Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.
This journal is © The Royal Society of Chemistry 2017

Electronic Supplementary Information

Fluorescent linear CO_2-derived poly(hydroxyurethane) for cool white LED

Bin Liu[a], Ya-Ling Wang[b], Wei Bai[a], Jun-Ting Xu[a], Zhi-Kang Xu[a], Ke Yang[c], Yong-Zhen Yang[b], Xing-Hong Zhang[*,a] and Bin-Yang Du[*,a]

[a] Department of Polymer Science and Engineering, MOE Key Laboratory of Macromolecular Synthesis and Functionalization, Zhejiang University, Hangzhou 310027, P. R. China.

*E-mail: xhzhang@zju.edu.cn (X.-H. Z.); duby@zju.edu.cn (B.-Y. D.)

[b] MOE Key Laboratory of Interface Science and Engineering in Advanced Materials, Research Center on Advanced Materials Science and Technology, Taiyuan University of Technology, Taiyuan 030024, P. R. China.

[c] Department of Materials Science and Engineering, University of Illinois at Urbana-Champaign, Urbana, IL, 61801 USA (Current address: The Dow Chemical Company, Marlborough, MA 01752 USA).

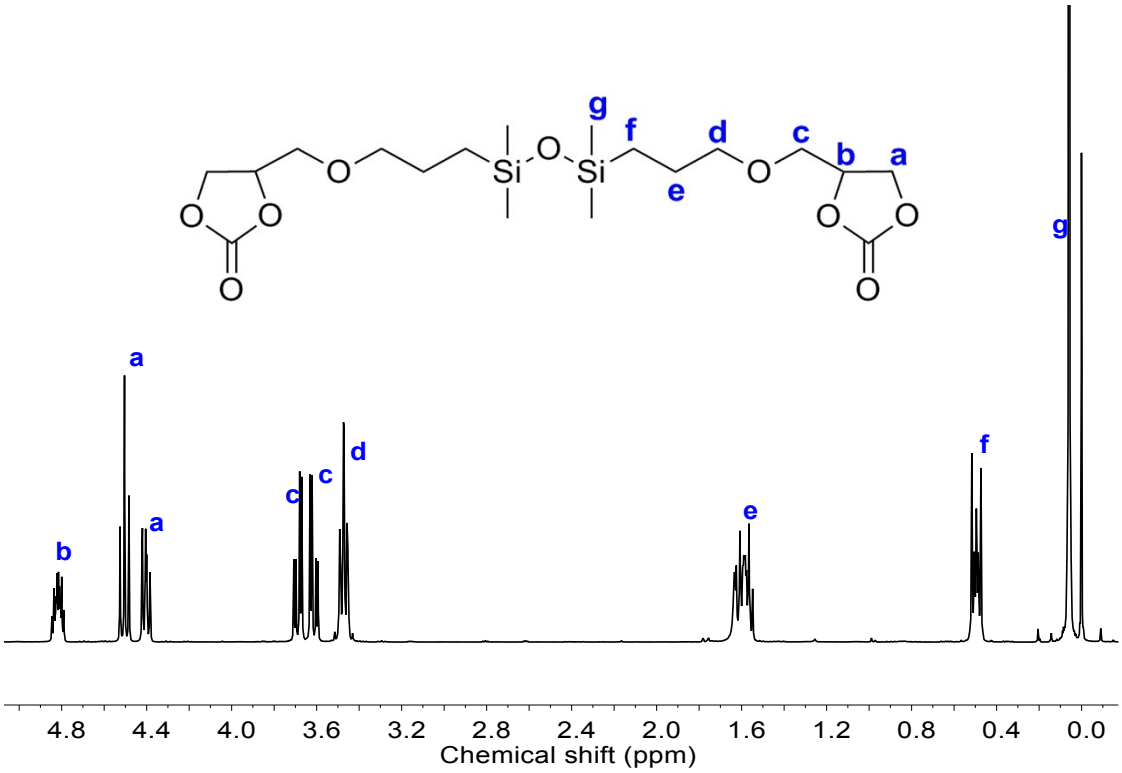

Figure S1. ^{1}H NMR spectrum of TMDSPOMD (400 MHz, $CDCl_3$).

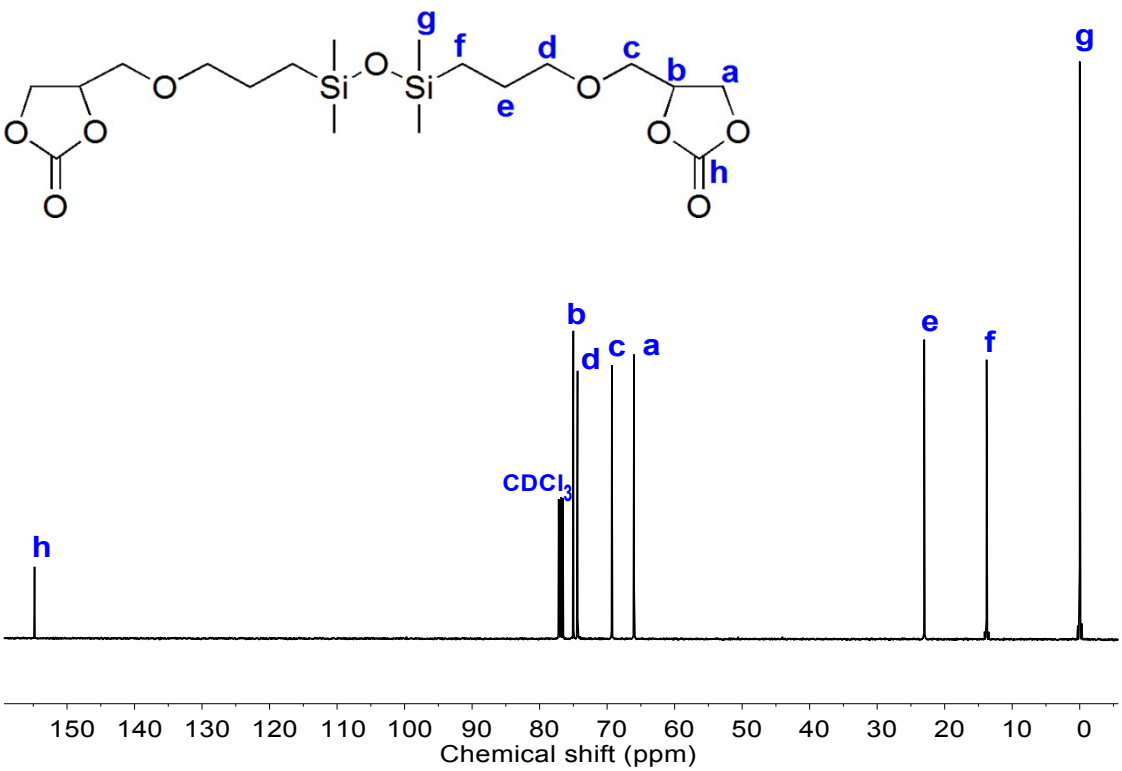

Figure S2. ^{13}C NMR spectrum of TMDSPOMD (101 MHz, $CDCl_3$).

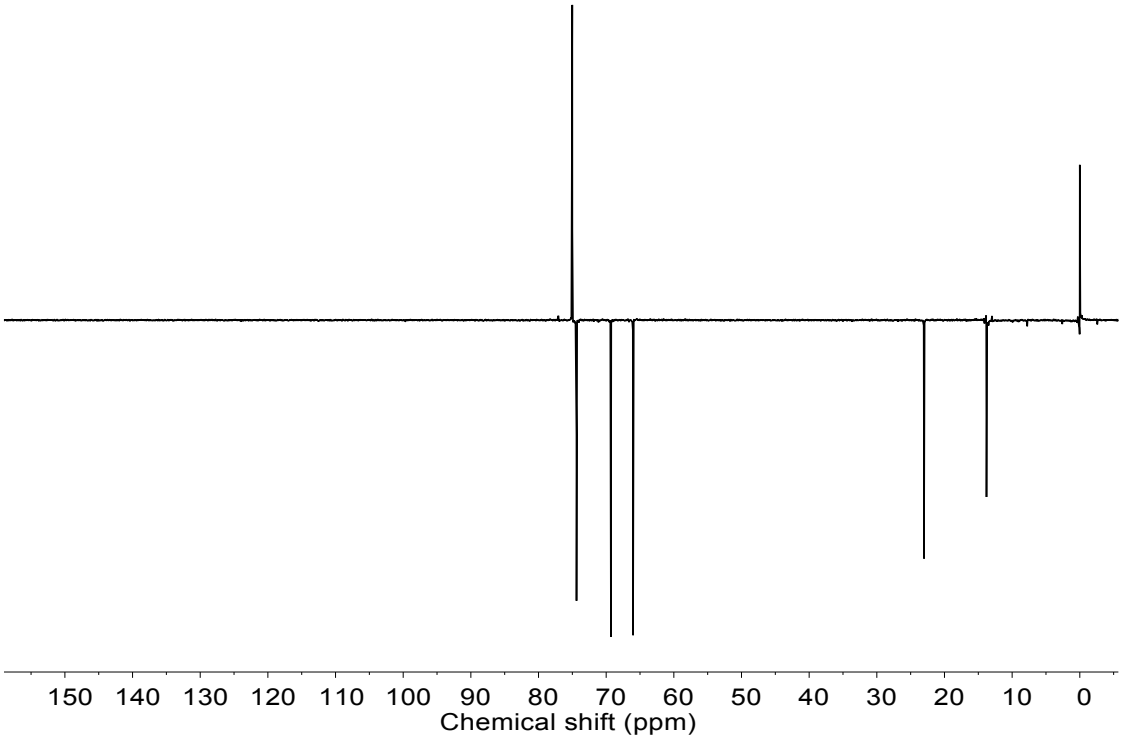

Figure S3. ^{13}C-DEPT 135 NMR spectrum of TMDSPOMD (101 MHz, $CDCl_3$).

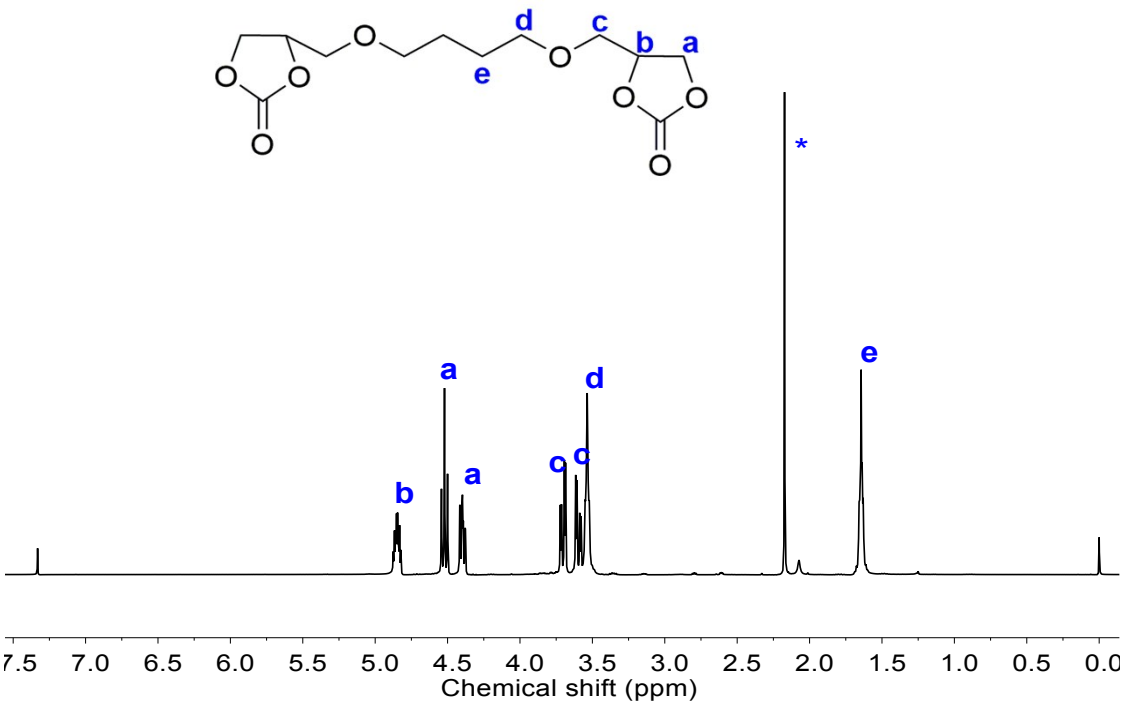

Figure S4. ^{1}H NMR spectrum of BDOMDO (400 MHz, $CDCl_3$).

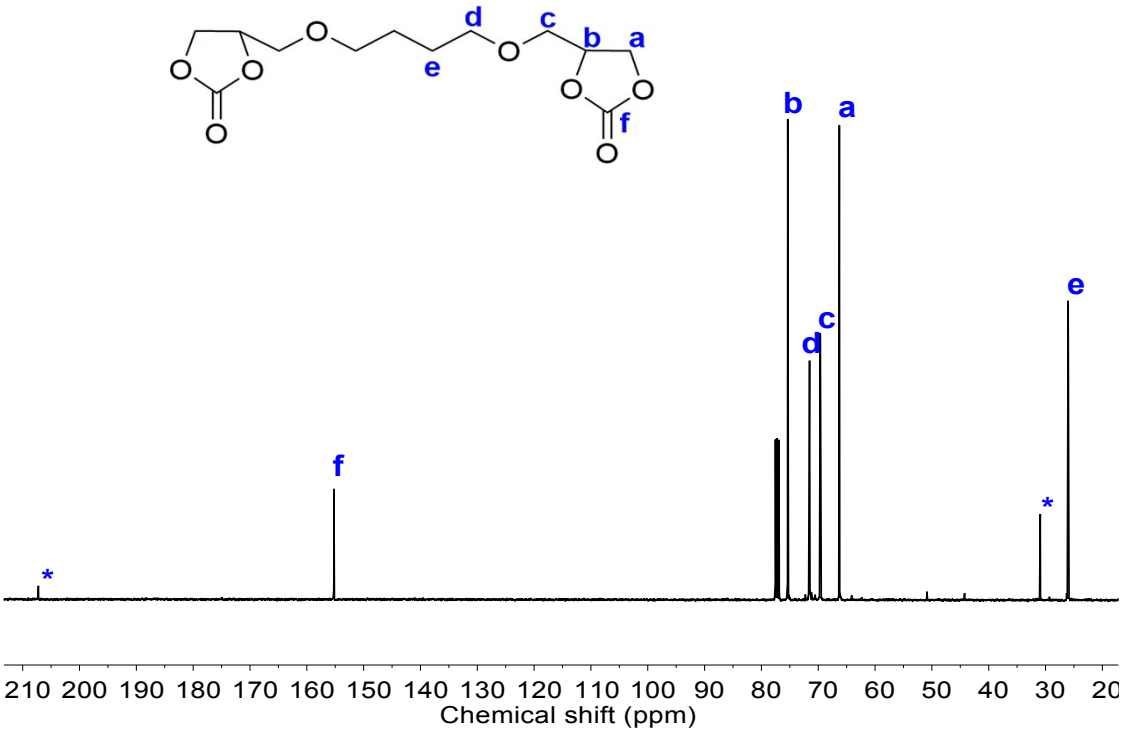

Figure S5. ^{13}C NMR spectrum of BDOMDO (101 MHz, $CDCl_3$).

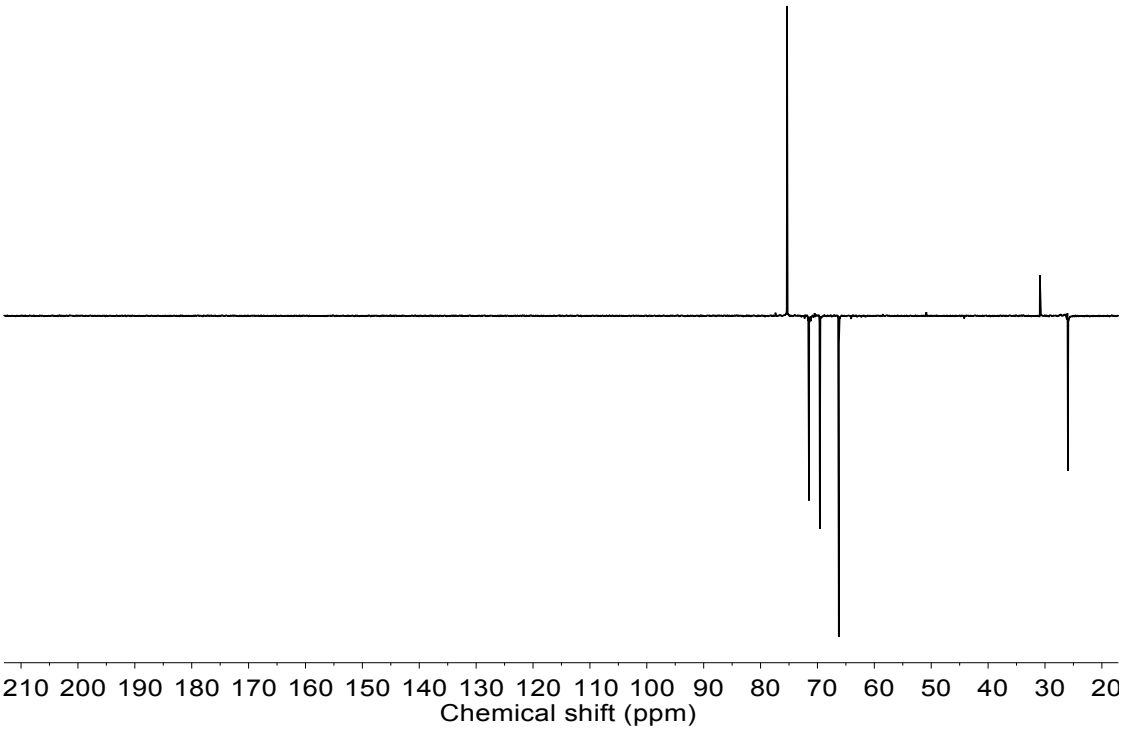

Figure S6. ^{13}C-DEPT 135 NMR spectrum of BDOMDO (101 MHz, $CDCl_3$).

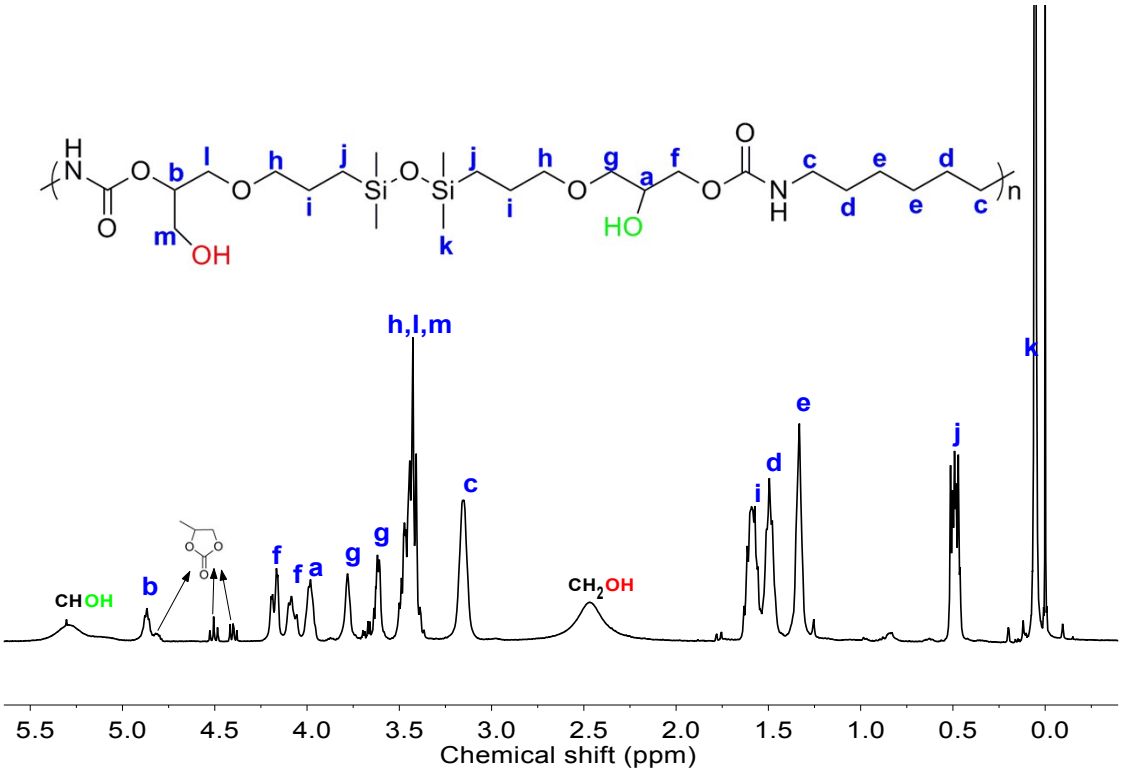

Figure S7. ^{1}H NMR spectrum of **P1** (400 MHz, $CDCl_3$). The ratio of primary hydroxyl group and secondary hydroxyl group is 1:1.97.

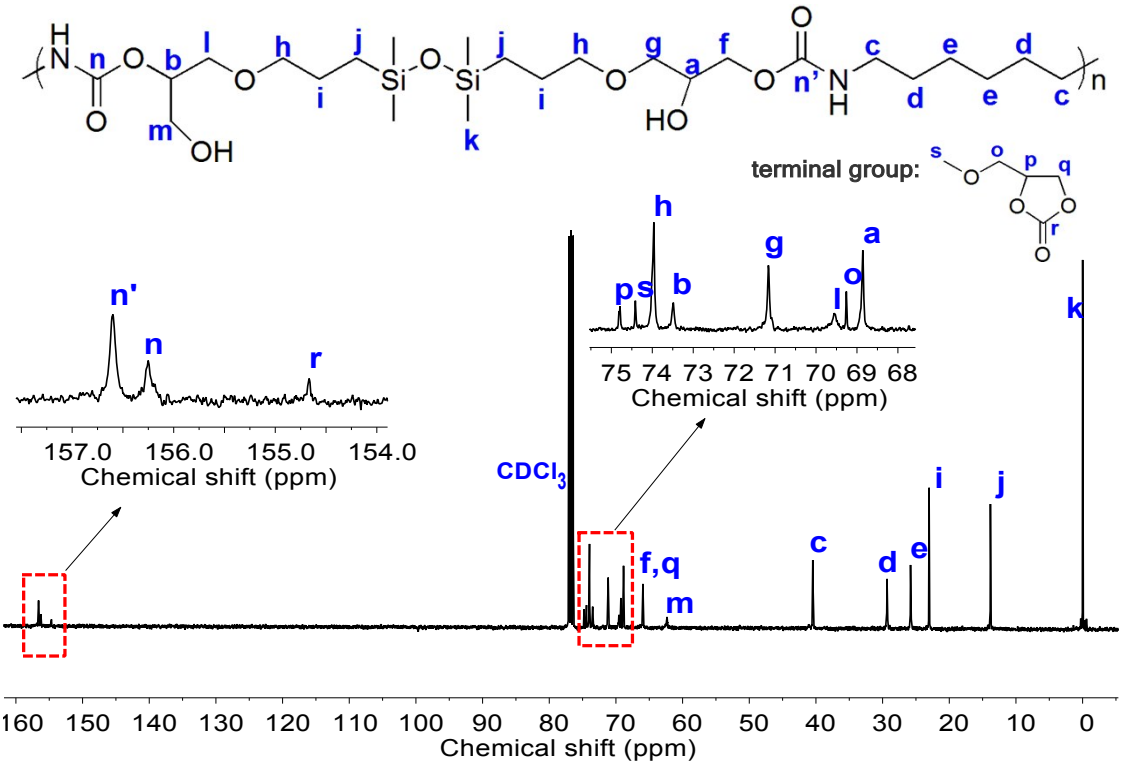

Figure S8. ^{13}C NMR spectrum of **P1** (101 MHz, $CDCl_3$).

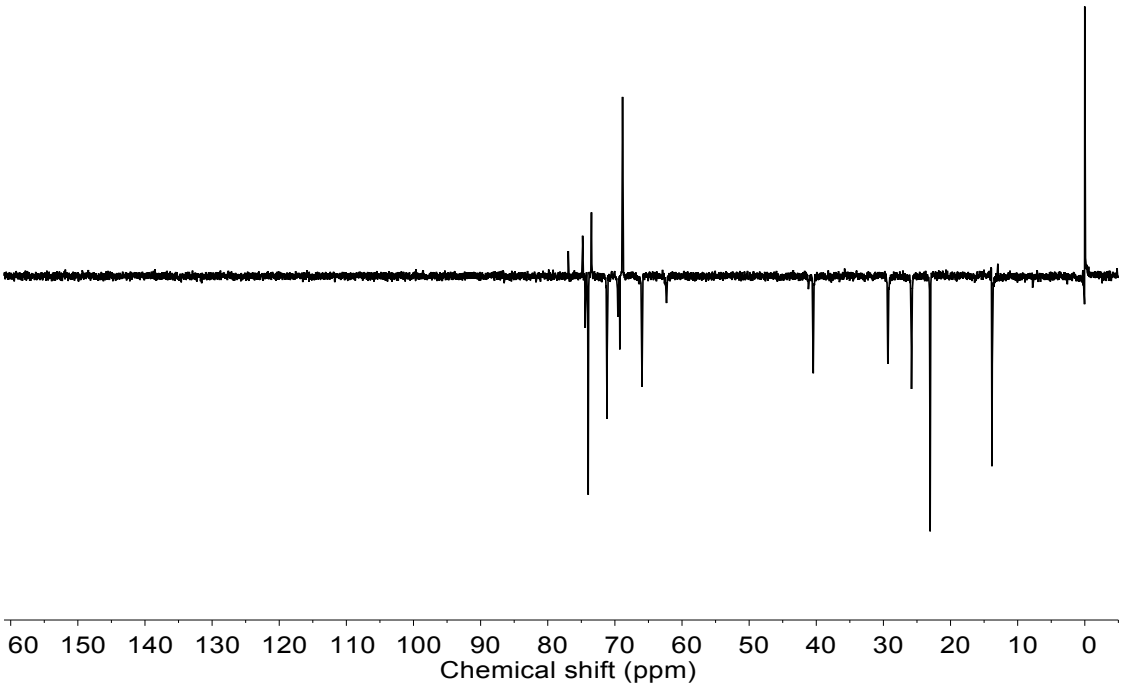

Figure S9. ^{13}C-DEPT 135 NMR spectrum of P1 (101 MHz, $CDCl_3$).

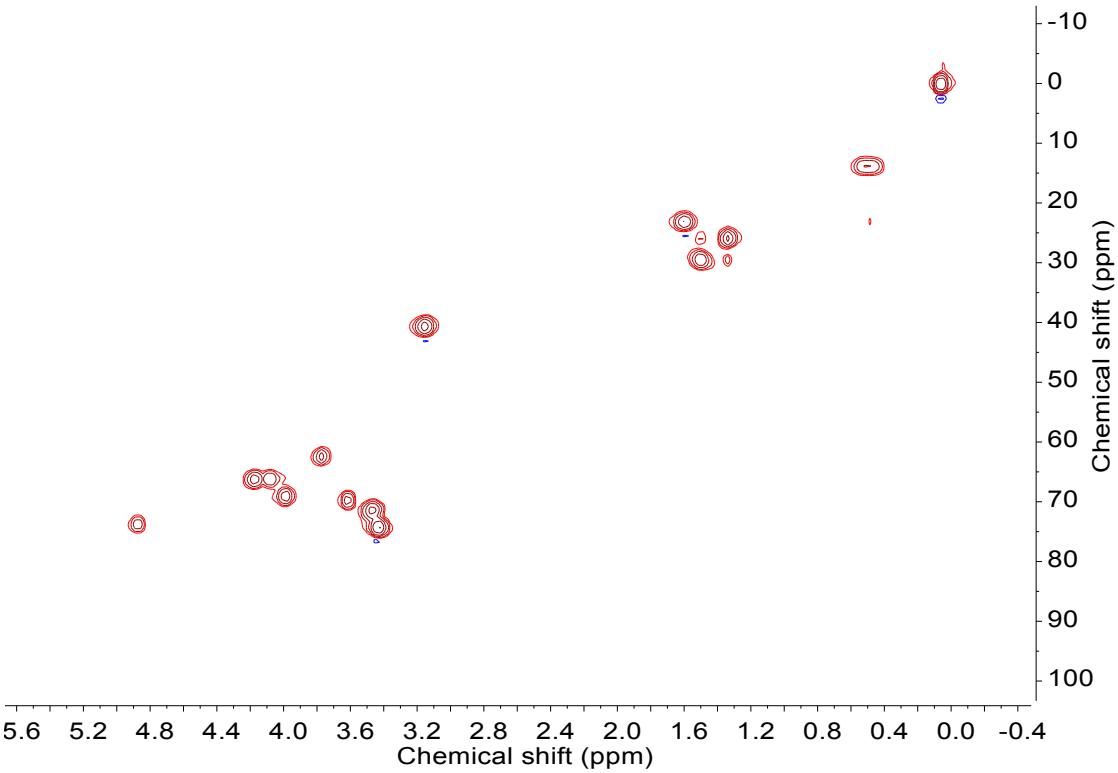

Figure S10. HSQC NMR spectrum of **P1** (101 MHz, $CDCl_3$).

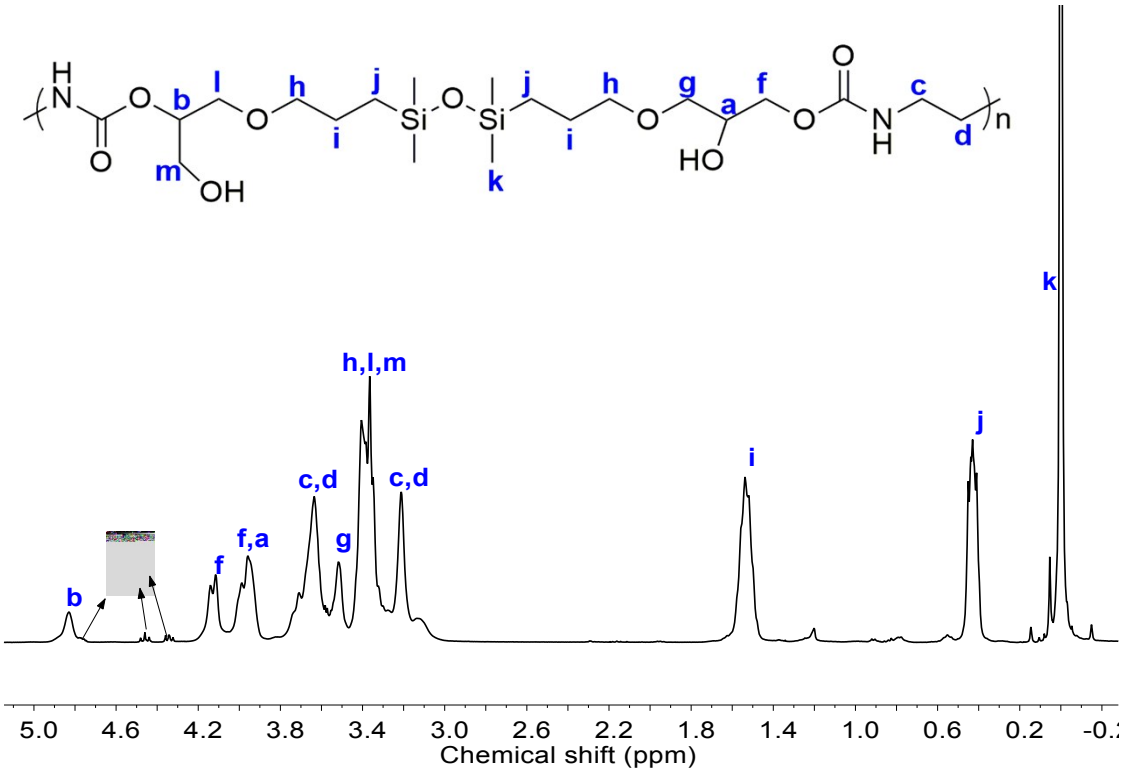

Figure S11. ^{1}H NMR spectrum of **P2** (400 MHz, $CDCl_3$). The ratio of primary hydroxyl group and secondary hydroxyl group is 1:2.33.

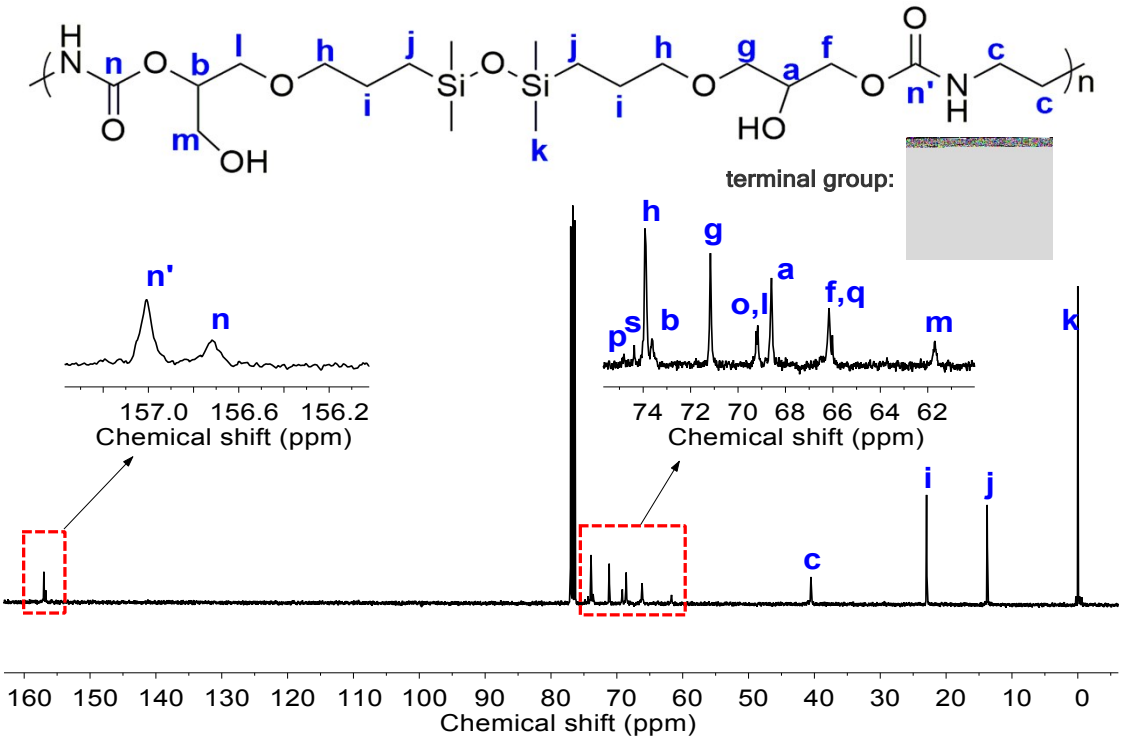

Figure S12. ^{13}C NMR spectrum of **P2** (101 MHz, $CDCl_3$).

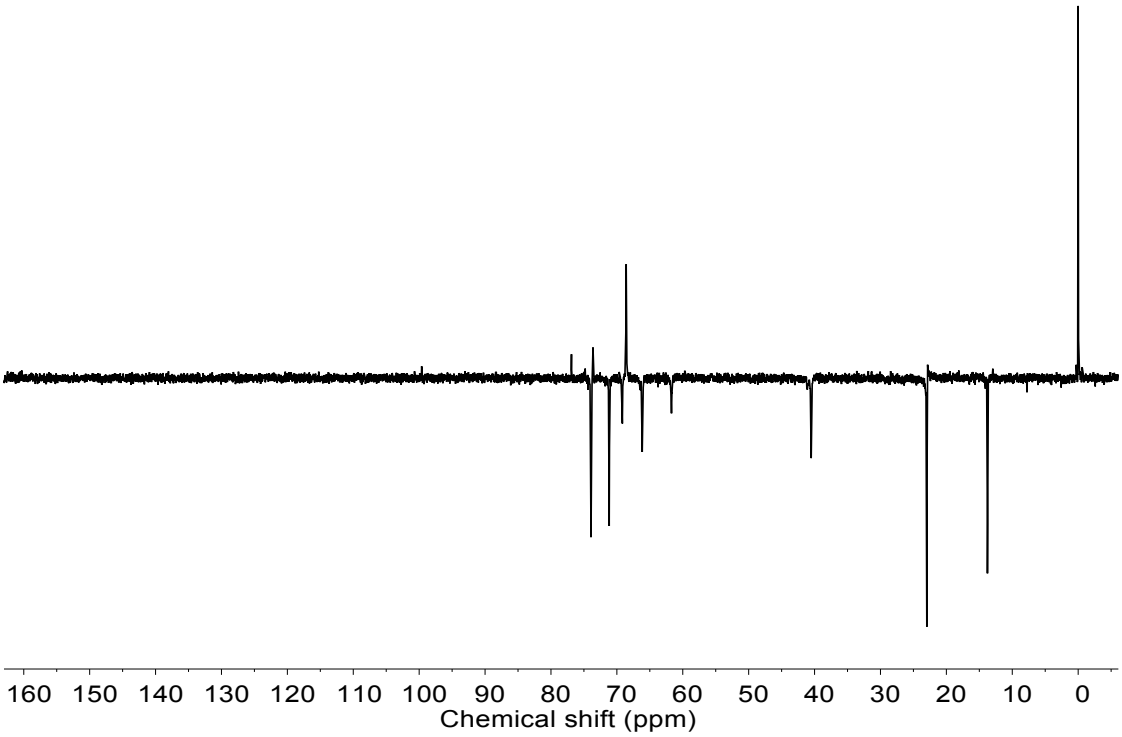

Figure S13. ^{13}C-DEPT 135 NMR spectrum of **P2** (101 MHz, $CDCl_3$).

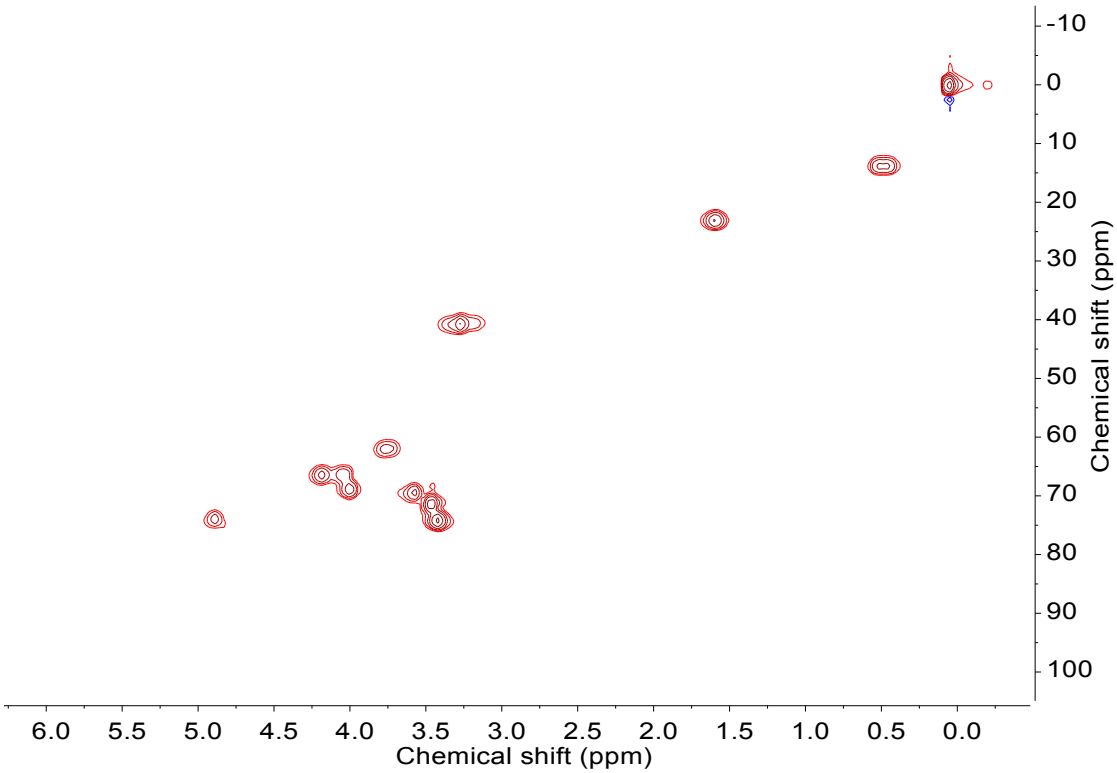

Figure S14. HSQC NMR spectrum of **P2** (101 MHz, $CDCl_3$).

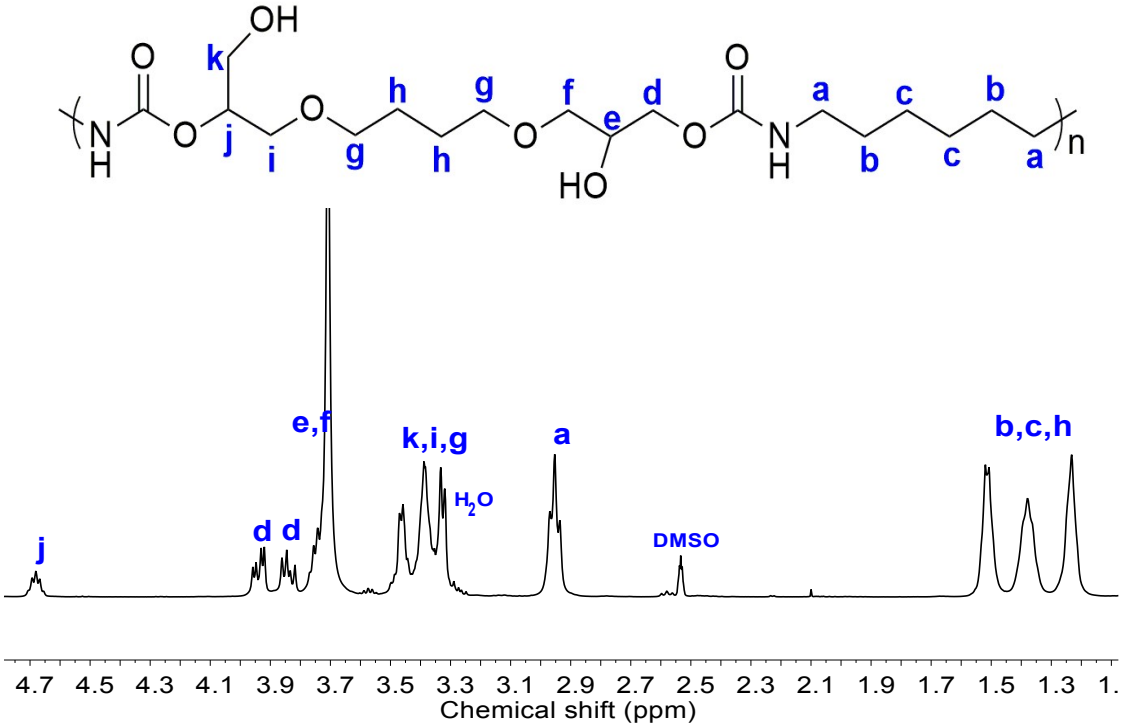

Figure S15. ^{1}H NMR spectrum of **P3** (400 MHz, d_6-DMSO). The ratio of Primary hydroxyl group and secondary hydroxyl group is 1:2.08.

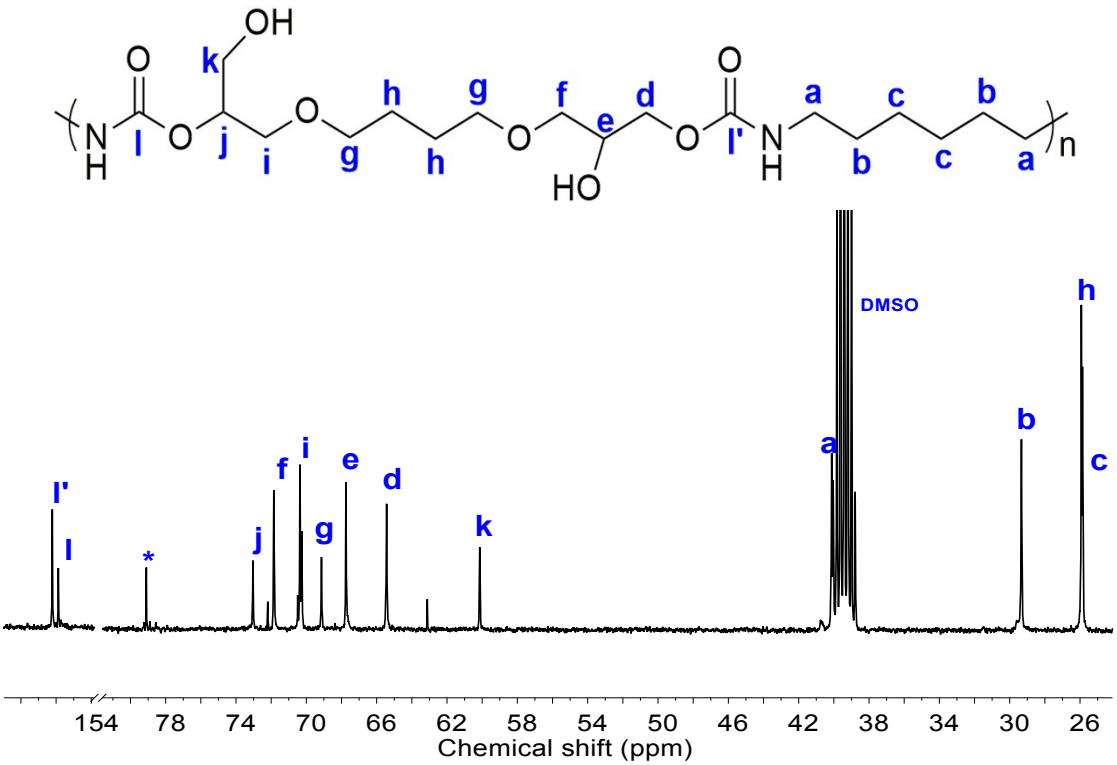

Figure S16. ^{13}C NMR spectrum of **P3** (101 MHz, d_6-DMSO).

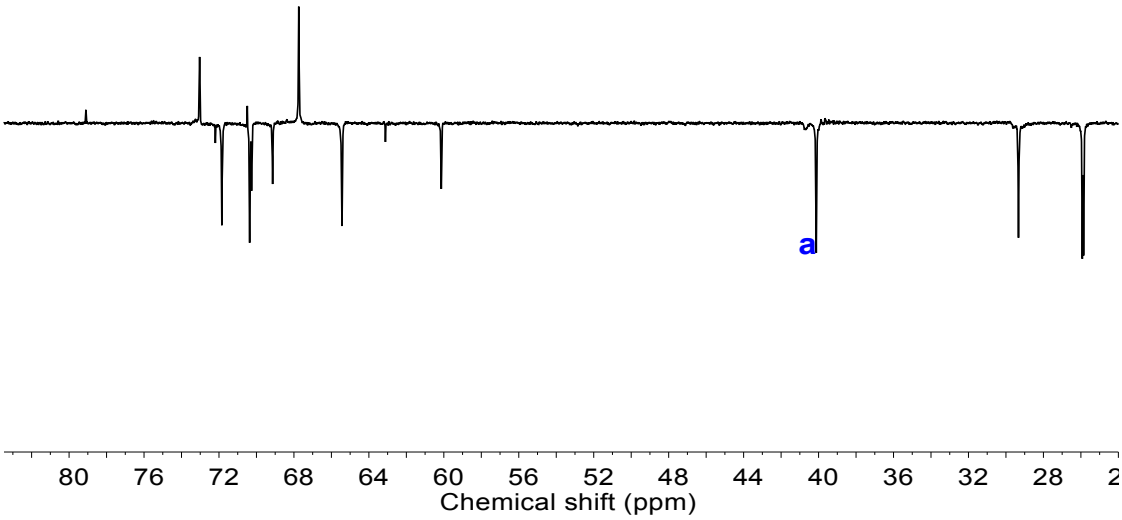

Figure S17. ^{13}C-DEPT 135 NMR spectrum of **P3** (101 MHz, d_6-DMSO).

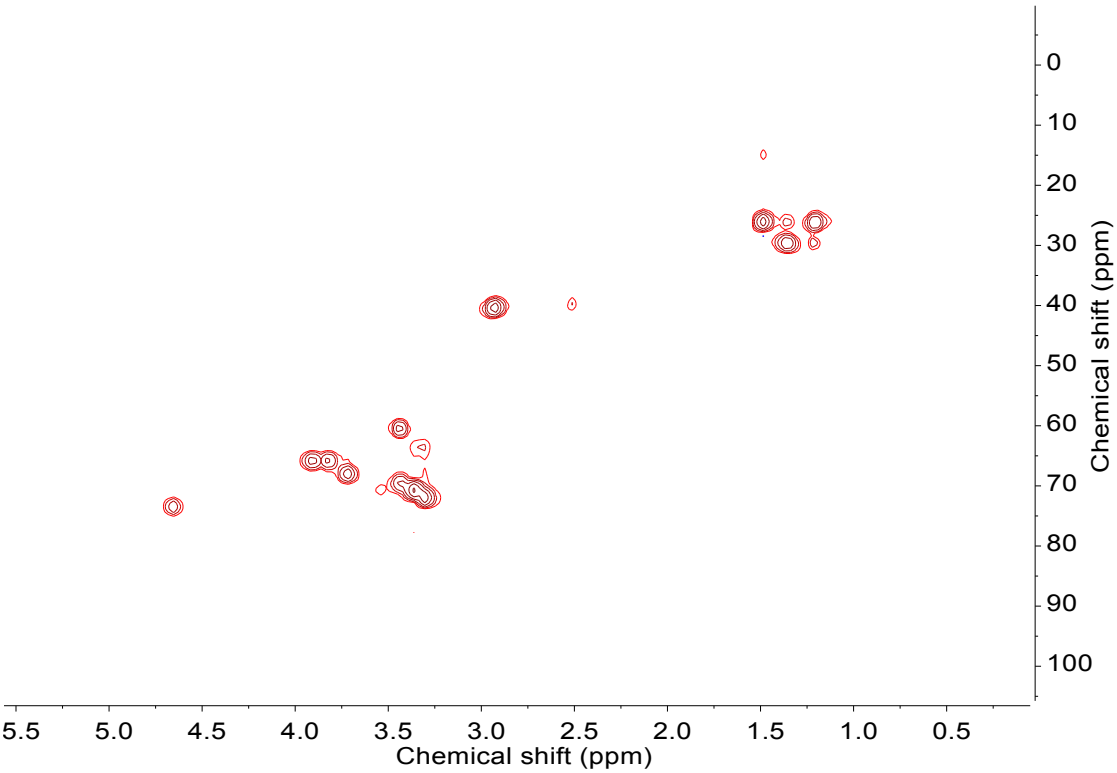

Figure S18. HSQC NMR spectrum of **P3** (101 MHz, d_6-DMSO).

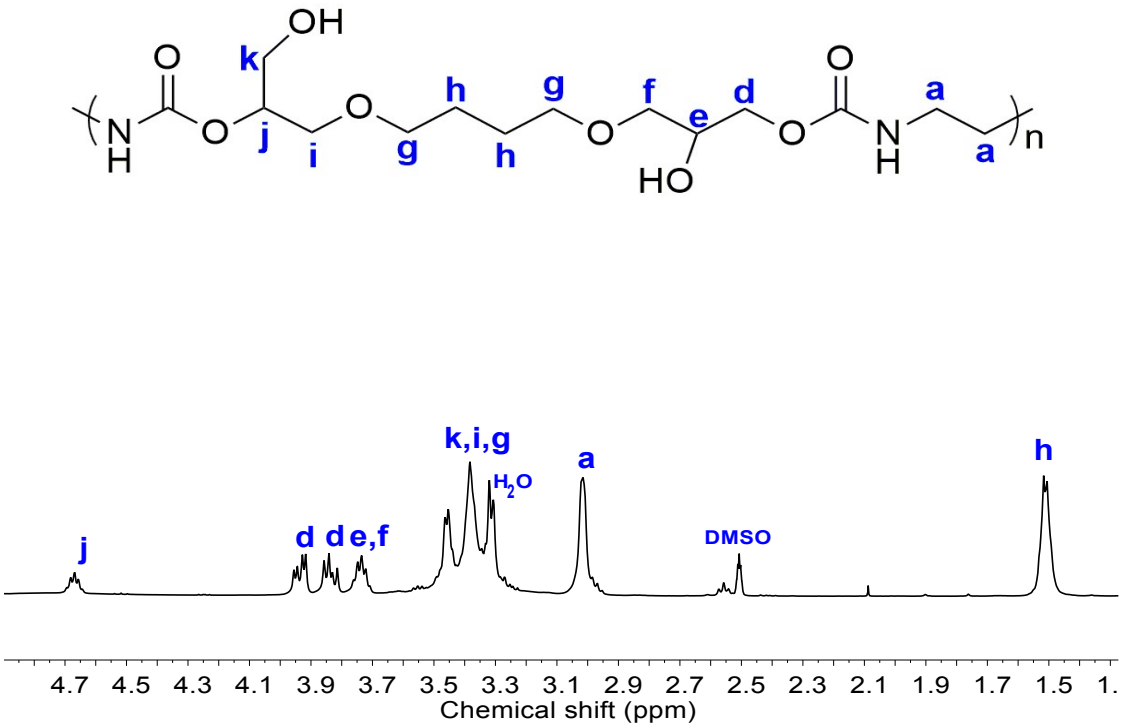

Figure S19. ^{1}H NMR spectrum of **P4** (400 MHz, d_6-DMSO). The ratio of Primary hydroxyl group and secondary hydroxyl group is 1:1.62.

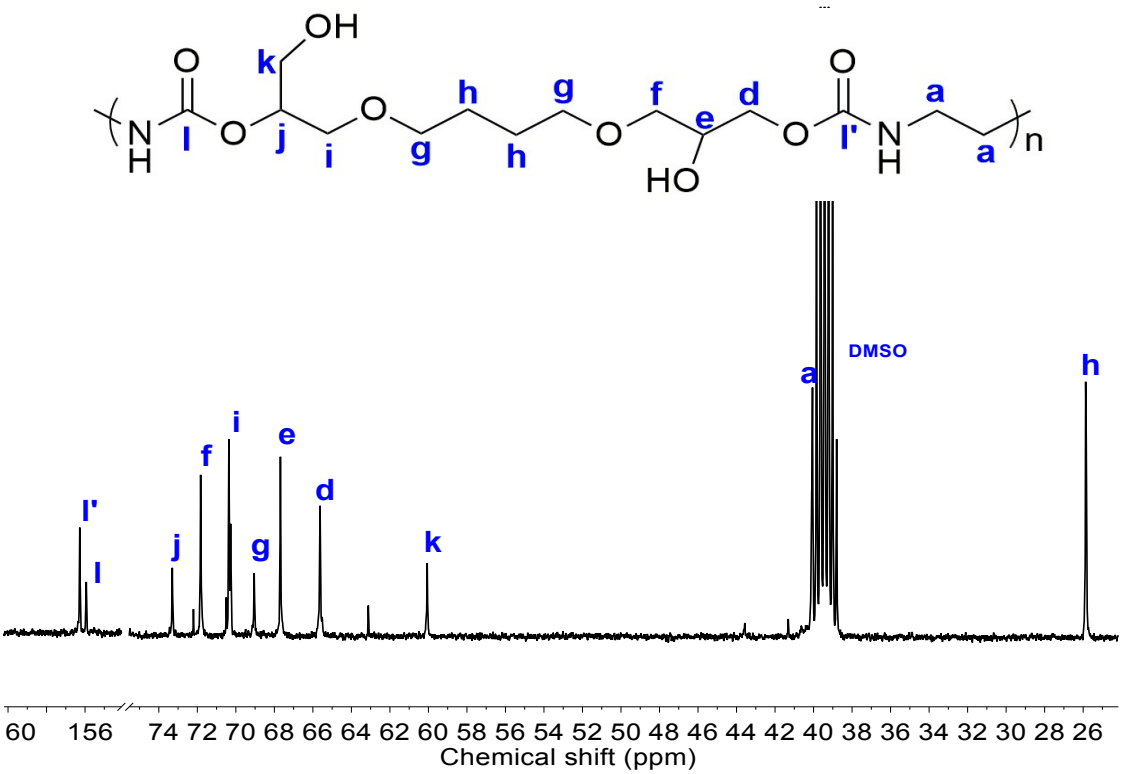

Figure S20. ^{13}C NMR spectrum of **P4** (101 MHz, d_6-DMSO).

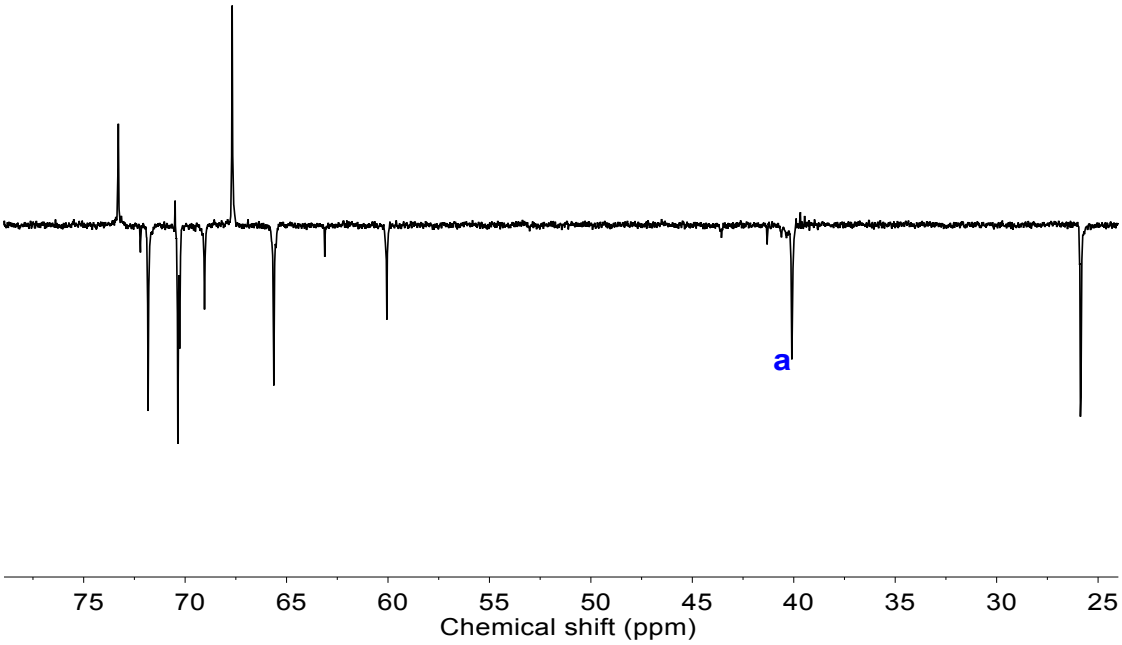

Figure S21. ^{13}C-DEPT 135 NMR spectrum of **P4** (101 MHz, d_6-DMSO).

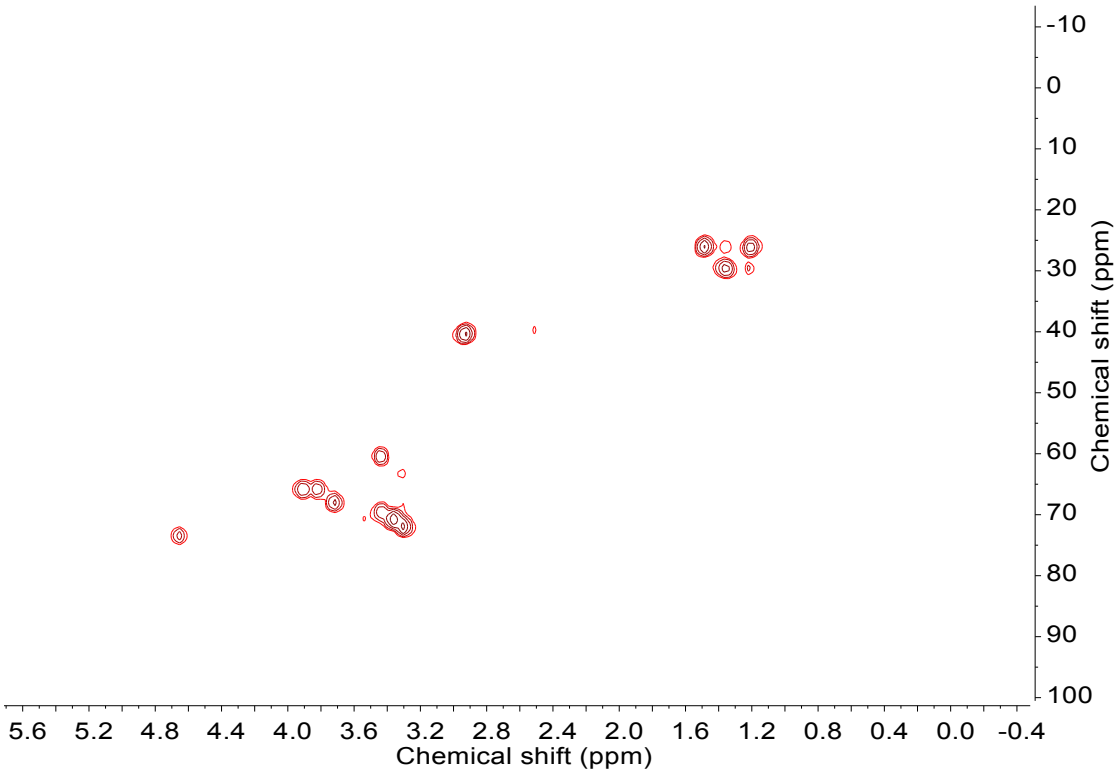

Figure S22. HSQC NMR spectrum of **P4** (101 MHz, d_6-DMSO).

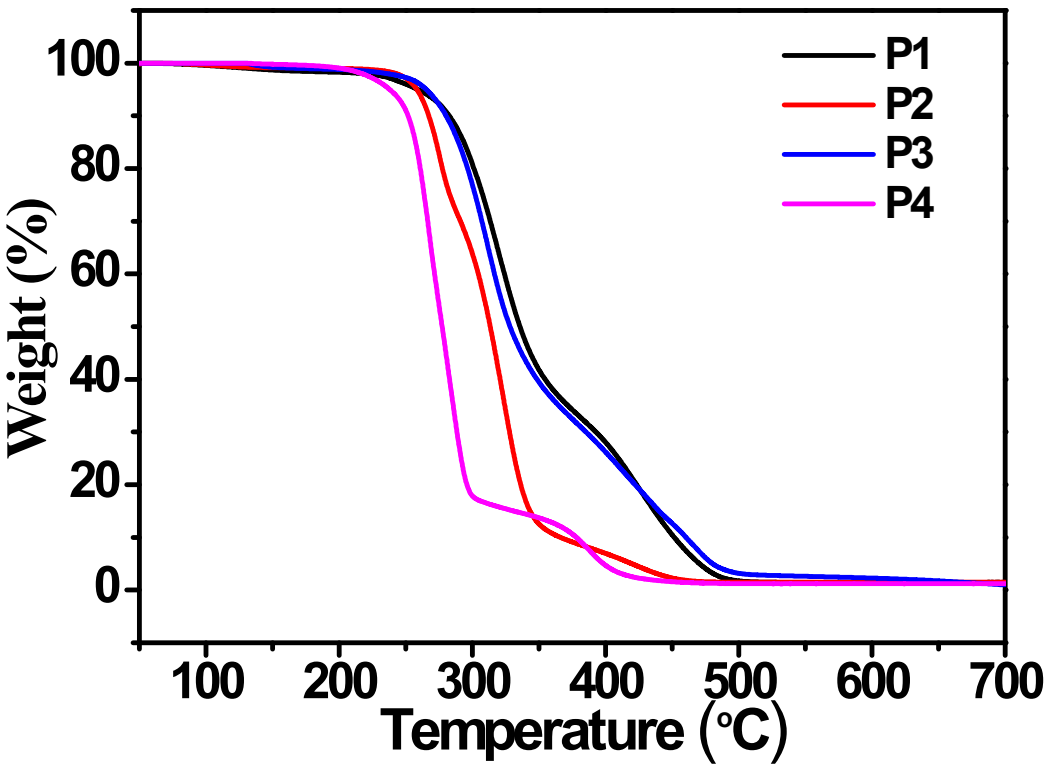

Figure S23. TGA curves of FPHUs ($T_{d,\ 5wt.\%}$=259 °C, 258 °C, 265 °C, 238 °C, with a heating rate of 10 °C min^{-1} under N_2 atmosphere).

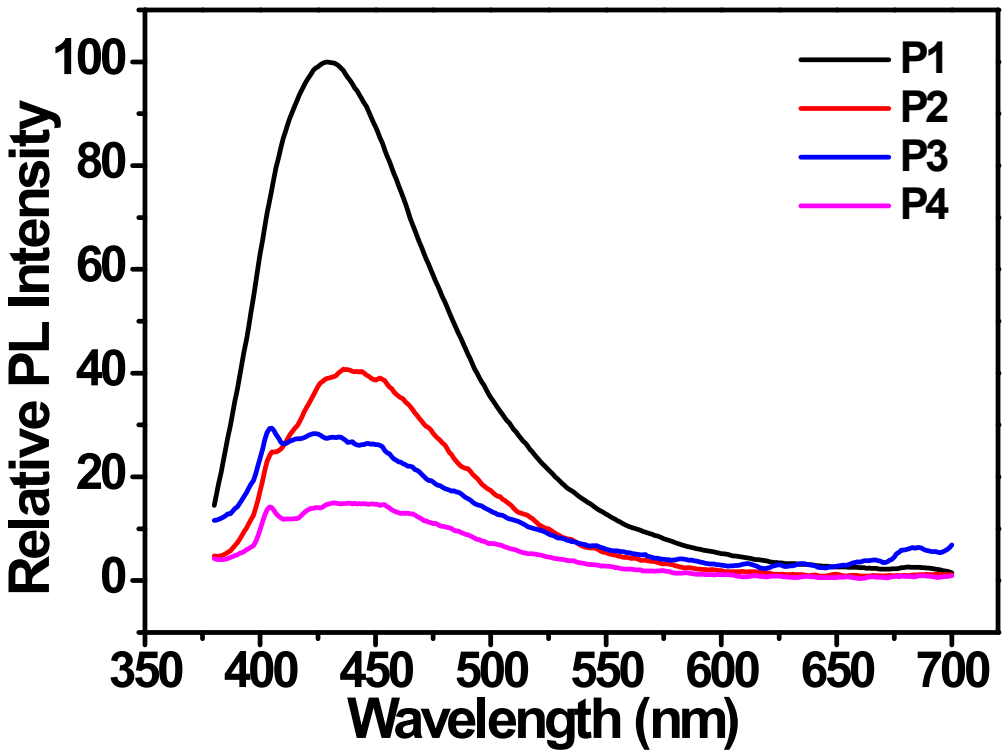

Figure S24. PL spectra of FPHUs in ethanol with the same mole structural unit.

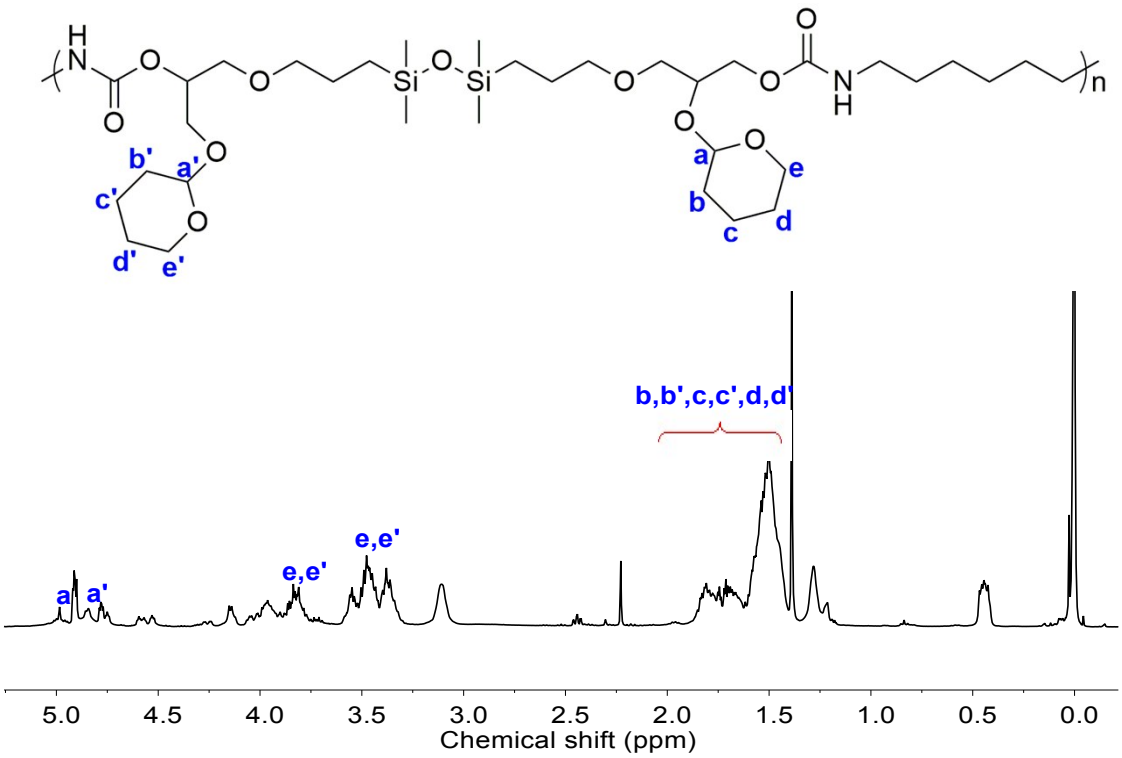

Figure S25. ^{1}H NMR spectrum of **P5** (400 MHz, $CDCl_3$).

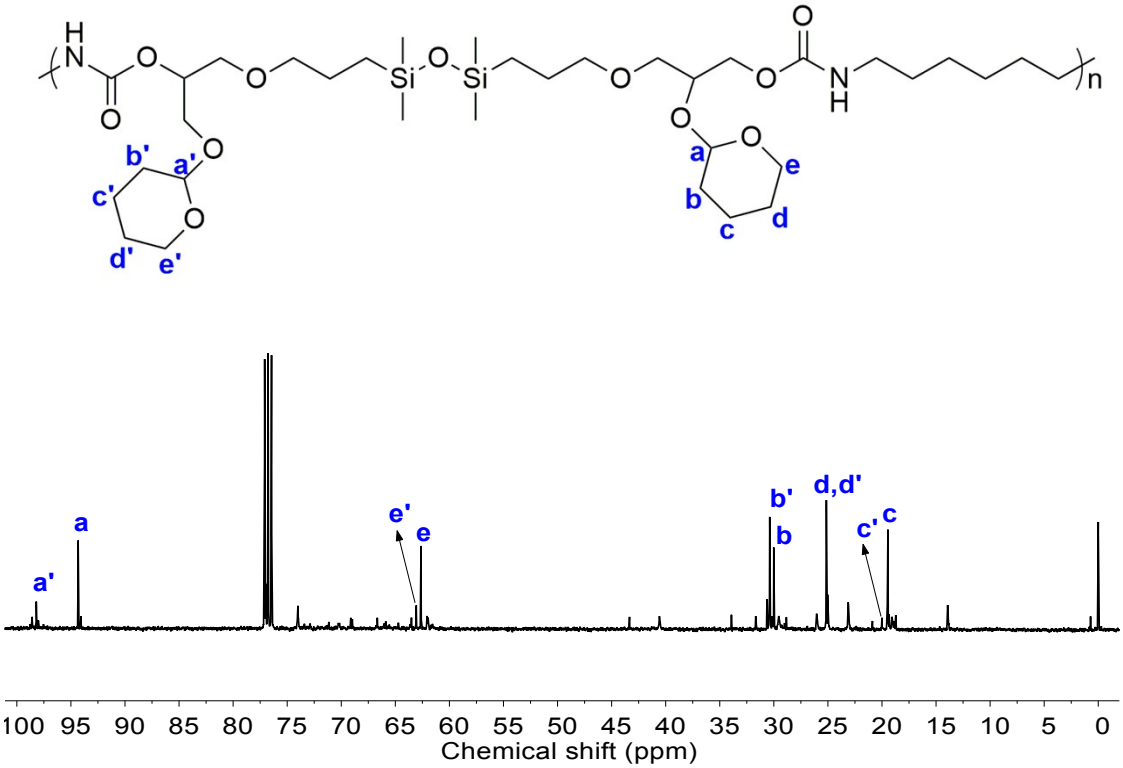

Figure S26. ^{13}C NMR spectrum of **P5** (101 MHz, $CDCl_3$).

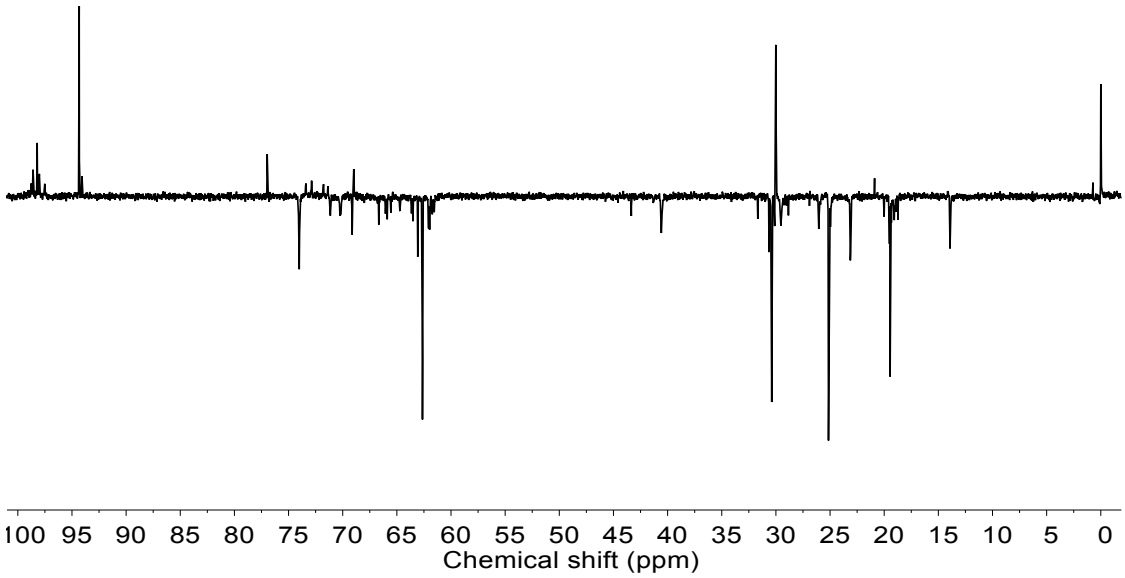

Figure S27. ^{13}C-DEPT 135 NMR spectrum of **P5** (101 MHz, $CDCl_3$).

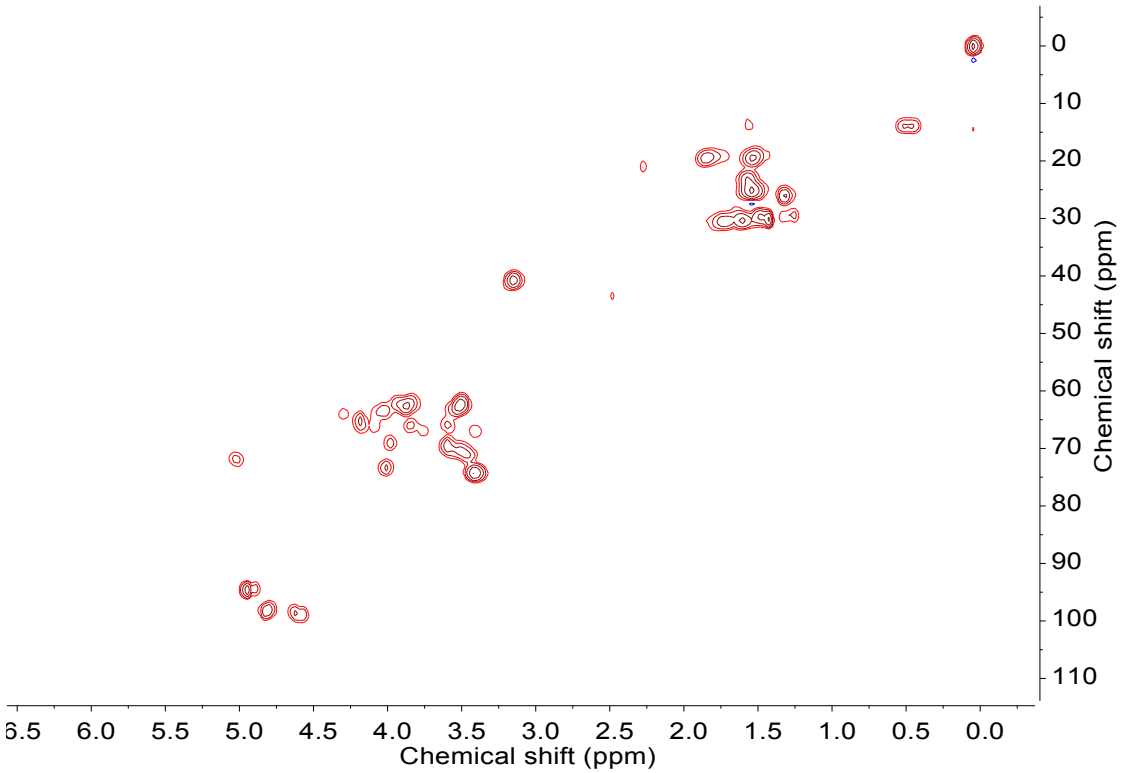

Figure S28. HSQC NMR spectrum of **P5** (101 MHz, $CDCl_3$).

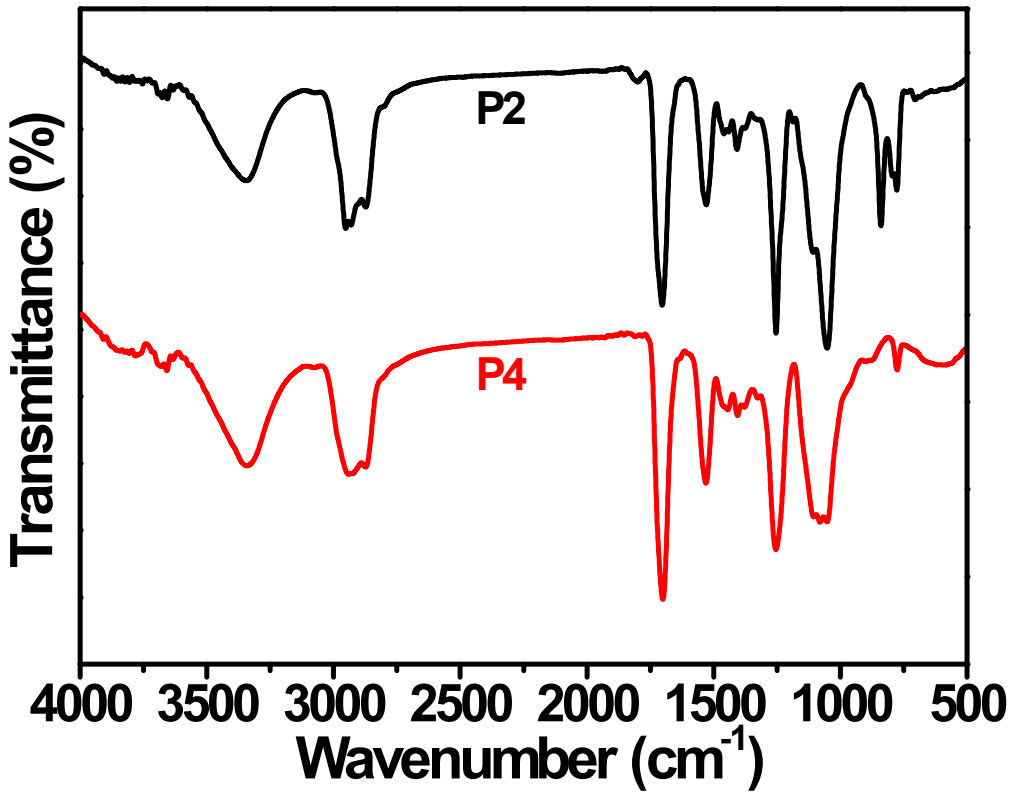

Figure S29. FT-IR spectra of **P2** and **P4**.

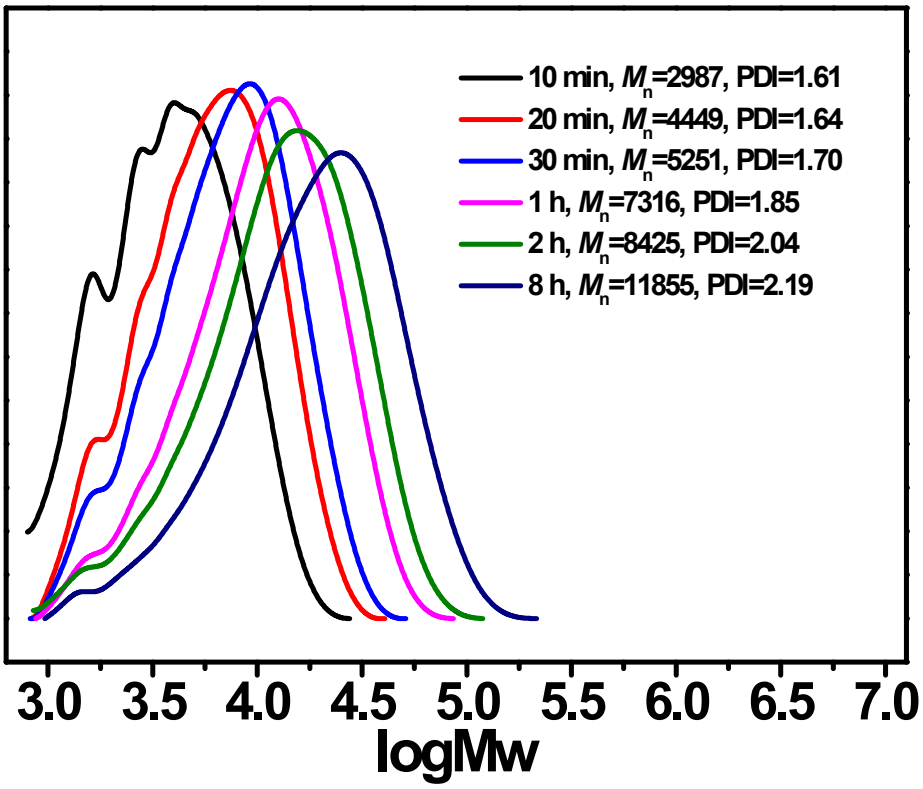

Figure S30. GPC curves of **P1** at different time.

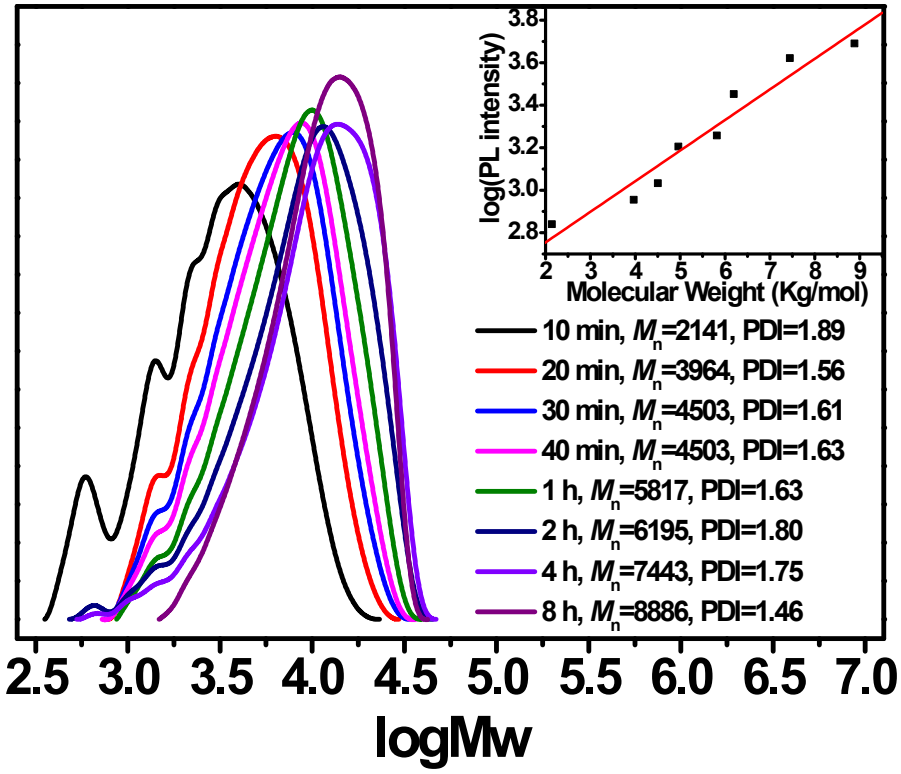

Figure S31. GPC curves of **P2** at different time. Insert: linear fitting curve of **P2** in ethanol with different molecular weights (Y-axis: the logarithm of fluorescence intensity at 440 nm).

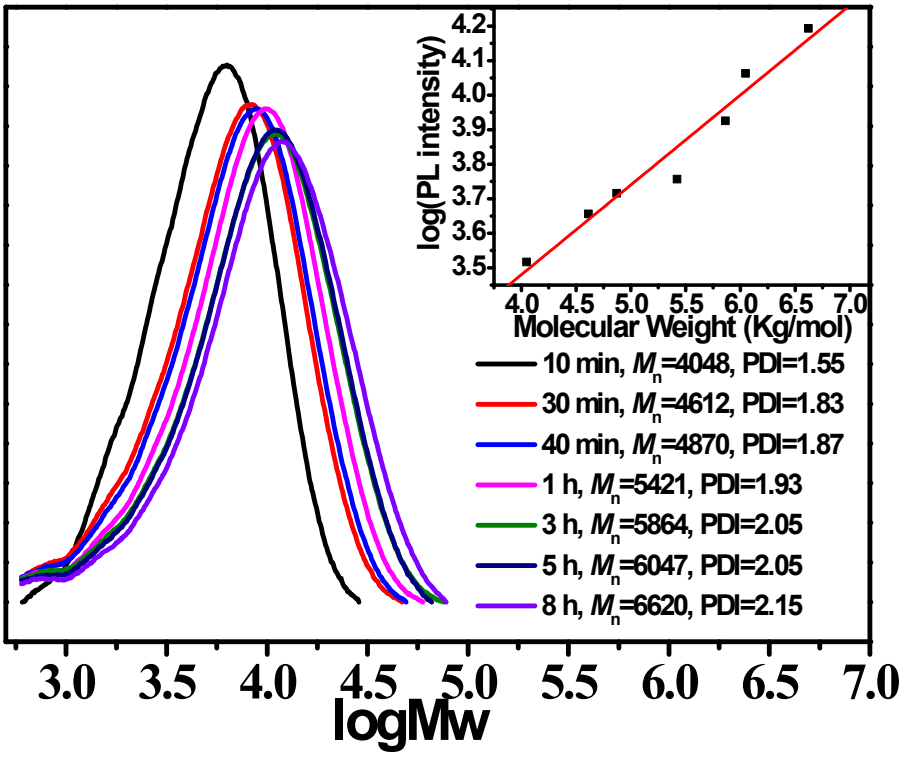

Figure S32. GPC curves of **P3** at different time. Insert: linear fitting curve of **P3** in ethanol with different molecular weights (Y-axis: the logarithm of fluorescence intensity at 440 nm).

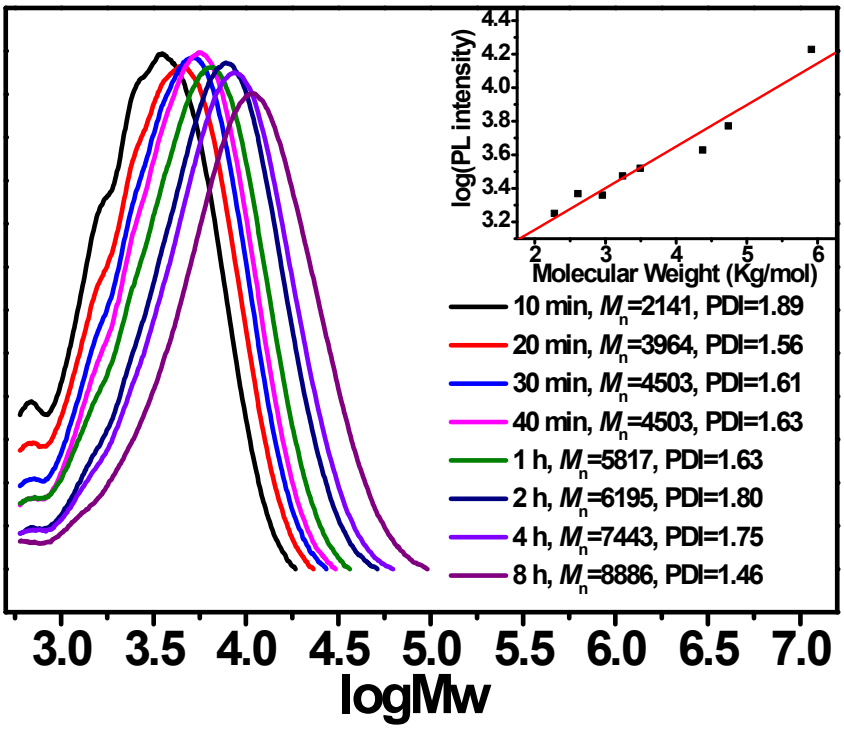

Figure S33. GPC curves of **P4** at different time. Insert: linear fitting curve of **P4** in ethanol with different molecular weights (Y-axis: the logarithm of fluorescence intensity at 440 nm).

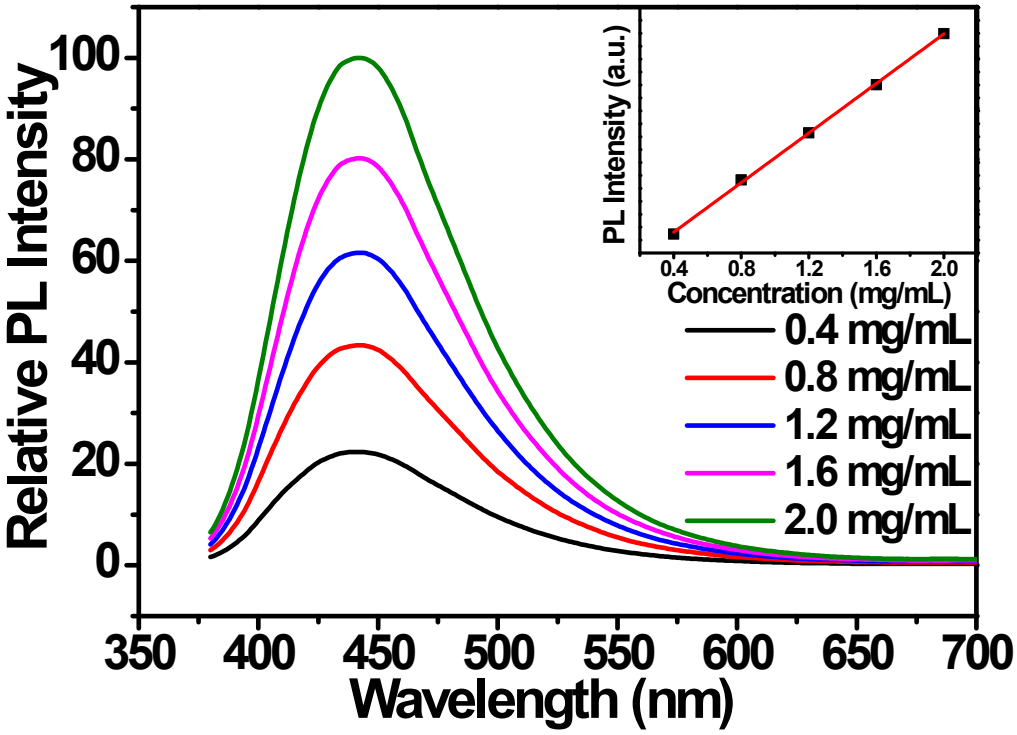

Figure S34. PL spectra of **P1** in ethanol at different concentrations. Insert: liner relationship of fluorescence intensity at 440 nm versus the concentrations of **P1**.

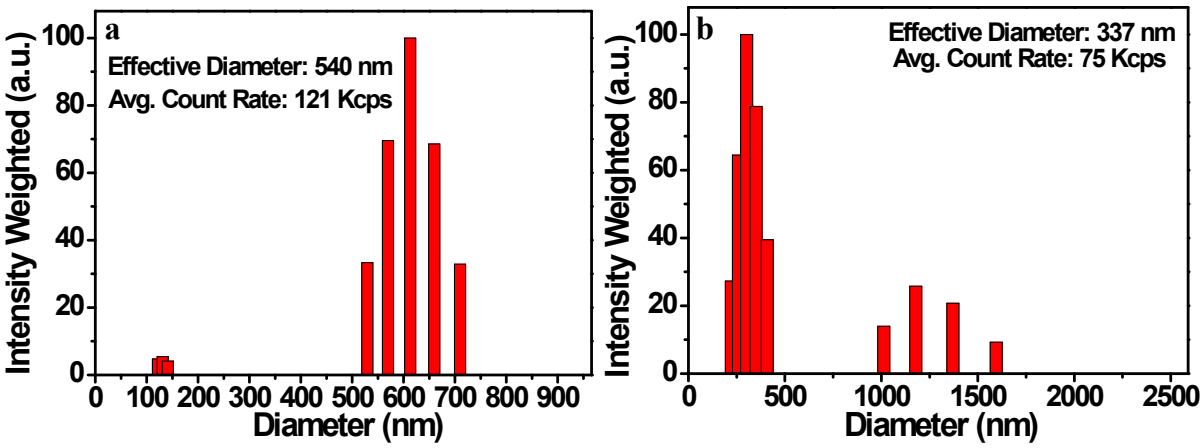

Figure S35. (a,b) Size distribution of **P1** with 40% (a) and 50% (b) water (f_{water}) fractions measured by DLS.

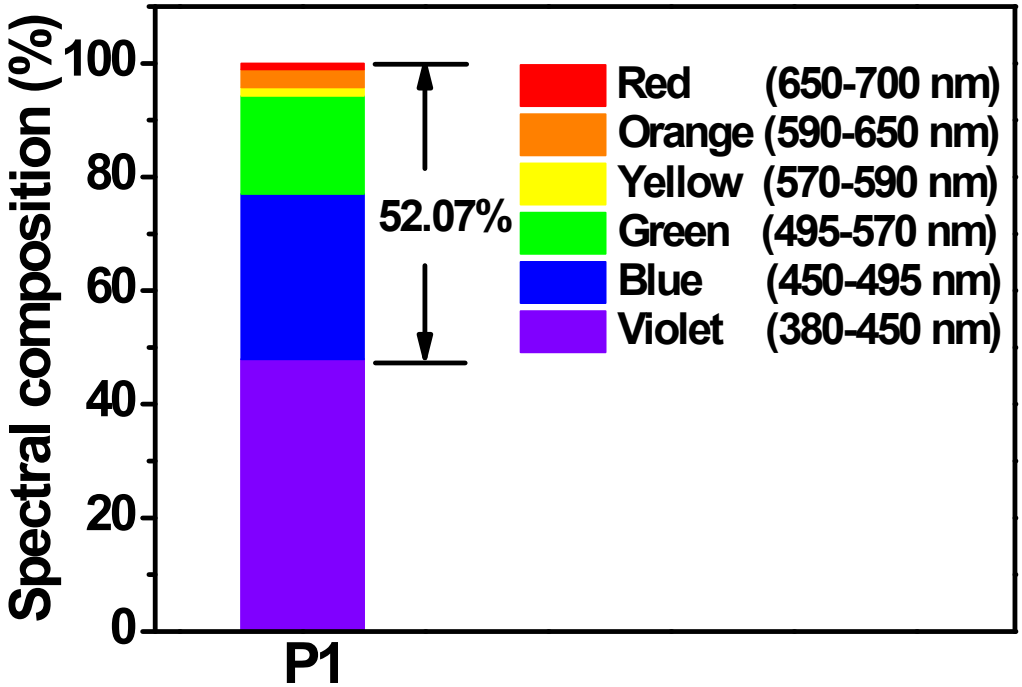

Figure S36. Blue-to-red spectral composition of the bulk **P1**.

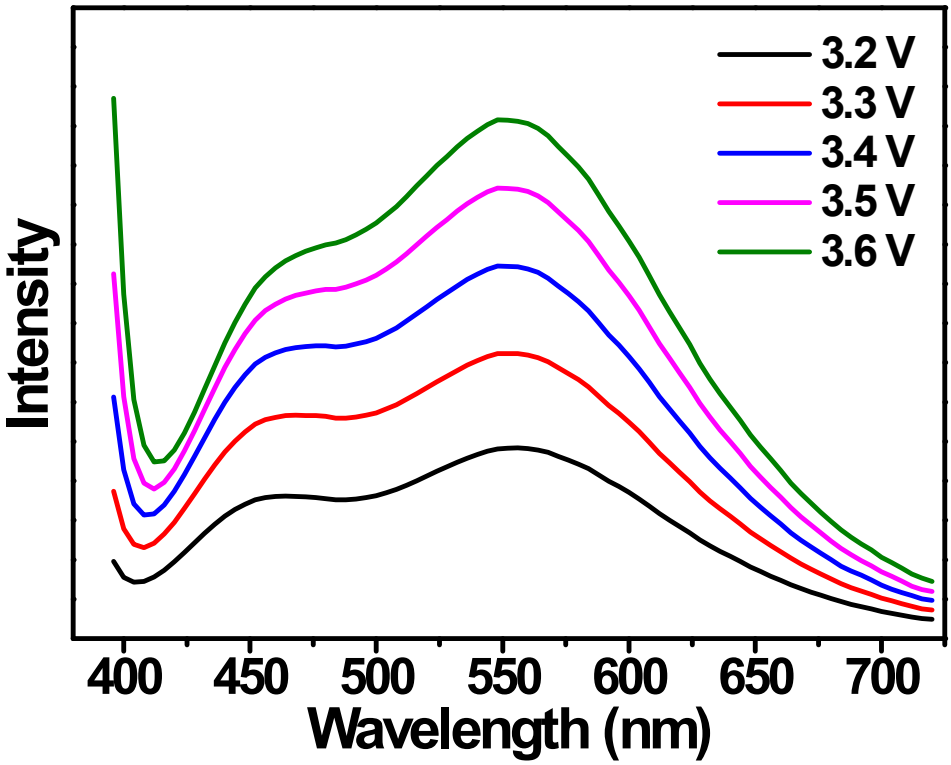

Figure S37. Emission spectra of the WLEDs under different working voltages.

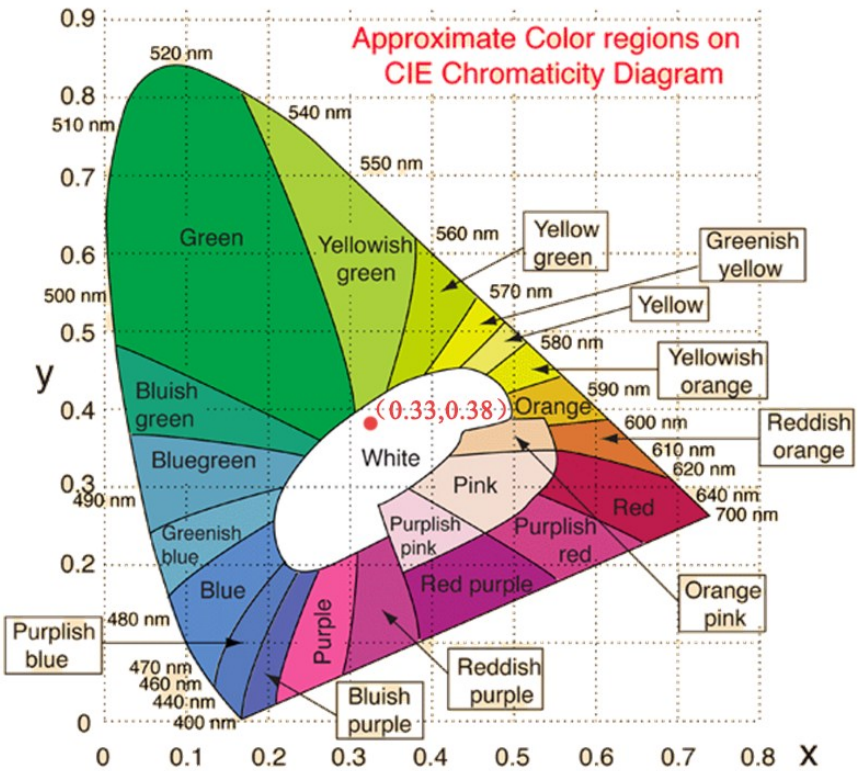

Figure S38. CIE 1931 chromaticity diagram for the WLED.