

Supplementary Information for

## **New AIE Photoluminescent Polymers with Multicolor Prepared through Controlling pH value**

Chenxi Hu,<sup>a, b</sup> Yue Ru,<sup>b</sup> Zhaoyan Guo,<sup>b</sup> Zhenjie Liu,<sup>b</sup> Jianhui Song,<sup>b</sup> Wenbo Song,<sup>b</sup>  
Xiaohong Zhang<sup>b</sup> and Jinliang Qiao<sup>\*a, b</sup>

<sup>a</sup> College of Materials Science and Engineering, Beijing University of Chemical and  
Technology, Beijing 100029, P. R. China. Email: qiaojl.bjhy@sinopec.com

<sup>b</sup> SINOPEC Beijing Research Institute of Chemical Industry, Beijing 100013, P. R. China.

## Experimental Section

*Materials:* Poly(maleic anhydride-alt-vinyl acetate) (PMV) was polymerized according to our previous report and used as powder.<sup>1</sup> NaOH, sodium chloride, sodium alginate were purchased from Sinopharm Chemical Reagent Co., Ltd. Poly(vinyl alcohol) (PVA) was purchased on Aladdin. Polydimethylsiloxane (PDMS) (Sylgard 184) was purchased from Dow Corning. YAG:Ce yellow phosphor, 380nm and 460 nm InGaN chips were purchased from Shenzhen looking long technology co., LTD. All the materials were used as received.

*Synthetic procedures:* In a typical routine, a total of 0.5 g NaOH was dissolved in 200 mL deionized water, and 4 g PMV powder was added. The mixed solution was stirred until PMV was completely depleted. Then the as-prepared solution was dried in vacuum oven at 50 °C for 10 h to remove all water. Finally, faint yellow solid was obtained and named as PMV-C. Other photoluminescent PMV derivatives, PMV-G, PMV-Y, PMV-O, PMV-R, were prepared similar to the routine of PMV-C, just adjusting NaOH usage to 2, 3, 4, 5 g, respectively.

h-PMV was prepared by dissolving 4 g PMV to 200 mL water and drying. h-PMV/Na was made by casting 4 g h-PMV into 200 mL NaOH aqueous solution (0.01g ml<sup>-1</sup>) and drying.

The mixtures of PMV-Y solid and sodium chloride, PVA, sodium alginate, PVA aqueous solution were used to prepare photoluminescent composites, film, fiber and gel, respectively.

*WLED Fabrication:* Commercially 380 nm and 460 nm InGaN chips were selected as excited light source. Photoluminescent PMV derivatives were mixed with PDMS at proper ratio to prepare the color conversion layer. The mixtures were coated on emissive chips and cured at 80 °C for 1 h to obtain WLEDs.

*Characterization:* All the 3D spectrograms, decay times, absolute quantum yields, emission spectra were conducted on Fluoromax-3 spectrofluorometer (HORIBA JY Inc). The UV–Vis spectra were measured on Evolution 600 (Thermo Electron Corp.). The FTIR spectrums were performed on Bruker VERTEX 70 FTIR spectrometer and NMR spectra were measured on an Agilent 400-MR DD2 NMR spectrometer using deuterated water as solvent.

The test data of WLEDs were obtained on HAAS-2000 High Accuracy Array Spectroradiometer.

## References

1. Y. Ru, X. Zhang, W. Song, Z. Liu, H. Feng, B. Wang, M. Guo, X. Wang, C. Luo, W. Yang, Y. Li and J. Qiao, *Polym. Chem.*, 2016, **7**, 6250-6256.

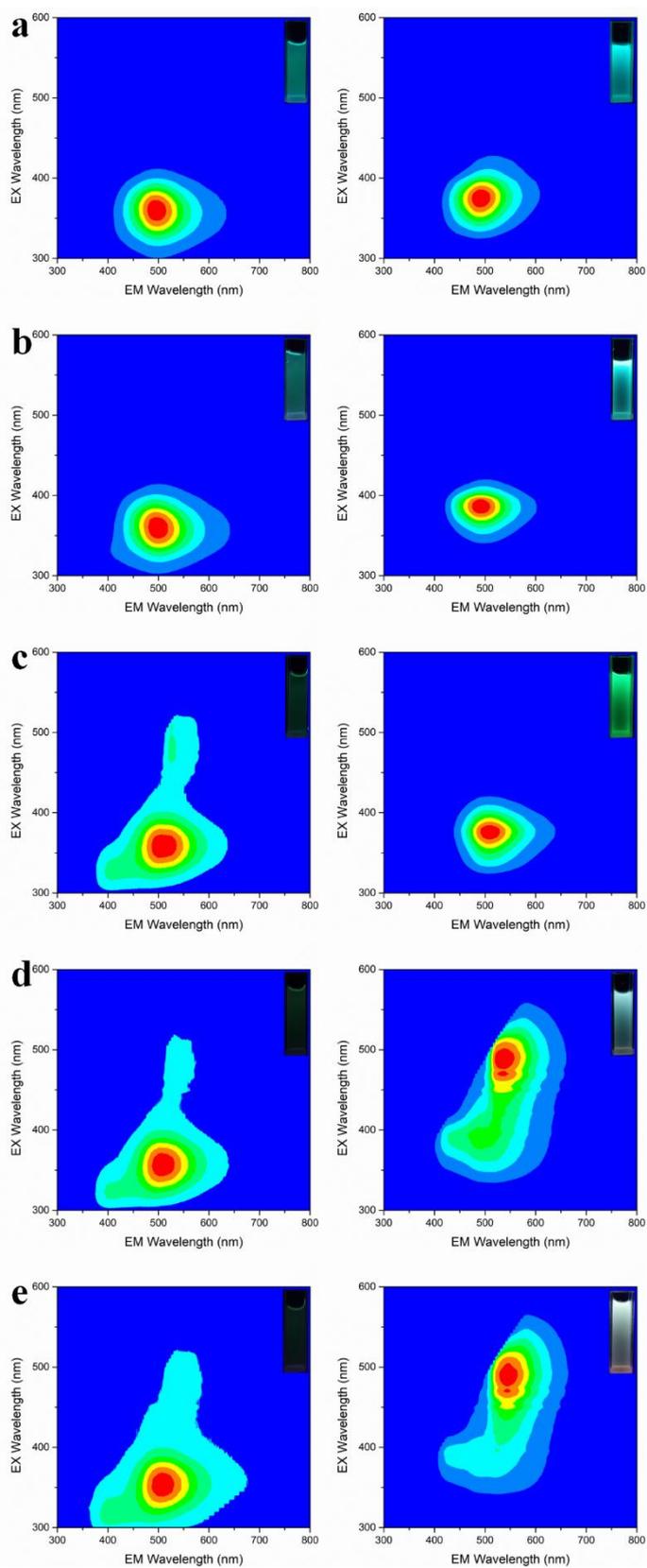


Figure S1. The 3D spectra of 1st (left), 2nd (right) solutions of (a) PMV-C, (b) PMV-G, (c) PMV-Y, (d) PMV-O and (e) PMV-R. Inset: photos of each solution under 365 nm UV light.

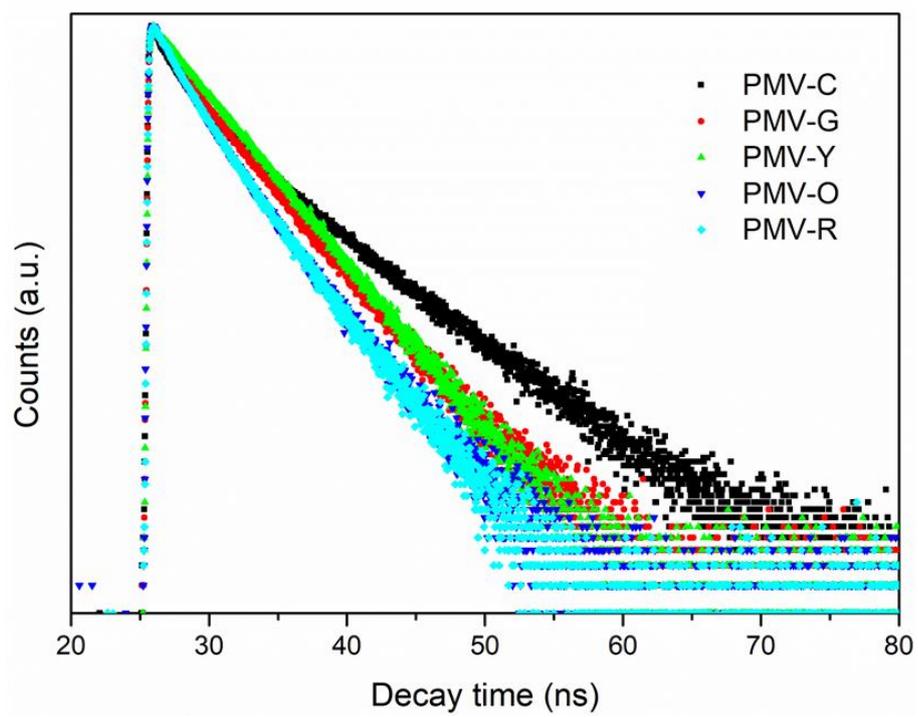


Figure S2. Decay times of PMV-C to PMV-R solids.

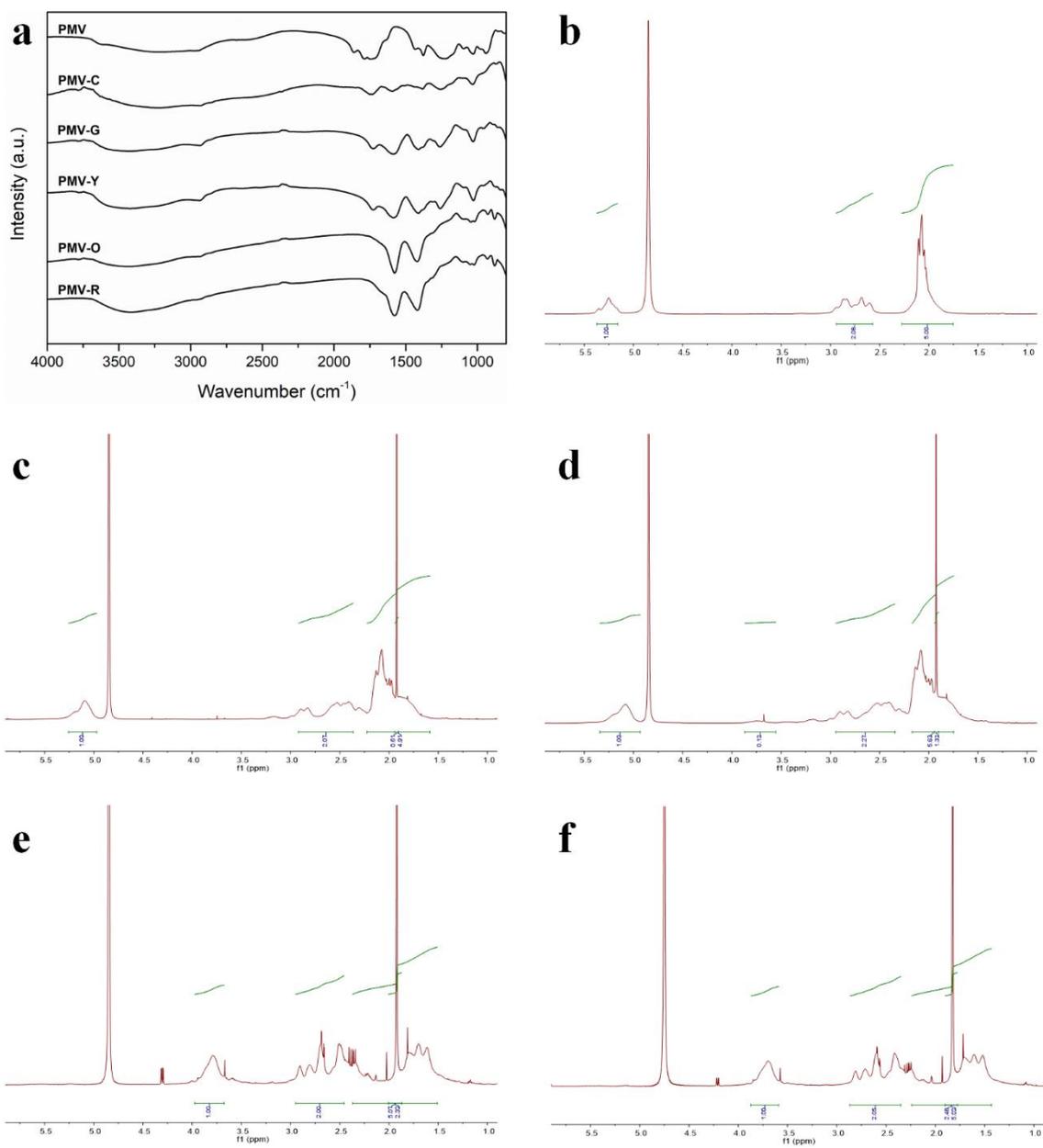


Figure S3. (a) FTIR of PMV and PMV derivatives.  $^1\text{H}$  NMR spectra of (b) PMV-C, (c) PMV-G, (d) PMV-Y, (e) PMV-O and (f) PMV-R.

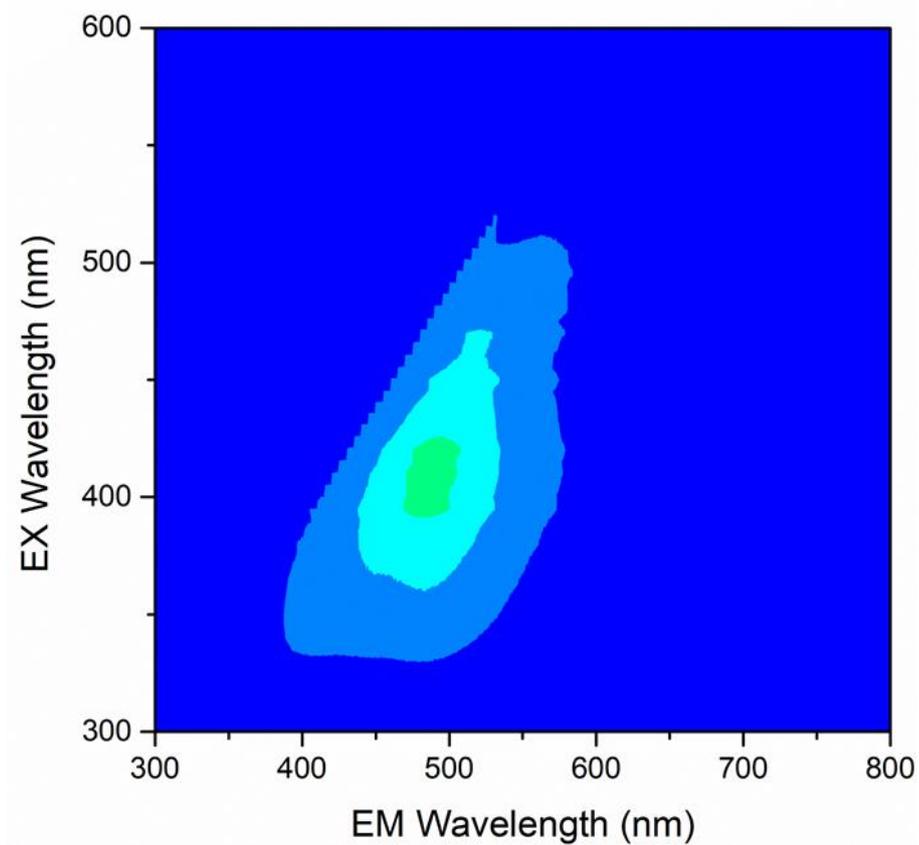


Figure S4. The 3D spectrogram of h-PMV/Na.

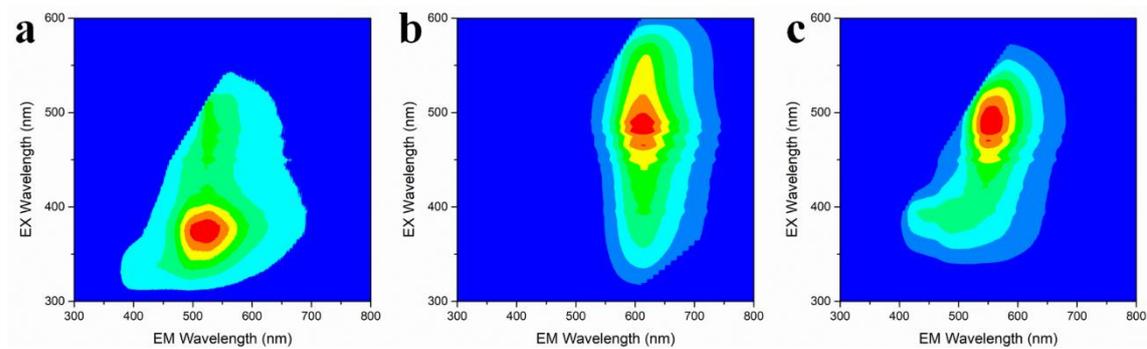


Figure S5. The 3D spectrograms of (a) 1st solution, (b) solid and (c) 2nd solution of PMV derivative when the usage of NaOH was 7 g.

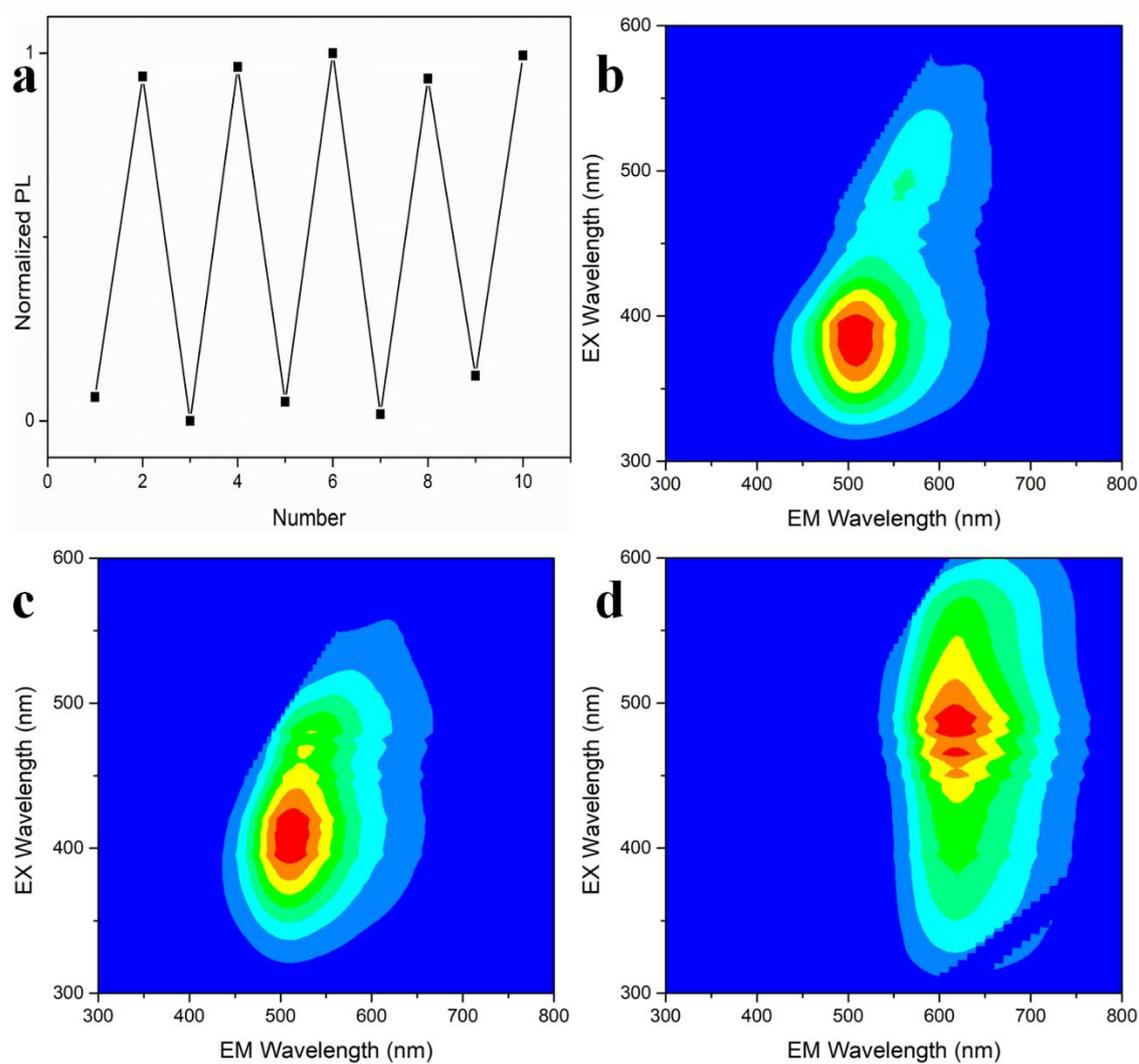


Figure S6. (a) pH reversibility of PMV-Y solution between pH = about 5.0 and 9.5. 3D photoluminescent spectrograms of dry PMV-Y solid under pH = (b) 1.31, (c) 7.69 and (d) 13.27.

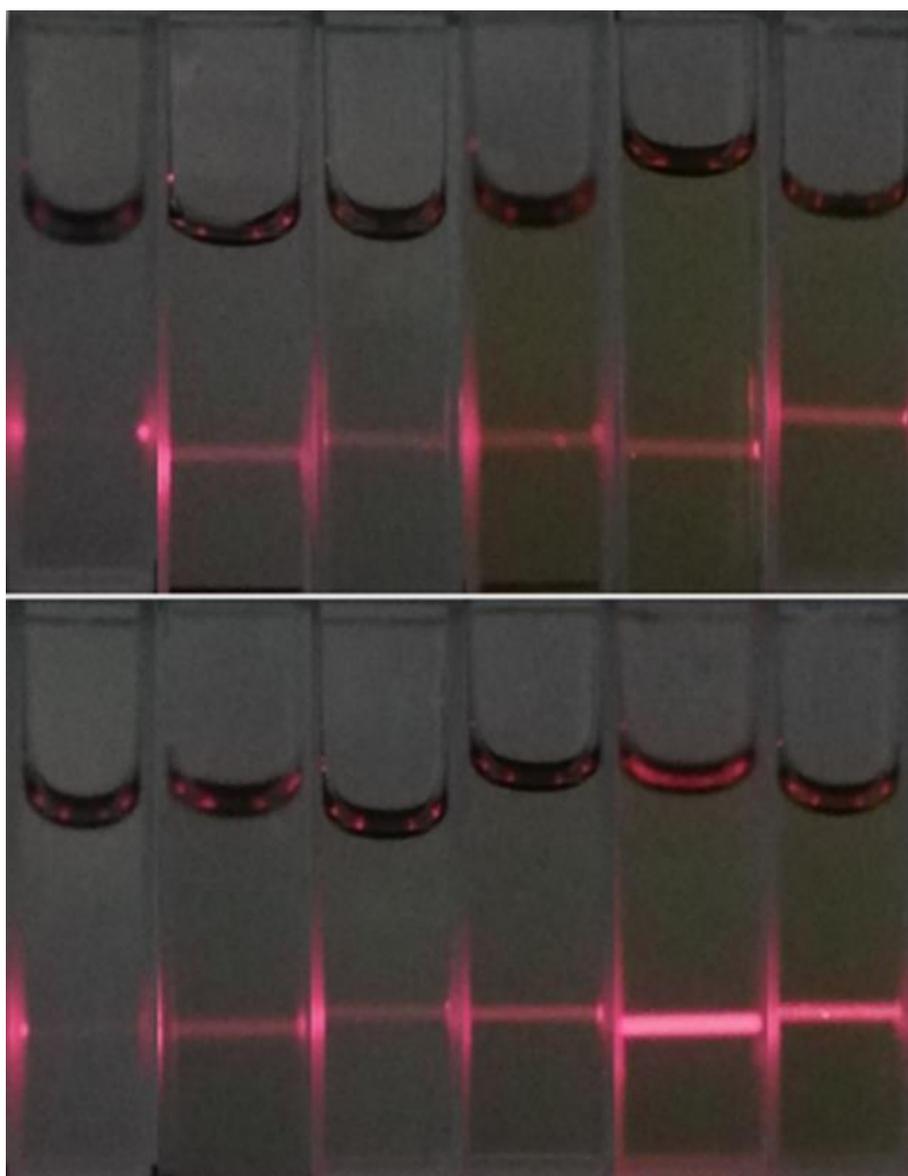


Figure S7. Tyndall effect of 1st solution (up) and 2nd solution (down) of h-PMV/Na, PMV-C to PMV-R (from left to right).

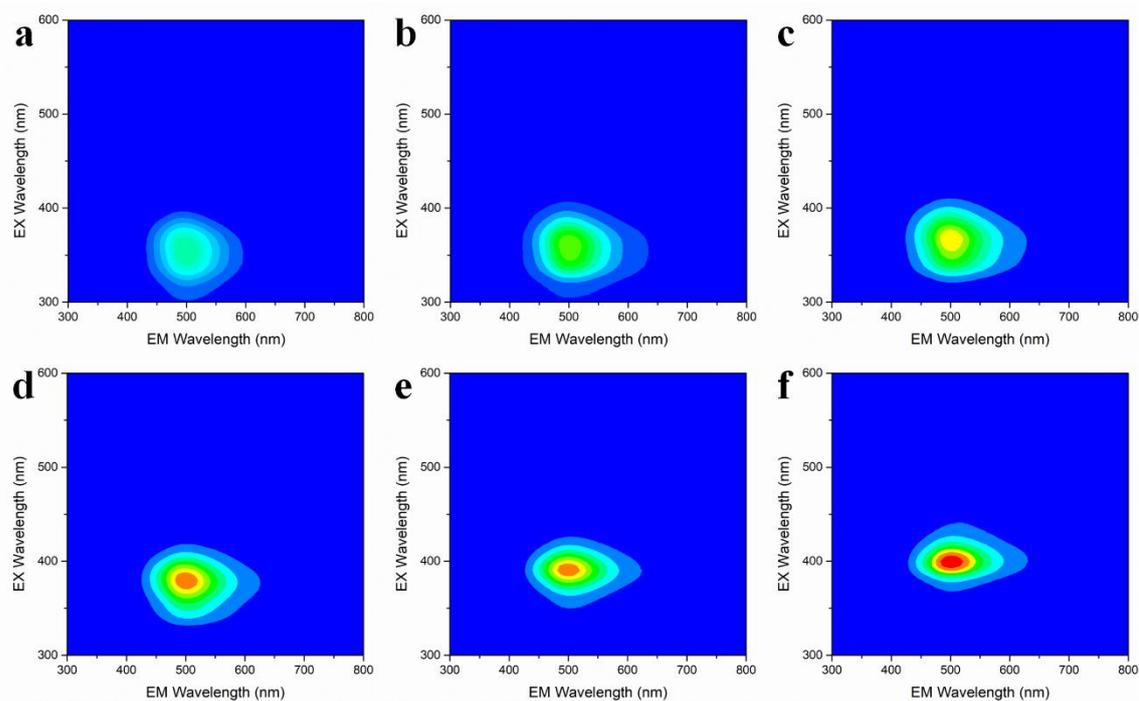


Figure S8. (a-f) The 3D spectrograms of PMV-Y solutions with different concentration of 1, 5, 10, 20, 50, 100 mg mL<sup>-1</sup>, respectively (These six samples were measured at the same condition).

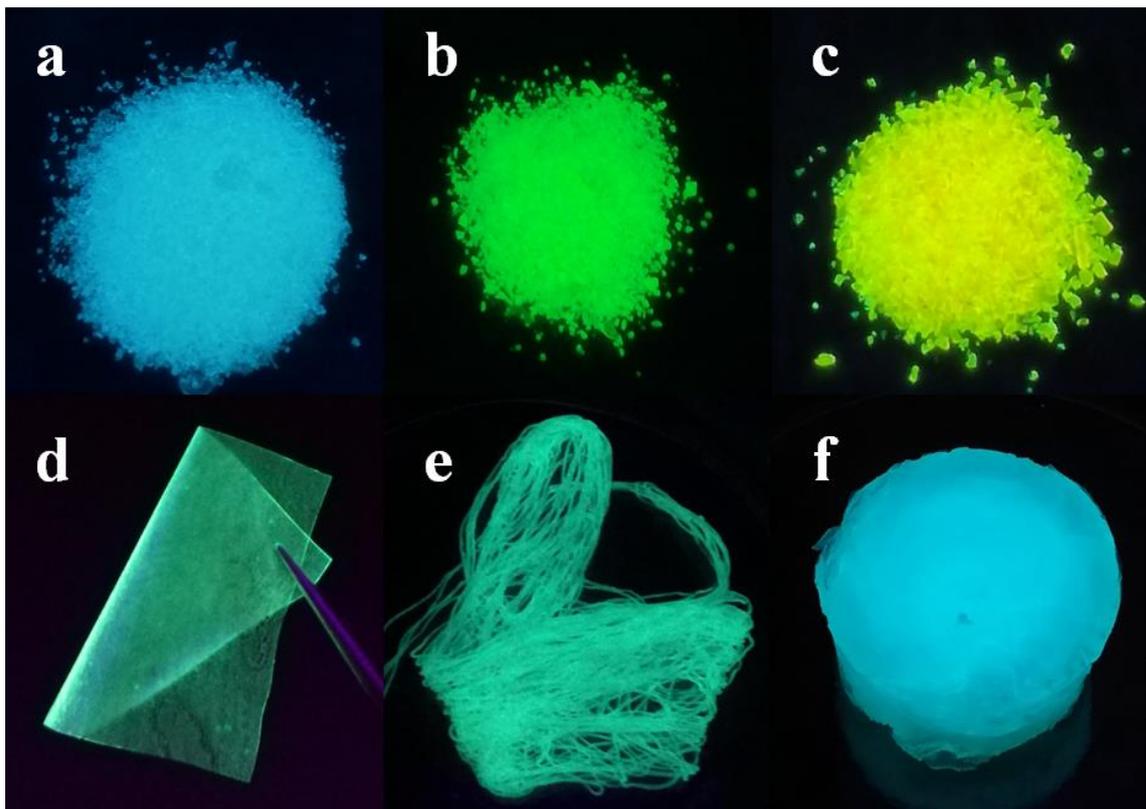


Figure S9. Photographs of PMV-Y@NaCl solids with different ratio of (a) 1/20, (b) 1/1, (c) 10/1 (PMV-Y/NaCl, w/w), (d) PMV-Y@PVA film, (e) PMV-Y@sodium alginate fiber and (f) PMV-Y@PVA gel at 365 nm UV light.

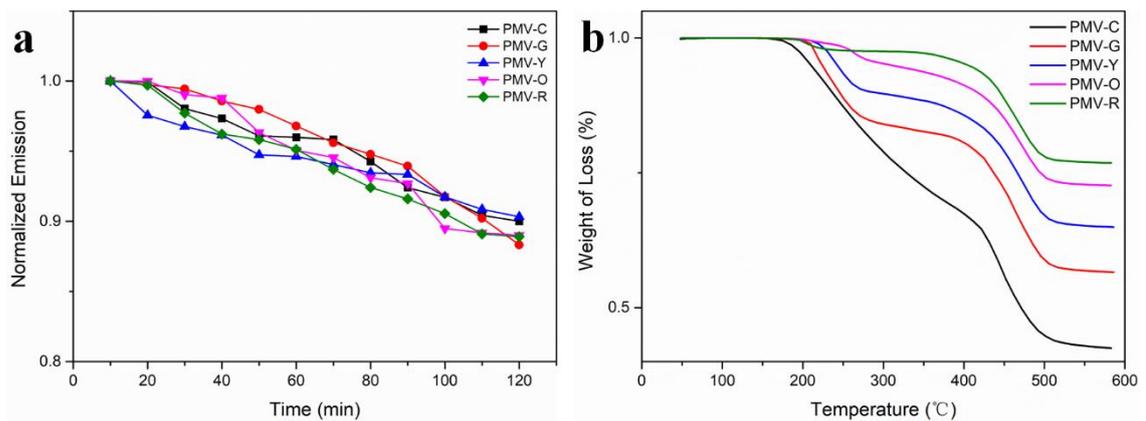


Figure S10. (a) Photo-stability and (b) thermos-stability of PMV-C to PMV-R solids.

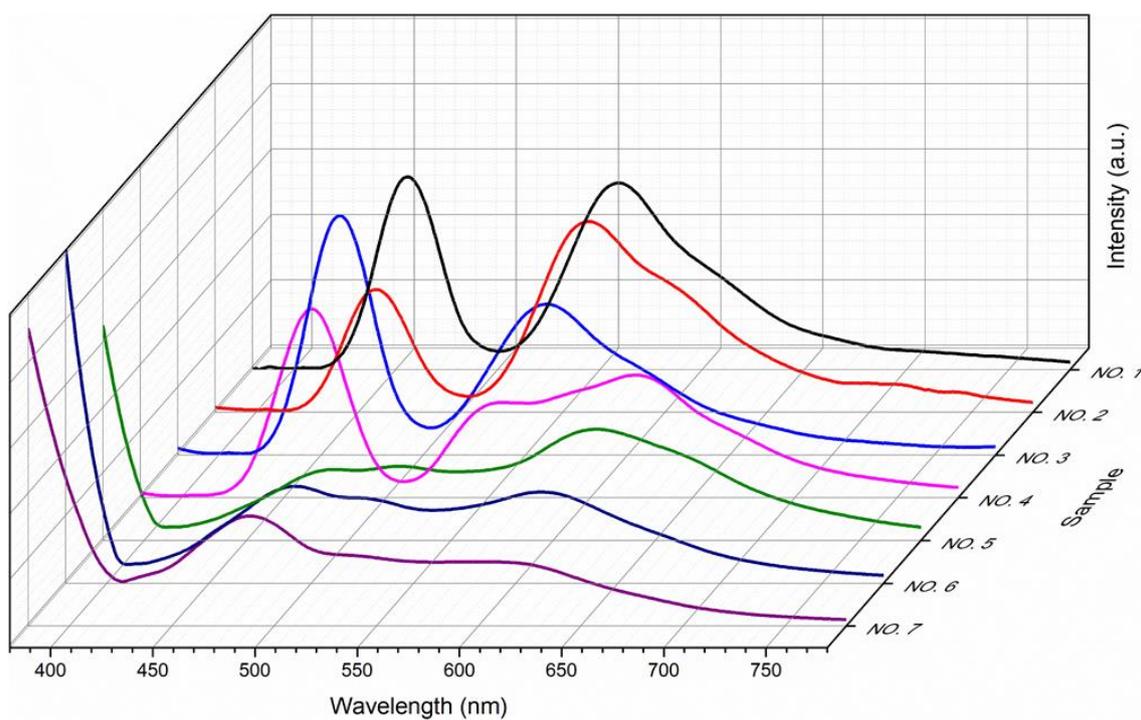


Figure S11. Emission spectra of as-prepared WLEDs (Sample NO. 1-7 were corresponding with those of Table 1).

Table S1. The QY data of photoluminescent PMV-C to PMV-R under their optimal excitation and emission range.

Sample	Excitation (nm)	Emission range (nm)	QY (%)
PMV-C	380	410~700	13.68
PMV-G	380	490~740	23.69
PMV-Y	480	495~750	30.93
PMV-O	480	530~780	14.22
PMV-R	480	535~780	12.34