Supporting Information

Chiroptical Sensing of Amino Acid Derivatives by Host-Guest Complexation with Cyclo[6]aramide

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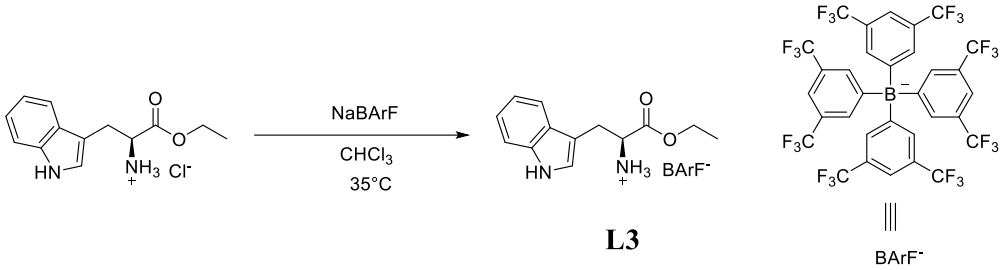
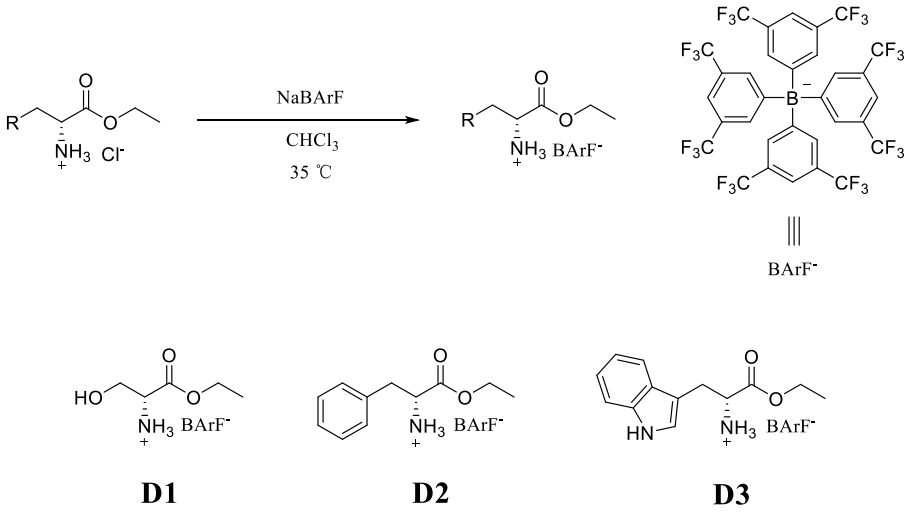
1. Synthetic route of novel compounds



Scheme S1. Synthetic route for compound **L3**.



Scheme S2. Synthetic route for compounds **D1**, **D2** and **D3**.

2. ^{1}H NMR and ^{13}C{^{1}H} NMR spectra of novel compounds

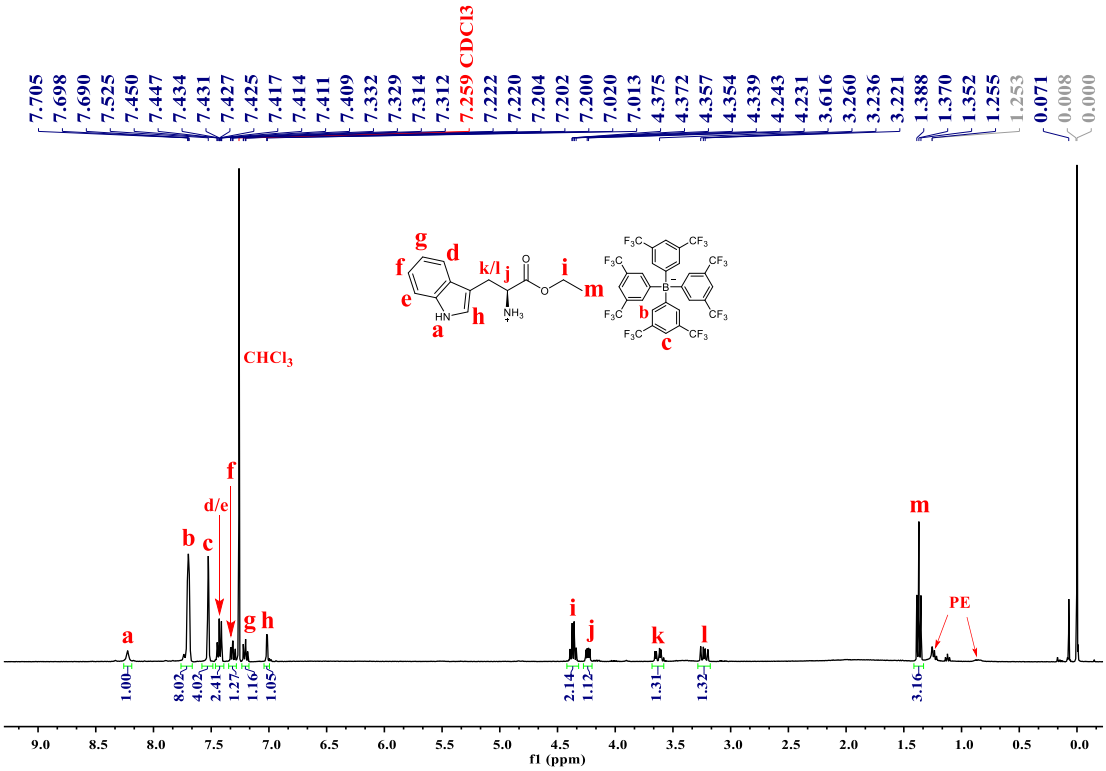


Figure S1. ^{1}H NMR spectrum of compound **L3** (400 MHz, $CDCl_3$, 298 K).

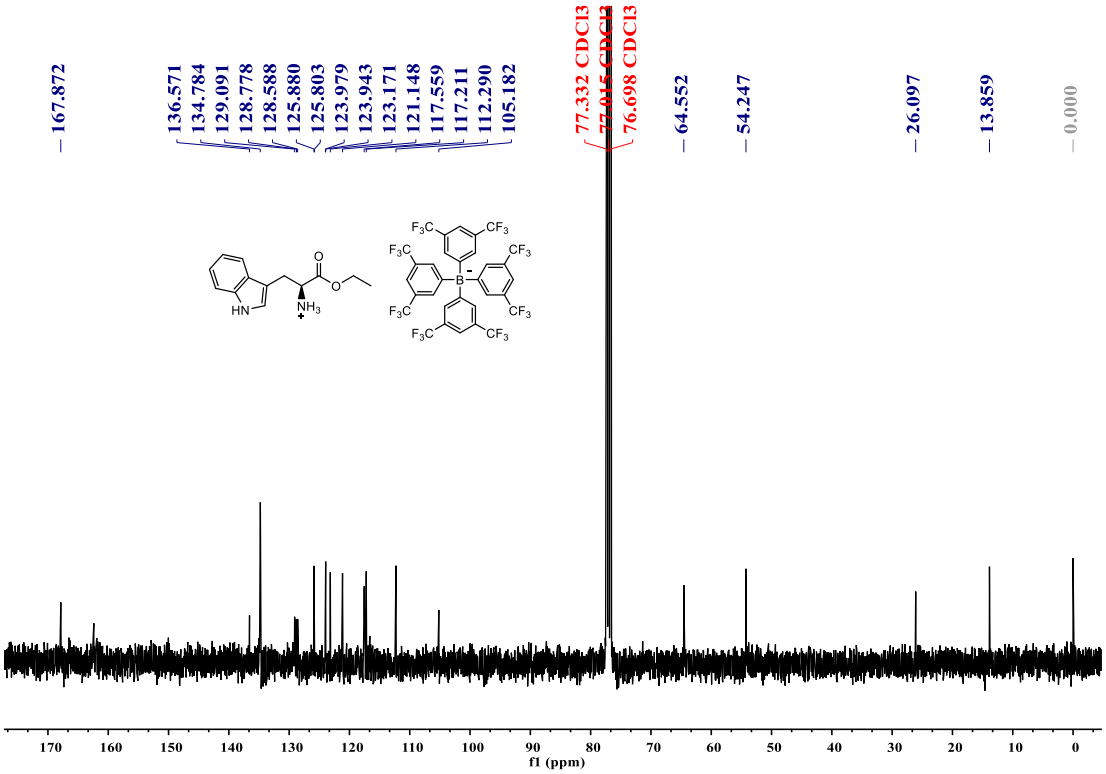


Figure S2. $^{13}C\{^{1}H\}$ NMR spectrum of compound **L3** (101 MHz, $CDCl_3$, 298 K).

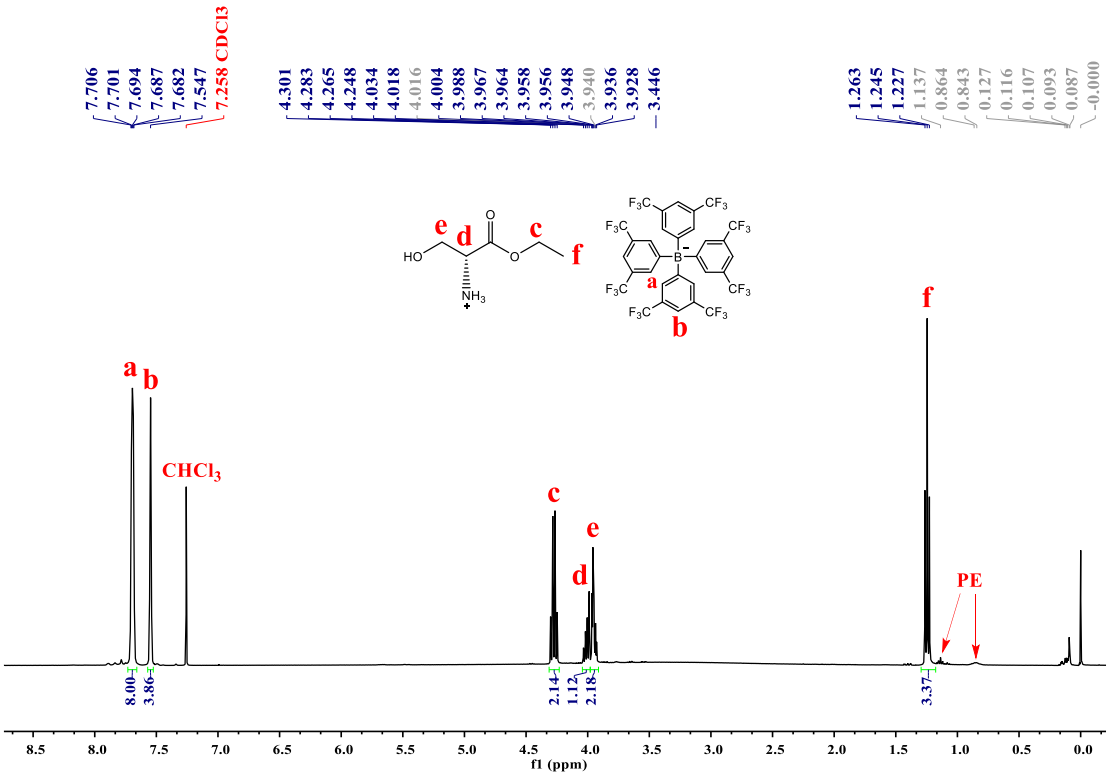


Figure S3. ^{1}H NMR spectrum of compound **D1** (400 MHz, $CDCl_3$, 298 K).

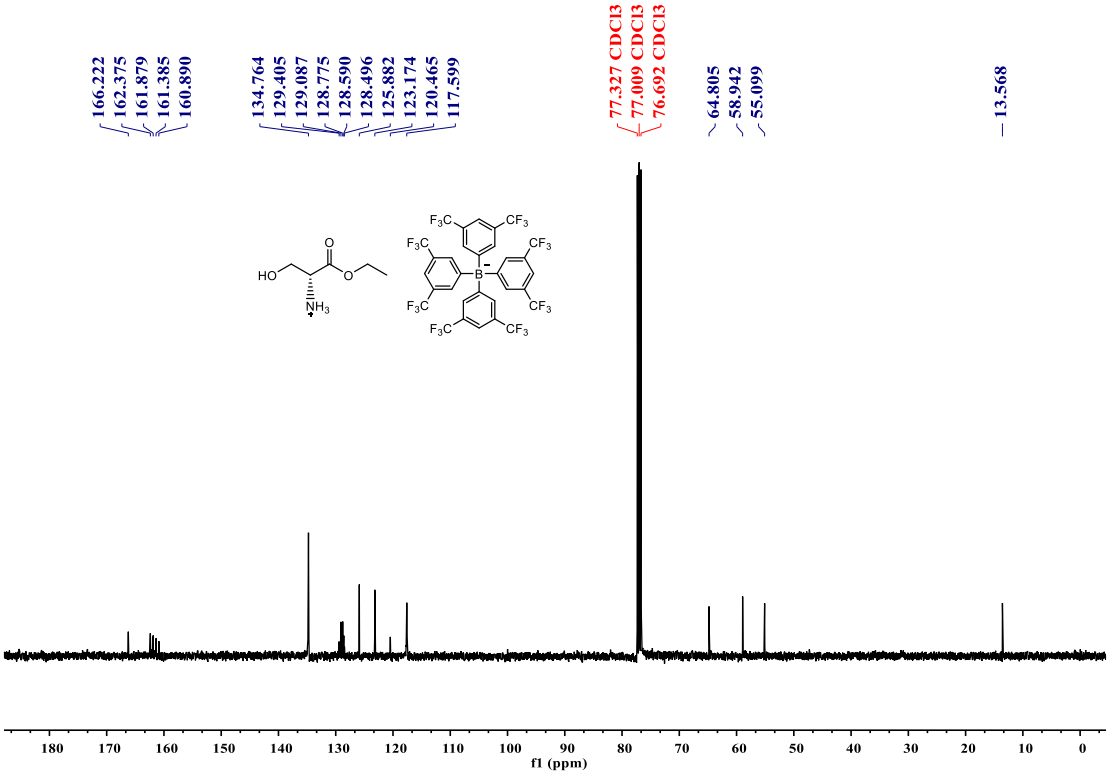


Figure S4. $^{13}C\{^{1}H\}$ NMR spectrum of compound **D1** (101 MHz, $CDCl_3$, 298 K).

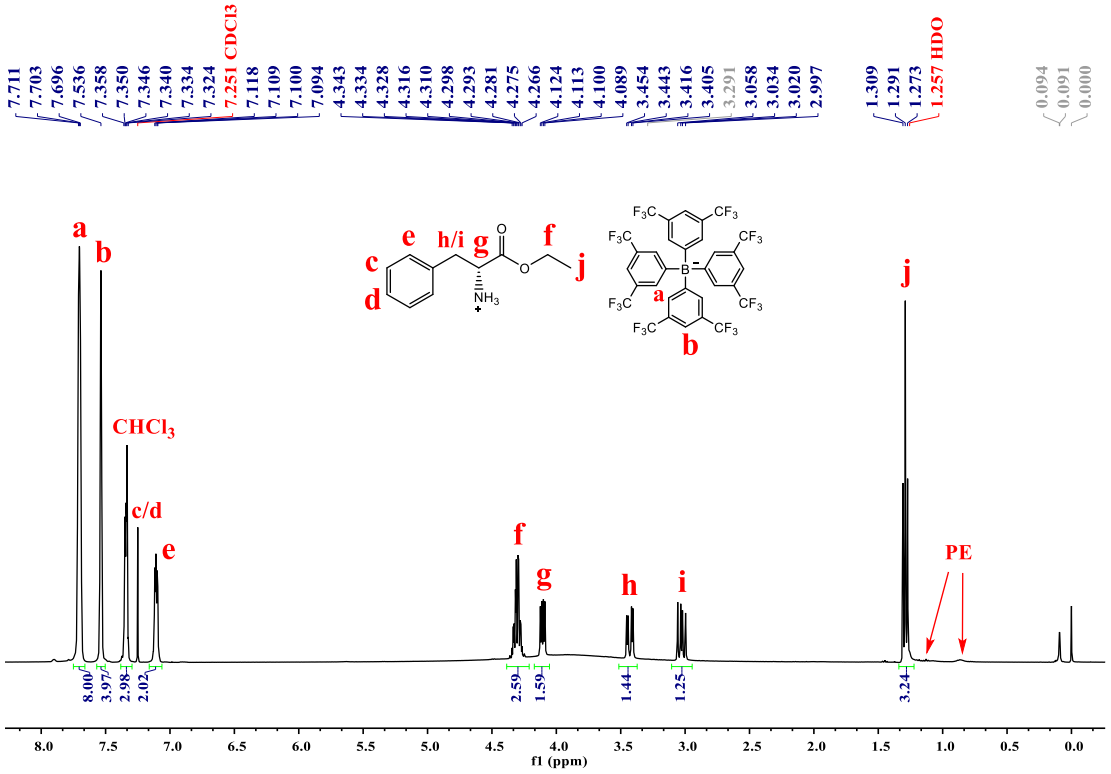


Figure S5. ^{1}H NMR spectrum of compound **D2** (400 MHz, $CDCl_3$, 298 K).

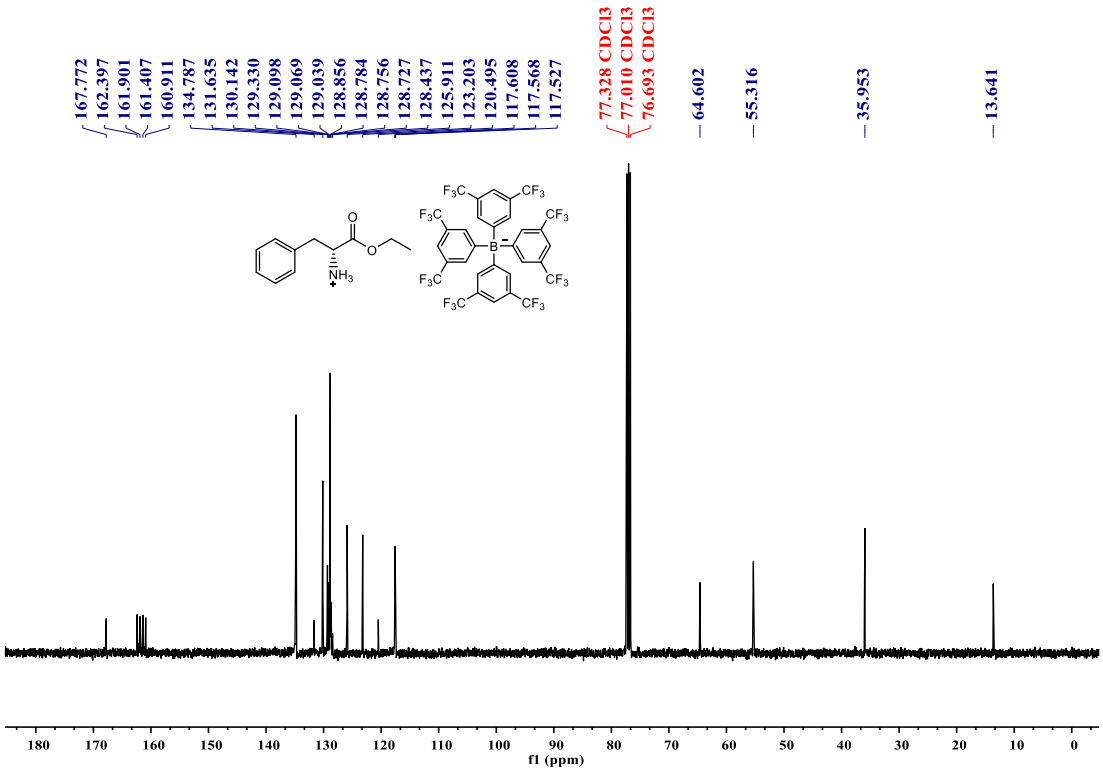


Figure S6. ^{13}C{^{1}H} NMR spectrum of compound **D2** (101 MHz, $CDCl_3$, 298 K).

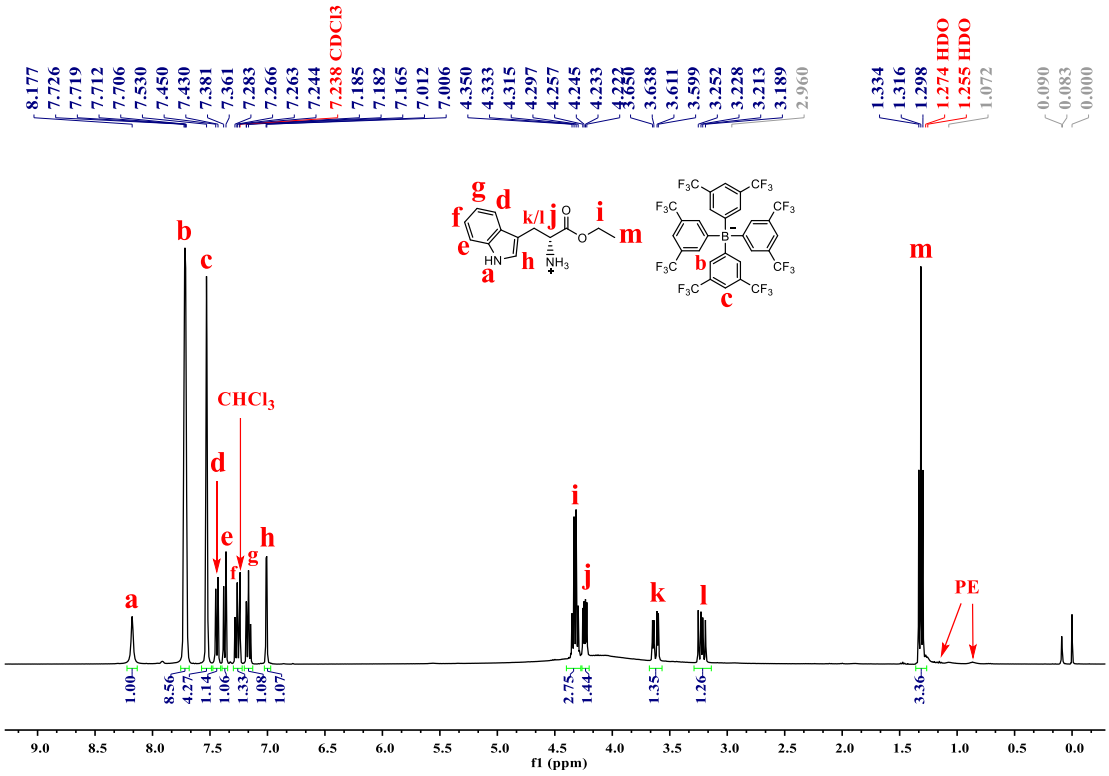


Figure S7. ^{1}H NMR spectrum of compound **D3** (400 MHz, $CDCl_3$, 298 K).

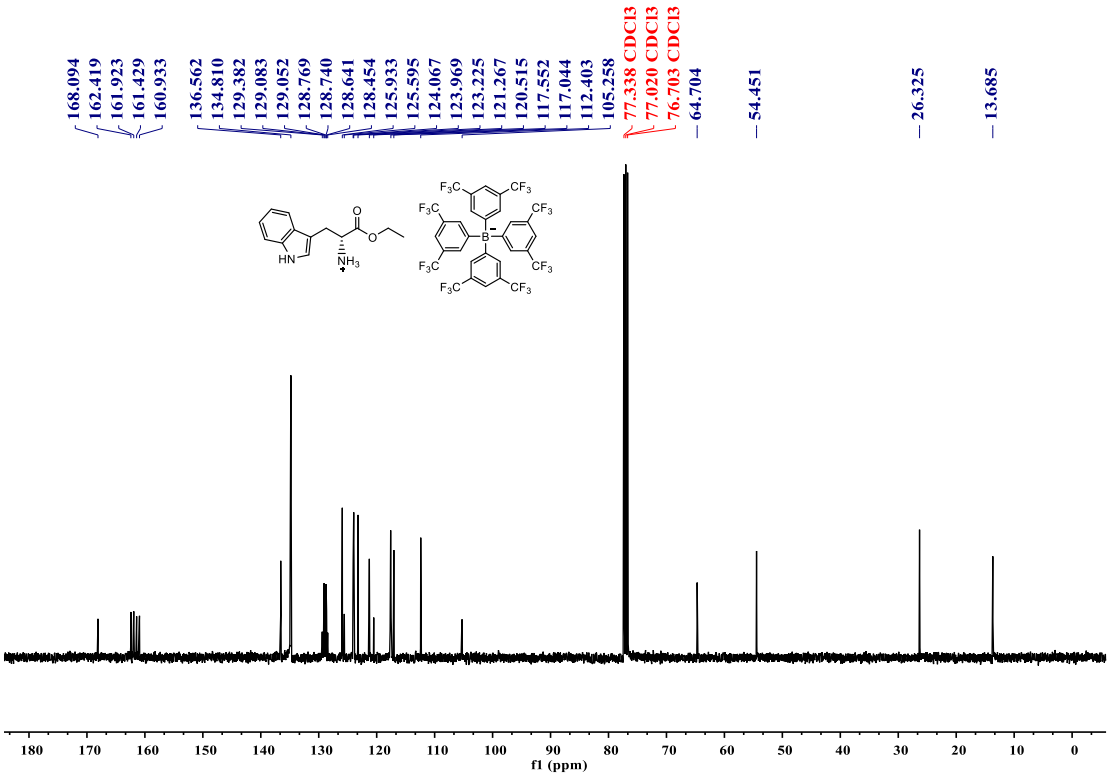


Figure S8. ^{13}C{^{1}H} NMR spectrum of compound **D3** (101 MHz, $CDCl_3$, 298 K).

3. ESI-HRMS spectrum of novel compounds

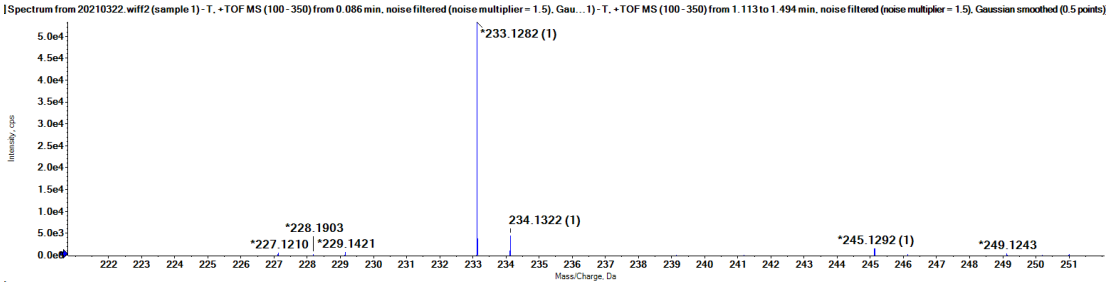


Figure S9. ESI-HRMS spectrum of compound **L3**.

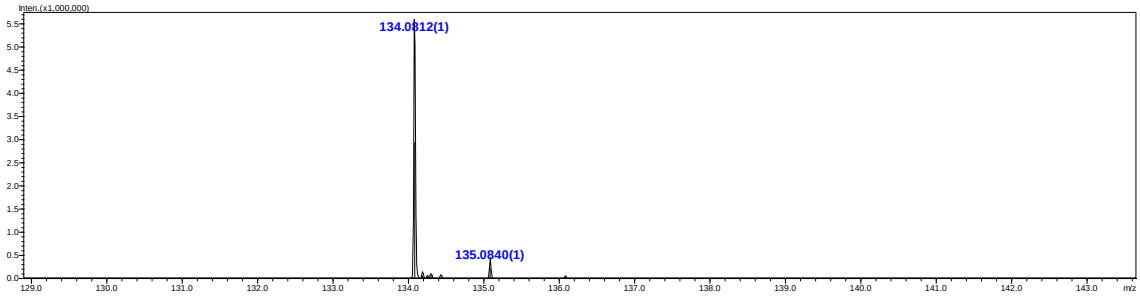


Figure S10. ESI-HRMS spectrum of compound **D1**.

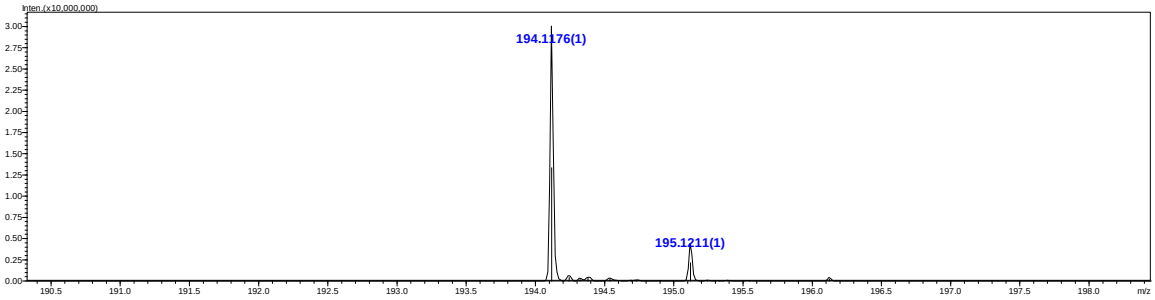


Figure S11. ESI-HRMS spectrum of compound **D2**.

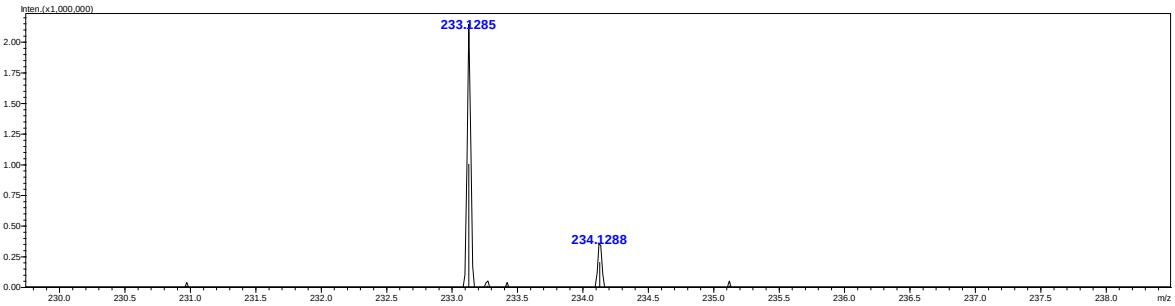
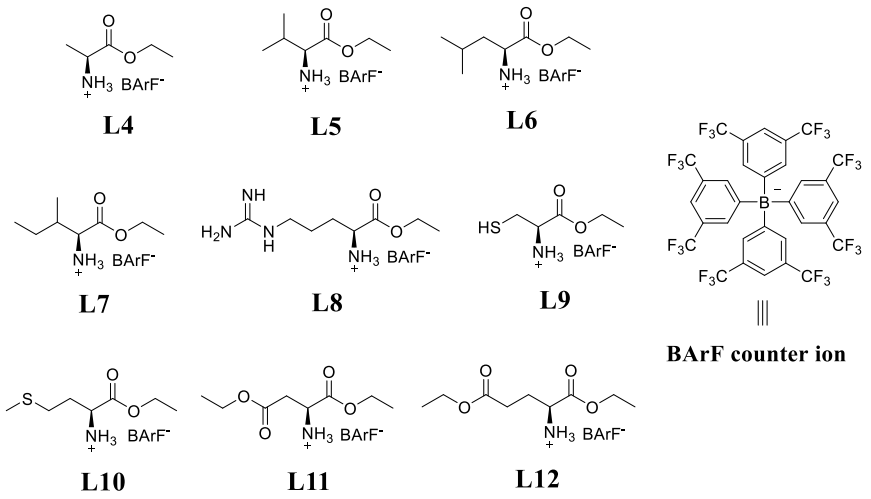


Figure S12. ESI-HRMS spectrum of compound **D3**.

4. Chemical structures of L4-L12



Scheme S3. Chemical structures of compounds **L4-L12**.

5. Stacked CD spectra between 1a and L1-L12

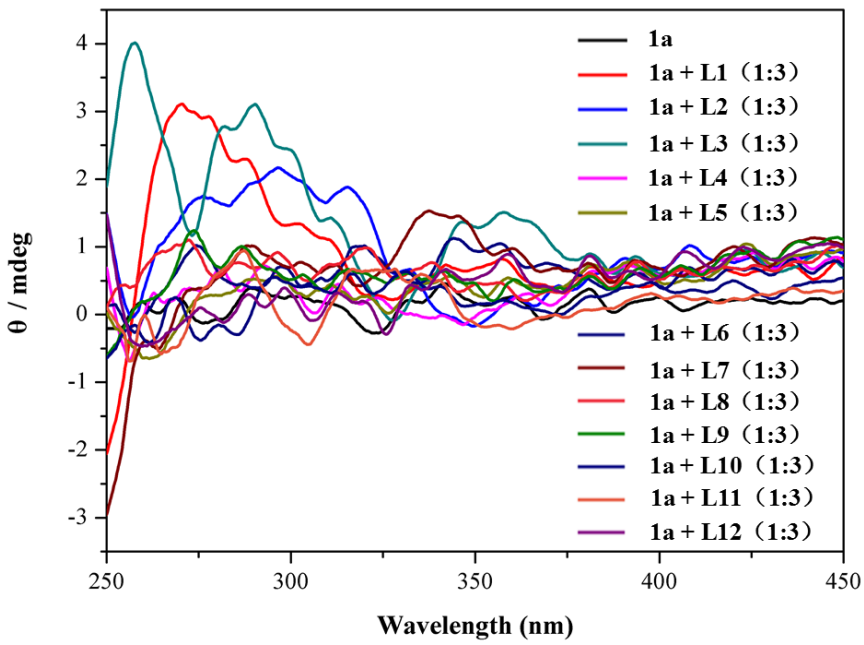


Figure S13. Stacked CD spectra of cyclo[6]aramide **1a** (25 μM) and chiral guests **L1-L12** (74 μM) in the presence of host **1a** (25 μM) measured in HPLC chloroform at 298 K respectively (optical path of cell: 10 mm).

6. Stacked ^{1}H NMR spectra of 1a⊃L2-L3

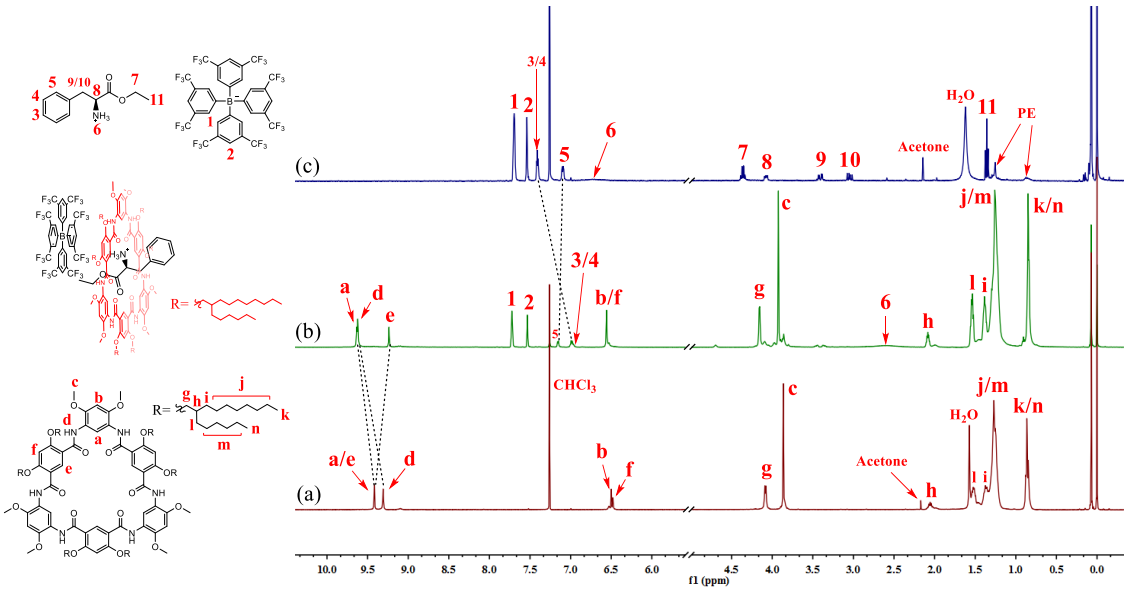


Figure S14. Stacked ^{1}H NMR spectra (400 MHz, $CDCl_3$, 298 K) of (a) 2 mM **1a**, (b) 2 mM **1a** and 2 mM **L2**, (c) 2 mM **L2**.

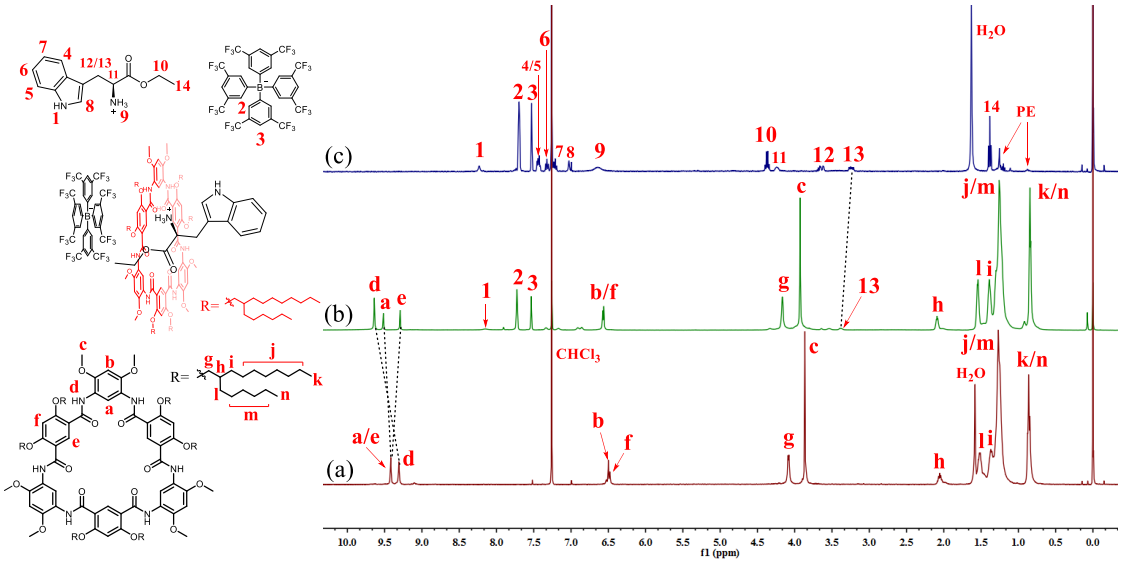


Figure S15. Stacked ^{1}H NMR spectra (400 MHz, $CDCl_3$, 298 K) of (a) 2 mM **1a**, (b) 2 mM **1a** and 2 mM **L3**, (c) 2 mM **L3**.

7. 2D NOESY spectra

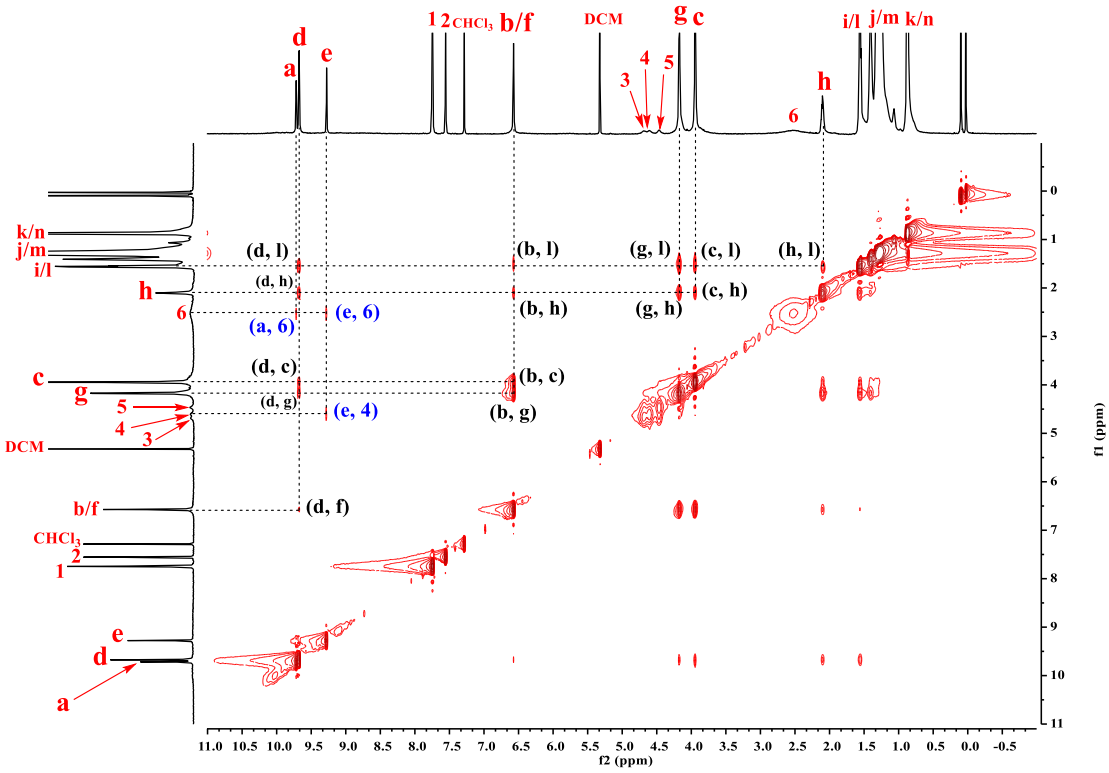


Figure S16. 2D NOESY spectrum of a mixture of 10 mM **1a** and 10 mM **L1** (600 MHz, $CDCl_3$, 298 K, mixing time = 0.4 s).

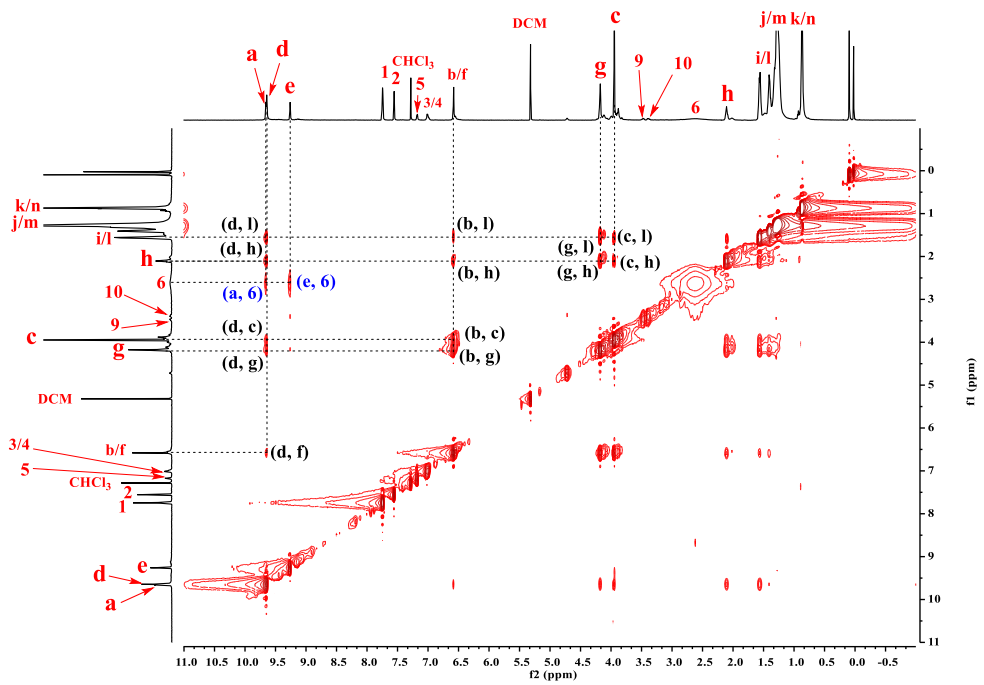


Figure S17. 2D NOESY spectrum of a mixture of 10 mM **1a** and 10 mM **L2** (600 MHz, $CDCl_3$, 298 K, mixing time = 0.4 s).

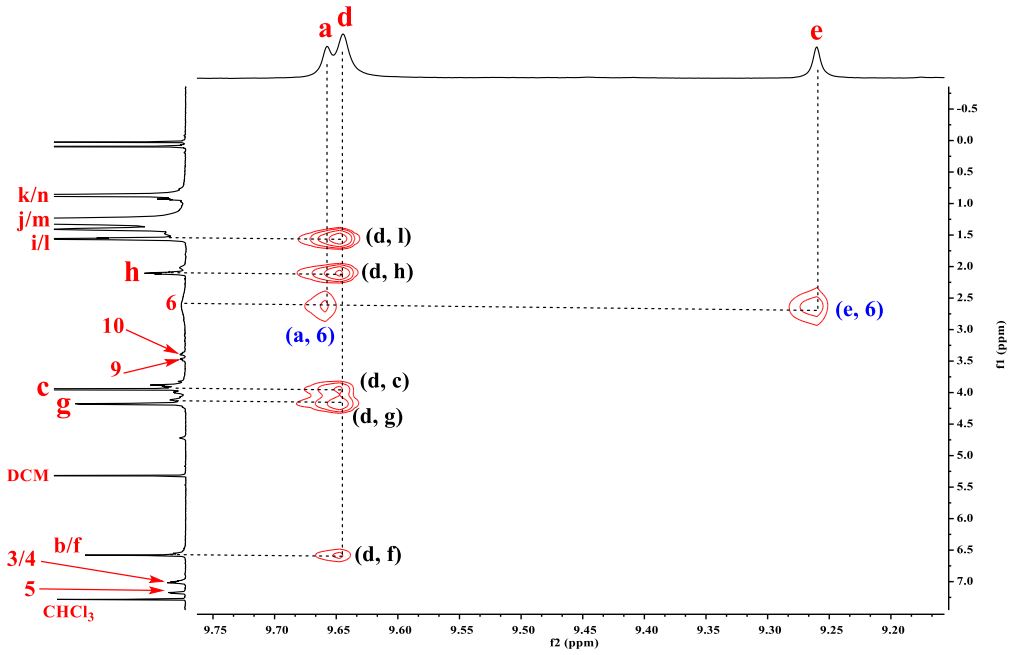


Figure S18. Partial 2D NOESY spectrum of a mixture of 10 mM **1a** and 10 mM **L2** (600 MHz, $CDCl_3$, 298 K, mixing time = 0.4 s).

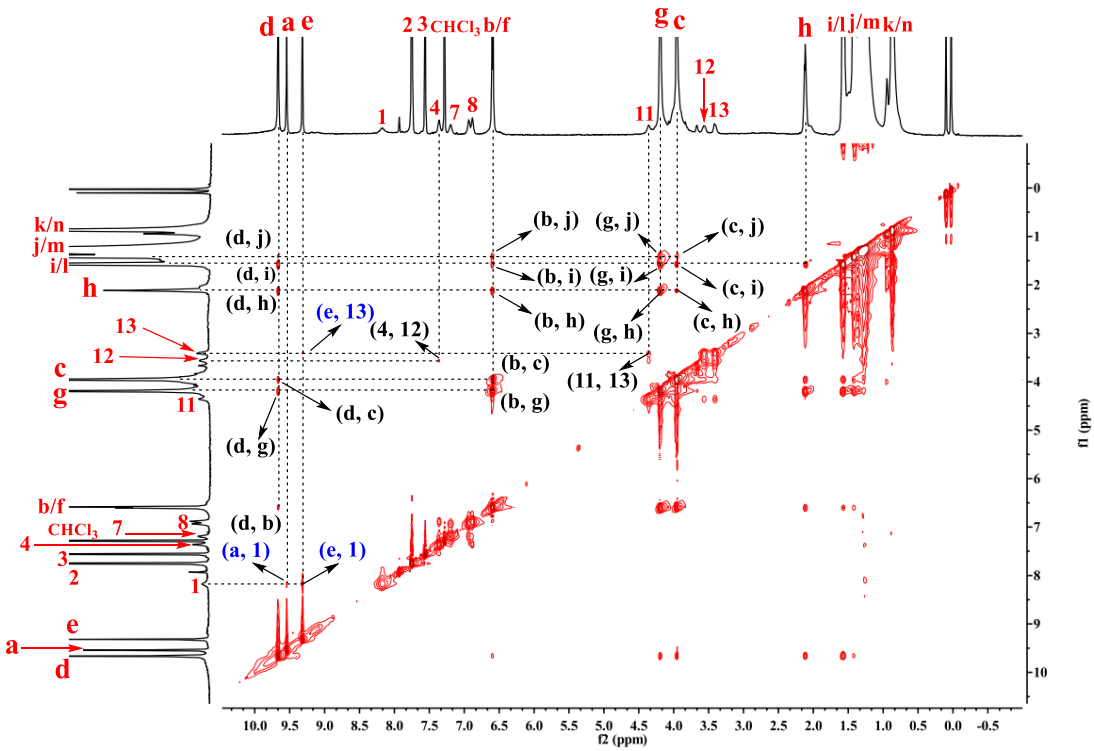


Figure S19. 2D NOESY spectrum of a mixture of 10 mM **1a** and 10 mM **L3** (600 MHz, $CDCl_3$, 298 K, mixing time = 0.4 s).

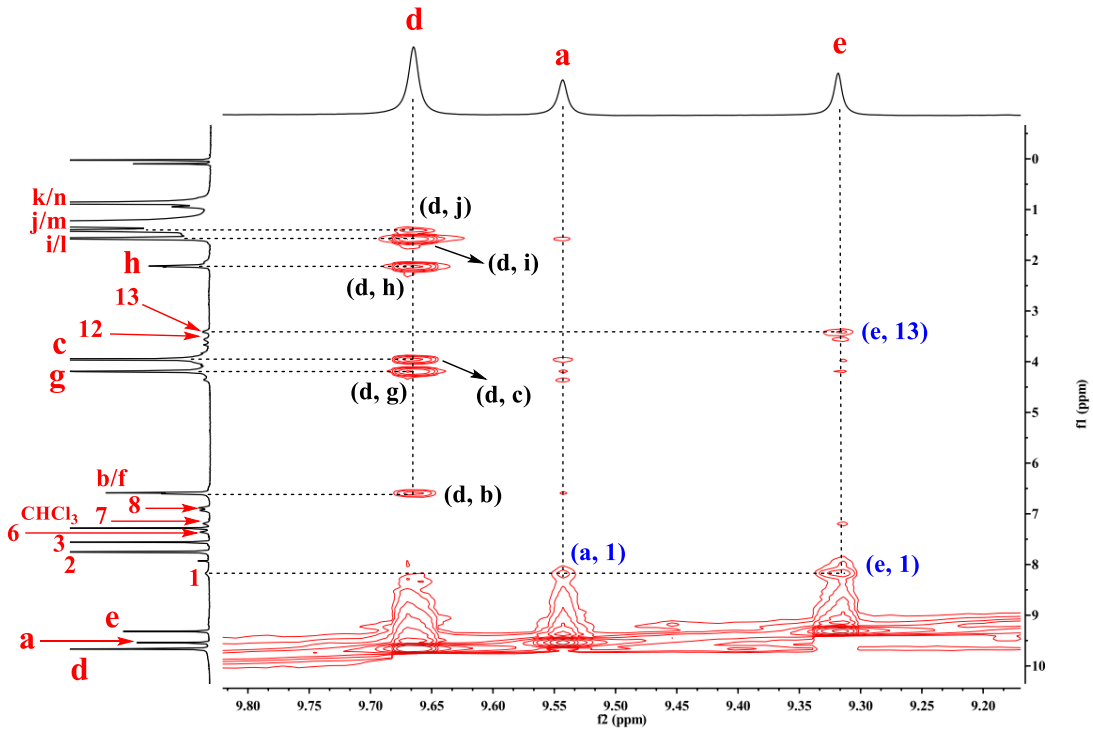


Figure S20. Partial 2D NOESY spectrum of a mixture of 10 mM **1a** and 10 mM **L3** (600 MHz, $CDCl_3$, 298 K, mixing time = 0.4 s).

8. Binding ratios determination between 1a and L1-L3

8.1 Job Plot experiments

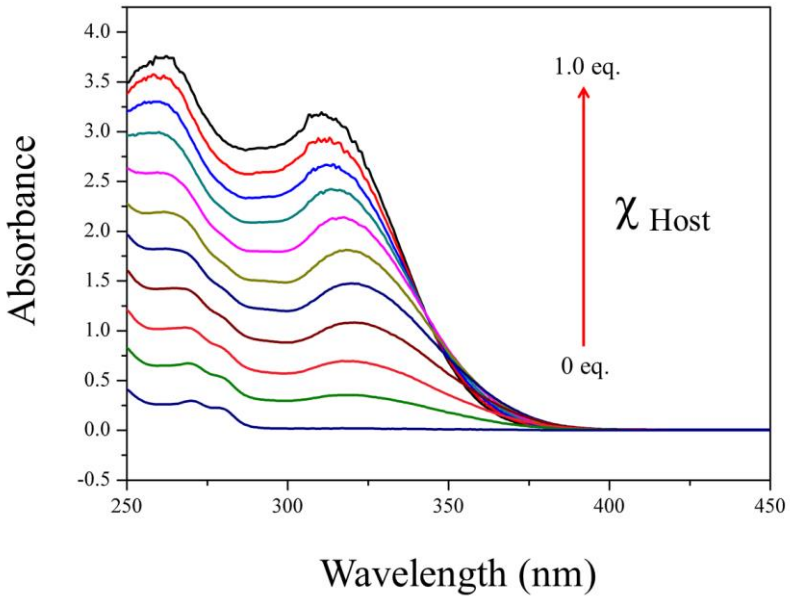


Figure S21. Stacked UV-vis spectra of Job plot experiment between **1a** and **L1** in HPLC chloroform. The total concentration is 50 μM.

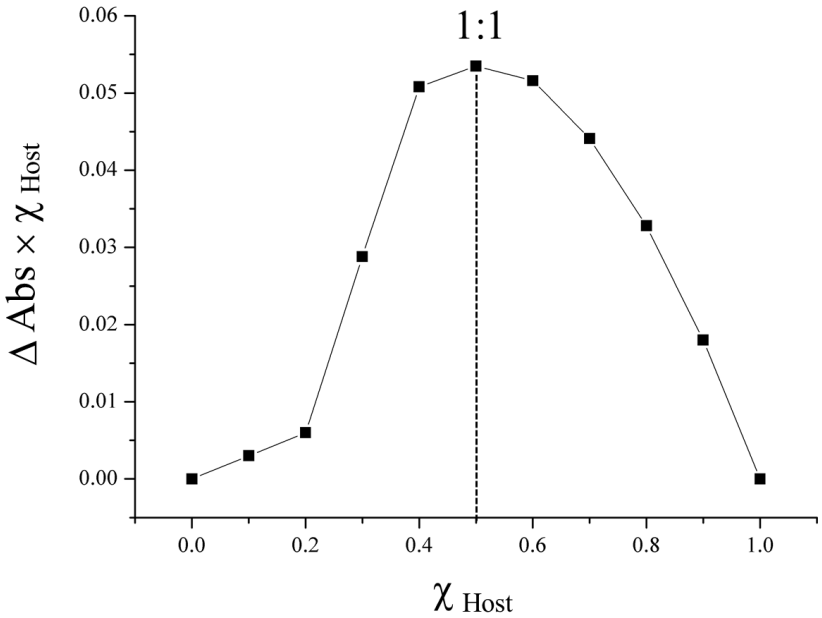


Figure S22. Job plot for the complexation of **1a** and **L1** based on the absorbance at 370 nm of UV-vis spectra.

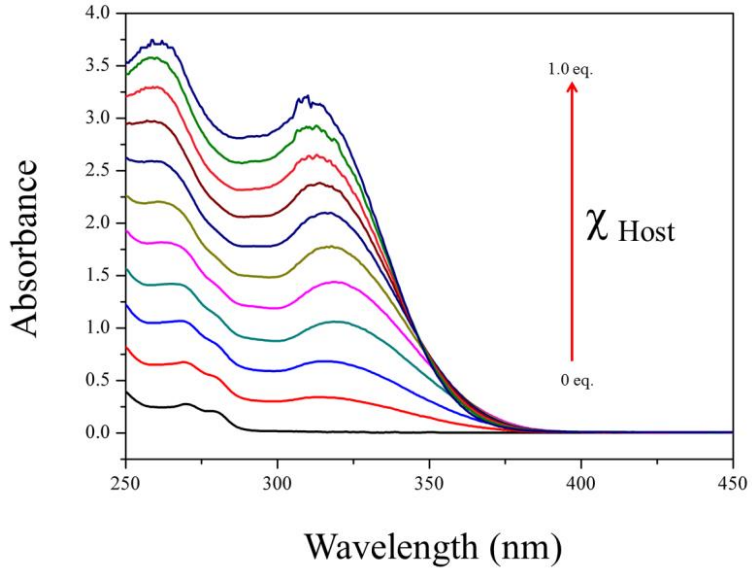


Figure S23. Stacked UV-vis spectra of Job plot experiment between **1a** and **L2** in HPLC chloroform. The total concentration is 50 μM.

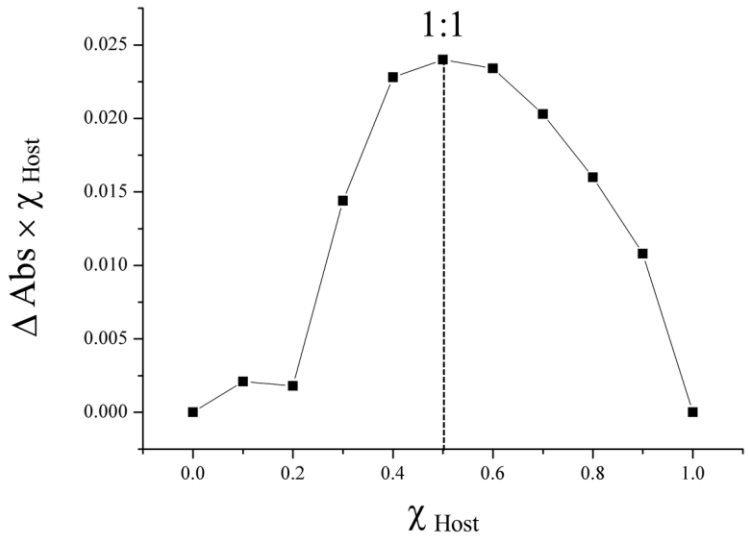


Figure S24. Job plot for the complexation of **1a** and **L2** based on the absorbance at 375 nm of UV-vis spectra.

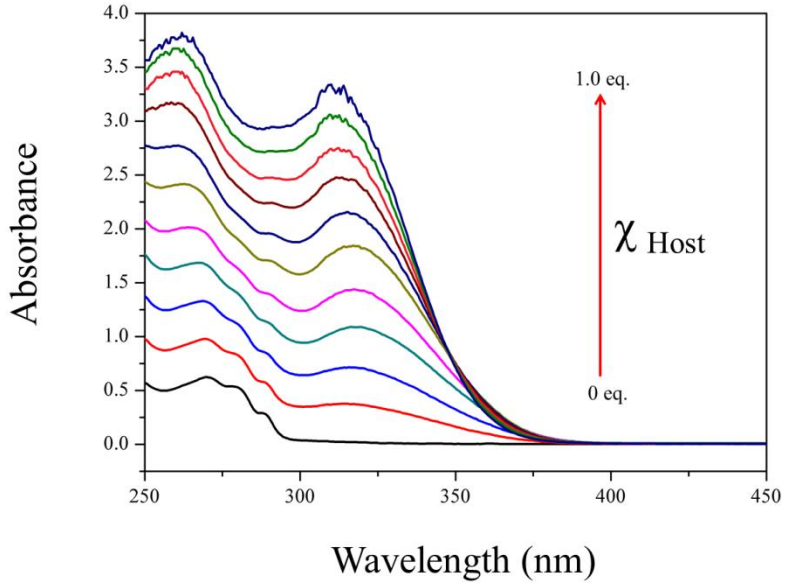


Figure S25. Stacked UV-vis spectra of Job plot experiment between **1a** and **L3** in HPLC chloroform. The total concentration is 50 μM.

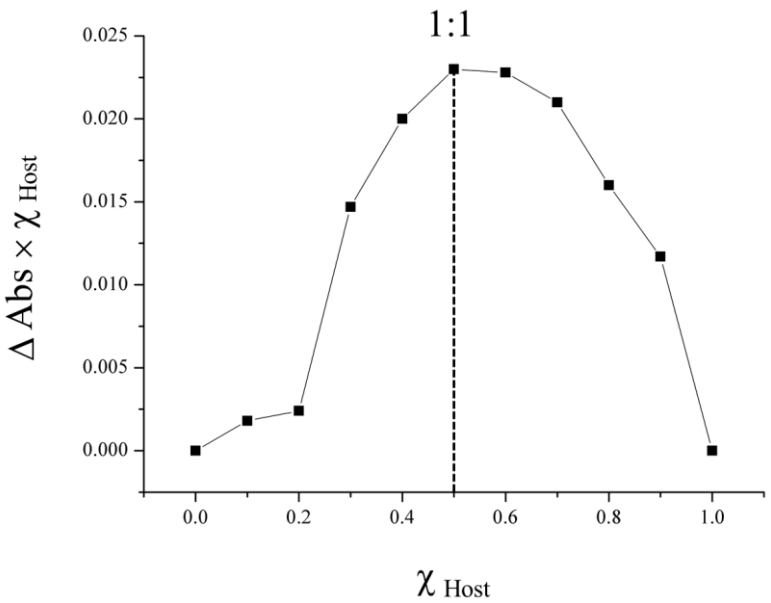


Figure S26. Job plot for the complexation of **1a** and **L3** based on the absorbance at 375 nm of UV-vis spectra.

8.2 MALDI-TOF-MS experiments

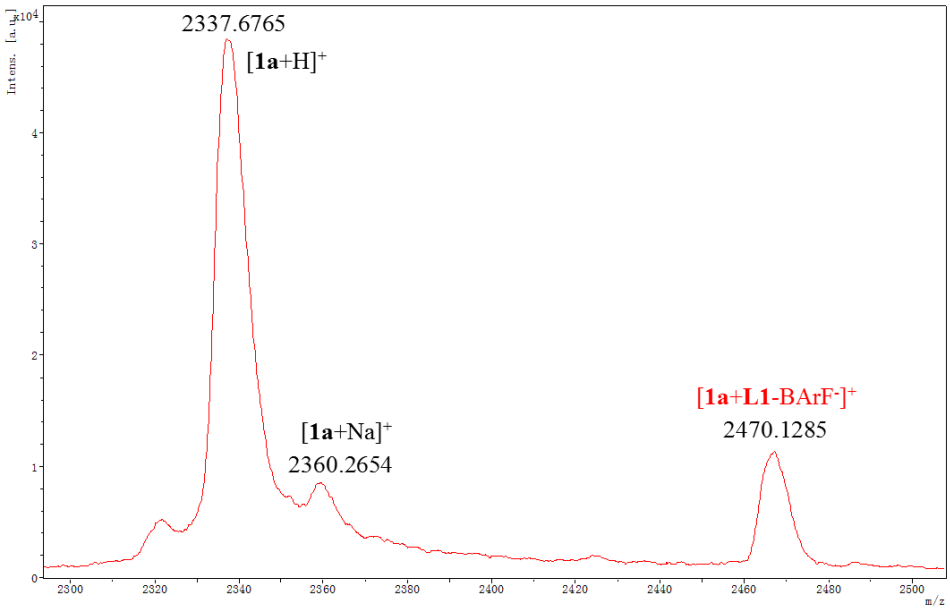


Figure S27. Partial MALDI-TOF-MS spectrum of complex **1a⊃L1**.

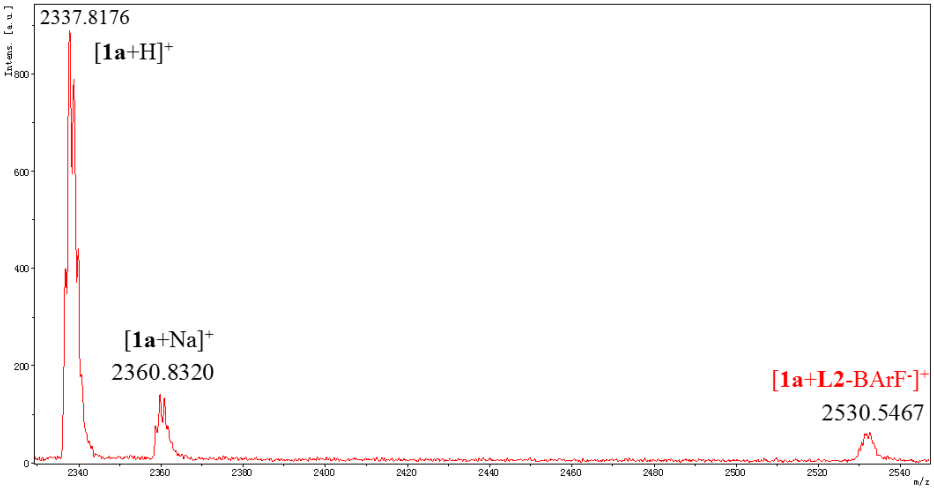


Figure S28. Partial MALDI-TOF-MS spectrum of complex **1a⊃L2**.

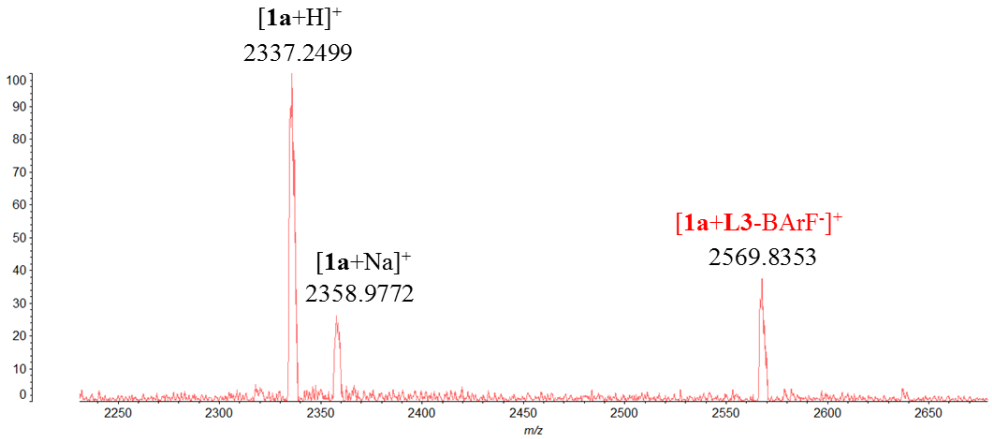


Figure S29. Partial MALDI-TOF-MS spectrum of complex **1a⊃L3**.

9. Binding constants determination between 1a and L1-L3

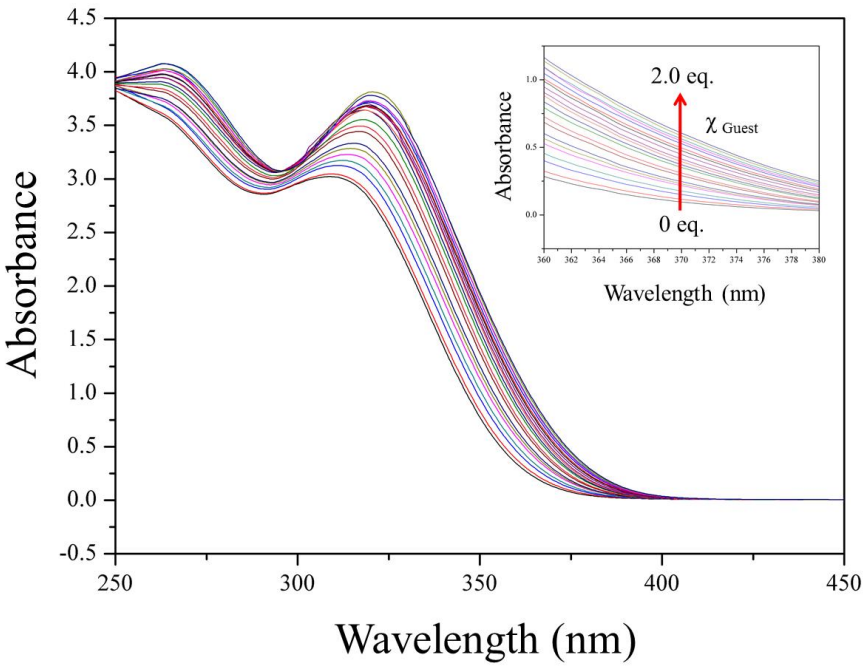


Figure S30. Stacked UV-Vis spectra of macrocycle **1a** (50 μM) titrated by **L1** from 0 eq. to 2.0 eq. in chloroform at 298 K.

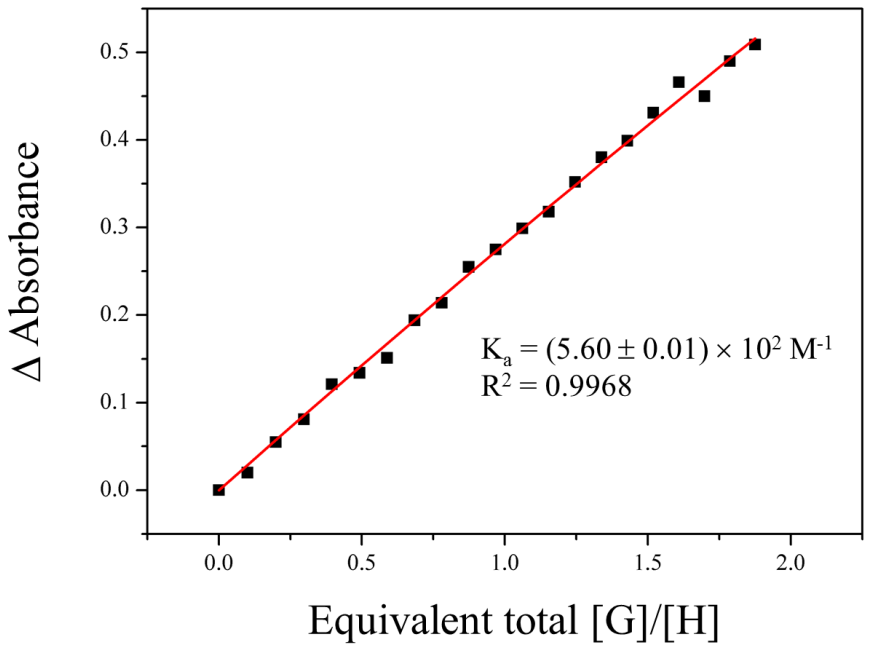


Figure S31. Determination of the binding constant of **1a⊃L1** in chloroform at 298 K. Fitting result based on absorbance at 370 nm.

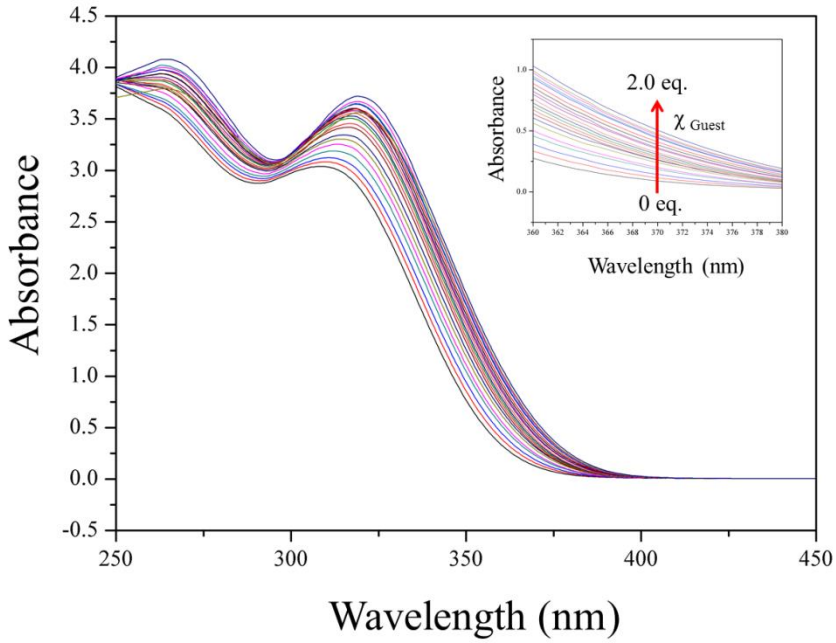


Figure S32. Stacked UV-Vis spectra of macrocycle **1a** (50 μM) titrated by **L2** from 0 eq. to 2.0 eq. in chloroform at 298 K.

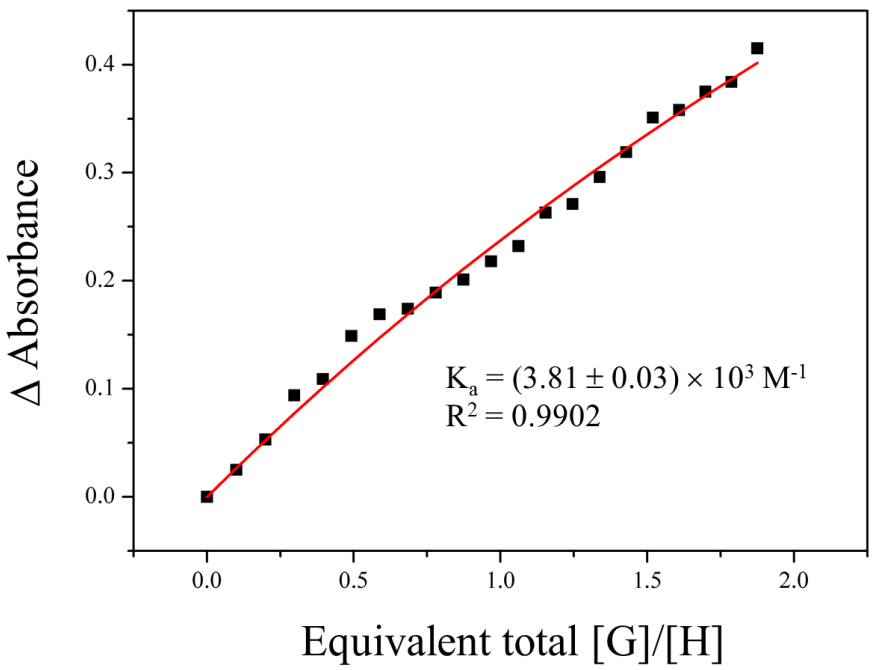


Figure S33. Determination of the binding constant of **1a⊃L2** in chloroform at 298 K. Fitting result based on absorbance at 370 nm.

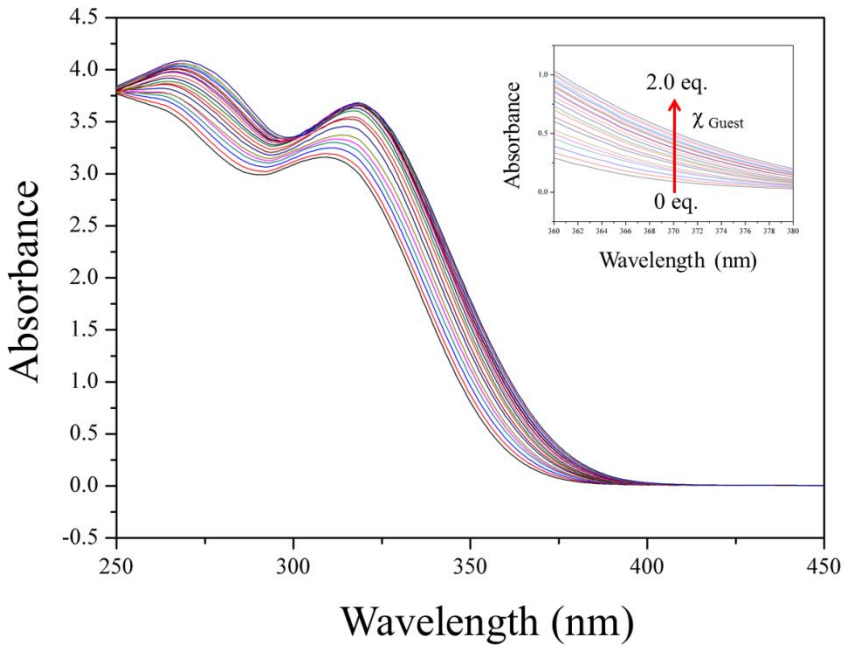


Figure S34. Stacked UV-Vis spectra of macrocycle **1a** (50 μM) titrated by **L3** from 0 eq. to 2.0 eq. in chloroform at 298 K.

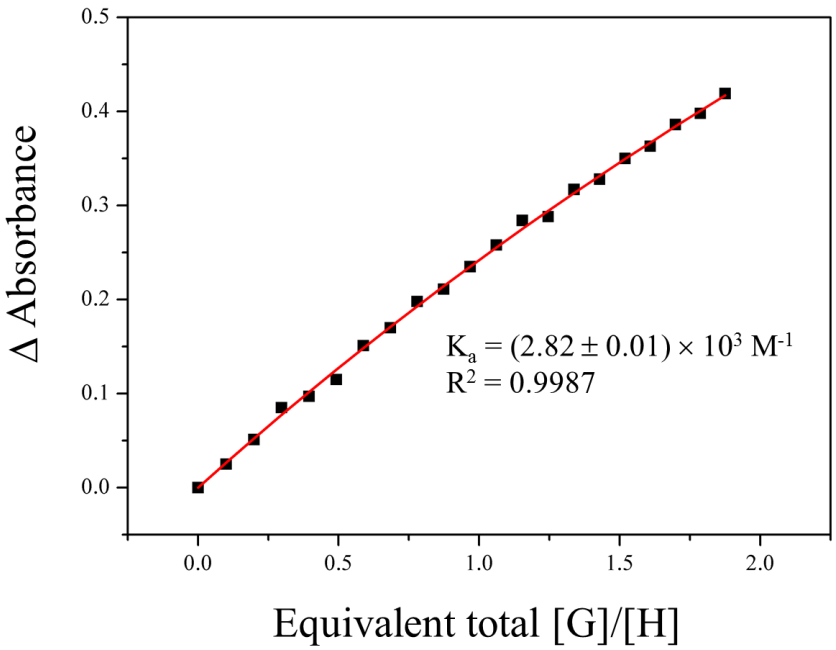


Figure S35. Determination of the binding constant of **1a⊃L3** in chloroform at 298 K. Fitting result based on absorbance at 370 nm.

10. Symmetrical CD spectral profiles of 1a, 1a⊃L/D-amino acid esters and L/D-amino acid esters

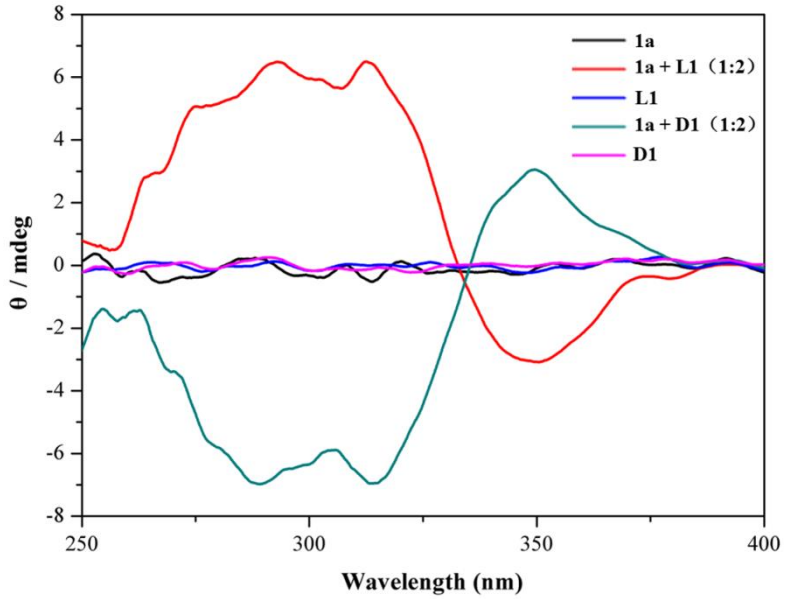


Figure S36. CD spectra of **1a** (25 μM), **L1** (25 μM), **D1** (25 μM) and **1a** in the presence of **L1** and **D1** respectively in $CHCl_3$ at 298 K (The stoichiometry of host and guest is 1:2. Optical path of cell: 10 mm).

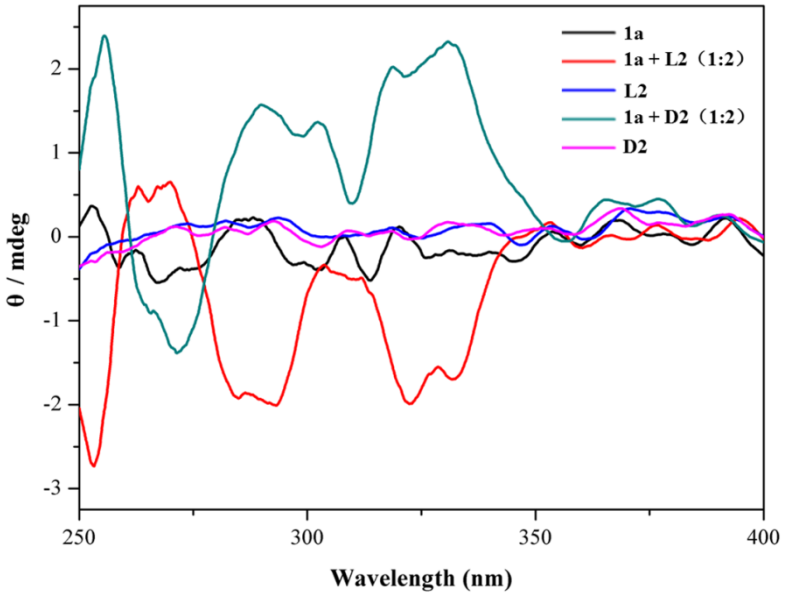


Figure S37. CD spectra of **1a** (25 μM), **L2** (25 μM), **D2** (25 μM) and **1a** in the presence of **L2** and **D2** respectively in $CHCl_3$ at 298 K (The stoichiometry of host and guest is 1:2. Optical path of cell: 10 mm).

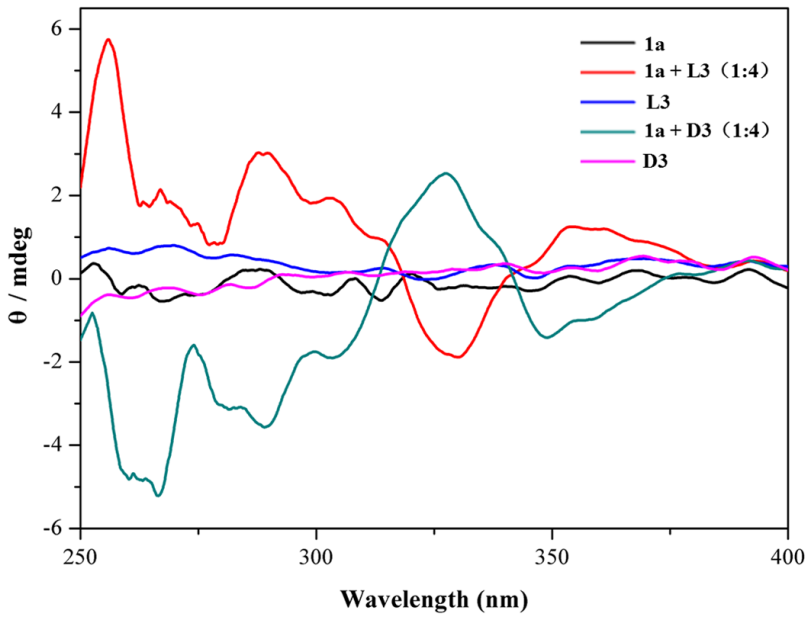


Figure S38. CD spectra of **1a** (25 μM), **L3** (25 μM), **D3** (25 μM) and **1a** in the presence of **L3** and **D3** respectively in $CHCl_3$ at 298 K (The stoichiometry of host and guest is 1:4. Optical path of cell: 10 mm).

11. DFT simulations

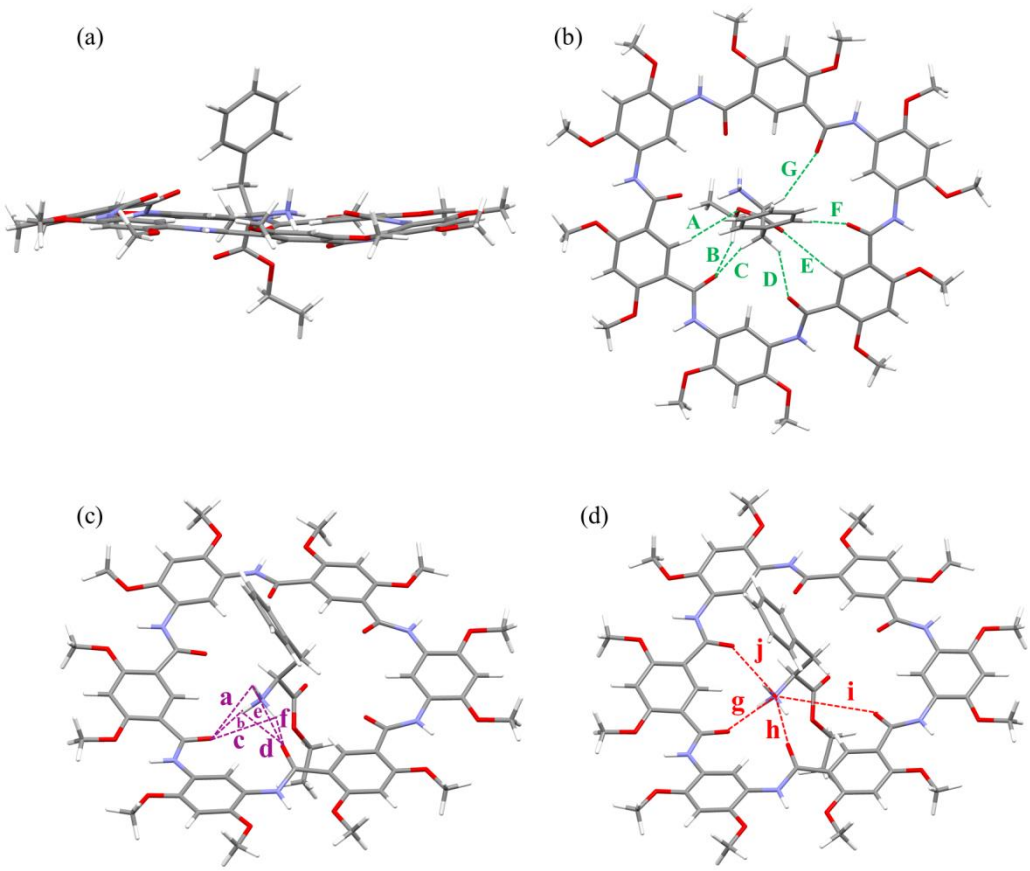


Figure S39. Side view (a) and top views (b) / (c) / (d) of optimized geometry of complex **1b⊃L2** at the B3LYP/6-311G (d, p) level (gray = C, white = H, red = O and blue = N). All side chains are replaced by methyl groups for simplicity and the counterion tetrakis [3,5-bis(trifluoromethyl)phenyl] borate anion ($BArF^-$) is omitted for clarity. The dashed green lines indicate C-H···O hydrogen bonds A-G and with A = 2.949 Å (150.84°), B= 2.587 Å (131.47°), C = 2.963 Å (135.27°), D = 2.411 Å (144.15°), E = 3.277 Å (122.50°), F = 2.333 Å (173.98°), G = 2.652 Å (154.95°). The dashed purple lines indicate N-H···O hydrogen bonds a-f and with a = 3.056 Å (64.01°), b = 1.814 Å (150.85°), c = 3.026 Å (65.65°), d = 3.060 Å (64.79°), e = 3.053 Å (65.11°), f = 1.827 Å (151.47°). The dashed red lines indicate N^+···O cation-dipole interactions g-j and with g = 4.033 Å, h = 2.765 Å, i = 2.781 Å and j = 4.628 Å.

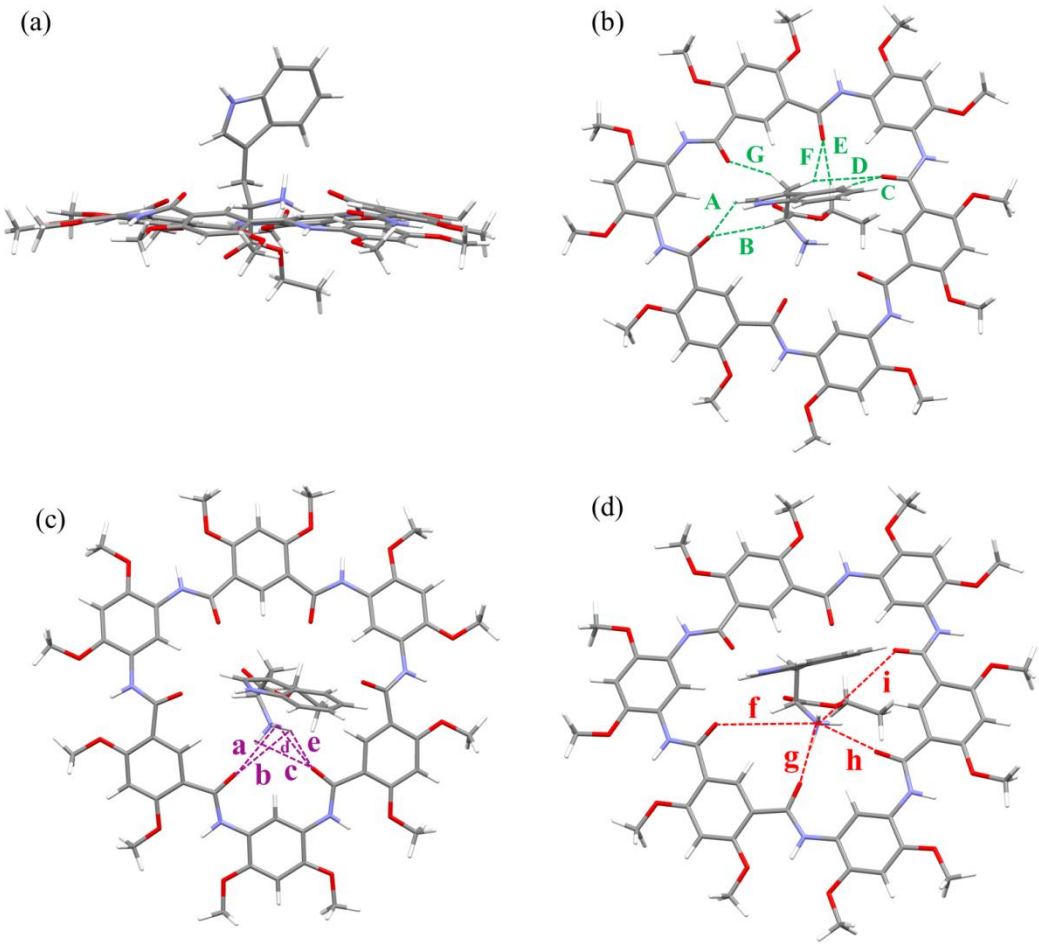


Figure S40. Side view (a) and top views (b) / (c) / (d) of optimized geometry of complex **1b⊃L3** at the B3LYP/6-311G (d, p) level (gray = C, white = H, red = O and blue = N). All side chains are replaced by methyl groups for simplicity and the counterion tetrakis [3,5-bis(trifluoromethyl)phenyl] borate anion ($BArF^-$) is omitted for clarity. The dashed green lines indicate C-H···O hydrogen bonds A-G and with A = 2.723 Å (136.37°), B= 2.521 Å (169.89°), C = 2.541 Å (173.77°), D = 3.221 Å (159.00°), E= 2.505 Å (145.68°), F = 3.104 Å (120.84°), G = 2.254 Å (155.43°). The dashed purple lines indicate N-H···O hydrogen bonds a-e and with a = 3.077 Å (61.53°), b = 3.208 Å (54.44°), c = 2.833 Å (77.10°), d = 3.013 Å (67.71°), e = 2.038 Å (127.88°). The dashed red lines indicate N^+···O cation-dipole interactions f-i and with f = 4.349 Å, g = 2.740 Å, h = 2.791 Å and i = 4.556 Å.