SUPPORTING INFORMATION

Chiral Microneedles from an achiral Bis(BODIPY): Spontaneous Mirror Symmetry Breaking Leading to a Promising Photoluminescent Organic Material

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Figure S1. Computed preferred conformations and corresponding electron-density maps and permanent dipolar moments in CHCl$_3$ (B3LYP/6-31+G*) for meso 1 (left) and its chiral (R,R) stereoisomer (right). Note that achiral 1 adopts a pleated conformation, whereas its chiral diastereomer adopts an axially-chiral conformation with a preferred (M) helical configuration.

Figure S2. Transmission (a) and fluorescence images (b and c) of representative 1 needles under excitation with band-pass filter of 470/40 nm and monitoring the emission with a cut-off filter of 515 nm (b) and 580 nm (c).
Figure S3. Fluorescence images of the two different morphologies detected for 1: major totally-ripened crystalline needles obtained at higher dye concentrations (top); wires-enrolling fibers obtained at lower dye concentrations (bottom). Band-pass filter of 470/40 nm for the excitation; cut-off filter of 515 nm for recording the emission. 20-μm Scale-bar.

Figure S4. Fluorescence image of 1 needles showing energy migration towards the needle edges (a; 10-μm scale-bar) and emission-intensity profile across the width of a single needle (b).
Figure S5. Calculated energy-splitting values ($\Delta \nu$; Davydov splitting) from possible dipole couplings (R1-R4) between nearest neighbor dipyrrins in the crystal structure obtained by X-Ray diffraction (key distances and angles are also given). Red double-head arrow show the transition dipole moment (along the longitudinal axis of the dipyrrin).

<table>
<thead>
<tr>
<th></th>
<th>R1</th>
<th>R2</th>
<th>R3</th>
<th>R4</th>
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<tr>
<td>Distance (Å)</td>
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<td>$\alpha$ (°)</td>
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<td>$\Delta \nu$ (cm$^{-1}$)</td>
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<td>-87.2</td>
<td>+100.6</td>
<td>-48.6</td>
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</table>

Figure S6. Examples of positive ECD spectra recorded from 1 needles dispersed in CHCl$_3$ at 1.4 $10^{-4}$ M (top, left) and 6.9·$10^{-5}$ M (top, right), and silent ECD spectra observed for individual 1 molecules at 6.9·$10^{-6}$ M (bottom). Formations of chiral nanostructured fibers is detected at high enough concentrations (top) by switching on the silent ECD (bottom) observed at a low enough concentration (disaggregated state). Red line indicates the estimated smoothed spectrum from the corresponding recorded (black line) spectrum.