Angularly Anisotropic Giant Circularly Polarized Luminescence from Chiral Conjugated Polymer Microsphere

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Pixeled circularly polarized luminescence (CPL) emitter of supramolecular assemblies with large dissymmetry (g_{lum}) and angular anisotropy are valuable for integrated organic optoelectronics devices. However, such CPL emitter has not yet been achieved.[1] The reason for this limitation mainly comes from the difficulty in incorporating ordered nano-helical architectures into a mechanically stiff minute object. Here, we present novel angularly anisotropic CPL emitters from self-assembled polymeric microspheres.

π-conjugated polymers bearing enantiopure chiral side chains (**(*S*,*S*)-PFBT**)[2] (**Fig. 1a**) self-assembly into well-defined solid microspheres upon a sluggish diffusion of poor solvent vapor. Despite its spherical morphology, the resultant microspheres exhibit anisotropic birefringence (**Fig. 1b**) and feature twisted-bipolar topology, where the polymer chains helically stack with one another to form cholesteric helicoids in a structurally anisotropic manner (**Fig. 1c**). The twisted bipolar interior is formed via liquid–liquid phase separation and subsequent condensation into cholesteric lyotropic liquid crystalline mesophase. The methanol suspension of the chiral microspheres displays marked CPL with the average $|g_{lum}|$ value as high as 0.23. Furthermore, single-particle CPL measurements reveal that the twisted-bipolar microspheres show distinct anisotropic CPL emission, where $|g_{lum}|$ toward the equatorial direction reaches ~0.5, which is 2.5-fold greater than that along the bipolar axis (**Fig. 1c, d**).

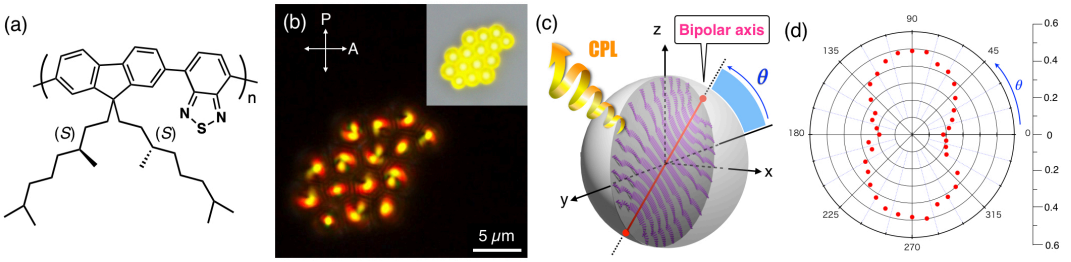

Figure 1. (a) Molecular structure of **(*S*,*S*)-PFBT**. (b) Polarized optical and optical (inset) micrographs of the self-assembled microspheres. (c) A schematic representation of twisted bipolar configuration in the microsphere. The cylinders (purple) represent the mainchain of the polymer. (d) Plots of altitudinal (θ) polar coordinate of $|g_{lum}|$ at 546 nm values of the single microsphere.

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