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Supporting Information

Chiral Transcription to Cationic Polycobaltocenes over Multiple Length Scales using Anionic Surfactants

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Figure S1. Representative photographs of the [PCE][A*]ₙ complexes during dialysis against water and ethanol: a) the [PCE][A*]ₙ complexes are insoluble in water and formed a precipitate during dialysis against water b) on further dialysis against ethanol, the precipitate gradually dissolves, and a clear yellow solution eventually formed.
Figure S2. $^1$H NMR (500 MHz, CD$_3$OD) spectrum of [PCE][C$_{16}$-L-Ala]$_n$ complex.
Figure S3. CD and UV-vis spectra of aqueous solutions of a) [Na][C\textsubscript{16}-L-Ala] and [Na][C\textsubscript{16}-D-Ala], and b) [Na][C\textsubscript{16}-L-Phe] and [Na][C\textsubscript{16}-D-Phe], all at 0.5 mg mL\textsuperscript{-1} in EtOH.

Figure S4. CD spectra of [PCE][C\textsubscript{16}-L-Ala]\textsubscript{n} at 0.5 mg mL\textsuperscript{-1} in EtOH taken at 5 °C and 55 °C.
Figure S5. CD response of [PCE][C_{16}-L-Ala]_n at 0.5 mg mL\(^{-1}\) in EtOH at 266 nm over a range of temperatures (5 °C to 55 °C).
Figure S6. CD spectra of complexes formed by (a) bis(ethylcyclopentadienyl) cobalt(III), (b) dicarba[2]cobaltocenophanium and (c) tricarba[3]cobaltocenophanium with [C_{16}-L-Ala]^- (red lines) and [C_{16}-D-Ala]^- (blue line), all at 0.5 mg mL^{-1} in EtOH.
Figure S7. $^1$H NMR (300 MHz, CD$_3$OD) spectrum of [OCE$_5$][OTf]$_5$ complex.

Figure S8. CD and UV-vis spectra of solutions of a) [OCE$_5$][C$_{16}$-L-Ala]$_5$ and [OCE$_5$][C$_{16}$-D-Ala]$_5$ complexes and b) [OCE$_5$][C$_{16}$-L-Phe]$_5$ and [OCE$_5$][C$_{16}$-D-Phe]$_5$ complexes, all at 0.5 mg mL$^{-1}$ in EtOH.
Figure S9. EDX analyses of spots A, B, C, D, E, F, G and H of [PCE][C\textsubscript{16}-L-Ala]\textsubscript{n} solution in ethanol, drop cast onto a carbon-coated copper TEM grid. The detection of Cu in all cases is due to the use of copper TEM grids.
Figure S10. DLS size distribution by volume of [PCE][C_{16}-L-Ala]_n complex (EtOH, 25 °C, 12 mg mL^{-1}). $R_h = 1.2$ nm.

Figure S11. Raw DLS correlation data of [PCE][C_{16}-L-Ala]_n complex (EtOH, 25 °C, 12 mg mL^{-1}).
Figure S12. DLS size distribution by intensity of [PCE][C_{16}-L-Ala]_n complex (EtOH, 25 °C, 12 mg mL^{-1}). \( R_h = 1.6 \text{ nm, 12.2 nm, 147.5 nm.} \)

Figure S13. DLS size distribution by volume of [PCE][Cl]_n complex (H_2O, 25 °C, 2 mg mL^{-1}). \( R_h = 18.2 \text{ nm.} \)
Figure S14. Raw DLS correlation data of [PCE][Cl]ₙ complex (H₂O, 25 °C, 2 mg mL⁻¹).

Figure S15. ¹H DOSY NMR (500 MHz, CD₃OD) spectrum of [PCE][C₁₆-L-Ala]ₙ complex.
Figure S16. WAXS data for [PCE][C$_{16}$-L-Ala]$_n$ drop cast from an ethanolic solution (12 mg mL$^{-1}$).

Figure S17. Small angle X-ray scattering data: plot of the scattered intensity ($I$) versus the magnitude of the scattering vector ($Q$) for [PCE][C$_{16}$-L-Ala]$_n$ at various concentrations in ethanol.
Figure S18. Small angle X-ray scattering data: log-log plot of the scattered intensity \( (I) \) versus the magnitude of the scattering vector \( (Q) \) for \([PCE][C_{16}-L-Ala]_n\) at various concentrations in ethanol.

Figure S19. Small angle X-ray scattering data: plot of the product of the scattering factor \( S(Q) \) versus the magnitude of the scattering vector \( (Q) \) for \([PCE][C_{16}-L-Ala]_n\) at various concentrations in ethanol.
**Figure S20.** Small angle X-ray scattering data: plot of the product of the scattered intensity and the scattering vector ($I^*Q$) versus the magnitude of the scattering vector ($Q$) for [PCE][C$_{16}$-L-Ala]$_n$ at various concentrations in ethanol.

**Figure S21.** TGA thermogram for [PCE][C$_{16}$-L-Ala]$_n$ drop cast from an ethanolic solution (12 mg mL$^{-1}$).
Figure S22. DSC thermogram for [PCE][C_{16}-L-Ala]_n drop cast from an ethanolic solution (12 mg mL$^{-1}$) obtained at a scan rate of 10 °C min$^{-1}$.

Figure S23. DSC thermogram for [PCE][Cl]_n solid obtained at a scan rate of 10 °C min$^{-1}$. 
Figure S24. WAXS data for [PCE][Cl]₆ solid.

Figure S25. DSC thermogram for [Na][C₁₆-L-Ala] (drop cast from a concentrated ethanol solution) obtained at a scan rate of 10 °C min⁻¹.
Figure S26. WAXS data for [Na][C_{16}-L-Ala] (drop cast from a concentrated ethanol solution)

Figure S27. Additional representative TEM images of assemblies of [PCE][C_{16}-L-Ala]_n in water on a carbon-coated copper grid, showing a) tightly twisted helices, and b) a larger twisted coil.
Figure S28. EDX analyses of spots A, B, C and D of [PCE][C_{16}-L-Ala]_{n} suspension in water, drop cast onto a carbon-coated copper TEM grid. The detection of Cu in all cases is due to the use of copper TEM grids.
**Figure S29.** TEM images obtained by drop-casting an aliquot of solutions of (a) [PCE][NO$_3$]$_n$ in water and (b) [Na][C$_{16}$-L-Ala] in a mixture of water and ethanol (1:1 in volume ratio) drop cast onto carbon-coated copper grids.

**Figure S30.** a) Molecular structure of [PCE][SDS]$_n$ and b) TEM image obtained by drop-casting an aliquot of solution of [PCE][SDS]$_n$ complex in ethanol on a carbon-coated copper grid.

**Figure S31.** a) Molecular structure of PFS-C$_{12}$ and TEM images obtained by drop-casting an aliquot of solutions of PFS-C$_{12}$ in b) hexane and c) isopropanol on a carbon-coated copper grid.
Figure S32. Photograph of yellow [PCE][C_{16}-L-Ala]_n precipitate of helical assemblies (isolated after dialysis with water) pressed between two quartz plates during sample preparation for solid-state CD measurements.

Figure S33. WAXS data for helical assemblies of [PCE][C_{16}-L-Ala]_n from water.
Figure S34. Additional representative SEM images of helical assemblies of [PCE][C_{16}-L-Ala]_n in water onto a carbon-coated copper grid which has been sputter-coated with Pt/Pd alloy.
Figure S35. Additional representative field emission SEM (FE-SEM) images of assemblies of [PCE][C_{16}-1-Ala]_n in water on a carbon-coated copper grid with subsequent sputter-coating with Pt/Pd alloy.
Figure S36. Additional AFM images obtained by drop-casting an aliquot of suspensions of [PCE][C_{16}-1-Ala]_n in water onto a carbon-coated copper TEM grid.
Figure S37. Additional AFM images obtained by drop-casting an aliquot of suspensions of [PCE][C_{16}-L-Ala]_6 in water onto a freshly cleaved mica surface.