Supporting Information

Wide-angle lasing from photonic crystal nanostructures of liquid-crystalline blue phase

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Calculation of specific mass concentration of chiral molecules in the three chiral mixtures, ZTO-5024LA-SB11, ZTO-5059LA-SB11 and HTW114200-100-SB11

Based on the Bragg condition and the relationship of HCP on helical pitch, the required weight percentage of chiral molecules in the three chiral mixtures can be calculated, which is described as below. The criterion of Bragg reflection is expressed as Equation S1.

$$2n_{av} d \cos\theta = \lambda \tag{S1}$$

, where

n_{av} = average refractive index of liquid crystal = $\frac{2n_o + n_e}{3}$

n_o = ordinary refractive index

n_e = extraordinary refractive index

d = reciprocal lattice spacing = $\frac{a}{\sqrt{(h^2 + k^2 + l^2)}}$

a = lattice constant

h, k, l = reciprocal lattice plane

θ = reflected (diffracted) angle

λ = wavelength = $\frac{2n_{av} a \cos\theta}{\sqrt{(h^2 + k^2 + l^2)}}$ (for BPI, a = P; for BPII, a = P/2)

P = helical pitch

HCP (μm^{-1}) = helical twisting power = $\frac{1}{PC}$

C (wt%) = weight percentage of chiral molecules

Because S811 exerts the HTP on the three NLCs are 13.11 μm^{-1}, 8.95μm^{-1}, and 11.4 μm^{-1} respectively, the corresponding weight percentages of chiral molecules are calculated to be 26.2, 31.3, and 37 based on the above equations.

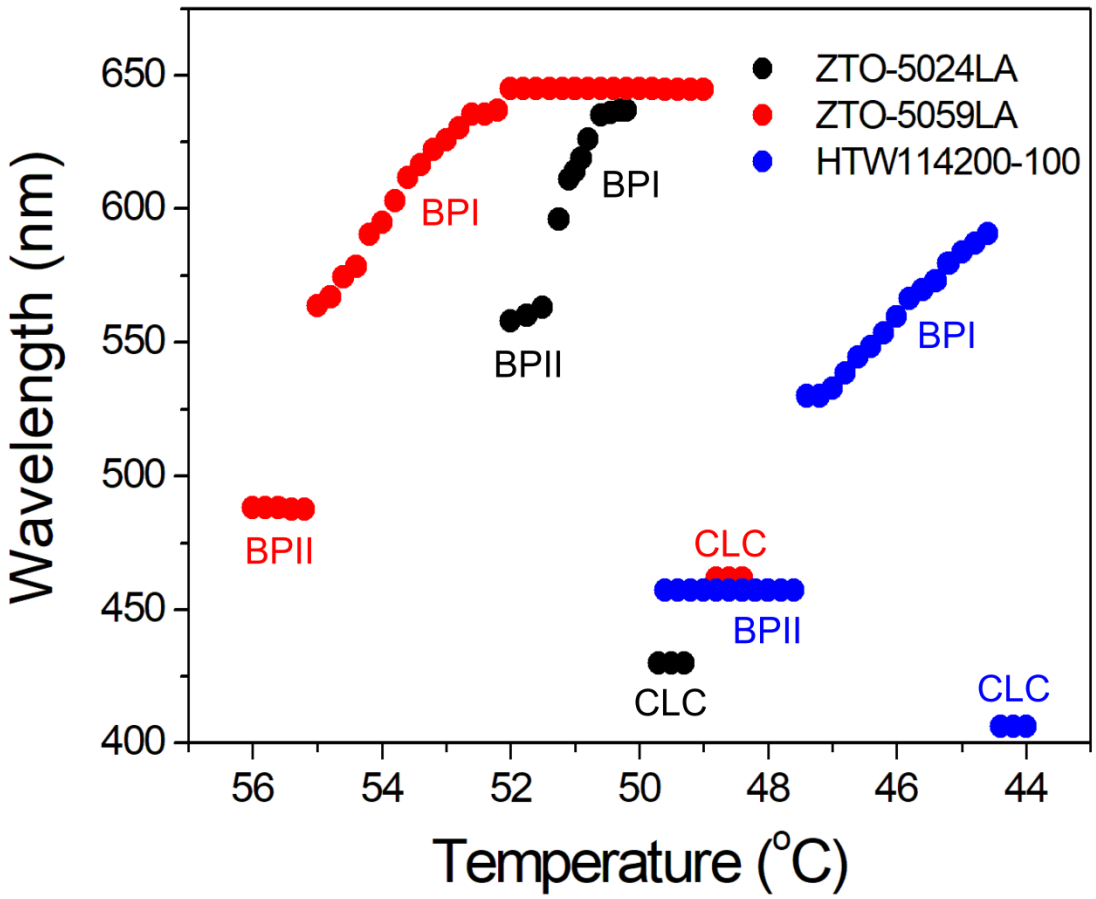

Figure S1. The phase evolution process of ZTO-5024LA+S811, ZTO-5059LA+S811 and HTW114200-100+S811 corresponds to the temperature of sample and Bragg reflection peak wavelength. In these cases, the phase starts at BPII (51.8 ºC, 56.0 ºC and 49.6 ºC) with reflection peak wavelength at 560 nm, 488 nm and 457 nm, and then experiences BPII-BPI phase transition, where a sudden rise in reflection peak wavelength takes place. When the sample continues to drop in temperature, it accompanies with red shift in reflection peak wavelength. With the same manner, the reflection peak wavelength from BPI keeps ascending toward a maximum value (634 nm/50.2 ºC, 645 nm/49.0 ºC and 591 nm/44.6 ºC) for the decrease in temperature and ends up until the phase transforms to CLC (49.7 ºC, 48.8 ºC and 44.4 ºC) with the reflection peak wavelength at 432 nm, 462nm, and 406 nm, respectively.

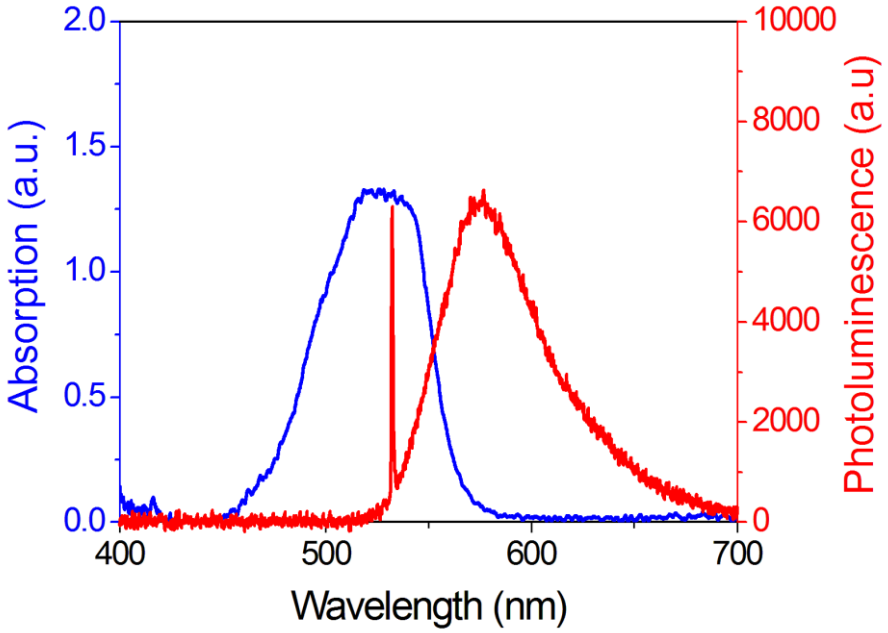

Figure S2. (a) The absorption and emission spectrum of PYRROMETH-597. The absorption band (blue line) ranges from 470 nm to 560 nm, while the emission band (red line) ranges from 530 nm to 650 nm, which overlaps with the PBG edge in the BP sample.