol, 2.8 equiv.) was added with stirring. After 4 days the reaction was quenched with saturated aqueous $NaHCO_3$ solution, and extracted into $CHCl_3$ (4 × 10 mL). All the organic fractions were washed with water (1 × 10 mL), brine (1 × 10 mL) and dried ($MgSO_4$) before the solvent removed with a rotary evaporator. The crude product was purified using flash chromatography on silica eluting with a gradient from 0% to 10% MeOH in a 1:1 mixture of EtOAc and hexane to yield a yellow oil (0.57 g, 59%).

^{1}H NMR (500 MHz, $CDCl_3$): δ_H = 8.12 – 8.03 (m, 3H), 7.91 (d, 1H, ^3J = 3.0), 7.07 – 6.98 (m, 4H), 6.84 (d, 1H, ^3J = 9.0), 6.78 (d, 2H, ^3J = 8.5), 6.75 (d, 1H, ^4J = 3.0), 6.71 (d, 1H, ^3J = 9.0), 6.59 (d, 1H, ^3J = 9.0), 6.43 (dd, 1H, ^3J = 9.0, ^4J = 3.0), 6.39 (d, 1H, ^4J = 3.0), 6.34 (dd, 1H, ^3J = 9.0, ^4J = 3.0), (s, 1H), 4.47 (s, 2H), 4.45 (s, 2H), 4.44 (s, 2H), 4.23 (s, 2H), 3.96 (d, 2H, ^3J = 5.5), 3.93 (s, 4H), 3.81 (d, 2H, ^3J = 5.5), 3.77 (d, 2H, ^3J = 5.5), 1.83 – 1.60 (m, 3H), 1.59 – 1.17 (m, 27H), 1.09 (d, 18H, ^3J = 7.5), 0.99 – 0.84 (m, 18H);

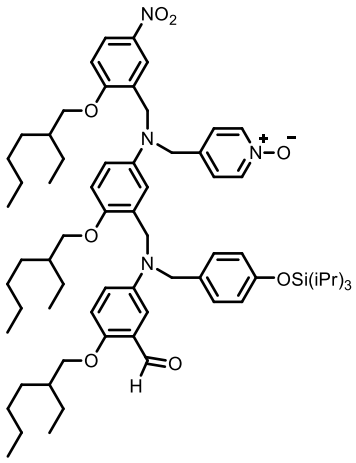
^{13}C NMR (101 MHz, $CDCl_3$): δ_C = 161.5, 154.8, 150.0, 149.1, 143.0, 141.2, 139.1, 138.6, 131.2, 127.7, 127.7, 127.4, 126.4, 124.6, 124.3, 122.9, 119.8, 113.5, 113.5,

113.3, 112.2, 111.8, 111.0, 110.7, 99.5, 71.7, 71.5, 70.7, 65.0, 54.6, 54.3, 50.8, 49.4, 39.6, 39.5, 39.2, 30.6, 30.5, 30.5, 29.1, 29.1, 29.0, 24.0, 23.9, 23.9, 23.1, 23.0, 23.0, 17.9, 14.1, 14.0, 12.6, 11.2, 11.1, 11.1;

HRMS (ES+): calculated for $C_{69}H_{103}N_4O_9Si$ 1159.7494, found 1159.7478;

FT-IR (thin film): ν_{max}/cm^{-1} 3055, 2987, 2686, 2306, 1422, 1266, 1156.

Synthesis of 8a



8 (0.57 g, 0.49 mmol, 1 equiv.) was dissolved in $CHCl_3$ (5 mL) and concentrated aqueous acid (5 mL) was added with stirring. After 2 days the mixture was neutralised using aqueous $NaHCO_3$ and the organic portion separated from the aqueous part. The aqueous layer was washed with $CHCl_3$ (3 × 10 mL) before all organic fractions were washed with brine (1 × 10 mL) dried ($MgSO_4$) and the solvent removed using a rotary evaporator to yield a bright yellow oil (0.50 g, 91%) requiring no further purification.

^{1}H NMR (500 MHz, $CDCl_3$): δ_H = 10.42, (s, 1H), 8.08 (d, 2H, ^3J = 7.0), 8.03 (dd, 1H, ^3J = 9.0, ^4J = 3.0), 7.85 (d, 1H, ^4J = 3.0), 7.08 (d, 2H, ^3J = 7.0), 6.99 (d, 2H, ^3J = 8.5), 6.96 (d, 1H, ^4J = 3.0), 6.82 – 6.76 (m, 3H), 6.73 (d, 1H, ^3J = 9.0), 6.64 (d, 1H, ^3J = 9.0), 6.56 (dd, 1H, ^3J = 9.0, ^4J = 3.0), 6.45 (dd, 1H, ^3J = 9.0, ^4J = 3.0), 6.30 (d, 1H, ^4J = 3.0), 4.49 (s, 2H), 4.45 (s, 2H), 4.43 (s, 2H), 4.29 (s, 2H), 3.92 (d, 2H, ^3J = 5.5), 3.88 (d, 2H, ^3J = 5.5), 3.79 (d, 2H, ^3J = 5.5), 1.81 – 1.63 (m, 3H), 1.59 – 1.17 (m, 27H), 1.08 (d, 18H, ^3J = 7.5), 1.02 – 0.83 (m, 18H);

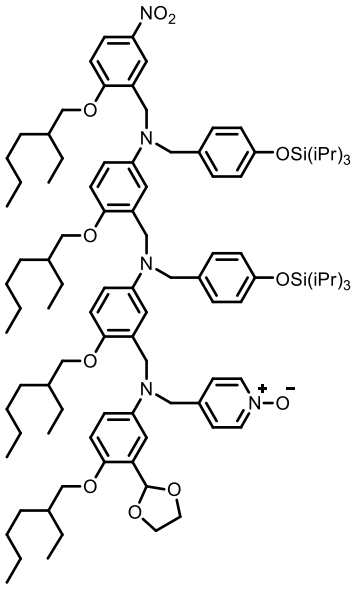
^{13}C NMR (101 MHz, $CDCl_3$): δ_C = 190.2, 161.7, 155.2, 154.1, 150.2, 142.9, 141.4, 141.4, 139.3, 138.6, 130.7, 127.9, 127.5, 127.3, 125.2, 124.7, 124.4, 123.0, 120.3, 120.2, 113.9, 113.3, 112.5, 112.1, 110.7, 109.7, 71.8, 71.5, 70.9, 54.7, 54.4, 51.0,

49.6, 39.8, 39.7, 39.4, 30.9, 30.8, 30.7, 29.3, 29.3, 29.2, 24.2, 24.2, 24.2, 23.2, 23.2, 23.2, 18.1, 14.3, 14.3, 14.2, 12.8, 11.4, 11.4, 11.4;

HRMS (ES+): calculated for $C_{67}H_{98}N_4O_8NaSi$ 1137.7052, found 1137.7024;

FT-IR (thin film): ν_{max}/cm^{-1} 3054, 2927, 2306, 1677,1507, 1422, 1266.

Synthesis of 10



7 (0.70 g, 0.55 mmol, 1 equiv.) and **2** (0.33 g, 0.82 mmol, 1.5 equiv.) were dissolved in $CHCl_3$ (4 mL) and $NaBH(OAc)_3$ (0.33 g, 1.5 mmol, 2.8 equiv.) was added with stirring. After 4 days the reaction was quenched with saturated aqueous $NaHCO_3$ solution, and extracted into $CHCl_3$ (4 × 10 mL). All the organic fractions were washed with water (1 × 10 mL), brine (1 × 10 mL) and dried ($MgSO_4$) before the solvent removed with a rotary evaporator. The crude product was purified using flash chromatography on silica eluting with a gradient from 5% to 100% EtOAc in hexane and then 10% MeOH in $CHCl_3$ to yield a pale yellow oil (0.32 g, 35%).

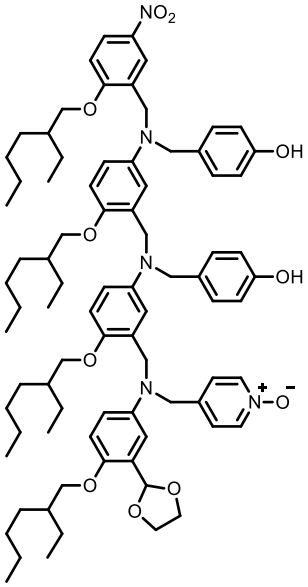
^{1}H NMR (400 MHz, $CDCl_3$): δ_H = 8.04 (d, 2H, ^3J = 7.0), 8.00 (dd, 1H, ^3J = 9.0, ^4J = 3.0), 7.96 (d, 1H, ^4J = 3.0), 7.04 – 6.99 (m, 4H), 6.95 (d, 2H, ^3J = 8.5), 6.85 (d, 1H, ^4J = 3.0), 6.82 (d, 2H, ^3J = 8.5), 6.79 – 6.76 (m, 3H), 6.75 – 6.69 (m, 3H), 6.61 (d, 1H, ^3J = 9.0), 6.52 – 6.44 (m, 3H), 6.34 (dd, 1H, ^3J = 9.0, ^4J = 3.0), 6.25 (d, 1H, ^4J = 3.0), 6.11 (s, 1H), 4.49 – 4.43 (m, 6H), 4.06 (s, 2H), 4.02 – 3.93 (m, 4H), 3.90 (s, 2H), 3.85 (d, 2H, ^3J = 5.5), 3.82 – 3.75 (m, 6H), 1.78 – 1.62 (m, 4H), 1.56 – 1.19 (m, 38H), 1.14 – 1.07 (m, 36H), 0.97 – 0.85 (m, 24H);

^{13}C NMR (101 MHz, $CDCl_3$): δ_C = 161.4, 154.9, 154.6, 150.0, 149.1, 148.4, 142.8, 142.7, 142.4, 141.3, 139.6, 138.8, 131.9, 131.1, 128.7, 128.2, 127.7, 127.5, 126.9, 125.8, 124.3, 124.1, 123.1, 119.9, 115.0, 113.6, 113.2, 112.8, 112.4, 112.3, 112.2, 111.4, 111.4, 110.3, 99.4, 71.8, 71.4, 70.8, 70.8, 65.1, 55.4, 54.5, 52.6, 50.8, 50.5, 50.2, 39.6, 39.6, 39.2, 30.7, 30.6, 30.5, 29.1, 29.1, 24.0, 23.9, 23.9, 23.1, 23.0, 23.0, 17.9, 17.9, 14.1, 12.7, 11.2, 11.1;

HRMS (ES+): calculated for $C_{100}H_{152}N_5O_{11}Si_2$ 1655.1027, found 1655.1080;

FT-IR (thin film): ν_{max}/cm^{-1} 2928, 2865, 1608, 1592, 1505, 1463, 1339, 1261, 1225.

Synthesis of 11 (DDA)



10 (0.097 g, 0.059 mmol, 1 equiv.) was dissolved in THF (3 mL) at 0 °C and TBAF (110 μL, 0.11 mmol, 1.8 equiv.) was added with stirring. After 1 hour water (5 mL) was added and the aqueous mixture washed with diethyl ether (4 × 10 mL). All organic fractions were combined and washed with brine (1 × 10 mL) dried ($MgSO_4$) and the solvent removed with a rotary evaporator. The crude mixture was then purified via flash chromatography on silica eluting with a gradient from 0% to 5% of MeOH in $CHCl_3$ to yield a viscous pale yellow oil (0.064 g, 81%).

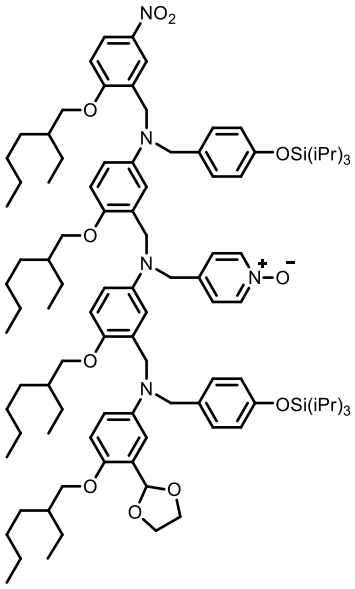
^{1}H NMR (400 MHz, $CDCl_3$): δ_H = 8.16 (dd, 1H, ^3J = 9.0, ^4J = 3.0), 8.11 – 8.06 (m, 3H), 6.99 (d, 1H, ^3J = 7.0), 6.94 (d, 1H, ^3J = 9.0), 6.88 (d, 2H, ^3J = 8.5), 6.83 – 6.72 (m, 5H), 6.70 (d, 1H, ^3J = 9.0), 6.71 – 6.64 (m, 3H), 6.62 (dd, 1H, ^3J = 9.0, ^4J = 3.0), 6.54 – 6.48 (m, 4H), 6.39 (dd, 1H, ^3J = 9.0, ^4J = 3.0), 6.24 (d, 1H, ^4J = 3.0), 6.14 (s, 1H), 4.66 (s, 2H), 4.50 – 4.46 (m, 4H), 4.41 (s, 2H), 4.24 – 4.03 (m, 6H), 4.02 (d, 2H, ^3J = 5.5), 3.87 – 3.81 (m, 4H), 3.77 (d, 2H, ^3J = 5.5), 3.74 (s, 2H), 1.87 – 1.60 (m, 4H), 1.58 – 1.24 (m, 32H), 1.01 – 0.85 (m, 18H);

^{13}C NMR (101 MHz, $CDCl_3$): δ_C = 162.0, 156.0, 155.3, 150.5, 149.1, 148.2, 143.6, 143.6, 142.4, 142.4, 141.7, 138.8, 130.7, 129.6, 129.3, 127.8, 127.7, 127.5, 125.8, 125.0, 124.5, 123.3, 116.0, 115.6, 115.4, 113.7, 113.3, 112.7, 112.7, 112.5, 112.1, 111.8, 110.7, 110.5, 100.1, 71.7, 71.6, 70.8, 70.7, 65.3, 55.6, 55.0, 54.0, 51.7, 51.5, 51.1, 39.9, 39.8, 39.7, 39.4, 31.0, 30.9, 30.8, 30.7, 29.4, 29.3, 29.3, 24.3, 24.2, 24.2, 24.1, 23.3, 23.3, 23.2, 23.2, 14.3, 14.3, 11.5, 11.4, 11.4, 11.3;

HRMS (ES+): calculated for $C_{82}H_{112}N_5O_{11}$ 1342.8358, found 1342.8372;

FT-IR (thin film): ν_{max}/cm^{-1} 3052, 3007, 2961, 2930, 2873, 1505, 1468, 1382, 1340, 1264, 1225.

Synthesis of 12



6a (0.78 g, 0.70 mmol, 1 equiv.) and **1** (0.58 g, 1.1 mmol, 1.5 equiv.) were dissolved in $CHCl_3$ (5 mL) and $NaBH(OAc)_3$ (0.41 g, 2.0 mmol, 2.8 equiv.) was added with stirring. After 3 days the reaction was quenched with saturated aqueous $NaHCO_3$ solution, and extracted into $CHCl_3$ (4 × 10 mL). All the organic fractions were washed with water (1 × 10 mL), brine (1 × 10 mL) and dried ($MgSO_4$) before the solvent removed with a rotary evaporator. The crude product was purified using flash chromatography on silica eluting with a gradient from 0% to 50% EtOAc in hexane to yield a pale yellow oil (0.42 g, 36%).

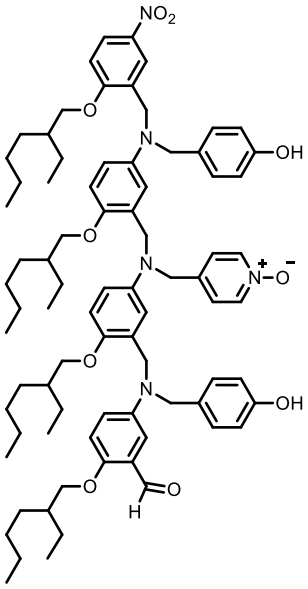
^{1}H NMR (500 MHz, $CDCl_3$): δ_H = 8.07 (dd, 1H, ^3J = 9.0, ^4J = 3.0), 8.01 – 7.97 (m, 3H), 7.03 – 6.98 (m, 4H), 6.86 (d, 2H, ^3J = 6.5), 6.84 – 6.76 (m, 6H), 6.72 – 6.62 (m, 3H), 6.52 – 6.43 (m, 3H), 6.40 (dd, 1H, ^3J = 9.0, ^4J = 3.0), 6.36 (d, 1H, ^4J = 3.0), 6.14 (s, 1H), 4.46 (s, 2H), 4.44 (s, 2H), 4.43 (s, 2H), 4.40 (s, 2H), 4.18 (s, 2H), 3.97 (s, 2H), 3.93 – 3.89 (m, 6H), 3.83 – 3.77 (m, 4H), 3.75 (d, 2H, ^3J = 5.5), 1.78 – 1.58 (m, 4H), 1.56 – 1.18 (m, 38H), 1.13 – 1.04 (m, 36H), 0.96 – 0.81 (m, 24H);

^{13}C NMR (101 MHz, $CDCl_3$): δ_C = 161.7, 155.1, 154.9, 149.6, 149.4, 143.2, 142.8, 142.5, 141.5, 139.6, 139.0, 131.4, 131.1, 128.9, 128.3, 128.0, 127.5, 126.9, 126.9, 124.4, 123.4, 120.1, 120.0, 114.2, 113.9, 113.7, 113.4, 112.5, 112.5, 112.4, 112.2, 111.9, 110.5, 99.8, 72.0, 71.6, 71.1, 70.9, 65.2, 55.4, 54.6, 53.4, 51.3, 50.4, 49.8, 39.8, 39.7, 39.3, 30.9, 30.8, 30.7, 30.7, 29.3, 29.3, 29.2, 24.2, 24.2, 24.1, 24.1, 23.3, 23.2, 23.2, 18.1, 18.1, 14.3, 14.3, 14.3, 12.8, 11.4, 11.3, 11.3;

HRMS (ES+): calculated for $C_{100}H_{152}N_5O_{11}Si_2$ 1655.1027, found 1655.0964;

FT-IR (thin film): ν_{max}/cm^{-1} 2927, 2866, 1609, 1592, 1506, 1464, 1339, 1261, 1225.

Synthesis of 13 (DAD)



12 (0.10 g, 0.062 mmol, 1 equiv.) was dissolved in THF (3 mL) at 0 °C and TBAF (110 μL, 0.11 mmol, 1.8 equiv.) was added with stirring. After 1 hour water (5 mL) was added and the aqueous mixture washed with diethyl ether (4 × 10 mL). All organic fractions were combined and washed with brine (1 × 10 mL) dried ($MgSO_4$) and the solvent removed with a rotary evaporator. The crude mixture was then purified via flash chromatography on silica eluting with a gradient from 0% to 5% of MeOH in DCM to yield the benzaldehyde derivative of expected product which is a viscous yellow oil (0.071 g, 85%).

^{1}H NMR (500 MHz, $CDCl_3$): δ_H = 10.44 (s, 1H), 8.12 (dd, 1H, ^3J = 9.0, ^4J = 3.0), 8.01 (d, 1H, ^4J = 3.0), 7.96 (d, 2H, J = 7.0), 7.25 (d, 1H, ^4J = 3.0), 6.92 – 6.88 (m, 3H), 6.87 – 6.83 (m, 4H), 6.81 (d, 1H, ^4J = 3.0), 6.79 (d, 1H, ^3J = 9.0), 6.74 – 6.70 (m, 3H), 6.67 – 6.63 (m, 3H), 6.52 (dd, 1H, ^3J = 9.0, ^4J = 3.0), 6.43 (d, 1H, ^4J = 3.0), 6.39 (dd, 1H, ^3J = 9.0, ^4J = 3.0), 6.33 (d, 1H, ^4J = 3.0), 4.56 (s, 2H), 4.42 (s, 2H), 4.38 (s, 2H), 4.32 (s, 2H), 4.19 (s, 2H), 3.97 (d, 2H, ^3J = 5.5), 3.90 (s, 2H), 3.86 (d, 2H, ^3J =

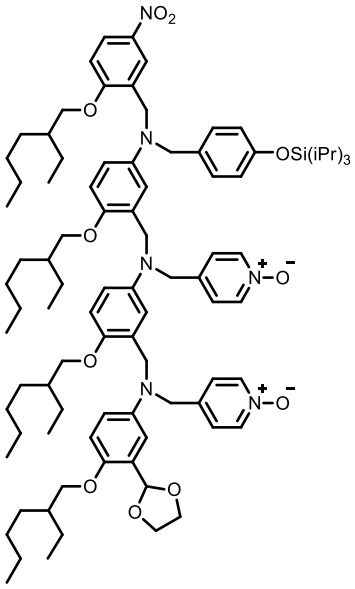
5.5), 3.83 (d, 2H, ^{3}J = 5.5), 3.71 (d, 2H, ^{3}J = 5.5), 1.80 – 1.67 (m, 4H), 1.53 – 1.19 (m, 32H), 0.96 – 0.81 (m, 24H);

^{13}C NMR (126 MHz, $CDCl_3$): δ_C = 190.5, 161.8, 155.4, 154.6, 149.6, 149.0, 143.8, 143.1, 142.6, 142.2, 141.4, 138.7, 130.0, 129.7, 128.7, 128.2, 127.6, 127.2, 126.2, 124.9, 124.4, 124.2, 123.1, 122.4, 115.8, 115.6, 113.8, 113.7, 113.0, 112.4, 112.3, 112.1, 111.5, 110.4, 71.4, 71.3, 70.8, 70.6, 55.5, 55.2, 53.3, 51.1, 51.0, 50.4, 39.6, 39.5, 39.2, 30.7, 30.6, 30.6, 30.5, 29.7, 29.1, 29.1, 29.0, 24.0, 24.0, 23.9, 23.1, 23.0, 23.0, 14.1, 14.0, 11.2, 11.2, 11.1;

HRMS (ES+): calculated for $C_{82}H_{112}N_5O_{11}$ 1342.8358, found 1342.8336;

FT-IR (thin film): ν_{max}/cm^{-1} 2959, 2928, 2871, 2856, 1680, 1666, 1613, 1592, 1505, 1465, 1340, 1263, 1225, 1165.

Synthesis of 14



6a (0.77 g, 0.69 mmol, 1 equiv.) and **2** (0.41 g, 1.0 mmol, 1.5 equiv.) were dissolved in $CHCl_3$ (5 mL) and $NaBH(OAc)_3$ (0.41 g, 1.9 mmol, 2.8 equiv.) was added with stirring. After 4 days the reaction was quenched with saturated aqueous $NaHCO_3$ solution, and extracted into $CHCl_3$ (4 × 10 mL). All the organic fractions were washed with water (1 × 10 mL), brine (1 × 10 mL) and dried ($MgSO_4$) before the solvent removed with a rotary evaporator. The crude product was purified using flash chromatography on silica eluting with a gradient from 0% to 10% EtOH in diethyl ether and then 2% to 10% EtOH in $CHCl_3$ to yield a pale yellow oil (0.31 g, 28%).

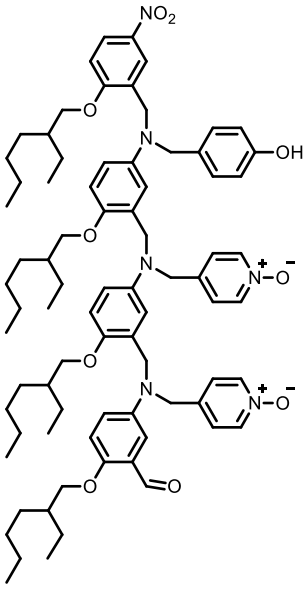
^{1}H NMR (500 MHz, $CDCl_3$): δ_H = 8.09 – 8.04 (m, 3H), 8.02 (d, 2H, ^3J = 7.0), 7.95 (d, 1H, ^4J = 3.0), 7.05 (d, 2H, ^3J = 7.0), 6.98 (d, 2H, ^3J = 8.5), 6.91 (d, 2H, ^3J = 7.0), 6.86 (d, 1H, ^3J = 9.0), 6.80 (d, 1H, ^4J = 3.0), 6.77 (d, 2H, ^3J = 8.5), 6.73 – 6.66 (m, 3H), 6.51 – 6.39 (m, 4H), 6.26 (d, 1H, ^4J = 3.0), 6.08 (s, 1H), 4.46 (s, 2H), 4.45 (s, 2H), 4.43 (s, 2H), 4.41 (s, 2H), 4.09 (s, 2H), 4.01 – 3.92 (m, 8H), 3.82 – 3.77 (m, 4H), 3.75 (d, 2H, ^3J = 5.5), 1.81 – 1.60 (m, 4H), 1.56 – 1.17 (m, 35H), 1.08 (d, 18H, ^3J = 7.0), 0.97 – 0.80 (m, 24H);

^{13}C NMR (101 MHz, $CDCl_3$): δ_C = 161.6, 155.0, 150.2, 149.4, 149.2, 142.6, 142.1, 142.1, 141.3, 139.3, 139.0, 138.8, 130.8, 128.6, 128.1, 126.8, 126.5, 126.3, 124.3, 124.2, 123.1, 119.9, 114.8, 113.6, 113.6, 113.4, 112.6, 112.4, 112.3, 112.0, 110.3, 99.3, 71.8, 71.5, 70.9, 70.8, 65.1, 55.2, 53.4, 53.1, 51.2, 50.3, 50.1, 39.5, 39.2, 30.6, 30.5, 29.1, 29.1, 29.0, 24.0, 24.0, 23.9, 23.0, 23.0, 23.0, 17.9, 14.1, 14.0, 12.6, 11.2, 11.1;

HRMS (ES+): calculated for $C_{90}H_{131}N_6O_{11}Si$ 1499.9645, found 1499.9701;

FT-IR (thin film): ν_{max}/cm^{-1} 2958, 2927, 2868, 1592, 1506, 1339, 1263.

Synthesis of 15 (DAA)



14 (0.078 g, 0.052 mmol, 1 equiv.) was dissolved in THF (3 mL) at 0 °C and TBAF (47 μL, 0.047 mmol, 0.9 equiv.) was added with stirring. After 1 hour water (5 mL) was added and the aqueous mixture washed with diethyl ether (4 × 10 mL). All organic fractions were combined and washed with brine (1 × 10 mL) dried ($MgSO_4$) and the solvent removed with a rotary evaporator. The crude mixture was then purified via flash chromatography on silica eluting with a gradient from 0% to 10% of MeOH in DCM to yield the benzaldehyde derivative of expected product which is a viscous yellow oil (0.057 g, 82%).

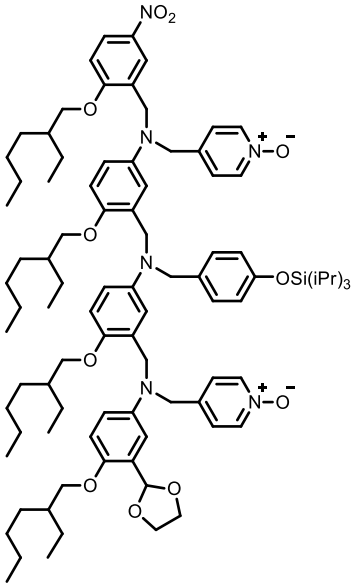
^{1}H NMR (500 MHz, $CDCl_3$): δ_H = 10.46 (s, 1H), 8.13 (dd, 1H, ^3J = 9.0, ^4J = 3.0), 8.08 (d, 2H, ^3J = 6.5), 7.99 (d, 1H, ^4J = 3.0), 7.90 (d, 2H, ^3J = 6.5 Hz), 7.11 (d, 1H, ^4J = 3.0), 7.01 (d, 2H, ^3J = 6.5), 6.93 – 6.87 (m, 4H), 6.84 – 6.78 (m, 2H), 6.76 – 6.64 (m, 5H), 6.59 (dd, 1H ^4J = 9.0, ^4J = 3.0), 6.47 (d, 1H, ^4J = 3.0), 6.42 – 6.38 (m, 1H), 6.24 (d, 1H, ^4J = 3.0), 4.56 (s, 2H), 4.43 (s, 2H), 4.40 (s, 2H), 4.34 (s, 2H), 4.20 (s, 2H), 3.98 (d, 2H, ^3J = 5.5), 3.93 – 3.88 (m, 4H), 3.80 (d, 2H, J = 5.5), 3.71 (d, 2H, ^3J = 5.5), 1.83 – 1.64 (m, 4H), 1.52 – 1.17 (m, 32H), 0.98 – 0.80 (m, 24H);

^{13}C NMR (101 MHz, $CDCl_3$): δ_C = 190.0, 161.8, 155.9, 155.1, 149.5, 149.0, 142.6, 142.3, 141.4, 140.3, 139.9, 138.9, 138.8, 129.4, 128.6, 127.6, 126.2, 125.9, 125.0, 124.5, 123.9, 123.0, 121.7, 115.8, 114.1, 113.9, 113.7, 112.6, 112.3, 111.7, 111.5, 110.4, 71.4, 71.4, 70.8, 70.6, 55.3, 53.7, 52.7, 51.5, 51.0, 50.9, 39.5, 39.2, 30.6, 30.6, 30.5, 29.7, 29.1, 29.1, 29.0, 24.0, 23.0, 23.0, 14.1, 11.2, 11.1;

HRMS (ES+): calculated for $C_{81}H_{111}N_6O_{11}$ 1343.8311, found 1343.8279;

FT-IR (thin film): ν_{max}/cm^{-1} 2957, 2925, 2855, 1682, 1612, 1503, 1339, 1226, 1167, 1019.

Synthesis of 16



8a (0.51 g, 0.46 mmol, 1 equiv.) and **2** (0.36 g, 0.91 mmol, 2 equiv.) were dissolved in $CHCl_3$ (3 mL) and $NaBH(OAc)_3$ (0.27 g, 1.3 mmol, 2.8 equiv.) was added with stirring. After 3 days the reaction was quenched with saturated aqueous $NaHCO_3$ solution, and extracted into $CHCl_3$ (4 × 10 mL). All the organic fractions were washed with water (1 × 10 mL), brine (1 × 10 mL) and dried ($MgSO_4$) before the solvent removed with a rotary evaporator. The crude product was purified using flash chromatography on silica eluting with a gradient from 0% to 10% EtOH in EtOAC to yield a pale yellow oil (0.38 g, 56%).

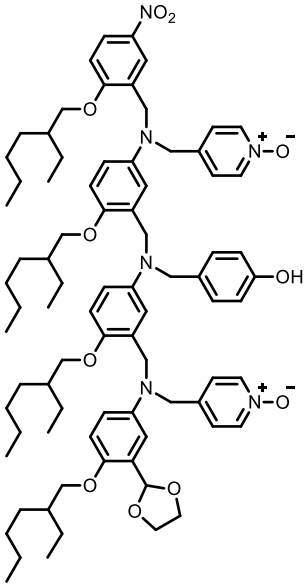
^{1}H NMR (400 MHz, $CDCl_3$): δ_H =8.03 (dd, 1H, ^3J = 9.0, ^4J = 3.0), 8.00 (d, 2H, ^3J = 7.0), 7.92 (d, 2H, ^3J = 7.0), 7.89 (d, 1H, ^4J = 3.0), 6.99 (d, 2H, ^3J = 7.0), 6.92 (d, 2H, ^3J = 8.5), 6.88 (d, 2H, ^3J = 7.0), 6.84 – 6.77 (m, 4H), 6.68 (d, 1H, ^3J = 9.0), 6.67 (d, 1H, ^3J = 9.0), 6.58 (d, 1H, ^3J = 9.0), 6.44 – 6.37 (m, 2H), 6.32 (d, 1H, ^4J = 3.0), 6.26 – 6.21 (m, 2H), 6.02 (s, 1H), 4.47 – 4.40 (m, 6H), 4.33 (s, 2H), 4.04 (s, 2H), 3.96 – 3.85 (m, 8H), 3.78 (d, 2H, ^3J = 5.5), 3.75 – 3.71 (m, 4H), 1.75 – 1.59 (m, 4H), 1.51 – 1.16 (m, 35H), 1.06 (d, 18H, ^3J = 7.5), 0.94 – 0.78 (m, 24H);

^{13}C NMR (101 MHz, $CDCl_3$): δ_C = 161.7, 154.9, 150.1, 150.0, 148.6, 142.6, 142.3, 141.4, 141.3, 139.8, 139.1, 139.0, 138.6, 131.6, 128.0, 127.9, 127.8, 127.0, 126.1, 124.8, 124.5, 124.4, 123.2, 120.2, 114.9, 113.8, 113.5, 112.6, 112.5, 112.3, 112.3, 112.2, 111.2, 110.8, 99.5, 72.0, 71.7, 70.9, 65.2, 54.8, 54.5, 53.2, 51.3, 50.8, 50.6, 39.8, 39.6, 39.3, 30.8, 30.8, 30.6, 29.3, 29.2, 29.2, 24.2, 24.1, 24.0, 23.2, 23.2, 23.2, 23.1, 18.1, 14.3, 14.2, 14.2, 12.8, 11.4, 11.3, 11.3, 11.2;

HRMS (ES+): calculated for $C_{90}H_{131}N_6O_{11}Si$ 1499.9645, found 1499.9578;

FT-IR (thin film): ν_{max}/cm^{-1} 2962, 2929, 2867, 1612, 1593, 1507, 1479, 1466, 1340, 1263.

Synthesis of 17 (ADA)



16 (0.11 g, 0.073 mmol, 1 equiv.) was dissolved in THF (3 mL) at 0 °C and TBAF (66 μL, 0.66 mmol, 0.9 equiv.) was added with stirring. After 1 hour water (5 mL) was added and the aqueous mixture washed with diethyl ether (4 × 10 mL). All organic fractions were combined and washed with brine (1 × 10 mL) dried ($MgSO_4$) and the solvent removed with a rotary evaporator. The crude mixture was then purified via flash chromatography on silica eluting with a gradient from 0% to 10% of MeOH in DCM to yield a viscous yellow oil (0.088 g, 89%).

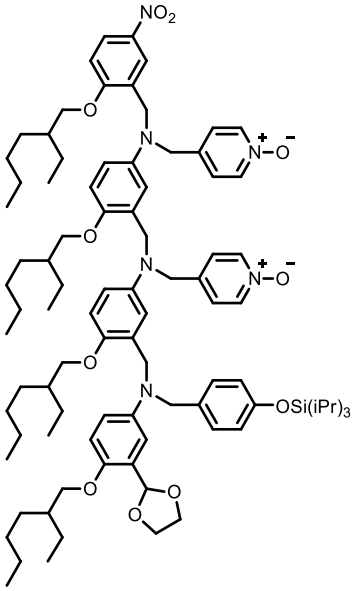
^{1}H NMR (500 MHz, $CDCl_3$): δ_H = 8.11 – 8.06 (m, 3H), 8.04 (d, 2H, ^3J = 7.0), 7.96 (d, 1H, ^4J = 3.0), 7.09 (d, 2H, ^3J = 7.0), 6.99 (d, 2H, ^3J = 7.0), 6.93 – 6.88 (m, 3H), 6.86 (d, 1H, ^3J = 9.0), 6.80 (d, 2H, ^3J = 8.5), 6.77 (d, 1H, ^3J = 9.0), 6.73 (d, 1H, ^3J = 9.0), 6.65 (d, 1H, ^3J = 9.0), 6.52 – 6.44 (m, 3H), 6.37 (dd, 1H, ^3J = 9.0, ^4J = 3.0), 6.29, (d, 1H, ^4J = 3.0), 6.10 (s, 1H), 4.51 (s, 2H), 4.49 (s, 2H), 4.47 (s, 2H), 4.43 (s, 2H), 4.10 (s, 2H), 4.07 – 3.91 (m, 8H), 3.85 – 3.78 (m, 6H), 1.82 – 1.65 (m, 4H), 1.56 – 1.23 (m, 32H), 0.99 – 0.84 (m, 24H).

^{13}C NMR (101 MHz, $CDCl_3$): δ_C = 161.6, 156.1, 150.2, 149.8, 148.6, 142.8, 142.2, 141.7, 141.3, 141.2, 139.6, 138.9, 138.8, 129.7, 128.3, 127.7, 126.7, 125.8, 124.7, 124.5, 124.5, 123.1, 115.9, 115.3, 113.6, 113.5, 113.2, 112.6, 112.2, 112.1, 112.0, 111.8, 110.6, 99.4, 71.8, 71.5, 70.7, 70.7, 65.1, 55.2, 54.3, 53.2, 51.7, 51.0, 50.6, 39.6, 39.5, 39.5, 39.2, 30.7, 30.7, 30.5, 29.1, 29.1, 29.1, 29.1, 24.1, 24.0, 23.9, 23.1, 23.1, 23.1, 23.0, 14.1, 14.1, 14.1, 11.2, 11.2, 11.2, 11.1;

HRMS (ES+): calculated for $C_{81}H_{111}N_6O_{11}$ 1343.8311, found 1343.8309;

FT-IR (thin film): ν_{max}/cm^{-1} 2956, 2927, 2856, 1682, 1612, 1593, 1504, 1464, 1339, 1265, 1225, 1165,

Synthesis of 18



9a (0.37 g, 0.38 mmol, 1 equiv.) and **1** (0.31 g, 0.76 mmol, 2 equiv.) were dissolved in $CHCl_3$ (3 mL) and $NaBH(OAc)_3$ (0.23 g, 1.1 mmol, 2.8 equiv.) was added with stirring. After 3 days the reaction was quenched with saturated aqueous $NaHCO_3$ solution, and extracted into $CHCl_3$ (4 × 10 mL). All the organic fractions were washed with water (1 × 10 mL), brine (1 × 10 mL) and dried ($MgSO_4$) before the solvent removed with a rotary evaporator. The crude product was purified using flash chromatography on silica eluting with a gradient from 0% to 10% MeOH in a 1:1 mixture of EtOAc and $CHCl_3$ to yield a pale yellow oil (0.11 g, 18%).

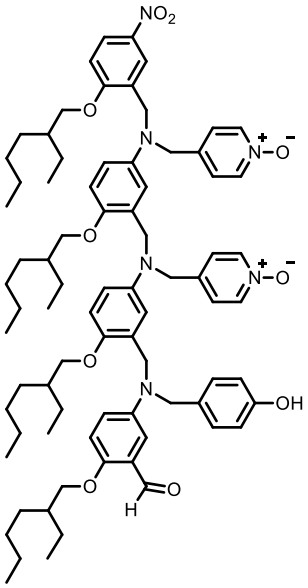
^{1}H NMR (400 MHz, $CDCl_3$): δ_H = 8.10 (dd, 1H, ^3J = 9.0, ^4J = 3.0), 8.03 (d, 2H, ^3J = 6.5), 7.99 (d, 2H, ^3J = 6.5), 7.93 (d, 1H, ^4J = 3.0), 7.01 (d, 2H, ^3J = 8.5), 6.89 – 6.94 (m, 4H), 6.88 (d, 1H, ^3J = 9.0), 6.82 (d, 1H, ^4J = 3.0), 6.77 (d, 2H, ^3J = 8.5), 6.62 – 6.72 (m, 3H), 6.49 (dd, 1H, ^3J = 9, ^4J = 3), 6.45 (dd, 1H, ^3J = 9, ^4J = 3), 6.39 (d, 1H, ^4J = 3.0), 6.35 (d, 1H, ^4J = 3.0), 6.31 (dd, 1H, ^3J = 9.0, ^4J = 3.0), 6.09 (s, 1H), 4.47 (s, 4H), 4.40 (s, 2H), 4.34 (s, 2H), 4.22 (s, 2H), 4.03 (s, 2H), 3.93 (d, 2H, ^3J = 5.5), 3.90 (s, 4H), 3.82 (d, 2H, ^3J = 5.5), 3.73 – 3.79 (m, 4H), 1.61 – 1.80 (m, 4H), 1.17 – 1.53 (m, 32H), 1.04 – 1.11 (m, 21H), 0.82 – 0.95 (m, 24H);

^{13}C NMR (101 MHz, $CDCl_3$): δ_C = 161.81, 155.00,150.14, 149.66, 149.45, 143.18, 142.21, 141.47, 141.37, 139.17, 139.10, 138.50, 131.32, 128.02, 127.81, 127.19, 126.88, 124.88, 124.49, 124.39, 123.29, 120.03, 114.41, 113.86, 113.78, 113.08, 112.76, 112.64, 112.45, 111.96, 110.81, 99.72, 72.04, 71.79, 71.09, 70.89, 68.14, 65.20, 55.08, 54.46, 53.51, 51.24, 50.90, 49.73, 39.74, 39.69, 39.62, 39.32, 30.83, 30.80, 30.66, 29.31, 29.24, 29.22, 29.17, 24.18, 24.09, 24.02, 23.22, 23.18, 23.14, 18.08, 14.27, 14.24, 12.80, 11.37, 11.34, 11.28;

HRMS (ES+): calculated for $C_{90}H_{131}N_6O_{11}Si$ 1499.9645, found 1499.9613;

FT-IR (thin film): ν_{max}/cm^{-1} 3020, 2400, 1521, 1425, 1265, 1217, 909.

Synthesis of 19 (AAD)



18 (0.054 g, 0.036 mmol, 1 equiv.) was dissolved in THF (3 mL) at 0 °C and TBAF (32 μL, 0.032 mmol, 0.9 equiv.) was added with stirring. After 1 hour water (5 mL) was added and the aqueous mixture washed with diethyl ether (4 × 10 mL). All organic fractions were combined and washed with brine (1 × 10 mL) dried ($MgSO_4$) and the solvent removed with a rotary evaporator. The crude mixture was then purified via flash chromatography on silica eluting with a gradient from 0% to 10% of MeOH in DCM to yield the benzaldehyde derivative of expected product which is a viscous yellow oil (0.041 g, 87%).

^{1}H NMR (400 MHz, $CDCl_3$): δ_H = 10.41 (s, 1H), 8.10 (dd, 1H, ^3J = 9.0, ^4J = 3.0), 8.04 (d, 2H, ^3J = 7.0), 7.97 (d, 2H, ^3J = 7.0), 7.92 (d, 1H, ^4J = 3.0), 7.11 (d, 1H, ^4J = 3.0), 7.00 (d, 2H, ^3J = 7.0), 6.93 (d, 2H, ^3J = 8.5), 6.90 – 6.85 (m, 3H), 6.80 (dd, 1H, ^3J = 9.0, ^4J = 3.0), 6.76 (d, 1H, ^3J = 9.0), 6.71 – 6.66 (m, 3H), 6.64 (d, 1H, ^3J = 9.0), 6.45 (dd, 1H, ^3J = 9.0, ^4J = 3.0), 6.34 (dd, 1H, ^3J = 9.0, ^4J = 3.0), 6.32 – 6.28 (m, 2H), 4.48 (s, 2H), 4.42 (s, 2H), 4.39 (s, 2H), 4.34 (s, 2H), 4.21 (s, 2H), 4.01 (s,

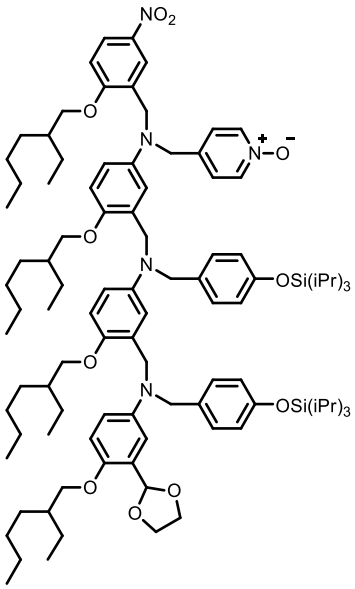
2H), 3.94 (d, 2H, ^{3}J = 5.5), 3.87 – 3.82 (m, 4H), 3,72 (d, 2H, ^{3}J = 5.5), 1.78 – 1.58 (m, 4H), 1.54 – 1.19 (m, 32H), 0.96 – 0.80 (m, 24H);

^{13}C NMR (126 MHz, $CDCl_3$): δ_C = 189.9, 161.7, 155.9, 154.5, 150.0, 149.3, 143.5, 142.2, 141.3, 141.1, 139.6, 139.5, 138.9, 138.9, 130.1, 128.5, 127.5, 127.3, 126.8, 124.9, 124.8, 124.4, 124.0, 123.0, 121.9, 115.7, 113.7, 113.2, 112.9, 112.5, 112.5, 112.3, 112.1, 111.9, 110.6, 71.6, 71.3, 70.8, 70.6, 56.6, 54.2, 52.5, 51.1, 50.5, 50.4, 39.6, 39.5, 39.4, 39.2, 30.7, 30.6, 30.5, 29.1, 29.1, 29.0, 29.0, 24.0, 24.0, 23.9, 23.1, 23.0, 23.0, 14.1, 14.0, 11.2, 11.2;

HRMS (ES+): calculated for $C_{79}H_{107}N_6O_{10}$ 1299.8049, found 1299.8041;

FT-IR (thin film): ν_{max}/cm^{-1} 3389, 2924, 2854, 1614, 1593, 1505, 1464, 1451, 1340, 1265, 1212, 1162, 1048.

Synthesis of 20



8a (0.33 g, 0.29 mmol, 1 equiv.) and **1** (0.32 g, 0.58 mmol, 2 equiv.) were dissolved in $CHCl_3$ (4 μL) and $NaBH(OAc)_3$ (0.35 g, 1.64 mmol, 5.6 equiv.) was added with stirring. After 4 days the reaction was quenched with saturated aqueous $NaHCO_3$ solution, and extracted into $CHCl_3$ (4 × 10 mL). All the organic fractions were washed with water (1 × 10 mL), brine (1 × 10 mL) and dried ($MgSO_4$) before the solvent removed with a rotary evaporator. The crude product was purified using flash chromatography on silica eluting with a gradient from 0% to 10% EtOH in a 1:1 mixture of EtOAc and hexane to yield a pale yellow oil (0.19 g, 39%).

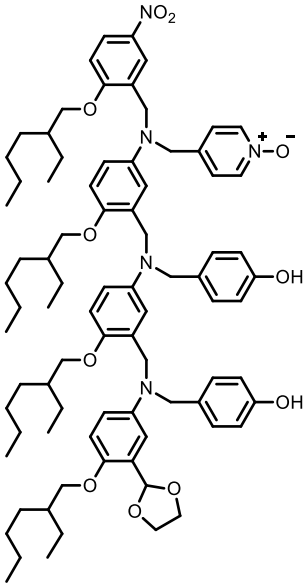
^{1}H NMR (500 MHz, $CDCl_3$): δ_H = 8.04 (dd, 1H, ^3J = 9.0, ^4J = 3.0), 7.96 – 7.92 (m, 3H), 6.98 – 6.92 (m, 4H), 6.88 – 6.83 (m, 3H), 6.79 (d, 2H, ^3J = 8.5), 6.72 (d, 2H, ^3J = 8.5), 6.67 (d, 2H, ^3J = 9.0), 6.58 (d, 1H, ^3J = 9.0), 6.50 (dd, 1H, ^3J = 9.0, ^4J = 3.0), 6.42 – 6.37 (m, 2H), 6.33 (d, 1H, ^4J = 3.0), 6.20 (dd, 1H, ^3J = 9.0, ^4J = 3.0), 6.08 (s, 1H), 4.46 (s, 2H), 4.44 (s, 2H), 4.43 (s, 2H), 4.30 (s, 2H), 4.09 (s, 2H), 4.04 (s, 2H), 3.92 – 3.83 (m, 6H), 3.80 (d, 2H, ^3J = 5.5), 3.76 – 3.70 (m, 4H), 1.76 – 1.60 (m, 4H), 1.56 – 1.14 (m, 38H), 1.12 – 1.01 (m, 36H), 0.96 – 0.78 (m, 24H);

^{13}C NMR (101 MHz, $CDCl_3$): δ_C = 161.7, 154.9, 154.8, 150.0, 149.1, 148.7, 143.4, 142.9, 141.5, 141.3, 139.1, 138.9, 131.6, 131.6, 128.1, 128.0, 127.9, 127.9, 127.4, 126.9, 124.8, 124.5, 123.3, 120.1, 119.9, 114.4, 114.0, 113.7, 112.5, 112.4, 112.3, 112.1, 111.7, 110.9, 110.8, 99.8, 72.1, 71.7, 71.0, 70.9, 65.1, 54.7, 54.5, 54.4(CH_2N), 51.5, 50.5, 49.8, 39.8, 39.7, 39.7, 39.4, 30.9, 30.8, 30.7, 29.3, 29.3, 29.2, 24.2, 24.2, 24.1, 24.0, 23.3, 23.2, 23.2, 23.2, 18.1, 18.1, 14.3, 14.3, 14.2, 12.8, 12.8, 11.4, 11.4, 11.3, 11.3;

HRMS (ES+): calculated for $C_{100}H_{152}N_5O_{11}Si_2$ 1655.1027, found 1655.1057;

FT-IR (thin film): ν_{max}/cm^{-1} 2957, 2926, 2955, 1608, 1591, 1504, 1463, 1339, 1260, 1225, 1165.

Synthesis of 21 (ADD)



20 (0.091 g, 0.055 mmol, 1 equiv.) was dissolved in THF (3 mL) at 0 °C and TBAF (100 μL, 0.10 mmol, 1.8 equiv.) was added with stirring. After 1 hour water (5 mL) was added and the aqueous mixture washed with diethyl ether (4 × 10 mL). All organic fractions were combined and washed with brine (1 × 10 mL) dried ($MgSO_4$) and the solvent removed with a rotary evaporator. The crude mixture was then purified via flash chromatography on silica eluting with a gradient from 0% to 5% of MeOH in $CHCl_3$ to yield a viscous yellow oil (0.071 g, 97%).

^{1}H NMR (500 MHz, $CDCl_3$): δ_H = 8.17 (dd, 1H, ^3J = 9.0, ^4J = 3.0), 8.12 (d, 2H, ^3J = 6.5), 8.01 (d, 1H, ^4J = 3.0), 7.00 (d, 2H, ^3J = 6.5), 6.96 – 6.89 (m, 3H), 6.86 (d, 1H, ^4J = 3.0), 6.80 – 6.66 (m, 7H), 6.58 (m, 3H), 6.49 – 6.39 (m, 3H), 6.36 (d, 1H, ^3J = 3.0), 6.12 (s, 1H), 4.55 (s, 2H), 4.43 (s, 2H), 4.37 (s, 2H), 4.34 (s, 2H), 4.25 (s, 2H), 4.10 – 3.94 (m, 6H), 3.87 (s, 2H), 3.84 (d, 2H, ^3J = 5.5), 3.82 – 3.75 (m, 4H), 1.85 – 1.61 (m, 4H), 1.59 – 1.21 (m, 32H), 1.02 – 0.80 (m, 24H);

^{13}C NMR (126 MHz, $CDCl_3$): δ_C = 161.7, 155.6, 154.7, 149.9, 149.5, 148.2, 143.9, 143.5, 141.4, 141.3, 141.2, 138.7, 131.0, 129.5, 128.9, 128.4, 127.8, 127.7, 127.3,

125.5, 124.8, 124.7, 123.0, 116.2, 115.5, 114.9, 113.5, 113.3, 112.5, 112.3, 111.8, 111.5, 111.2, 110.6, 100.6, 71.7, 71.5, 70.7, 70.6, 65.1, 57.7, 54.1, 53.7, 51.1, 50.8, 49.6, 39.7, 39.5, 39.5, 39.2, 30.8, 30.6, 30.5, 29.2, 29.1, 29.1, 29.0, 24.1, 24.0, 23.9, 23.1, 23.0, 23.0, 14.2, 14.1, 14.1, 11.3, 11.1, 11.1;

HRMS (ES+): calculated for $C_{82}H_{112}N_5O_{11}$ 1342.8358, found 1342.8383;

FT-IR (thin film): ν_{max}/cm^{-1} 2957, 2928, 2871, 2859, 1613, 1593, 1505, 1464, 1380, 1340, 1265, 1224, 1167, 1079, 1029.

NMR Binding studies

All association constants were measured by ^{1}H NMR spectroscopy. One species, labelled the host, was dissolved in toluene-d_8 to a known concentration. A second species, labelled the guest, was dissolved in the host solution at a known concentration such that the concentration of the host was the same in both solutions. A known volume of host was added to an NMR tube and the spectrum was measured. Known volumes of guest solution were added to the NMR tube, and the spectrum was measured after each addition. The chemical shifts of the host were recorded as a function of guest concentration and analysed using purpose-written macros in Microsoft Excel® to fit the experimental data to the appropriate binding isotherm. Errors were calculated as two times the standard deviation from the average value from repetitions.

All of the 3-mers dimerise to some extent in toluene solution, but the measured self-association constants were used make sure that all titration experiments were carried out under conditions where dimerization did not compete to a significant extent with the formation of 1:1 complexes. Consider the AAD•ADA complex as an example. Table 1 of the main text shows that log$K$ / M^{-1} for dimerization of AAD is 2.1, whereas for ADA, it is an order of magnitude lower, log$K$ / M^{-1} is 2.9. Thus ADA was used as the host in this titration at a concentration of 0.1 mM, where host dimerization is negligible. AAD was used as the guest, and the maximum guest concentration reached in the course of the titration was 4 mM, where guest dimerization is not significant (less than 20%). The titration data therefore fit well to a 1:1 binding isotherm. It was also possible to fit the data to a more complex isotherm that allows for dimerization of both host and guest as well as formation of the 1:1 complex, but when this was done for the AAD•ADA complex, the value of log$K$ / M^{-1} changed by less than 0.1, which is within the experimental error. Thus it was possible to obtain reliable 1:1 association constants by fitting the titration data to simple 1:1 binding isotherms.

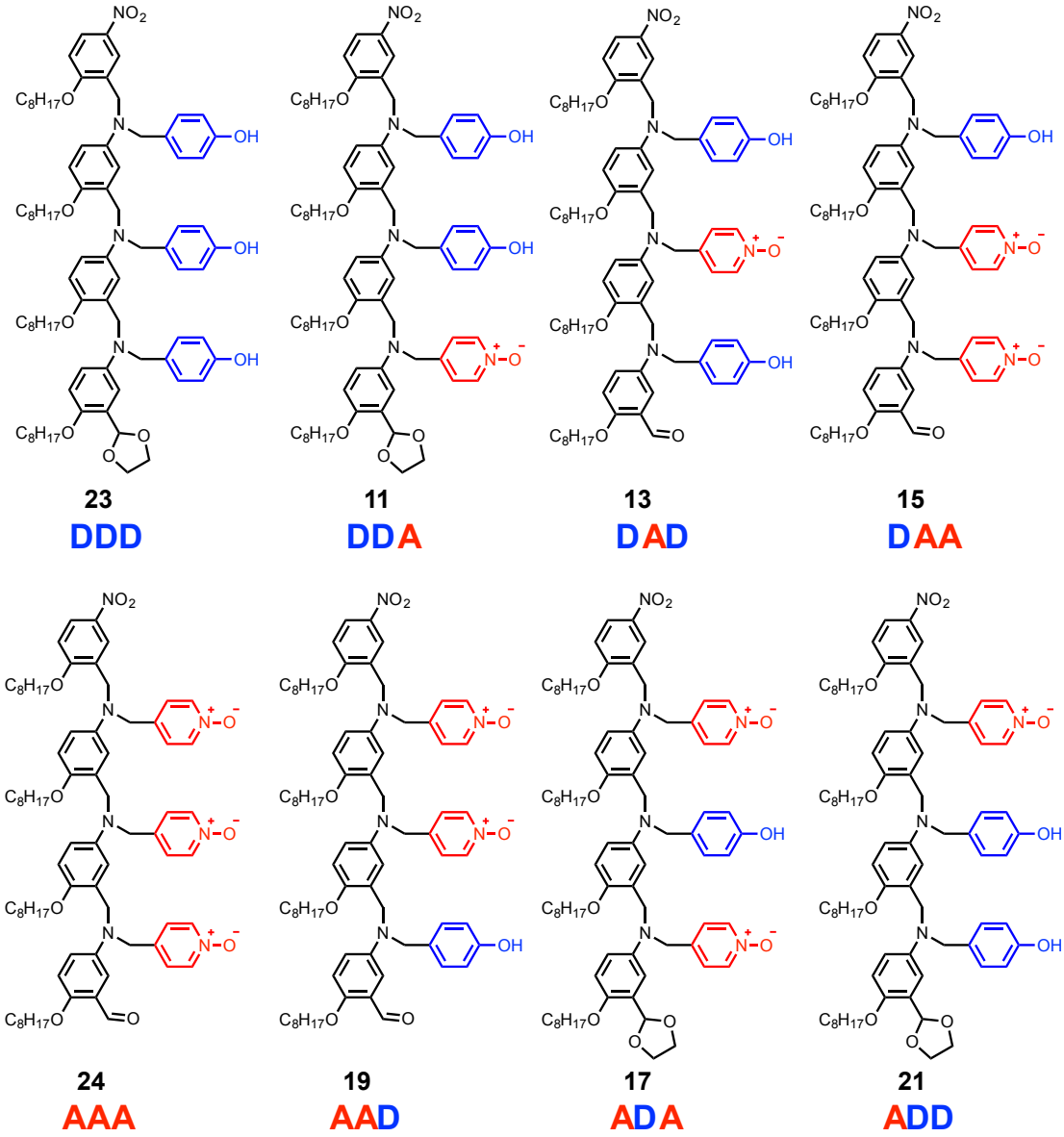


Figure S1 Eight 3-mers with all the possible sequences of H-bond donor phenol (D) and H-bond acceptor N-oxide (A) groups.

1 Data for titrations using AAD as host

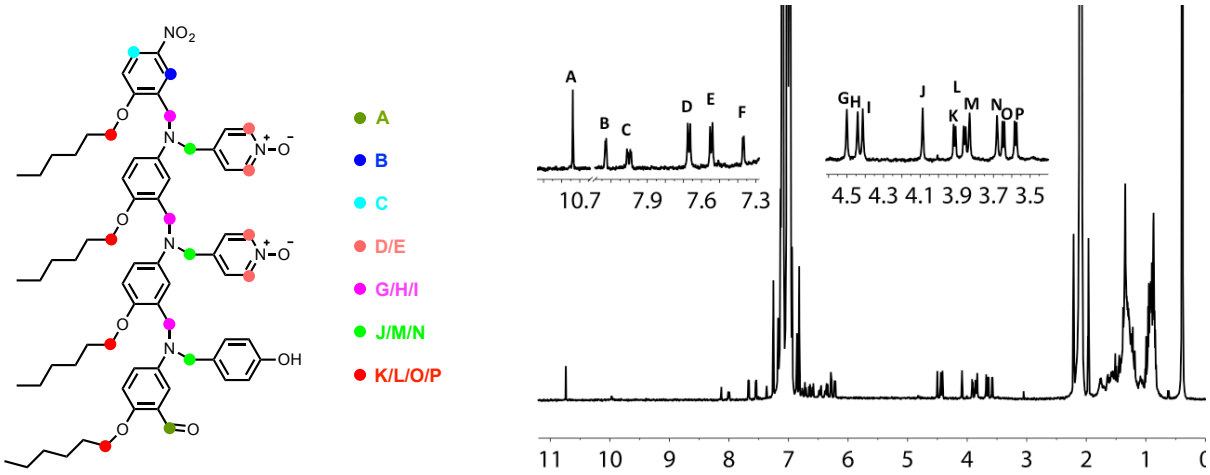


Figure S2 ^{1}H NMR spectrum of **AAD** (0.1 mM) 3-mer in toluene-d_8 and the signal labeling key.

Table S1 Complexation-induced changes in ^{1}H NMR chemical shift (ppm) obtained by fitting titration data measured in toluene-d_8 at 298 K to a 1:1 binding isotherm. See Figure S2 for the signal labeling key.

Host	Guest	Signal														
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
AAD	DDA				0.09	0.13	0.05				0.04						
AAD	DDD	-0.04		0.02		0.14	0.06			0.04	0.03	0.01					0.03
AAD	DAD	-0.01			0.07	0.22	0.06		.004		0.03		-0.07				0.02
AAD	ADD	-.005	0.02		-0.30	0.24	0.02	0.30	0.20	-0.01	-0.20						0.02
AAD	DAA	0.01	0.01			0.22	0.07	0.07	0.06		0.08				0.11		

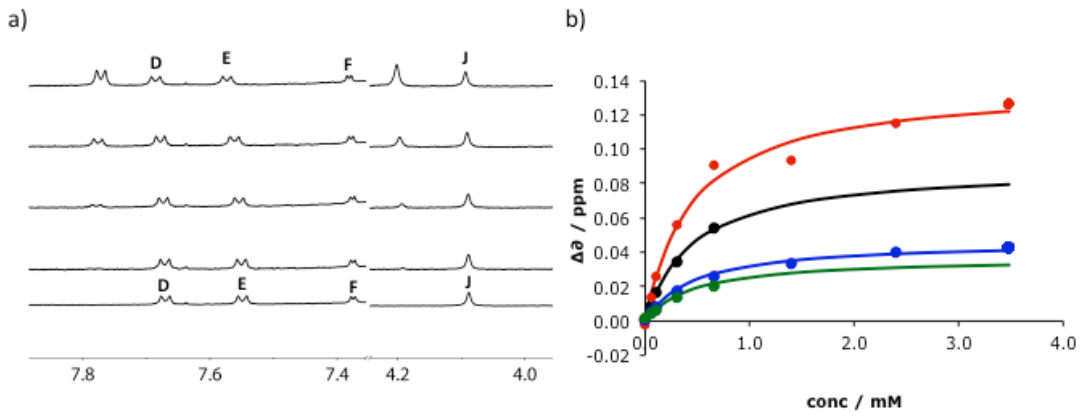


Figure S3 ^{1}H NMR data for titration of **DDA** into **AAD** (0.1 mM) at 298 K in toluene-d_8. (a) Example 500 MHz ^{1}H NMR spectra. (b) Plot of the change in chemical shift of the ^{1}H signal as a function of guest concentration (the lines represent the best fit to a 1:1 binding isotherm). The average association constant K = 2200±150 M^{-1} was obtained as the result of two independent measurements and the error is reported as two times the standard deviation (95% confidence limit)

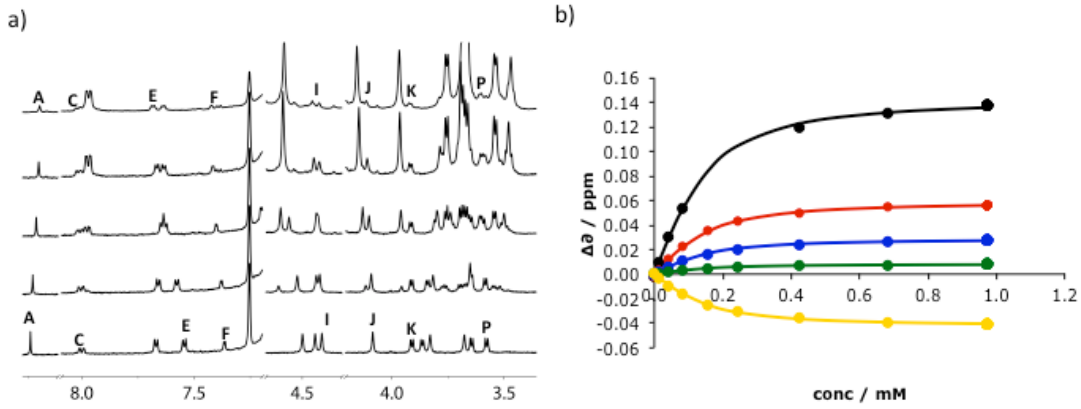


Figure S4 ^{1}H NMR data for titration of **DDD** into **AAD** (0.1 mM) at 298 K in toluene-d_8. (a) Example 500 MHz ^{1}H NMR spectra. (b) Plot of the change in chemical shift of the ^{1}H signal as a function of guest concentration (the lines represent the best fit to a 1:1 binding isotherm). The average association constant K = 15400±8500 M^{-1} was obtained as the result of two independent measurements and the error is reported as two times the standard deviation (95% confidence limit

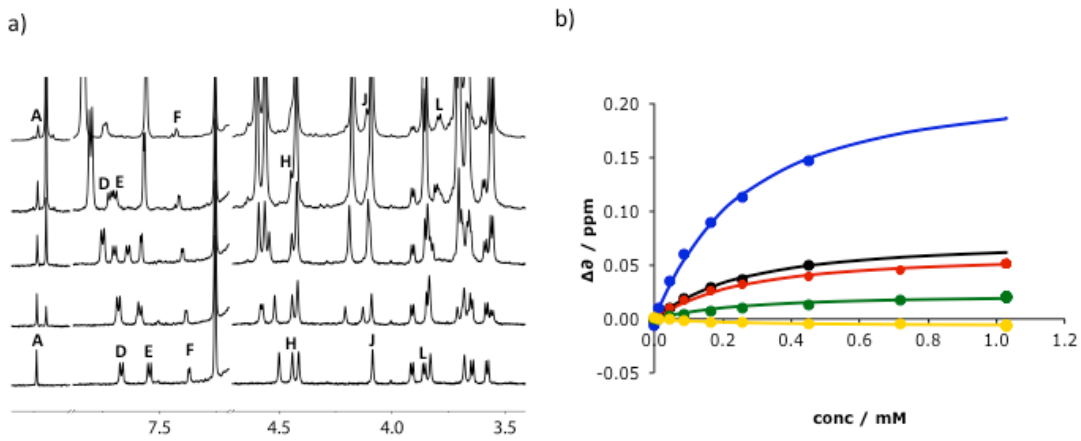


Figure S5 ^{1}H NMR data for titration of **DAD** into **AAD** (0.1 mM) at 298 K in toluene-d_8. (a) Example 500 MHz ^{1}H NMR spectra. (b) Plot of the change in chemical shift of the ^{1}H signal as a function of guest concentration (the lines represent the best fit to a 1:1 binding isotherm). The average association constant K = 6300±3000 M^{-1} was obtained as the result of two independent measurements and the error is reported as two times the standard deviation (95% confidence limit)

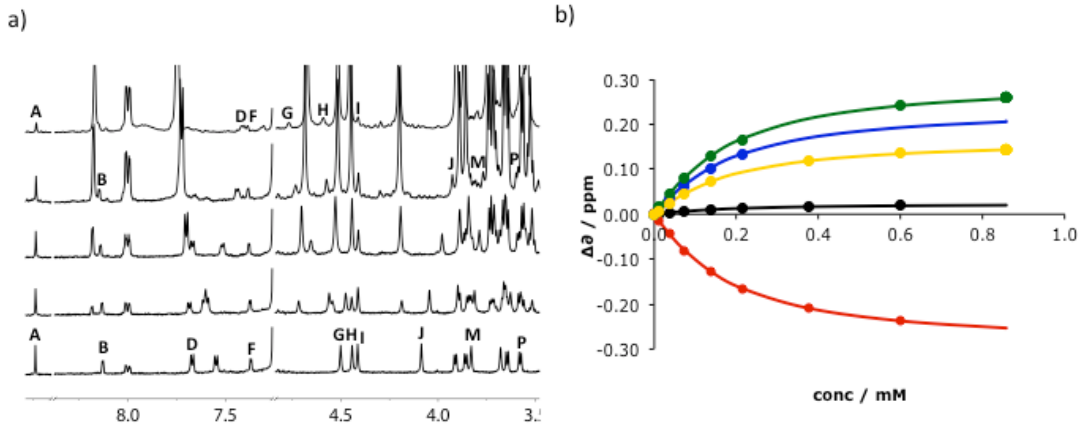


Figure S6 ^{1}H NMR data for titration of **ADD** into **AAD** (0.1 mM) at 298 K in toluene-d_8. (a) Example 500 MHz ^{1}H NMR spectra. (b) Plot of the change in chemical shift of the ^{1}H signal as a function of guest concentration (the lines represent the best fit to a 1:1 binding isotherm). The average association constant K = 8000±700 M^{-1} was obtained as the result of two independent measurements and the error is reported as two times the standard deviation (95% confidence limit)

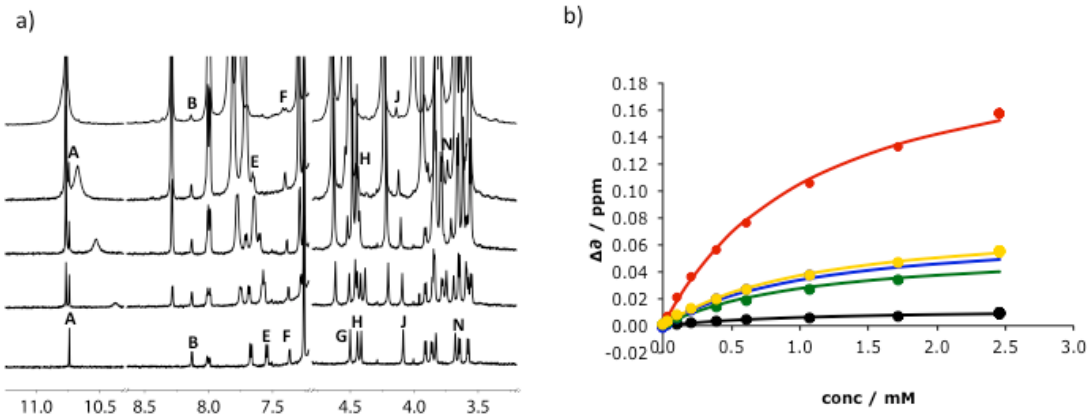


Figure S7 ^{1}H NMR data for titration of **DAA** into **AAD** (0.1 mM) at 298 K in toluene-d_8. (a) Example 500 MHz ^{1}H NMR spectra. (b) Plot of the change in chemical shift of the ^{1}H signal as a function of guest concentration (the lines represent the best fit to a 1:1 binding isotherm). The average association constant K = 800±600 M^{-1} was obtained as the result of two independent measurements and the error is reported as two times the standard deviation (95% confidence limit)

2 Data for titrations using DAD as host

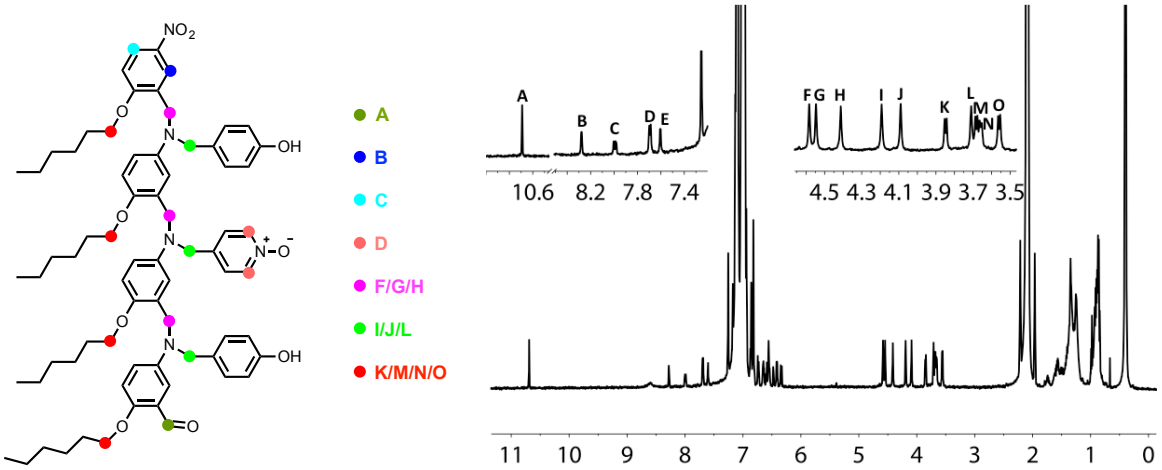


Figure S8 ^{1}H NMR spectrum of **DAD** (0.1 mM) 3-mer in toluene-d_8 and the signal labeling key.

Table S2 Complexation-induced changes in ^{1}H NMR chemical shift (ppm) obtained by fitting titration data measured in toluene-d_8 at 298 K to a 1:1 binding isotherm. See Figure S8 for the signal labeling key.

Host	Guest	Signal															
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
DAD	AAA	0.06	0.07			-.06	0.07	0.18		0.06	0.29					0.02	
DAD	DDA	0.03							0.04		0.17					0.01	
DAD	DDD	-0.04			-0.08	0.03			0.02	0.04							

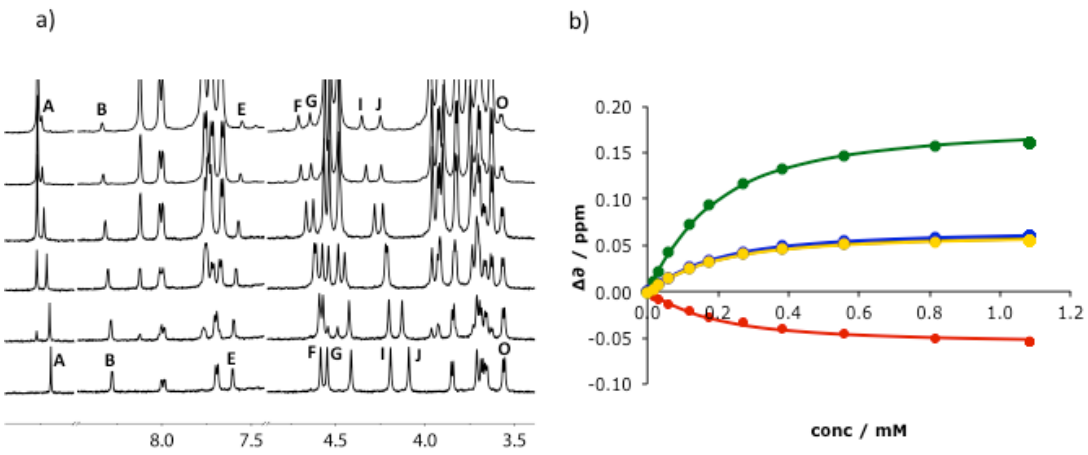


Figure S9 ^{1}H NMR data for titration of **AAA** into **DAD** (0.1 mM) at 298 K in toluene-d_8. (a) Example 500 MHz ^{1}H NMR spectra. (b) Plot of the change in chemical shift of the ^{1}H signal as a function of guest concentration (the lines represent the best fit to a 1:1 binding isotherm). The average association constant K = 8400±600 M^{-1} was obtained as the result of two independent measurements and the error is reported as two times the standard deviation (95% confidence limit)

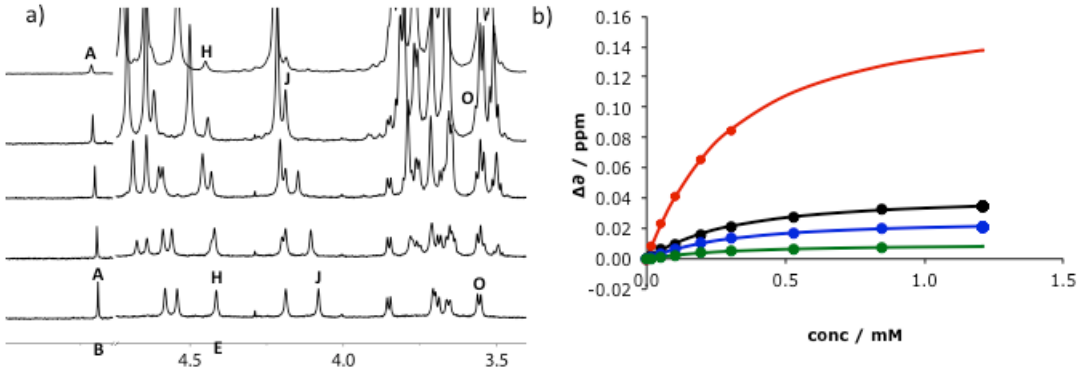


Figure S10 ^{1}H NMR data for titration of **DDA** into **DAD** (0.1 mM) at 298 K in toluene-d_8. (a) Example 500 MHz ^{1}H NMR spectra. (b) Plot of the change in chemical shift of the ^{1}H signal as a function of guest concentration (the lines represent the best fit to a 1:1 binding isotherm). Due to lack of material, this experiment was carried out once giving an association constant of K = 4200 M^{-1}

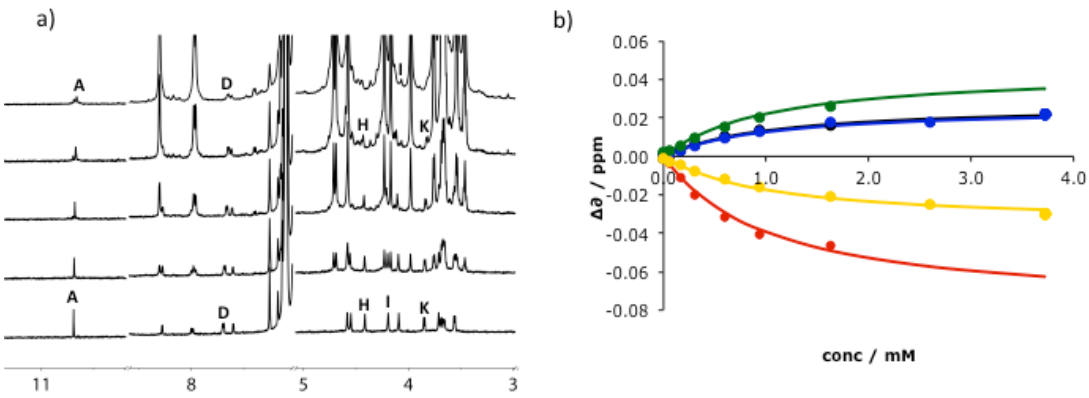


Figure S11 ^{1}H NMR data for titration of **DDD** into **DAD** (0.1 mM) at 298 K in toluene-d_8. (a) Example 500 MHz ^{1}H NMR spectra. (b) Plot of the change in chemical shift of the ^{1}H signal as a function of guest concentration (the lines represent the best fit to a 1:1 binding isotherm). Due to lack of material, this experiment was carried out once giving an association constant of K = 1000 M^{-1}

3 Data for titrations using ADD as host

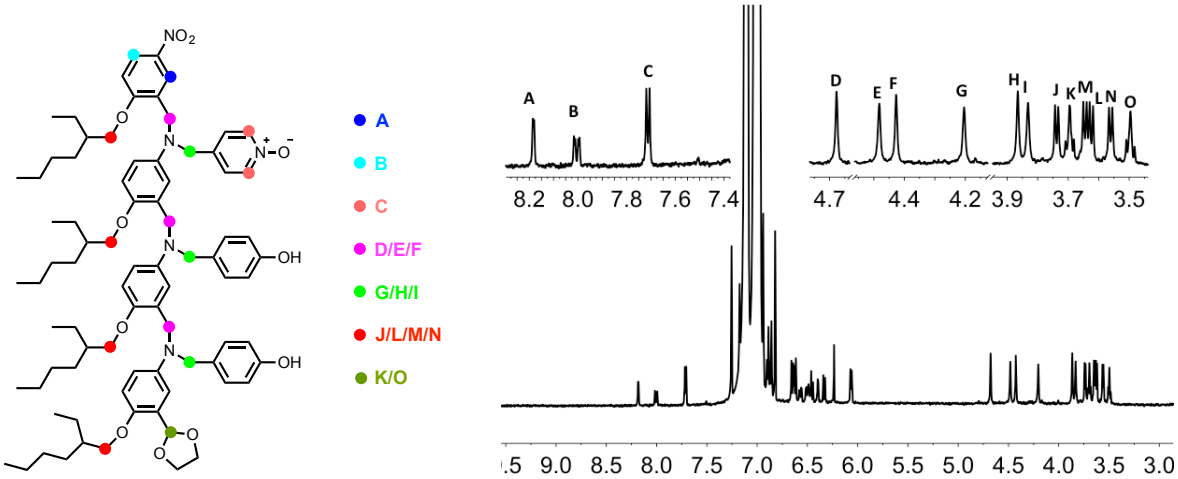


Figure S12 ^{1}H NMR spectrum of **ADD** (0.1 mM) 3-mer in toluene-d_8 and the signal labeling key.

Table S3 Complexation-induced changes in ^{1}H NMR chemical shift (ppm) obtained by fitting titration data measured in toluene-d_8 at 298 K to a 1:1 binding isotherm. See Figure S12 for the signal labeling key.

Host	Guest	Signal													
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
ADD	AAA	-0.03			-0.02	0.20		-0.02	0.24		0.06				0.04	0.10
ADD	DDA	-0.02		0.05	-0.04	0.04			0.07							
ADD	DAD	-0.03		0.06	-0.04	0.05		0.01	0.06		0.02					0.05
ADD	DDD			0.05	-0.06				0.14	0.12						

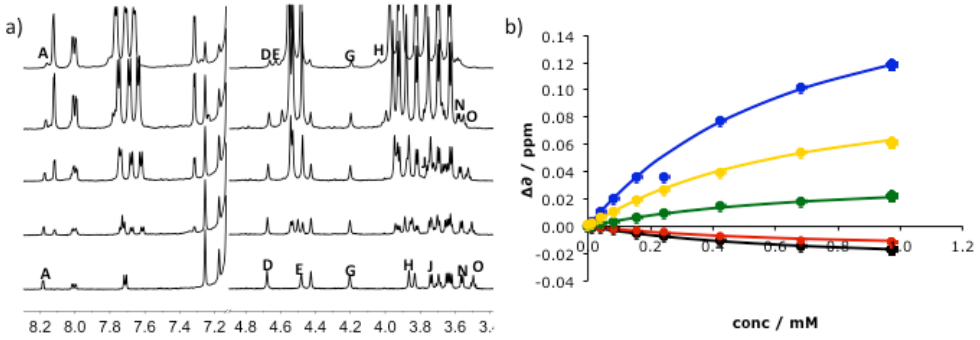


Figure S13 ^{1}H NMR data for titration of **AAA** into **ADD** (0.1 mM) at 298 K in toluene-d_8. (a) Example 500 MHz ^{1}H NMR spectra. (b) Plot of the change in chemical shift of the ^{1}H signal as a function of guest concentration (the lines represent the best fit to a 1:1 binding isotherm). The average association constant K = 1600±200 M^{-1} was obtained as the result of two independent measurements and the error is reported as two times the standard deviation (95% confidence limit)

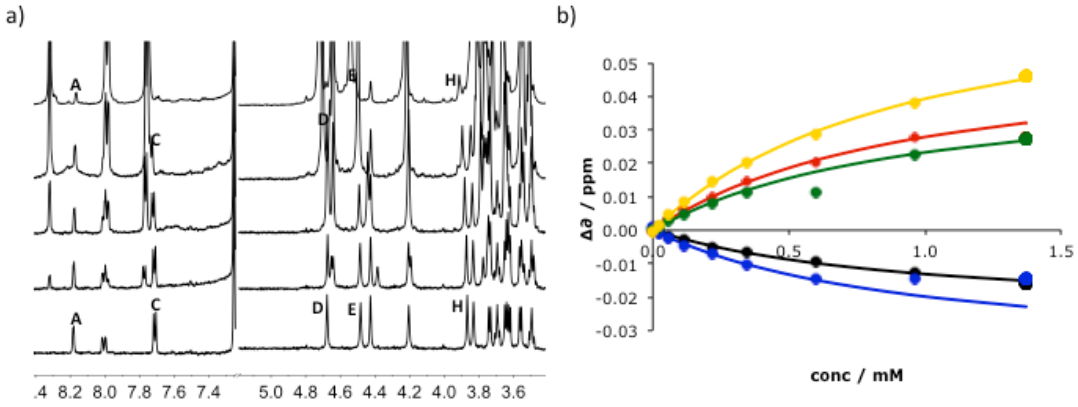


Figure S14 ^{1}H NMR data for titration of **DDA** into **ADD** (0.1 mM) at 298 K in toluene-d_8. (a) Example 500 MHz ^{1}H NMR spectra. (b) Plot of the change in chemical shift of the ^{1}H signal as a function of guest concentration (the lines represent the best fit to a 1:1 binding isotherm). Due to lack of material, this experiment was carried out once giving an association constant of K = 1200 M^{-1}

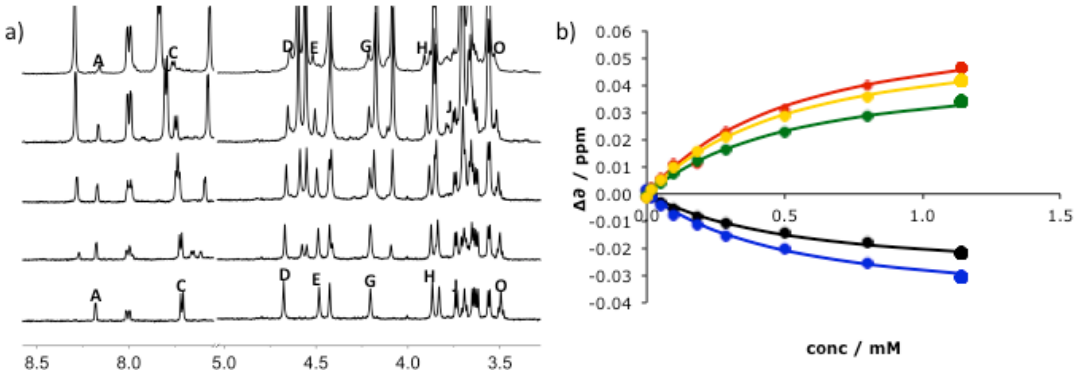


Figure S15 ^{1}H NMR data for titration of **DAD** into **ADD** (0.1 mM) at 298 K in toluene-d_8. (a) Example 500 MHz ^{1}H NMR spectra. (b) Plot of the change in chemical shift of the ^{1}H signal as a function of guest concentration (the lines represent the best fit to a 1:1 binding isotherm). The average association constant K = 2200±300 M^{-1} was obtained as the result of two independent measurements and the error is reported as two times the standard deviation (95% confidence limit)

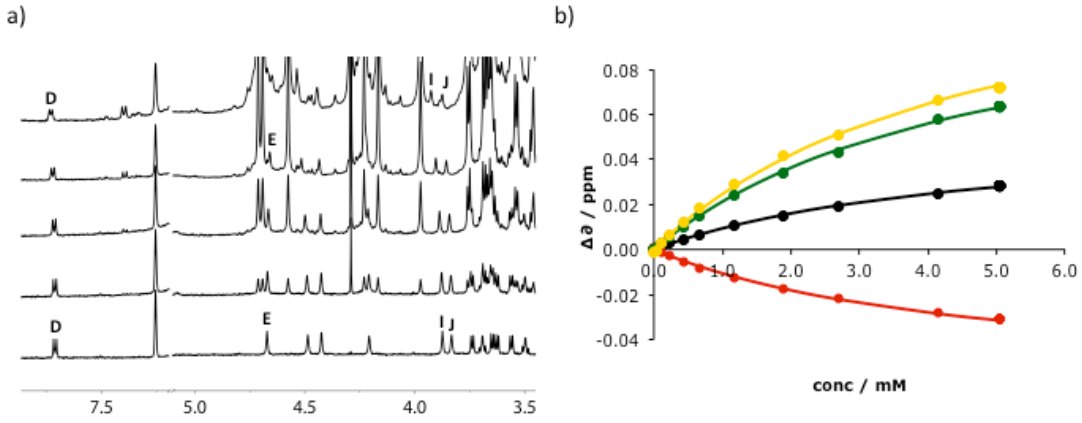


Figure S16 ^{1}H NMR data for titration of **DDD** into **ADD** (0.1 mM) at 298 K in toluene-d_8. (a) Example 500 MHz ^{1}H NMR spectra. (b) Plot of the change in chemical shift of the ^{1}H signal as a function of guest concentration (the lines represent the best fit to a 1:1 binding isotherm). Due to lack of material, this experiment was carried out once giving an association constant of K = 200 M^{-1}

4 Data for titrations using AAA as host

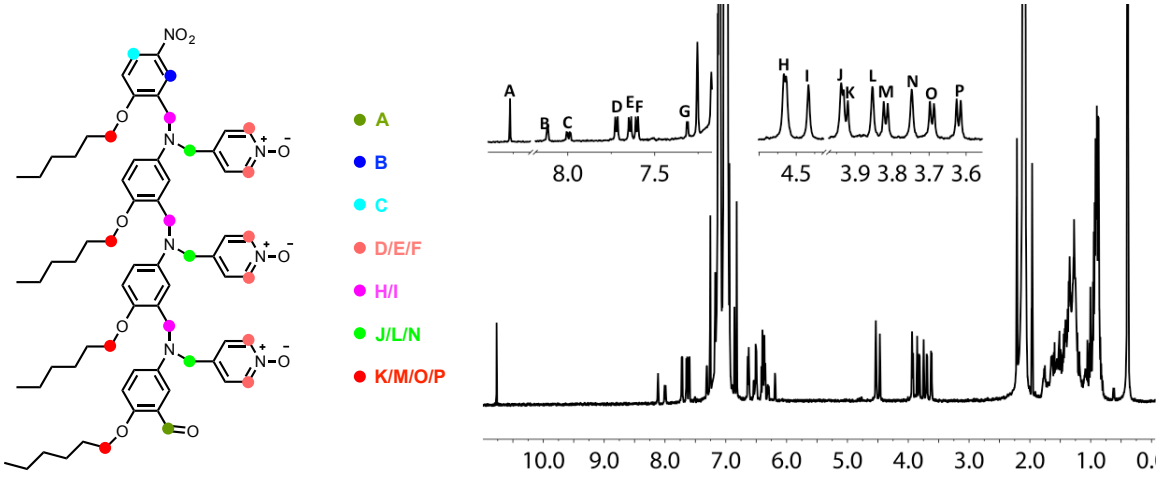


Figure S17 ^{1}H NMR spectrum of **AAA** (0.1 mM) 3-mer in toluene-d_8 and the signal labeling key.

Table S4 Complexation-induced changes in ^{1}H NMR chemical shift (ppm) obtained by fitting titration data measured in toluene-d_8 at 298 K to a 1:1 binding isotherm. See Figure S17 for the signal labeling key.

Host	Guest	Signal														
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
AAA	DDA		0.01	0.02			0.17	0.01	0.10		0.07		0.16			0.01	0.01

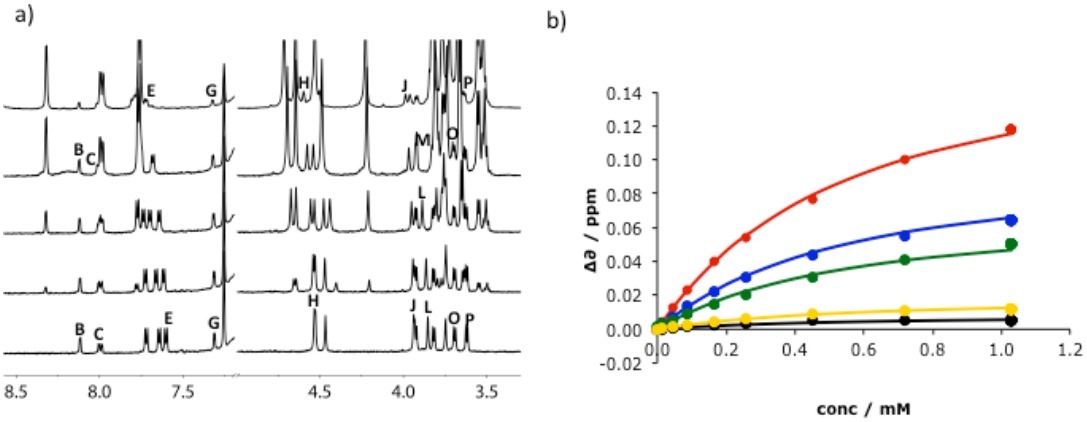


Figure S18 ^{1}H NMR data for titration of **DDA** into **AAA** (0.1 mM) at 298 K in toluene-d_8. (a) Example 500 MHz ^{1}H NMR spectra. (b) Plot of the change in chemical shift of the ^{1}H signal as a function of guest concentration (the lines represent the best fit to a 1:1 binding isotherm). Due to lack of material, this experiment was carried out once giving an association constant of K = 2200 M^{-1}

5 Data for titrations using DDA as host

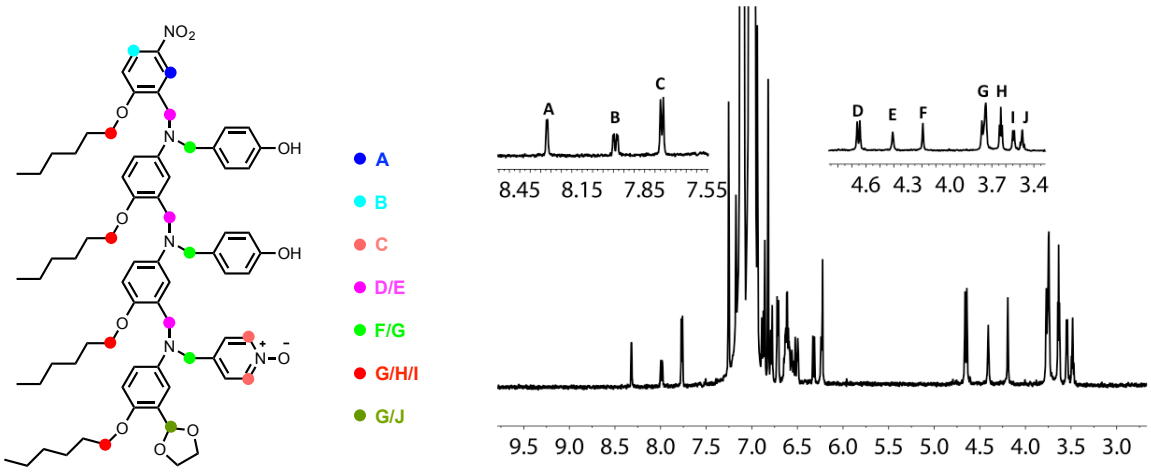


Figure S19 ^{1}H NMR spectrum of **AAA** (0.1 mM) 3-mer in toluene-d_8 and the signal labeling key.

Table S5 Complexation-induced changes in ^{1}H NMR chemical shift (ppm) obtained by fitting titration data measured in toluene-d_8 at 298 K to a 1:1 binding isotherm. See Figure S19 for the signal labeling key.

Host	Guest	Signal															
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
DDA	AAA	0.02				0.17	0.12										

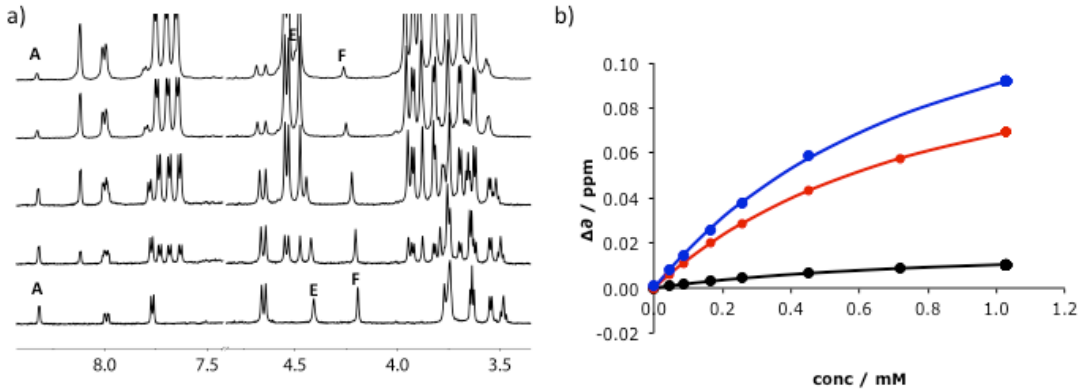


Figure S20 ^{1}H NMR data for titration of **AAA** into **DDA** (0.1 mM) at 298 K in toluene-d_8. (a) Example 500 MHz ^{1}H NMR spectra. (b) Plot of the change in chemical shift of the ^{1}H signal as a function of guest concentration (the lines represent the best fit to a 1:1 binding isotherm). Due to lack of material, this experiment was carried out once giving an association constant of K = 1300 M^{-1}

6 Data for titrations using ADA as host

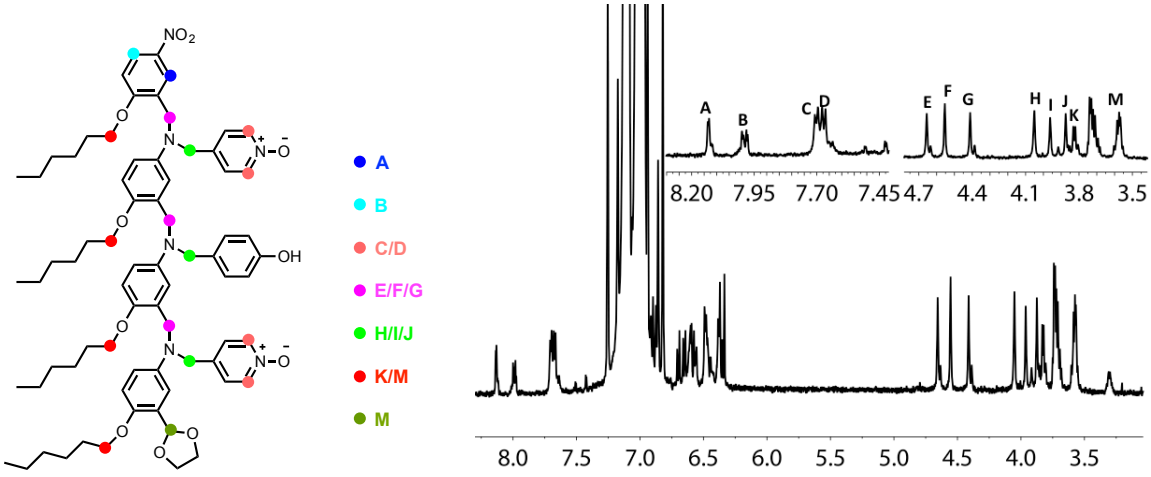


Figure S21 ^{1}H NMR spectrum of **ADA** (0.1 mM) 3-mer in toluene-d_8 and the signal labeling key.

Table S6 Complexation-induced changes in ^{1}H NMR chemical shift (ppm) obtained by fitting titration data measured in toluene-d_8 at 298 K to a 1:1 binding isotherm. See Figure S21 for the signal labeling key.

Host	Guest	Signal															
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
ADA	AAD					0.05			-0.08	0.08							
ADA	DAD	0.03		0.17		0.07	0.07	0.05	-0.22	0.08							
ADA	DDD							0.06	-0.15	0.08							
ADA	DDA	0.02		0.15	0.08		0.10	0.03	-0.09	0.07							
ADA	ADD	0.01		0.20	0.05	0.06			-0.24	0.10							

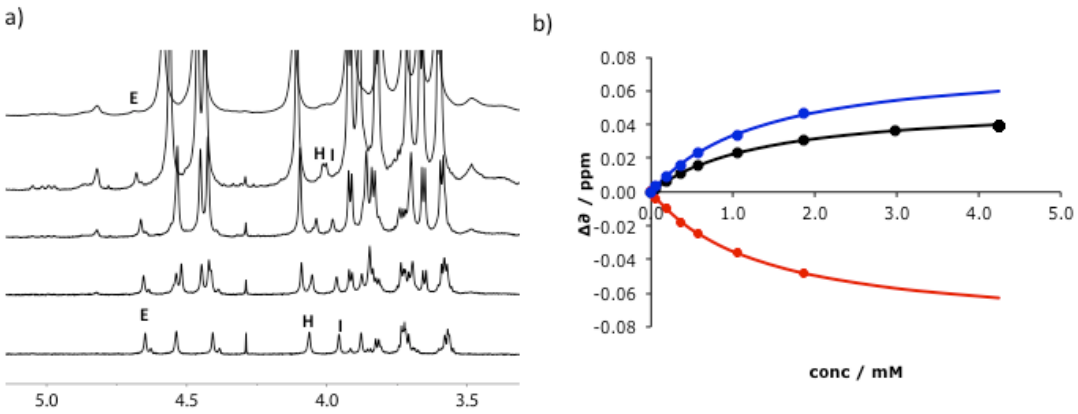


Figure S22 ^{1}H NMR data for titration of **AAD** into **ADA** (0.1 mM) at 298 K in toluene-d_8. (a) Example 500 MHz ^{1}H NMR spectra. (b) Plot of the change in chemical shift of the ^{1}H signal as a function of guest concentration (the lines represent the best fit to a 1:1 binding isotherm). The average association constant K = 1000±700 M^{-1} was obtained as the result of two independent measurements and the error is reported as two times the standard deviation (95% confidence limit)

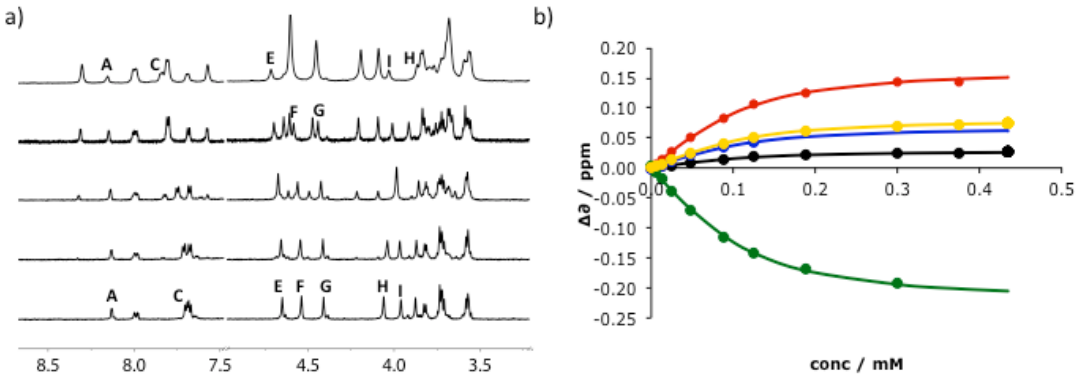


Figure S23 ^{1}H NMR data for titration of **DAD** into **ADA** (0.1 mM) at 298 K in toluene-d_8. (a) Example 500 MHz ^{1}H NMR spectra. (b) Plot of the change in chemical shift of the ^{1}H signal as a function of guest concentration (the lines represent the best fit to a 1:1 binding isotherm). The average association constant K = 25300±14000 M^{-1} was obtained as the result of two independent measurements and the error is reported as two times the standard deviation (95% confidence limit)

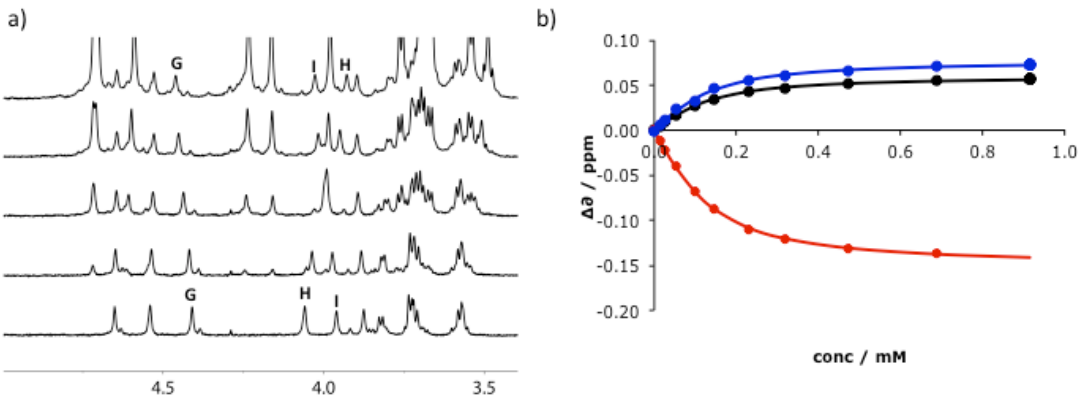


Figure S24 ^{1}H NMR data for titration of **DDD** into **ADA** (0.1 mM) at 298 K in toluene-d_8. (a) Example 500 MHz ^{1}H NMR spectra. (b) Plot of the change in chemical shift of the ^{1}H signal as a function of guest concentration (the lines represent the best fit to a 1:1 binding isotherm). The average association constant K = 14800±5000 M^{-1} was obtained as the result of two independent measurements and the error is reported as two times the standard deviation (95% confidence limit)

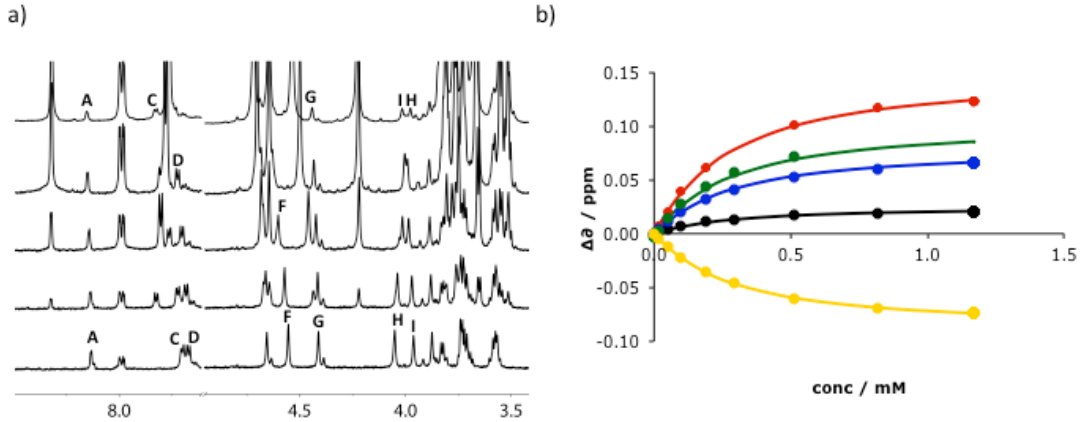


Figure S25 ^{1}H NMR data for titration of **DDA** into **ADA** (0.1 mM) at 298 K in toluene-d_8. (a) Example 500 MHz ^{1}H NMR spectra. (b) Plot of the change in chemical shift of the ^{1}H signal as a function of guest concentration (the lines represent the best fit to a 1:1 binding isotherm). The average association constant K = 4600±250 M^{-1} was obtained as the result of two independent measurements and the error is reported as two times the standard deviation (95% confidence limit)

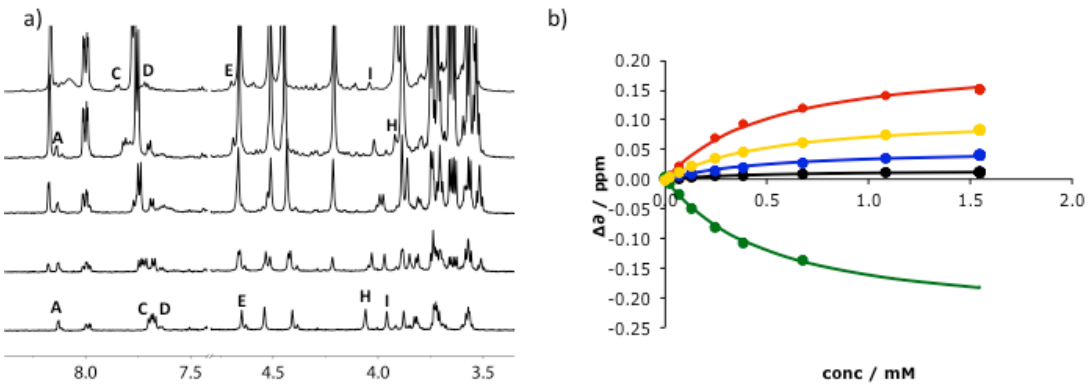


Figure S26 ^{1}H NMR data for titration of **ADD** into **ADA** (0.1 mM) at 298 K in toluene-d_8. (a) Example 500 MHz ^{1}H NMR spectra. (b) Plot of the change in chemical shift of the ^{1}H signal as a function of guest concentration (the lines represent the best fit to a 1:1 binding isotherm). The average association constant K = 2300±100 M^{-1} was obtained as the result of two independent measurements and the error is reported as two times the standard deviation (95% confidence limit)

7 Data for titrations using DAA as host

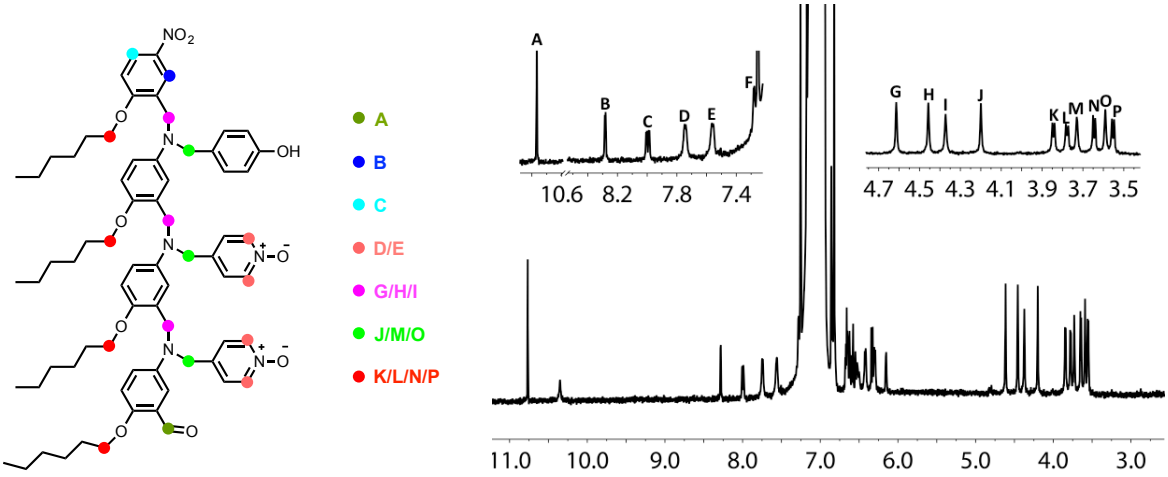


Figure S27 ^{1}H NMR spectrum of **DAA** (0.1 mM) 3-mer in toluene-d_8 and the signal labeling key.

Table S7 Complexation-induced changes in ^{1}H NMR chemical shift (ppm) obtained by fitting titration data measured in toluene-d_8 at 298 K to a 1:1 binding isotherm. See Figure S27 for the signal labeling key.

Host	Guest	Signal														
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
DAA	DDD	-0.06			0.04	0.20		0.01	0.01	0.08	0.02						
DAA	ADD	-0.03			0.12		0.04	0.01									
DAA	ADA						0.01	0.03	0.06	0.20	0.04				0.04		0.02
DAA	DDA	-0.01	0.02			0.22				0.23				0.29			0.02
DAA	DAD	-0.01			0.10	0.26	0.03	0.03	0.05	0.20	0.03			0.30		0.05	
DAA	AAA		0.01					0.03			0.07						

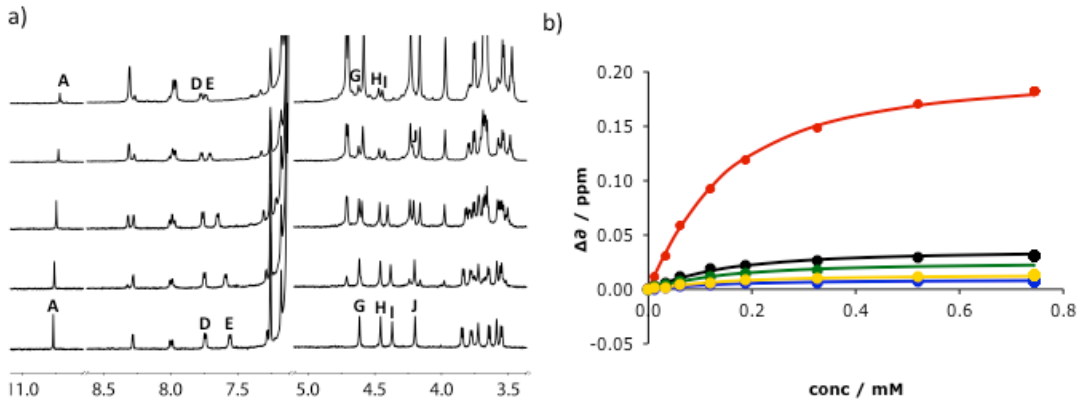


Figure S28 ^{1}H NMR data for titration of **DDD** into **DAA** (0.1 mM) at 298 K in toluene-d_8. (a) Example 500 MHz ^{1}H NMR spectra. (b) Plot of the change in chemical shift of the ^{1}H signal as a function of guest concentration (the lines represent the best fit to a 1:1 binding isotherm). The average association constant K = 10600±1700 M^{-1} was obtained as the result of two independent measurements and the error is reported as two times the standard deviation (95% confidence limit)

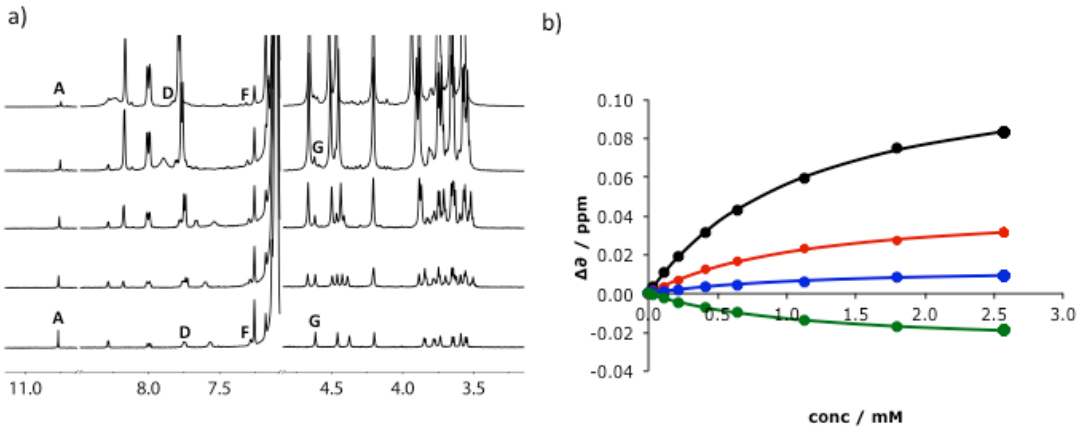


Figure S29 ^{1}H NMR data for titration of **ADD** into **DAA** (0.1 mM) at 298 K in toluene-d_8. (a) Example 500 MHz ^{1}H NMR spectra. (b) Plot of the change in chemical shift of the ^{1}H signal as a function of guest concentration (the lines represent the best fit to a 1:1 binding isotherm). The average association constant K = 1000±100 M^{-1} was obtained as the result of two independent measurements and the error is reported as two times the standard deviation (95% confidence limit)

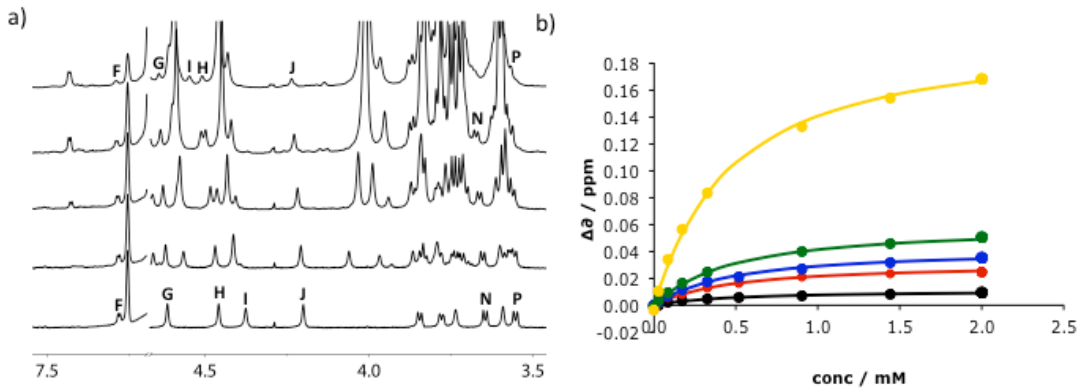


Figure S30 ^{1}H NMR data for titration of **ADA** into **DAA** (0.1 mM) at 298 K in toluene-d_8. (a) Example 500 MHz ^{1}H NMR spectra. (b) Plot of the change in chemical shift of the ^{1}H signal as a function of guest concentration (the lines represent the best fit to a 1:1 binding isotherm). The average association constant K = 2600±300 M^{-1} was obtained as the result of two independent measurements and the error is reported as two times the standard deviation (95% confidence limit)

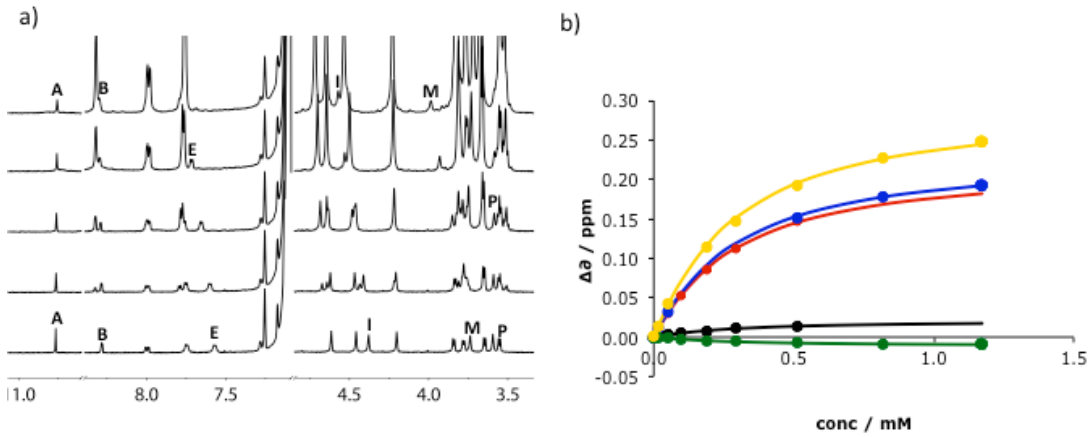


Figure S31 ^{1}H NMR data for titration of **DDA** into **DAA** (0.1 mM) at 298 K in toluene-d_8. (a) Example 500 MHz ^{1}H NMR spectra. (b) Plot of the change in chemical shift of the ^{1}H signal as a function of guest concentration (the lines represent the best fit to a 1:1 binding isotherm). The average association constant K = 4150±900 M^{-1} was obtained as the result of two independent measurements and the error is reported as two times the standard deviation (95% confidence limit)

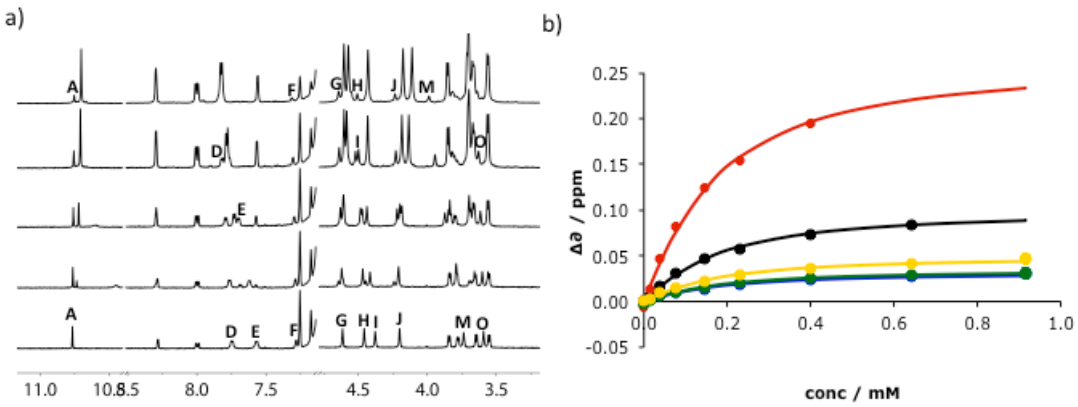


Figure S32 ^{1}H NMR data for titration of **DAD** into **DAA** (0.1 mM) at 298 K in toluene-d_8. (a) Example 500 MHz ^{1}H NMR spectra. (b) Plot of the change in chemical shift of the ^{1}H signal as a function of guest concentration (the lines represent the best fit to a 1:1 binding isotherm). The average association constant K = 8900±700 M^{-1} was obtained as the result of two independent measurements and the error is reported as two times the standard deviation (95% confidence limit)

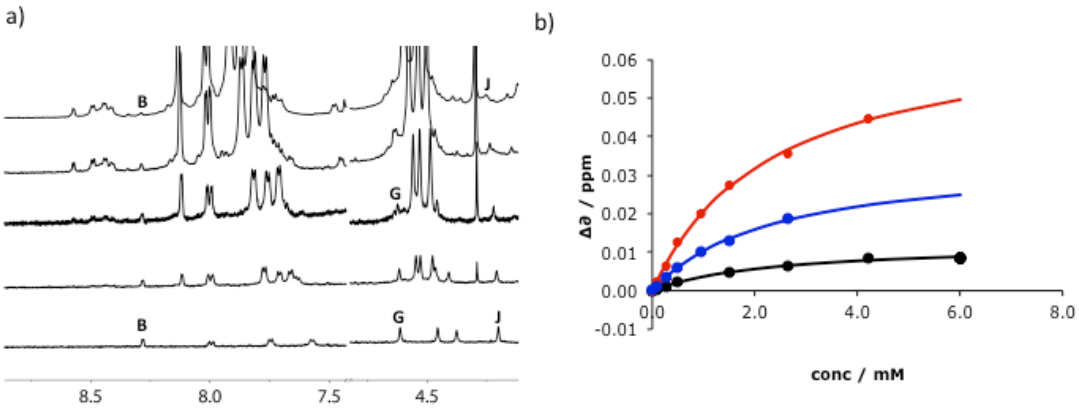


Figure S33 ^{1}H NMR data for titration of **AAA** into **DAA** (0.1 mM) at 298 K in toluene-d_8. (a) Example 500 MHz ^{1}H NMR spectra. (b) Plot of the change in chemical shift of the ^{1}H signal as a function of guest concentration (the lines represent the best fit to a 1:1 binding isotherm). Due to lack of material, this experiment was carried out once giving an association constant of K = 500 M^{-1}

8 A•DD control titration experiment

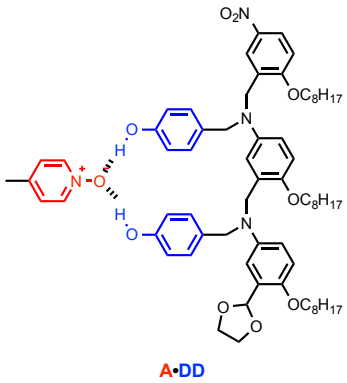


Figure S34 A•DD complex

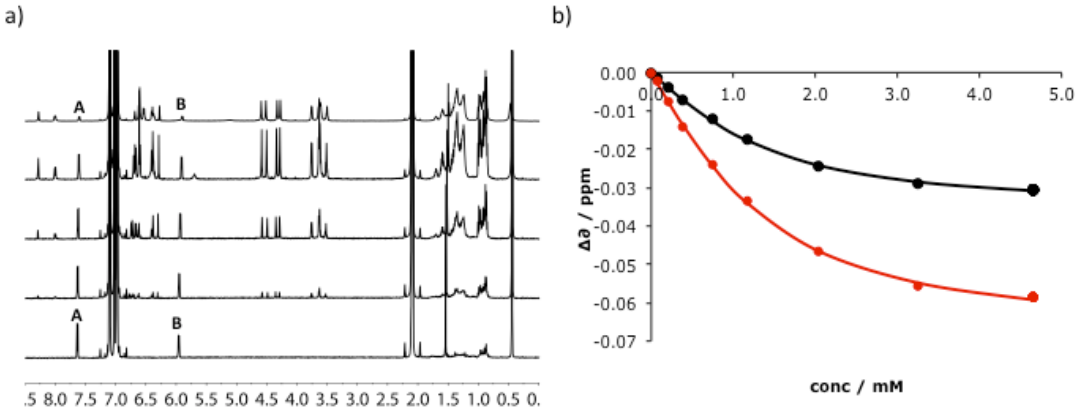


Figure S35 ^{1}H NMR data for titration of **DD** into **A** (1.2 mM) at 298 K in toluene-d_8. (a) Example 500 MHz ^{1}H NMR spectra. (b) Plot of the change in chemical shift of the ^{1}H signal as a function of guest concentration (the lines represent the best fit to a 1:1 binding isotherm). The average association constant K = 1650±150 M^{-1} was obtained as the result of two independent measurements and the error is reported as two times the standard deviation (95% confidence limit)

Table S8 Complexation-induced changes in ^{1}H NMR chemical shift (ppm) obtained by fitting titration data measured in toluene-d_8 at 298 K to a 1:1 binding isotherm. See Figure S35 for the signal labeling key.

Host	Guest	Signal	
		A	B
A	DD	-0.04	-0.07

9 Dilution Experiments

Dilution of ADA

Table S9 Complexation-induced changes in ^{1}H NMR chemical shift (ppm) obtained by fitting dilution data (57-0.03 mM) measured in toluene-d_8 at 298 K to a dimerisation isotherm. See Figure S21 for the signal labeling key.

	Signal														
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**
	0.02	0.27	0.19		0.11	0.12	0.18								

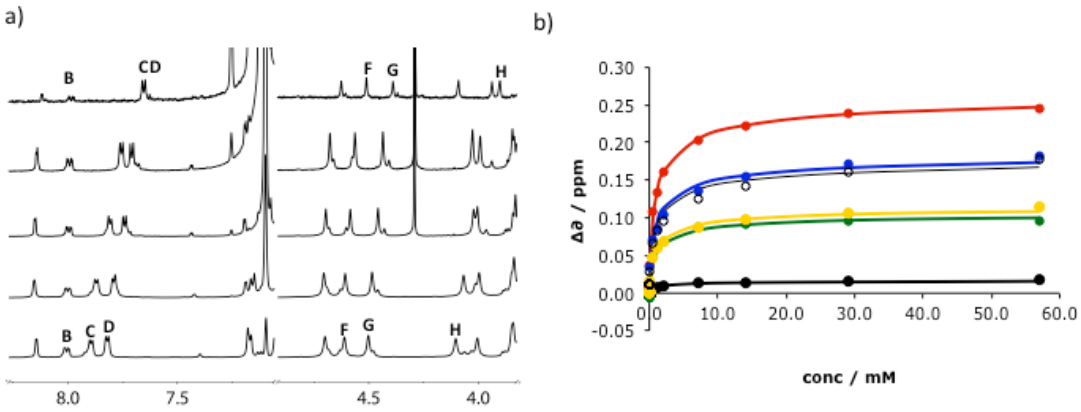


Figure S36 ^{1}H NMR data for dilution of **ADA** (57-0.03 mM) at 298 K in toluene-d_8. (a) Example 500 MHz ^{1}H NMR spectra. (b) Plot of the change in chemical shift of the ^{1}H signal as a function of concentration (the lines represent the best fit to a dimerisation isotherm). Due to lack of material, this experiment was carried out once giving an association constant of K = 800 M^{-1}

Dilution of AAA

Table S10 Complexation-induced changes in ^{1}H NMR chemical shift (ppm) obtained by fitting dilution data (8.6-0.07 mM) measured in toluene-d_8 at 298 K to a dimerisation isotherm. See Figure S17 for the signal labeling key.

	Signal														
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**
	0.15	0.10	0.74	0.84	0.81		0.10	0.32	0.4			0.07	0.49	-0.01	0.18

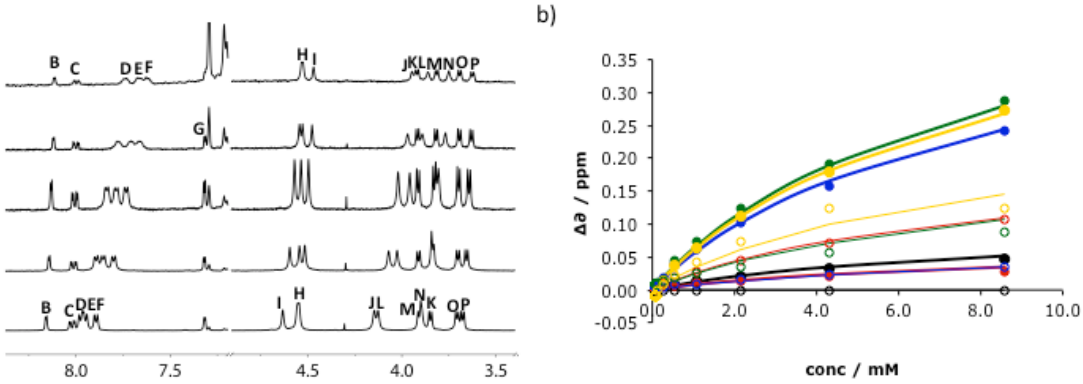


Figure S37 ^{1}H NMR data for dilution of **AAA** (8.6-0.07 mM) at 298 K in toluene-d_8. (a) Example 500 MHz ^{1}H NMR spectra. (b) Plot of the change in chemical shift of the ^{1}H signal as a function of concentration (the lines represent the best fit to a dimerisation isotherm). Due to lack of material, this experiment was carried out once giving an association constant of $K = 43$ M^{-1}

Dilution of AAD

Table S11 Complexation-induced changes in ^{1}H NMR chemical shift (ppm) obtained by fitting dilution data (34-0.05 mM) measured in toluene-d_8 at 298 K to a dimerisation isotherm. See Figure S2 for the signal labeling key.

	Signal														
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**
	0.03	0.06	0.27	0.41		0.19	0.09	0.12	0.1		-0.10	0.31	0.13	0.06	0.13

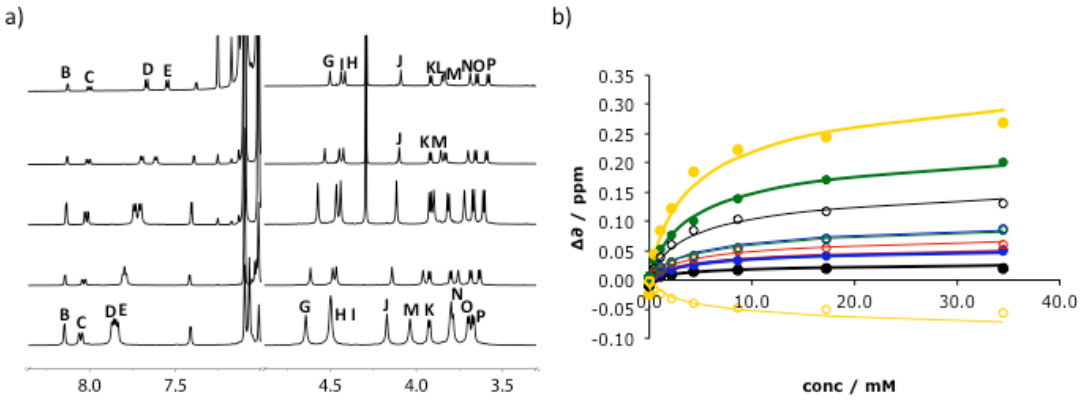


Figure S38 ^{1}H NMR data for dilution of **AAD** (34-0.05 mM) at 298 K in toluene-d_8. (a) Example 500 MHz ^{1}H NMR spectra. (b) Plot of the change in chemical shift of the ^{1}H signal as a function of concentration (the lines represent the best fit to a dimerisation isotherm). Due to lack of material, this experiment was carried out once giving an association constant of K = 120 M^{-1}

Dilution of ADD

Table S12 Complexation-induced changes in ^{1}H NMR chemical shift (ppm) obtained by fitting dilution data (10-0.08mM) measured in toluene-d_8 at 298 K to a dimerisation isotherm. See Figure S12 for the signal labeling key.

						Signal								
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**
-0.6	-0.02	0.17	-0-0.	0.09	0.11		0.29	0.27	0.03	0.14			0.08	0.18

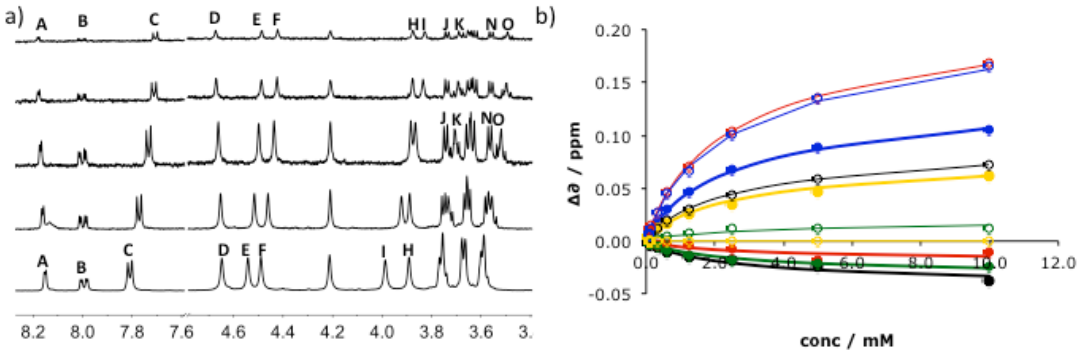


Figure S39 ^{1}H NMR data for dilution of **ADD** (10-0.08) at 298 K in toluene-d_8. (a) Example 500 MHz ^{1}H NMR spectra. (b) Plot of the change in chemical shift of the ^{1}H signal as a function of concentration (the lines represent the best fit to a dimerisation isotherm). Due to lack of material, this experiment was carried out once giving an association constant of K = 190 M^{-1}

Dilution of DDD

Table S13 Complexation-induced changes in ^{1}H NMR chemical shift (ppm) obtained by fitting dilution data (10-0.08 mM) measured in toluene-d_8 at 298 K to a dimerisation isotherm.

Signal OH		
A	**B**	**C**
3.09	4.93	6.12

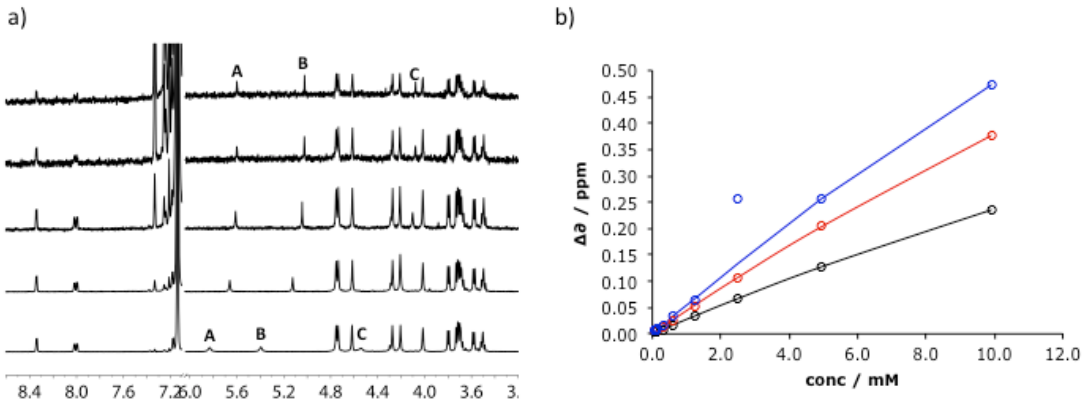


Figure S40 ^{1}H NMR data for dilution of **DDD** (10-0.08) at 298 K in toluene-d_8. (a) Example 500 MHz ^{1}H NMR spectra. (b) Plot of the change in chemical shift of the ^{1}H signal as a function of concentration (the lines represent the best fit to a dimerisation isotherm). Due to lack of material, this experiment was carried out once giving an association constant of $K = 4$ M^{-1}

Molecular mechanics calculations.

General details

Molecular mechanics calculations were performed using MacroModel version 9.8 (Schrödinger Inc.).[S1] All structures were minimized first and the minimized structures were then used as the starting molecular structures for all MacroModel conformational searches. The force field used was MMFFs as implemented in this software ($CHCl_3$ solvation). The charges were defined by the force field library and no cut off was used for non-covalent interactions. A Polak-Ribiere Conjugate Gradient (PRCG) was used and each minimisation was subjected to 10,000 iterations. The minima converged on a gradient with a threshold of 0.01. Conformational searches were performed from previously minimized structures using 10,000 steps. Images were created using PyMol.[S2]

Duplex formation

Calculations were performed on simplified 3-mer duplexes in which the solubilising groups were changed to methyl groups and terminal groups were simplified to methyl and phenyl in order to reduce the computational cost. In the case of the complex of DD and 4-methylpyridine *N*-oxide shown in Fig. 6, the terminal groups were not simplified. In all cases, one terminal H-bond was fixed by constraining the distance between the phenol hydrogen and *N*-oxide oxygen to 2 ± 1 Å, and three different starting conformations were used in each case.

Folding

Calculations were performed on simplified 3-mers in which the solubilising groups were changed to methyl groups in order to reduce the computational cost.[S1]

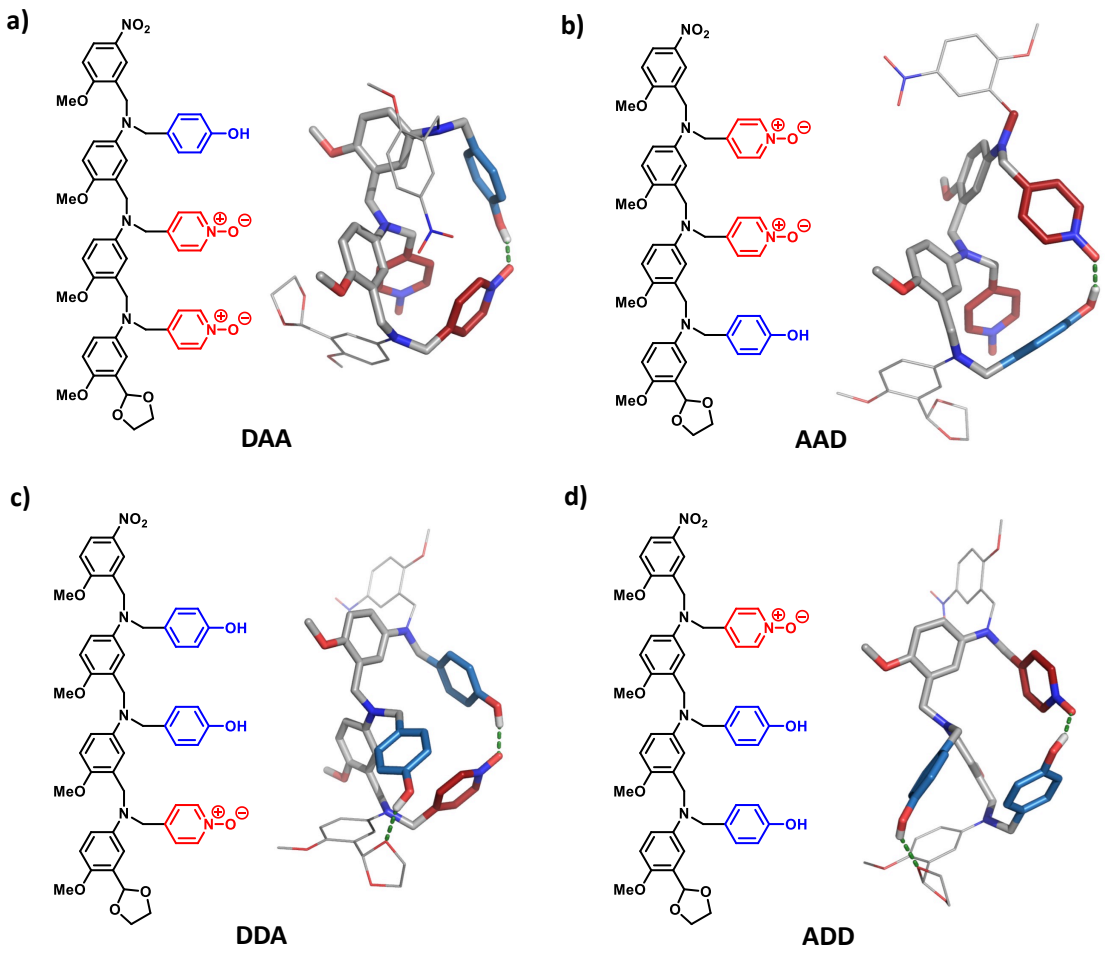


Figure S41. Lowest energy conformations calculated using molecular mechanics conformational searches (MMFFs force-field and $CHCl_3$ solvation implemented in Macromodel)[S1] of DAA (a), AAD (b), DDA (c) and ADD (d) 3-mers (three letter code refers to the nitrobenzene to benzaldehyde sequence of donor, D, and acceptor, A, groups). The backbone is shown in grey, the H-bond donor recognition unit in blue and the H-bond acceptor unit in red. Benzaldehyde and nitrobenzene caps are shown in lines for clarity.

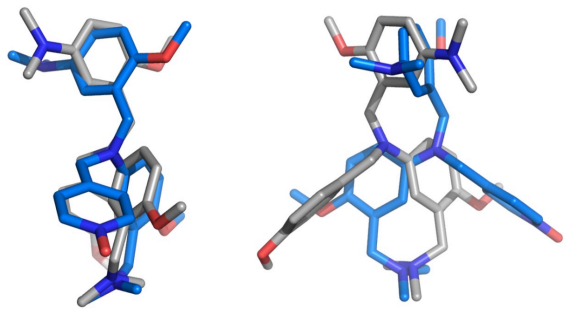


Figure S42. Two views of the superimposed backbones of DAA (blue) and DDA (grey) 3-mers. Recognition units as well as benzaldehyde and nitrobenzene caps have been omitted for clarity.

References

[S1] MacroModel, version 9.8, Schrödinger, LLC, New York, NY, 2014.

[S2] The PyMOL Molecular Graphics System, Version 1.6 Schrödinger, LLC.