Electronic Supplementary Material (ESI) for Soft Matter.

Supplementary Materials for

Chirality Amplification and Detection by Tactoids of Lyotropic Chromonic Liquid Crystals

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Circular dichroism (CD) spectroscopy

CD absorption spectroscopy is often used to analyse optical activity of liquid crystals[1, 2]. In our CD experiments, in order to quantify the optical activity of LCLC solutions with chiral dopants, the samples were melted into the isotropic phase. The samples were confined between two quartz substrates purchased from GM Associates separated by $10\,\mu\mathrm{m}$ spacers. The actual sample thickness was measured by the light interference technique prior to the filling of the cells. The LCLC solutions with chiral molecules were filled into the cells at the temperature that is $10°\mathrm{C}$ above the clearing point. The cells were promptly sealed by epoxy glue. The CD spectra were recorded using a CD spectrophotometer OLIS-14 (OLIS, Inc.) equipped with the OLIS-DSM CD sample chamber, water cooler and Quantum Northwest Peltier temperature control box.

The CD spectra are presented in Fig.S1. The CD spectra and optical rotatory dispersion are related by the Kramers-Kronig transformation[3,4],

$$\alpha(\lambda)=\frac{2}{\pi}\int_0^{\infty}\theta(\mu)\frac{\mu}{\lambda^2-\mu^2}d\mu \tag{1}$$

where $\theta(\mu)$ is the ellipticity measured in CD spectra at a wavelength μ, $\alpha(\lambda)$ is the optical rotation at a different wavelength λ. To find the dependency $\alpha(\lambda)$ from the data on $\theta(\mu)$ that are limited by the spectral range of measurements, in our case between 200 nm and 400 nm, we use the so-called Moscowitz's numerical method, see, for example, Ref.[4] The intensity profile for the CD band is assumed to be of a Gaussian profile,

$$\theta(\mu)=\theta^0 e^{-\left(\frac{\mu-\mu^0}{\Delta}\right)^2} \tag{2}$$

where θ^0 is the peak intensity at a peak wavelength μ^0 and Δ is the full width at half maximum (FWHM). Then Eq. (1) becomes

$$\alpha(\lambda)=\frac{2\theta^0}{\pi}\int_0^{\infty} e^{-\left(\frac{\mu-\mu^0}{\Delta}\right)^2} \frac{\mu}{\lambda^2-\mu^2}\,d\mu \tag{3}$$

For $\Delta << \mu^0$, Eq. (3) can be approximated as

$$\alpha(\lambda)=\frac{2\theta^0}{\pi^{1/2}}\left[e^{-\left(\frac{\lambda-\mu^0}{\Delta}\right)^2} \int_0^{\frac{\lambda-\mu^0}{\Delta}} e^{x^2}\,dx - \frac{\Delta}{2\left(\lambda+\mu^0\right)}\right]; \tag{4}$$

numerical integration of the latter expression is performed by dividing the range from 0 to $\frac{\lambda-\mu^0}{\Delta}$ into $N = 100$ intervals to obtain

$$\alpha(\lambda)=\frac{2\theta^0}{\pi^{1/2}}\left[\sum_{x=0}^{\left(\frac{\lambda-\mu^0}{\Delta}\right)} \frac{e^{(x+h)^2-\left(\frac{\lambda-\mu^0}{\Delta}\right)^2}+e^{(x)^2-\left(\frac{\lambda-\mu^0}{\Delta}\right)^2}}{2}h\right]-\frac{2\theta^0}{\pi^{1/2}}\frac{\Delta}{2\left(\lambda+\mu^0\right)}\ , \tag{5}$$

where $h=\frac{1}{N}\left(\frac{\lambda-\mu^0}{\Delta}\right)$.

The CD spectra and the corresponding optical rotatory dispersion are shown in Fig. S1.

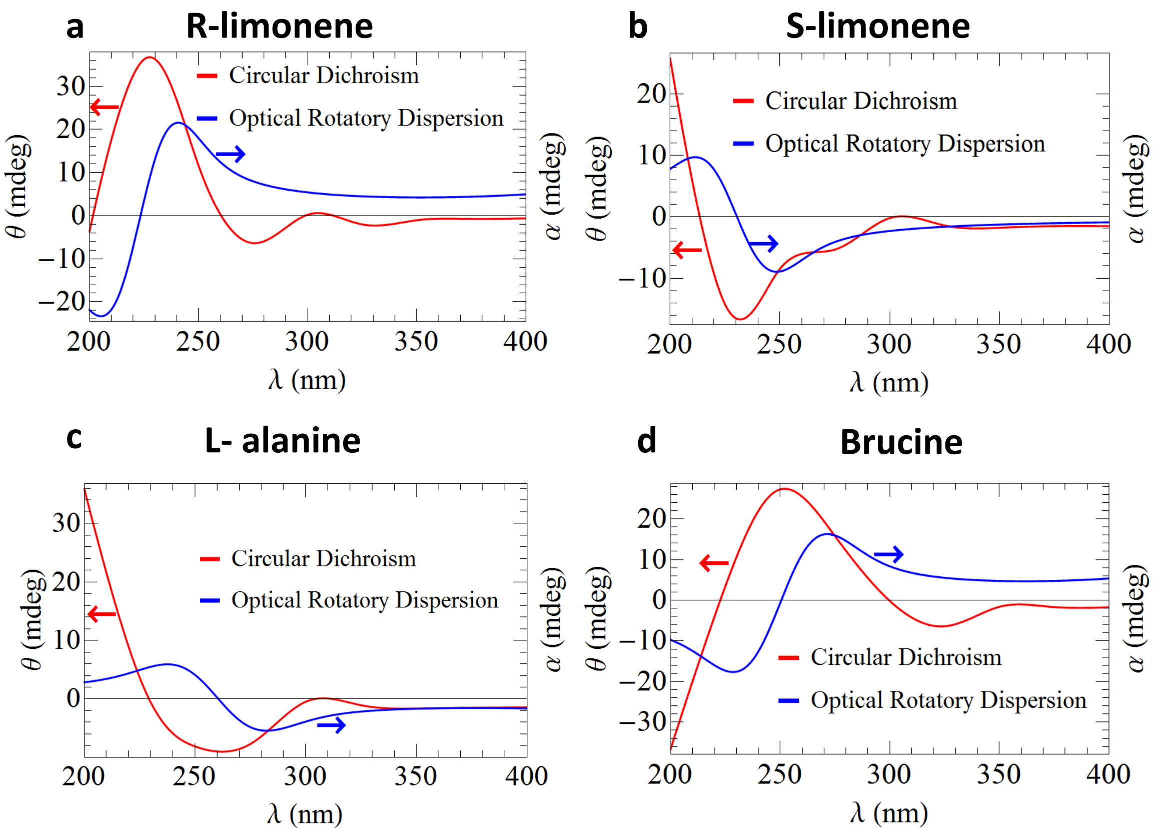

Fig.S1 CD spectra and optical rotatory dispersion of LCLC samples with chiral dopants in the isotropic phase. **a-b**, R- and S-limonene samples in isotropic phase. Optically active signals at 225nm were observed for both samples. **c-d,** L-alanine and brucine samples in isotropic phase. Optically active signals are at 255nm. The variations in cell thickness due to the preparation of the sandwiched quartz cells and the experimental errors in the mixture preparation result in the difference in signal intensity.

References

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