

# Supporting Information

## Optically Active Upconverting Nanoparticles with Induced Circularly Polarized Luminescence and Enantioselectively Triggered Photopolymerization

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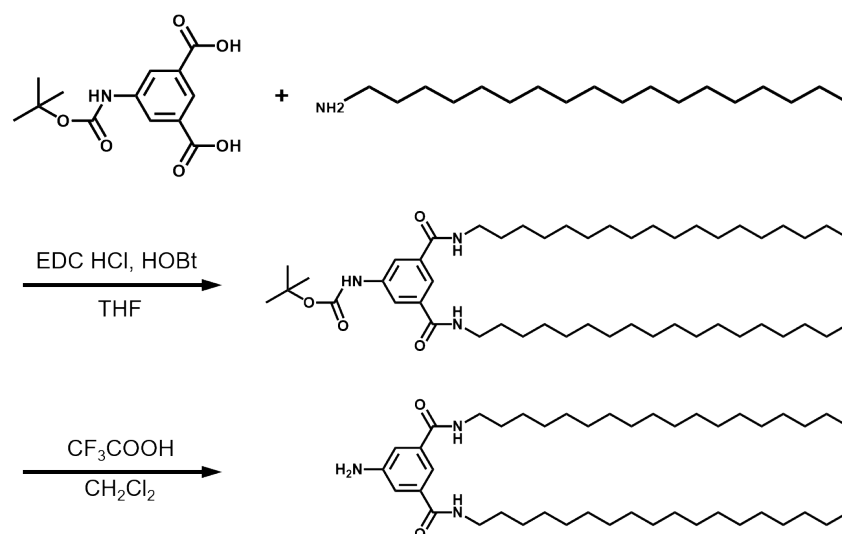
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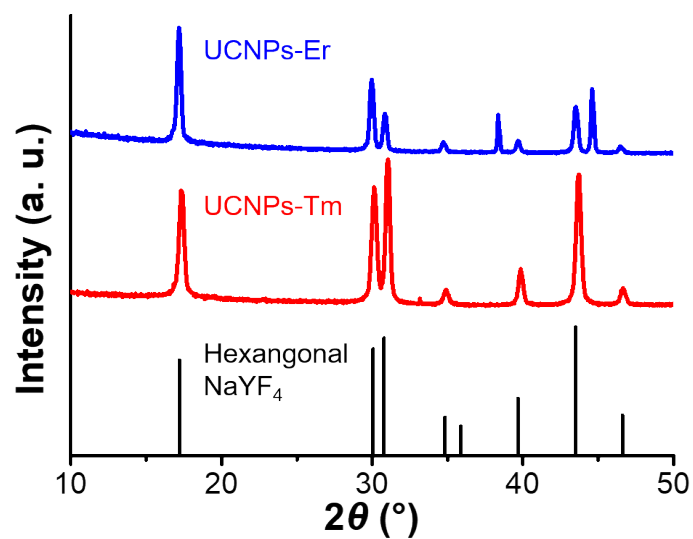
## Synthesis of BAm



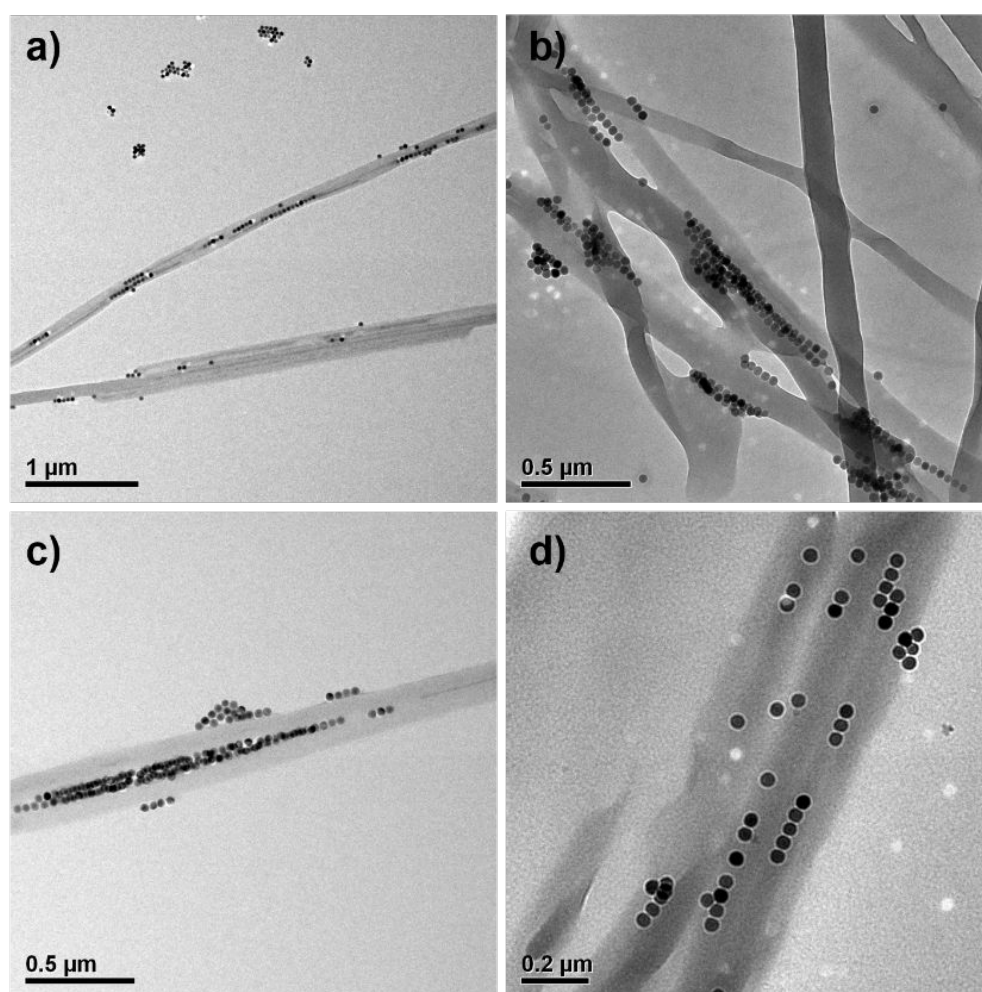
**Scheme S1.** Synthetic route of BAm.

BAm was synthesized according to previous reported methods.<sup>1</sup> Briefly, Boc-5-aminoisophthalic acid (0.24 mmol) and octadecanamine (0.5 mmol) was dissolved in tetrahydrofuran (THF, 100 mL). Then, 1-ethyl-3-(3-dimethylaminopropyl)carbodiimide hydrochloride (EDC·HCl, 0.6 mmol) and 1-hydroxybenzotriazole (HOBt, 0.6 mmol) were added. The mixture was stirred at room temperature for 48 h. After removal of the solvents, the remained solids were dissolved in 30 mL of ethanol and then poured into the 1 % Na<sub>2</sub>CO<sub>3</sub> aqueous solution (500 mL). The collected precipitate was purified by column chromatography over silica gel to yield a white powder (yield: 56%). The purified Boc-BAm was firstly dissolved in dichloromethane (20 mL). Afterwards, trifluoroacetic acid (4 mL) was added and stirred at room temperature for 6 h. After removal of the solvents, the remained substance was dissolved in 30 mL of THF and then poured into 1 % Na<sub>2</sub>CO<sub>3</sub> aqueous solution (500 mL). After filtration, the product was purified by reprecipitation in THF to give a light yellow solid BAm (yield: 98%). <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>, ppm): δ = 7.41 (s, 1H), 7.17 (s, 2H), 6.21 (s, 2H), 3.44-3.39 (m, 4H), 1.60-1.55 (m, 4H), 1.32-1.25 (m, 60H), 0.89-0.85 (m, 6H). MALDI-TOF-MS: calculated for C<sub>44</sub>H<sub>81</sub>N<sub>3</sub>O<sub>2</sub>: 684.30. Found: 684.8.

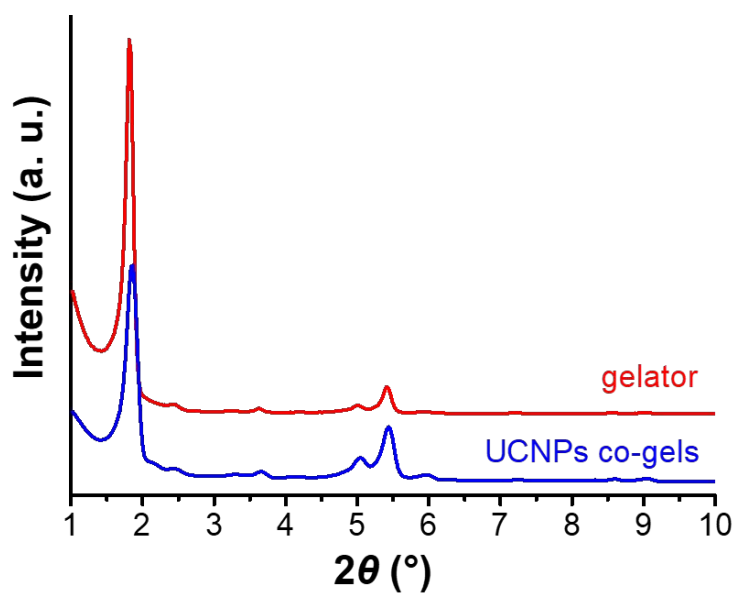
## Supplementary Figures and Tables



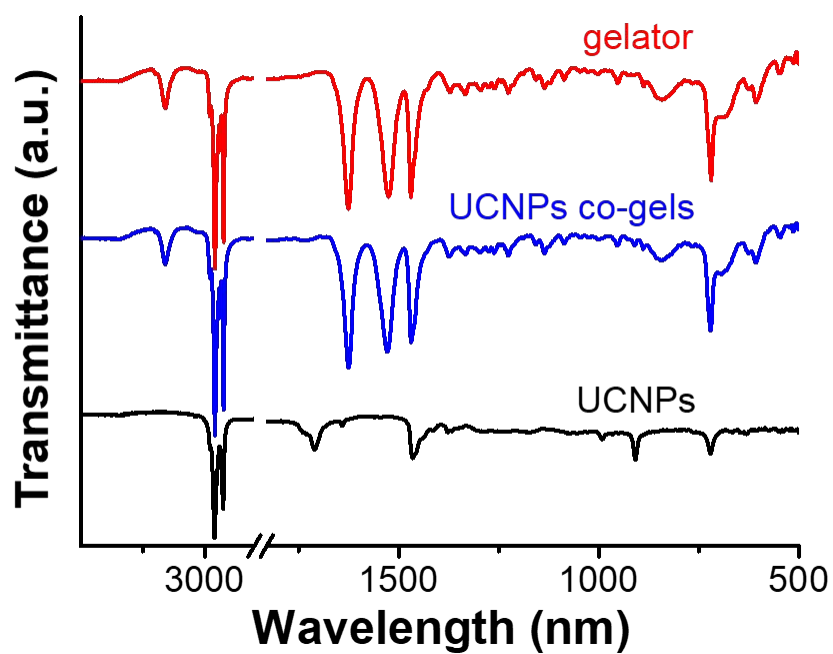
**Figure S1.** XRD patterns of UCNPs-Er (blue), UCNPs-Tm (red) and hexagonal NaYF<sub>4</sub> (JCPDS No. 16-0334).



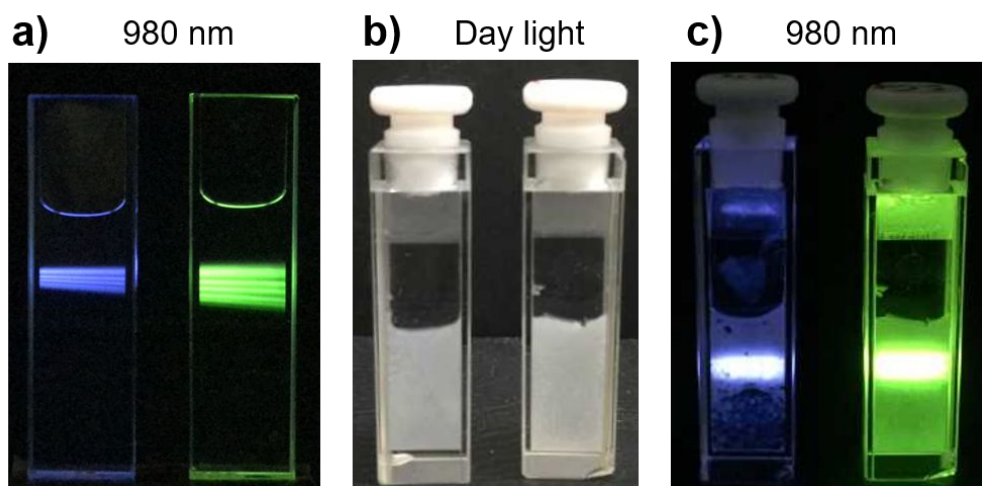
**Figure S2.** TEM images of UCNPs/chiral gelator co-gels.



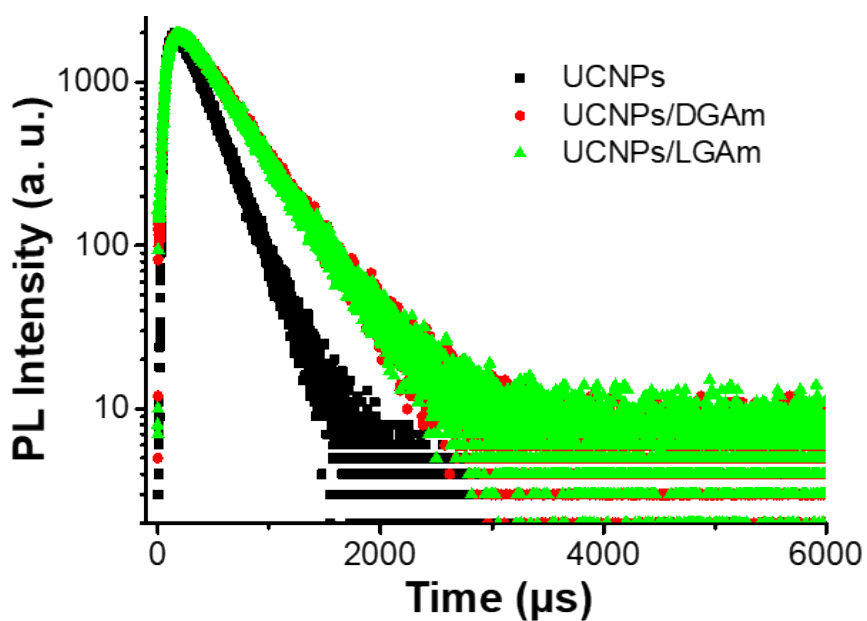
**Figure S3.** XRD of DGAm (red line) and DGAm/UCNPs-Er co-gels (blue line).



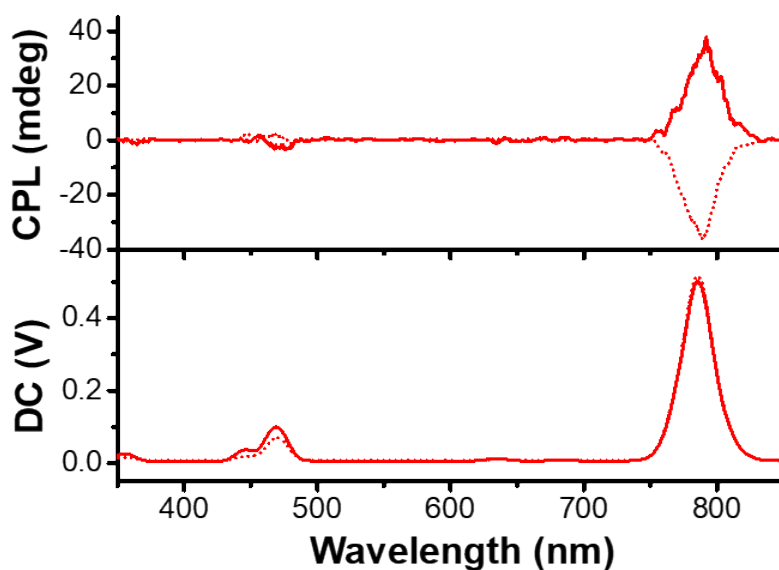
**Figure S4.** FTIR spectra of DGAm (red line), DGAm/UCNPs-Er co-gels (blue line) and UCNPs-Er (black line).



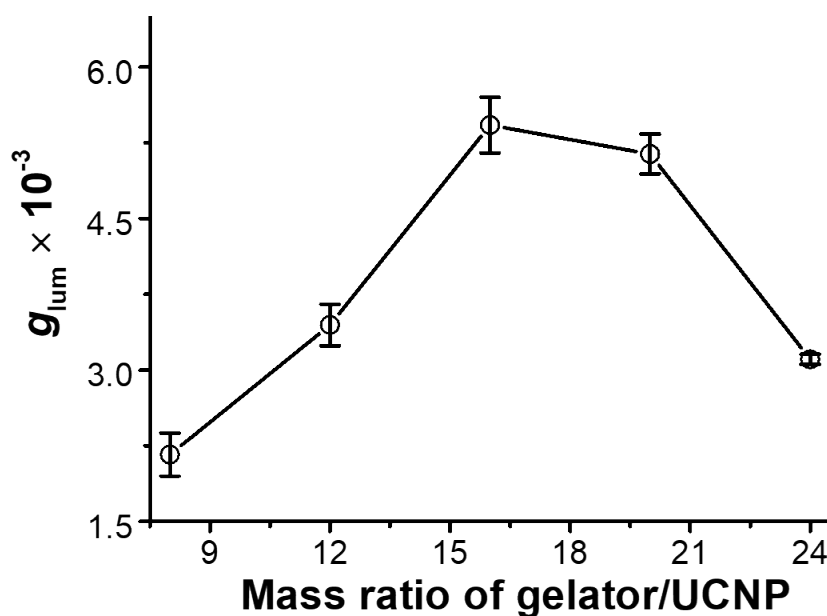
**Figure S5.** The photo images for UCNPs-Tm (left) and UCNPs-Er (right) in (a) DMF solution and (b, c) co-gel systems under the irradiation of 980 nm laser (a, c) and day light (b).



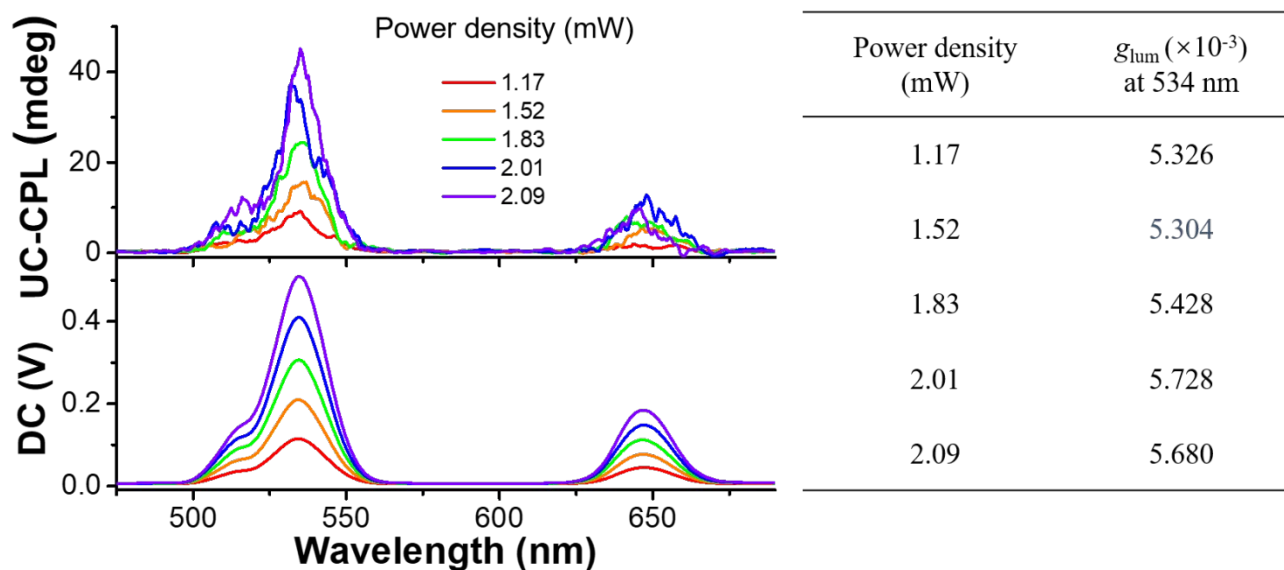
**Figure S6.** Time resolved upconverted emission at 540 nm of the UCNPs-Er (black square), UCNPs-Er/DGAm co-gels (red circle) and UCNPs-Er/LGAm co-gels (green triangle).  $[\text{LGAm}] = [\text{DGAm}] = 26.67 \text{ mg mL}^{-1}$ ,  $[\text{UCNPs-Er}] = 1.67 \text{ mg mL}^{-1}$ ,  $\lambda_{\text{ex}} = 980 \text{ nm}$ .



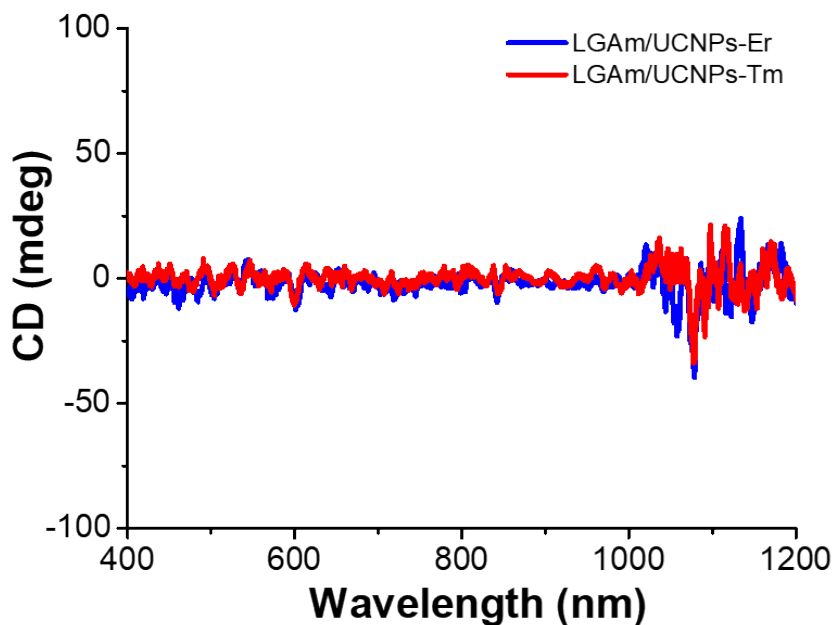
**Figure S7.** UC-CPL spectra of UCNPs-Tm doped co-gels excited by 980 nm laser. [LGAm] = [DGAm] = 26.67 mg mL<sup>-1</sup>, [UCNPs-Tm] = 1.67 mg mL<sup>-1</sup>. Clearly, due to the strong emission at 785 nm, the UC-CPL at other emission position were weak. Therefore, the UC-CPL spectra of UCNPs-Tm doped co-gels was tested in separate parts of wavelength (300-490 nm and 700-850 nm), wherein the maximum emission peaks were modulated around 0.5 V, as shown in Figure 4a.



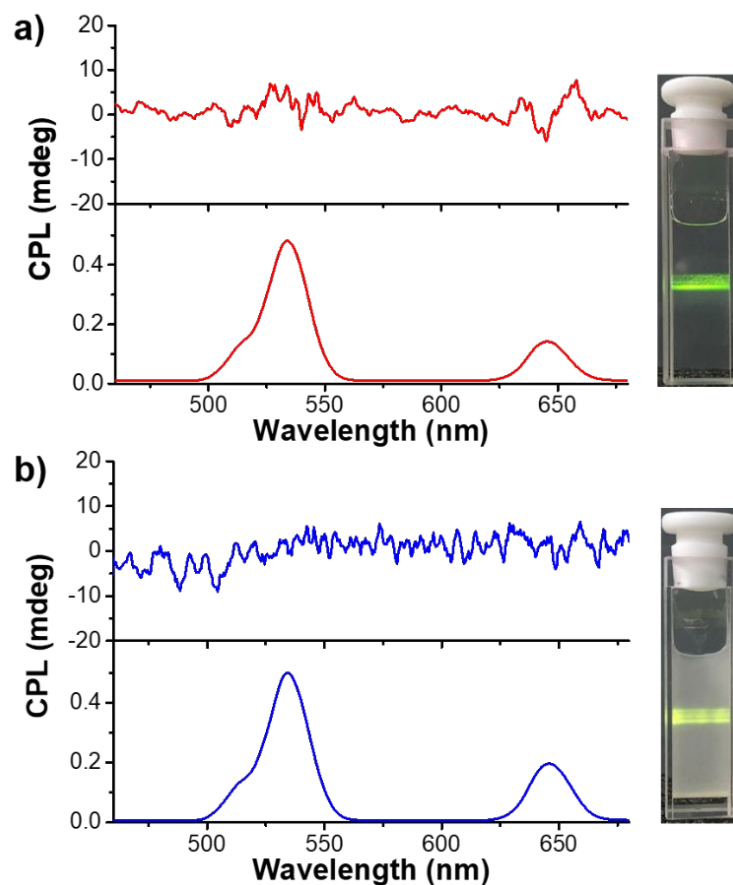
**Figure S8.**  $g_{lum}$  values of the co-gel system measured at 534 nm as a function of mass ratio of LGAm/UCNPs-Er. The concentration of gelator was kept constant at 26.67 mg mL<sup>-1</sup> in DMF.



**Figure S9.** UC-CPL spectra of LGAm/UCNPs-Er co-gels with different incident power density of 980 nm laser. The table shows the corresponding  $g_{\text{lum}}$  values. [LGAm] = 26.67 mg mL<sup>-1</sup>, [UCNPs-Er] = 1.67 mg mL<sup>-1</sup>.

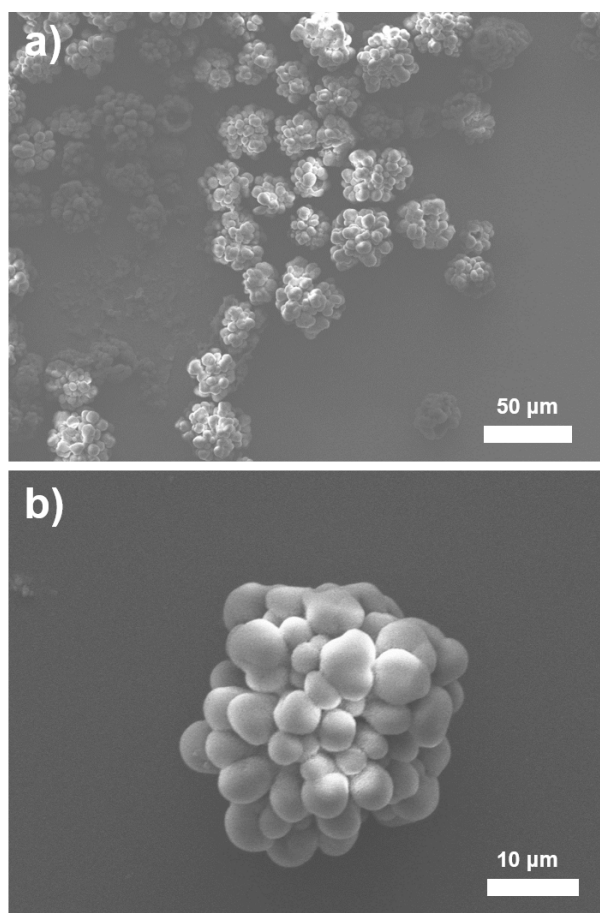


**Figure S10.** CD spectra of UCNPs doped co-gels. [LGAm] = 26.67 mg mL<sup>-1</sup>, [UCNPs-Tm] = [UCNPs-Er] = 1.67 mg mL<sup>-1</sup>.

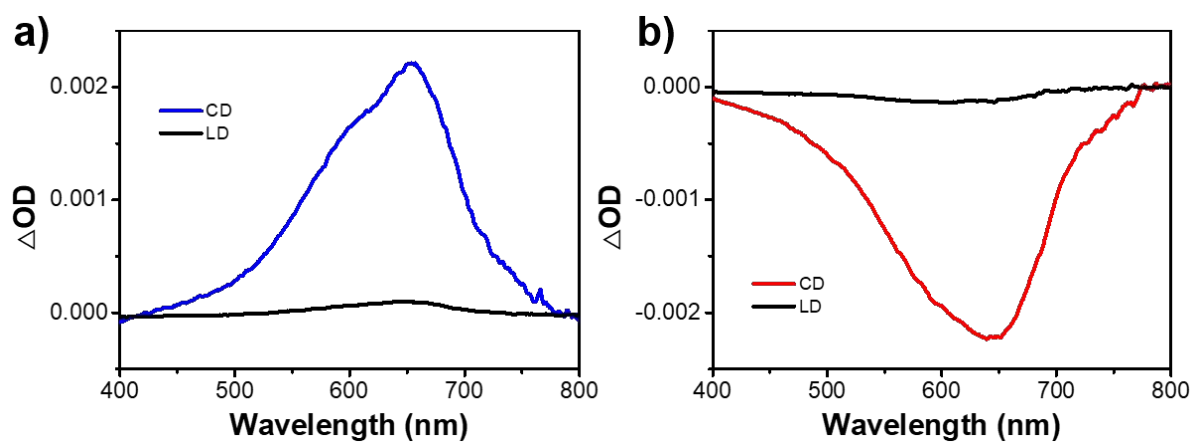


**Figure S11.** (a) CPL spectra of LGAm/UCNPs-Er in the disassembly state excited by 980 nm laser. The disassembly spectrum of LGAm/UCNPs-Er was obtained from a chlorobenzene solution. [LGAm] = 13.34 mg mL<sup>-1</sup>, [UCNPs-Er] = 1.67 mg mL<sup>-1</sup>. (b) CPL spectra of BAm/UCNPs-Er in the excited by 980 nm laser. [BAm] = 28.07 mg mL<sup>-1</sup>, [UCNPs-Er] = 1.67 mg mL<sup>-1</sup>. The left photographs are the images of corresponding samples excited by 980 nm laser.





**Figure S12.** SEM images of BAm/UCNPs-Er. [BAm] = 28.07 mg mL<sup>-1</sup>, [UCNPs-Tm] = 1.67 mg mL<sup>-1</sup>.



**Figure S13.** CD and LD spectra of the PDA films, which are unified as the same unit ( $\Delta OD$ ).