Supporting Information
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Spectroscopic Visualization of Vortex Flows Using a Dye-Containing Nanofiber


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1. Materials

Unless otherwise noted, benzene (spectroscopic grade; 99.7%) was used as received from Nacalai Tesque. Compound 1 and its ester version were prepared by procedures analogous to those reported previously, and unambiguously characterized by means of $^1$H NMR, absorption, and IR spectroscopies, along with MALDI-TOF mass spectrometry.\[1\]

2. Measurements

CD and LD spectra were recorded on a JASCO type J-820 spectropolarimeter equipped with a JASCO type PTC-423L temperature/stirring controller and a custom made upside-stirring system. Absorption spectra were recorded on a JASCO type V-570 UV/VIS/NIR spectrometer equipped with a JASCO type ETC-505T temperature/stirring controller. Prior to spectral measurements, sample solutions (3.0 mL; [I] = 6.0 × $10^{-6}$ M) in benzene were prepared by dilution of a stock solution of self-assembled 1 ([I] = 9.1 × $10^{-5}$ M) with benzene and allowed to stand in the dark at 20 °C for 2 weeks. Dynamic light scattering (DLS) measurement was performed on an Otsuka model ELS-Z2 instrument. Atomic force microscopy (AFM) (contact mode) was performed on a JEOL model JSPM-5200 microscope. Transmission electron micrographs (TEM) were recorded on a Philips model Tecnai F20 transmission electron microscope operating at 120 kV.

3. Evaluation of the Contamination of CD by LD

For evaluating the spectral contamination of CD by LD, the true CD intensity ([CD Intensity]$_{\text{true}}$) at 448 nm (wavelength for the maximum LD intensity) was calculated from the observed intensities of CD ([CD Intensity]$_{\text{obsd}}$) and LD ([LD intensity]$_{\text{obsd}}$) at the same wavelength using the following semi-empirical equation.\[2,3\]

[CD Intensity]$_{\text{true}}$ = [CD Intensity]$_{\text{obsd}}$ – [LD intensity]$_{\text{obsd}}$ × 0.02

The %-contaminations of CD by LD, as calculated by the following equation, upon CW and CCW rotary stirrings, were evaluated as 23 and 24%, respectively.

%-Contamination of CD by LD = 100 × |(CD intensity)$_{\text{true}}$ – (CD intensity)$_{\text{obsd}}$|/(CD intensity)$_{\text{obsd}}$|
4. DLS measurement of self-assembled 1 in benzene

Figure S1. DLS histogram profile of nanofibers of 1 in benzene ([1] = 9.1 × 10^{-5} M) at 20 °C.
5. Time-dependent absorption spectral change on dilution of a benzene solution of 1

**Figure S2.** Absorption spectral change of a benzene solution of 1 (6.0 × 10^{-6} M) at 20 °C upon 5-fold dilution of a benzene solution (3.0 × 10^{-5} M). The spectral data were collected every 2 h over a period of 24 h. a) Absorption spectral change profile. b) Plots of absorbance at 453 nm.
6. Simulation of fluidic flows generated by rotary stirring

**Figure S3A.** A three-dimensional model for simulation of fluidic flows by a software package COSMOS/FloWorks2006™, where a $10 \times 10 \times 30$ mm cell, a $\phi 2.0 \times 5.0$ mm stirring bar for lower-side rotary stirring, and a $\phi 8.0 \times 1.0$ mm disk-shaped fin for upper-side rotary stirring were used.
Figure S3B. Simulated fluidic flows in benzene generated by lower-side clockwise (CW) stirring at 600 rpm. a) A two-dimensional representation of the flow direction (left) and velocity gradient (right). b) A three-dimensional representation of a snapshot of fluidic flows.
**Figure S3C.** Simulated fluidic flows in benzene generated by upper-side clockwise (CW) stirring at 600 rpm.  
a) A two-dimensional representation of the flow direction (left) and velocity gradient (right).  
b) A three-dimensional representation of a snapshot of fluidic flows.
7. Experimental set-up for CD and LD spectroscopies upon rotary stirring

Figure S4. a) Experimental set-up for LD and CD spectroscopies upon lower- and upper-side rotary stirrings. The cell holder is attached to a Peltier-type temperature controller. Stirring speeds for lower- and upper-side rotary stirrings are variable separately. b) A $\phi 8.0 \times 1.0$ mm disk-shaped glass fin is attached, via a glass shaft, to a movable mechanical stirrer, which allows changing the stirring position from the light pass for CD spectroscopy. The light pass is $\phi 8.0$ mm in diameter.
8. Absorption spectroscopy of a benzene solution of 1 without and with rotary stirring

Figure S5. Absorption spectra of a benzene solution (3.0 mL) of 1 (6.0 × 10⁻⁶ M) at 20 °C in a 10 × 10 × 40 mm quartz optical cell upon lower-side rotary stirring at 1350 rpm in clockwise (CW) direction using a φ2.0 × 5.0 mm Teflon-coated magnetic stirring bar (black curve) and without stirring (red curve).

→ Rotary stirring did not cause any substantial change in the absorption spectrum of 1.
9. LD spectroscopy of a benzene solution of 1 without and with rotary stirring

**Figure S6.** Linear dichroism (LD) spectra of a benzene solution (3.0 mL) of 1 (6.0 × 10⁻⁶ M) at 20 °C in a 10 × 10 × 40 mm quartz optical cell a) without stirring and b) upon lower-side rotary stirring at 1350 rpm in clockwise (CW) direction using a φ2.0 × 5.0 mm Teflon-coated magnetic stirring bar.
10. Dependence of CD intensity of a benzene solution of 1 on stirring speed

*Figure S7.* Plots of CD intensity at 453 nm of a benzene solution of 1 (6.0 × 10⁻⁶ M) at 20 °C upon stirring at varying rotating speeds in a range 0–1250 rpm. CD spectra were recorded while the solution (3.0 mL) was stirred in a counter-clockwise (CCW) direction at the bottom of a 10 × 10 × 40 mm quartz optical cell using a φ2.0 × 5.0 mm Teflon-coated magnetic stirring bar.
11. Absorption and CD spectroscopies of a benzene solution of an ester reference of 1

Figure S8. Absorption and circular dichroism (CD) spectroscopies of a benzene solution (3.0 mL) of an ester reference of 1 (4.1 \times 10^{-6} \text{ M}) in a 10 \times 10 \times 40 \text{ mm quartz optical cell at } 20^\circ \text{C}. a) Absorption spectrum. b) CD spectrum upon lower-side rotary stirring at 1350 rpm in a clockwise (CW) direction using a \( \varphi 2.0 \times 5.0 \text{ mm } \text{Teflon-coated magnetic stirring bar.}
12. CD spectroscopy of a benzene solution of 1 in quartz optical cells masked at the marginal and central parts

![Diagram](image.png)

**Figure S9.** Circular dichroism (CD) spectra of a benzene solution (3.0 mL) of 1 (6.0 × 10⁻⁶ M), upon lower-side rotary stirring at 1350 rpm using a φ2.0 × 5.0 mm Teflon-coated magnetic stirring bar at 20 °C, in 10 × 10 × 40 mm quartz optical cells a) masked at a vertical center of the cell with a 6 mm wide black tape (blue curves), b) masked at marginal parts of the cell with 4 mm wide black tapes to leave a 2 mm wide central slit (red curves), and c) unmasked (black curves). Solid and broken curves are the spectra observed upon counterclockwise (CCW) and clockwise (CW) rotary stirrings, respectively.
13. References

