

Polymer grafting inside wood cellulose fibers by improved hydroxyl accessibility from fiber swelling

Supporting information

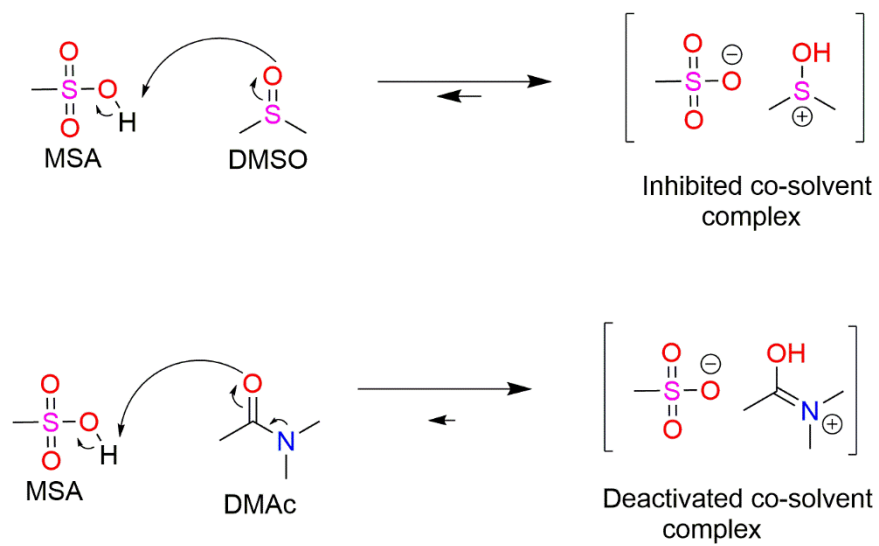
Peter Olsén*, Natalia Herrera and Lars A. Berglund

Wallenberg Wood Science Center, WWSC, Department of Fibre and Polymer Technology, KTH Royal Institute of Technology, Teknikringen 56-58, 100 44 Stockholm, Sweden

Contents

Polymerization Details	2
Dispersed fibres in CDCl_3	6
Calculation of graft-coverage. Equation S1	10
Free polymer Characterization	10

Polymerization Details



Scheme S1. Mechanistic description for co-solvent related catalyst deactivation.

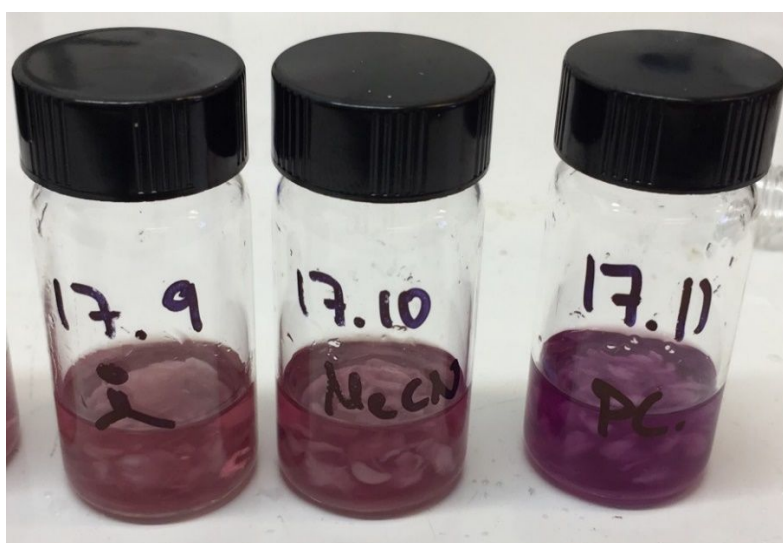
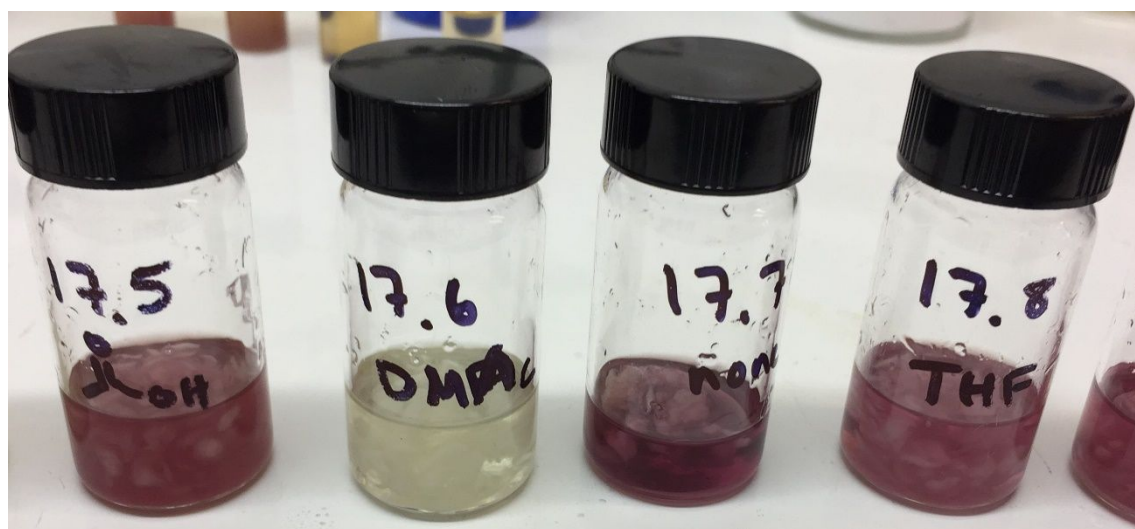
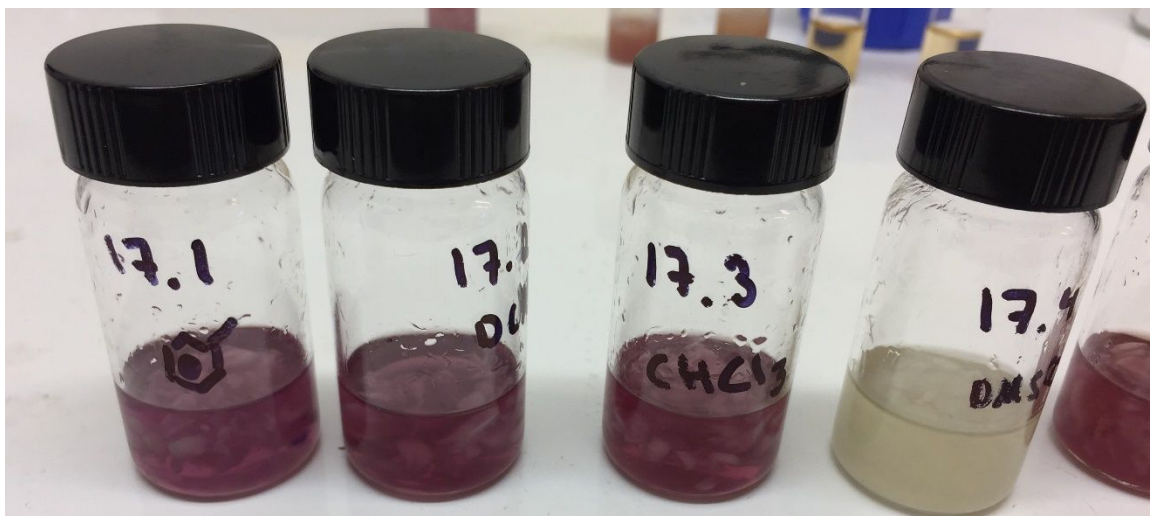


Figure S1. Activation of ϵ CL with MSA in different solvent systems with a CL:solvent weight ratio of 2:1.

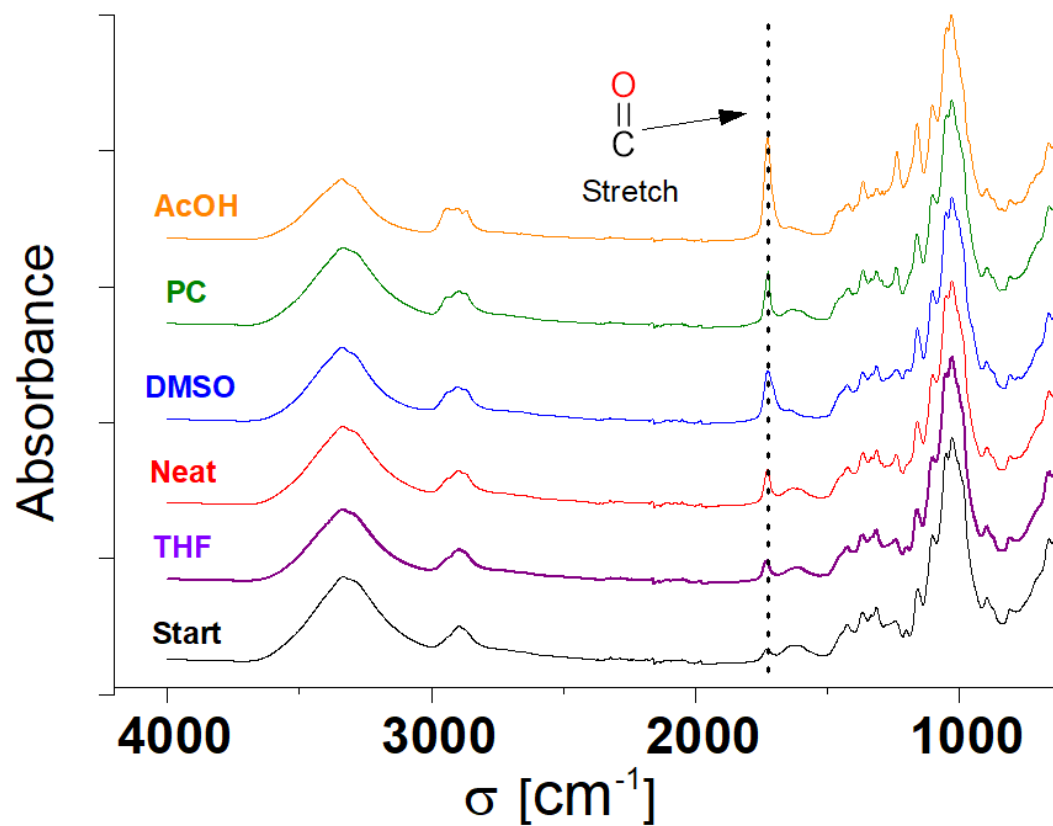


Figure S2. FTIR data over the grafted-HC fibres in different solvent systems

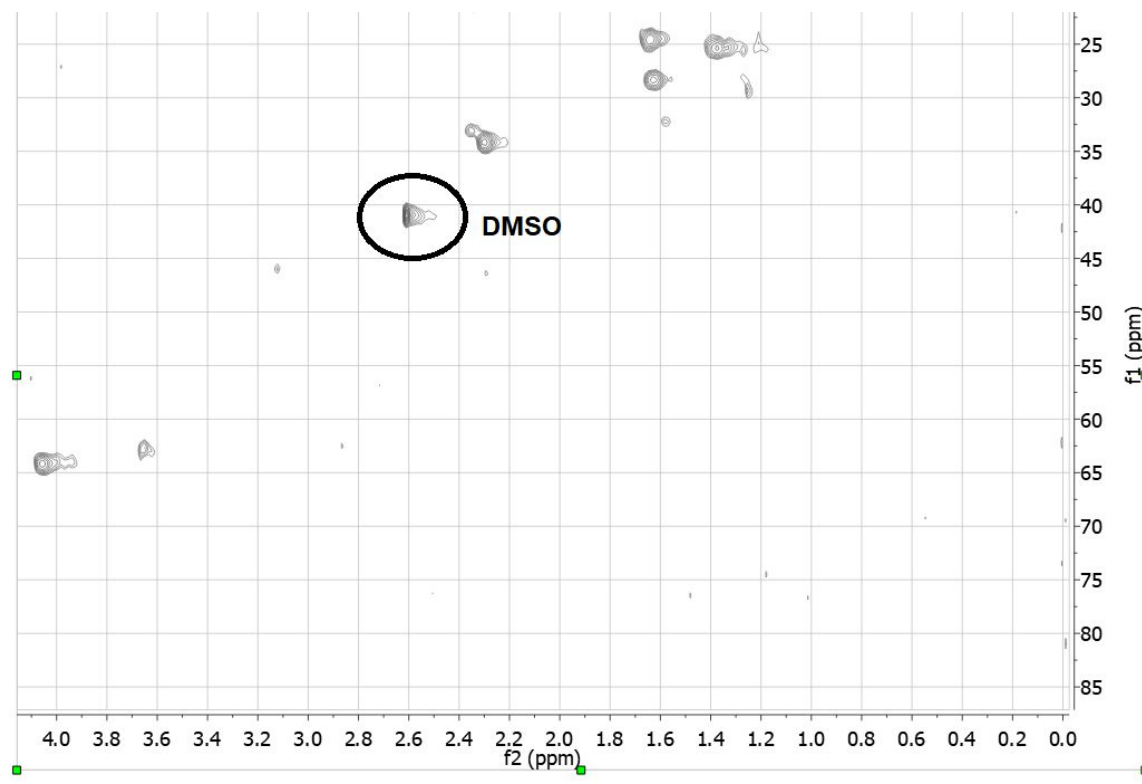


Figure S3. ^1H - ^{13}C HSQC of 10 mg hollocellulose grafted with PCL with 1/3 (v/v) of DMSO as a cosolvent, the analysis was performed in 1 ml CDCl_3 . Showing that some DMSO still is present around the fibers.

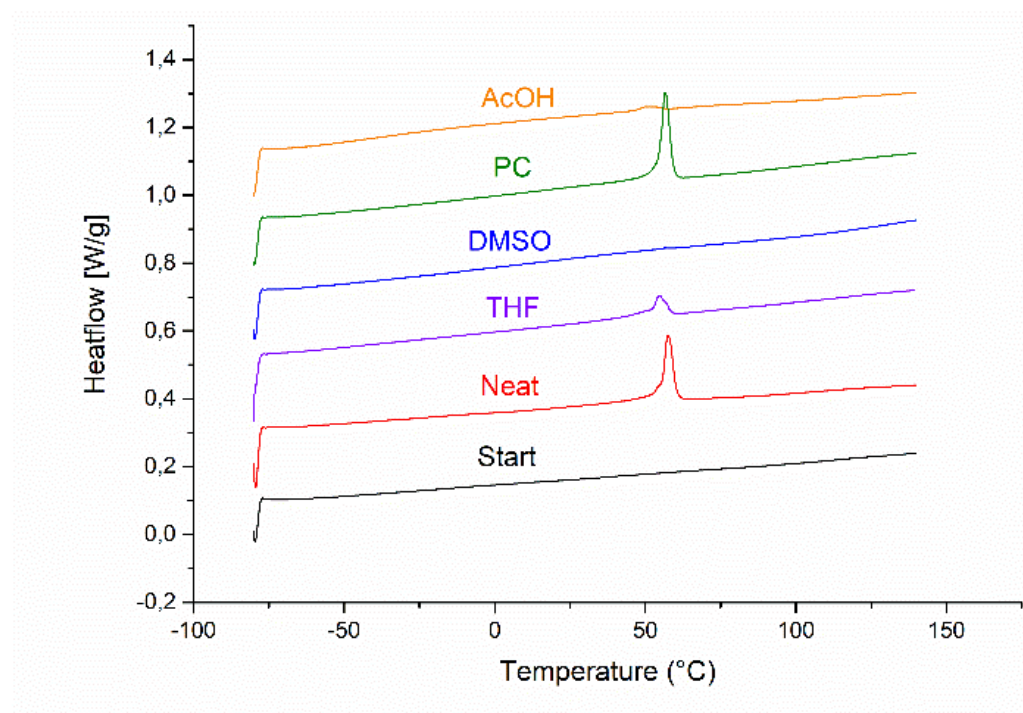


Figure S4. DSC data over the grafted-HC fibres in different solvent systems

Dispersed fibres in CDCl_3

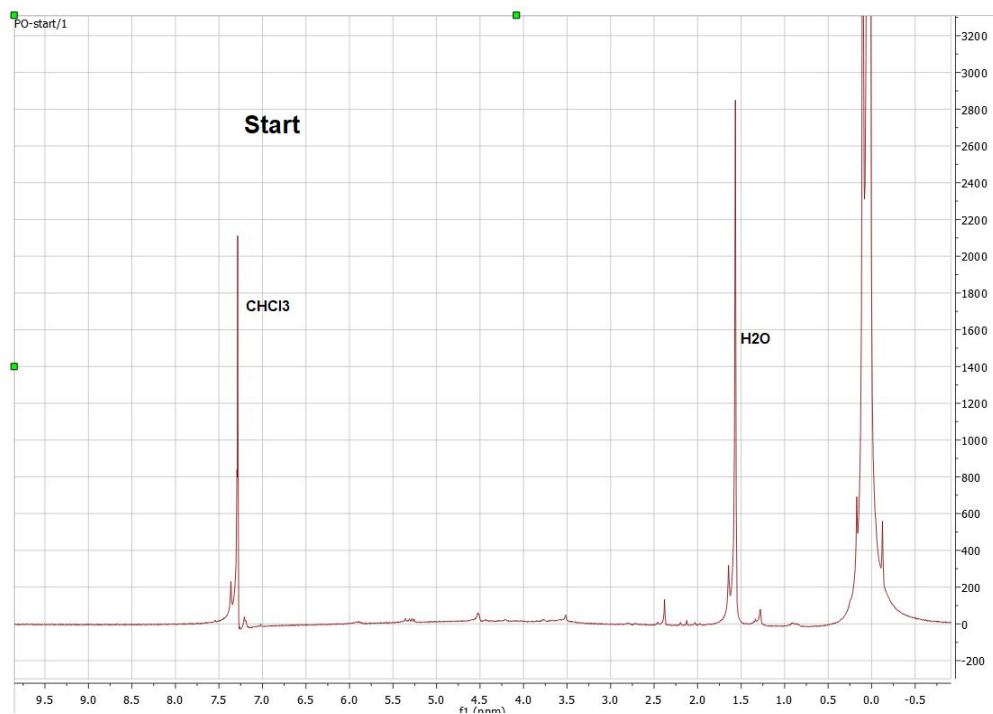


Figure S5. ^1H NMR of 10 mg of Hollocellulose in 1 ml of CDCl_3

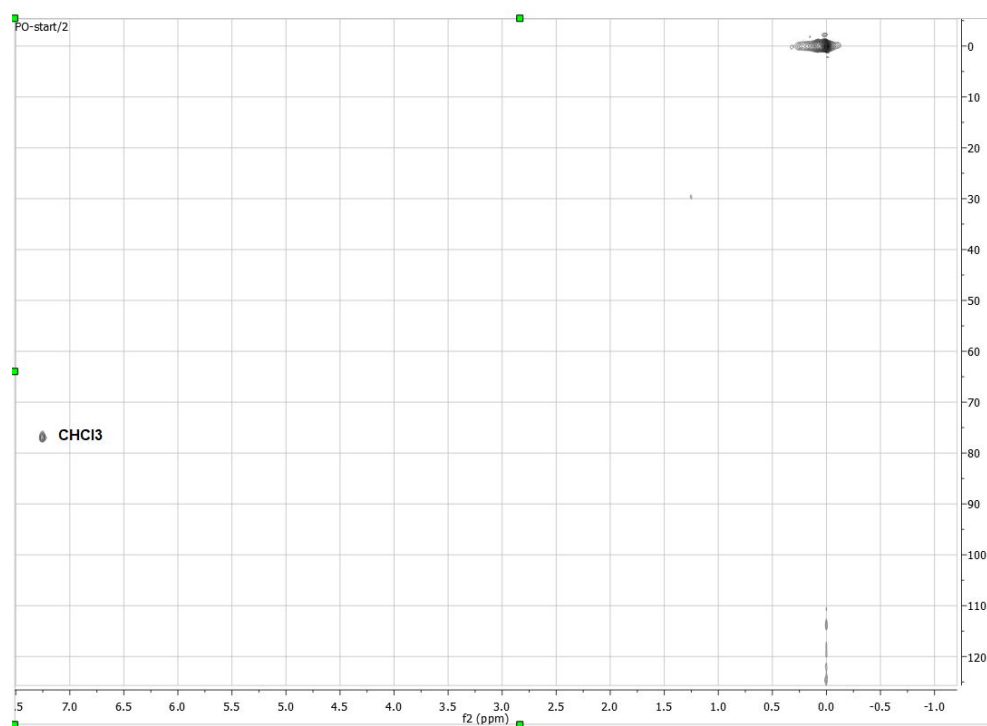


Figure S6. ^1H - ^{13}C HSQC of 10 mg of Hollocellulose in 1 ml of CDCl_3

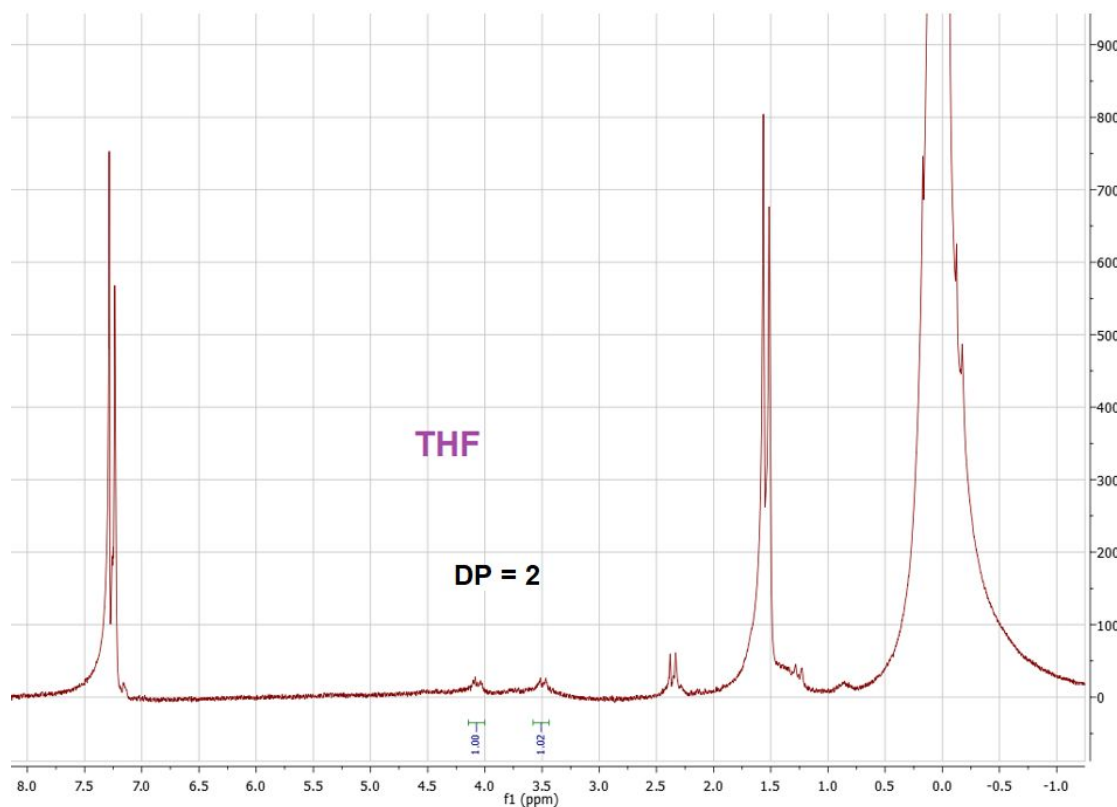


Figure S7. ^1H NMR of 10 mg hollocellulose grafted with PCL with 1/3 (v/v) of THF as a solvent, the analysis was performed in 1 ml CDCl_3 .

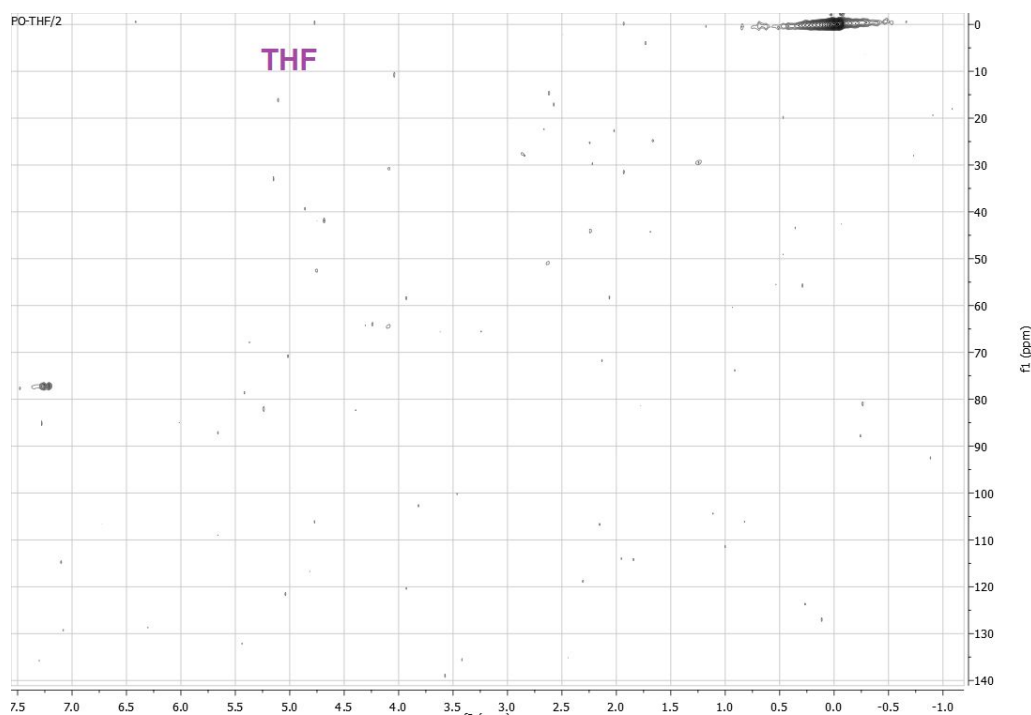


Figure S8. ^1H - ^{13}C HSQC of 10 mg hollocellulose grafted with PCL with 1/3 (v/v) of THF as a solvent, the analysis was performed in 1 ml CDCl_3 .

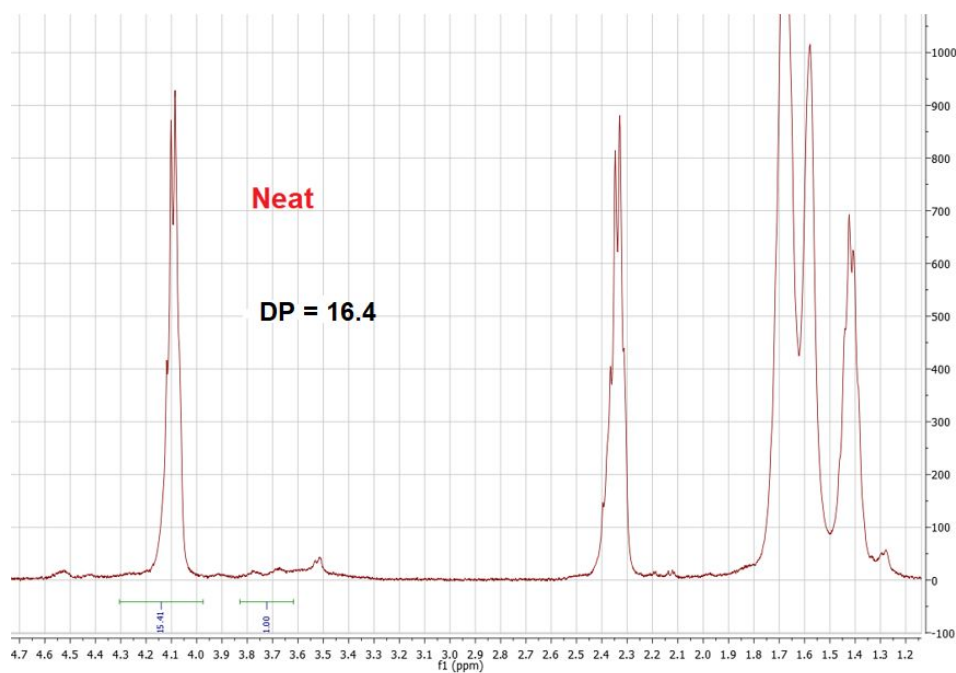


Figure S9. ^1H NMR of 10 mg hollocellulose grafted with PCL under neat conditions, the analysis was performed in 1 ml CDCl_3 .

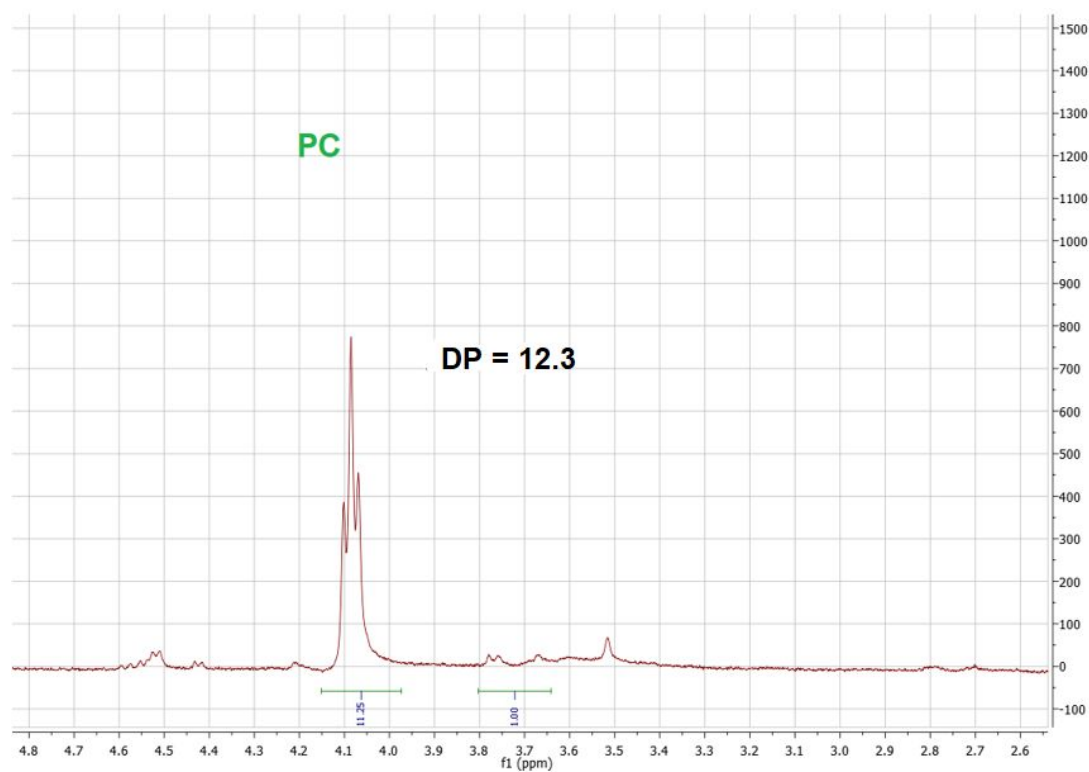


Figure S10. ^1H NMR of 10 mg hollocellulose grafted with PCL with 1/3 (v/v) of PC as a solvent, the analysis was performed in 1 ml CDCl_3 .

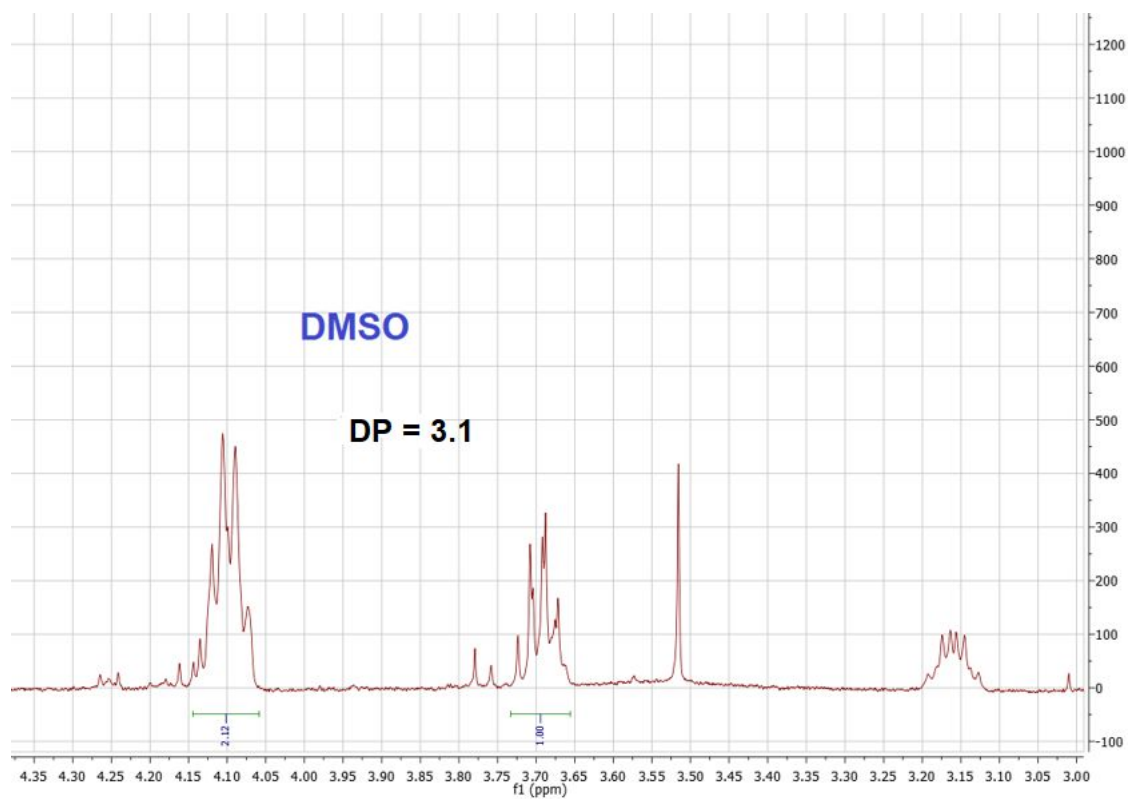


Figure S11. ^1H NMR of 10 mg hollocellulose grafted with PCL with 1/3 (v/v) of DMSO as a solvent, the analysis was performed in 1 ml CDCl_3 .

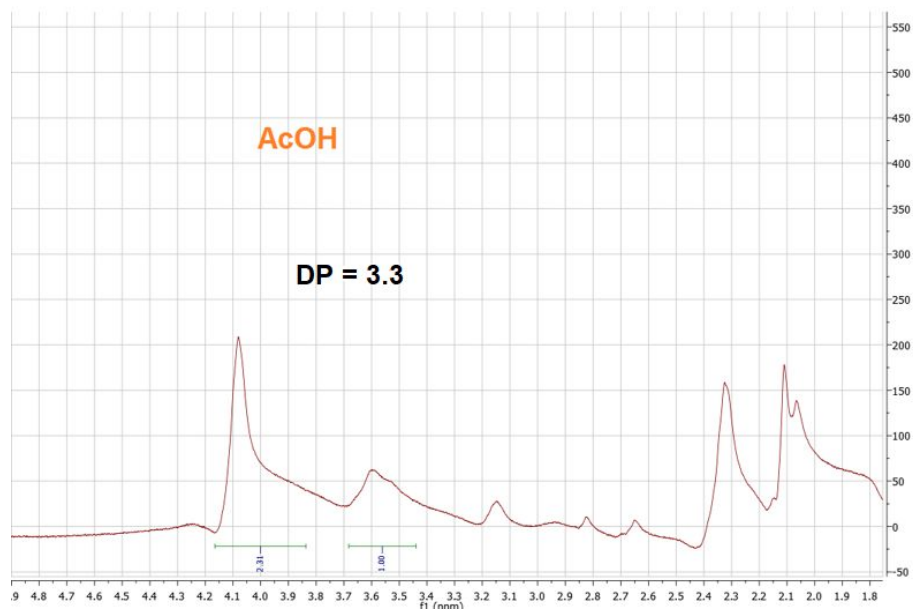


Figure S12. ^1H NMR of 10 mg hollocellulose grafted with PCL with 1/3 (v/v) of AcOH as a solvent, the analysis was performed in 1 ml CDCl_3 .

Calculation of graft-coverage. Equation S1

$$(Weight\ Change\ in\ gram)/((DP * M_{CL} * N * Surface\ area))$$

Free polymer Characterization

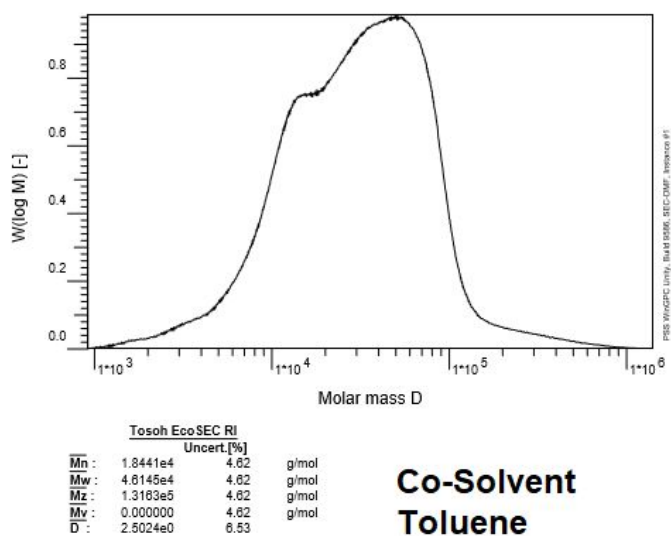


Figure S13. GPC traces for the free chains after SI-ROP in toluene as a solvent

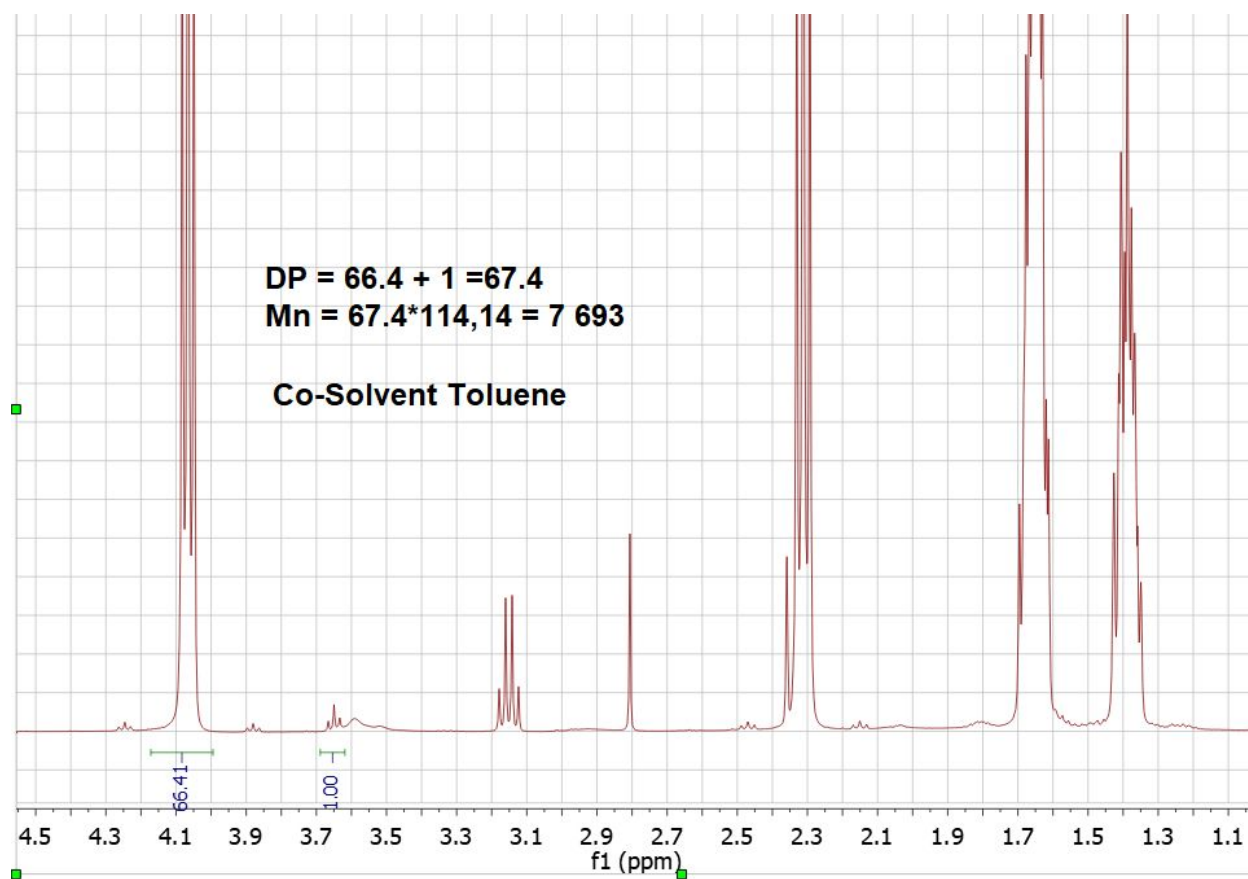


Figure S14. ^1H NMR for the free chains after SI-ROP in toluene as a solvent

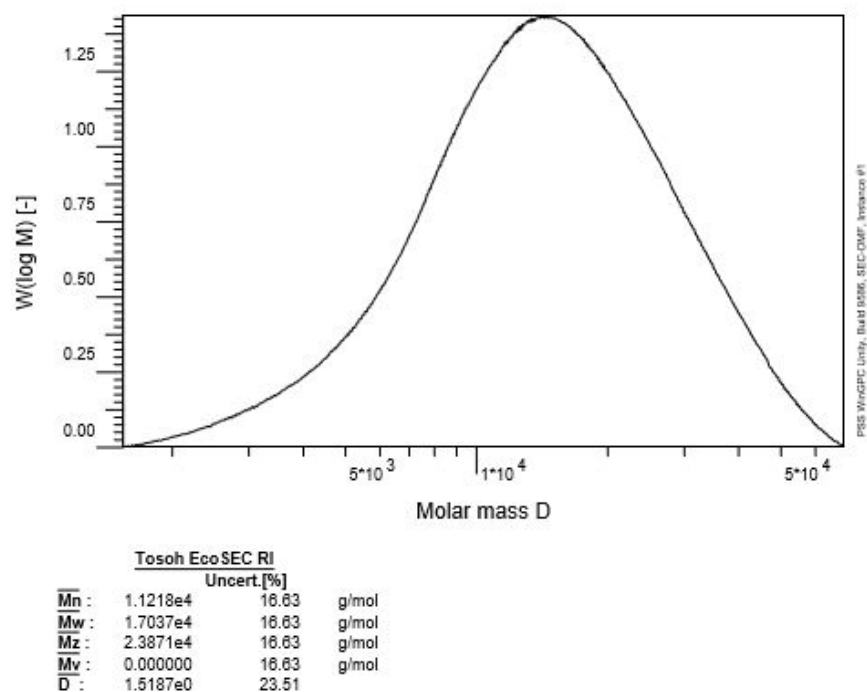


Figure S15. GPC traces for the free chains after SI-ROP in Chloroform as a solvent

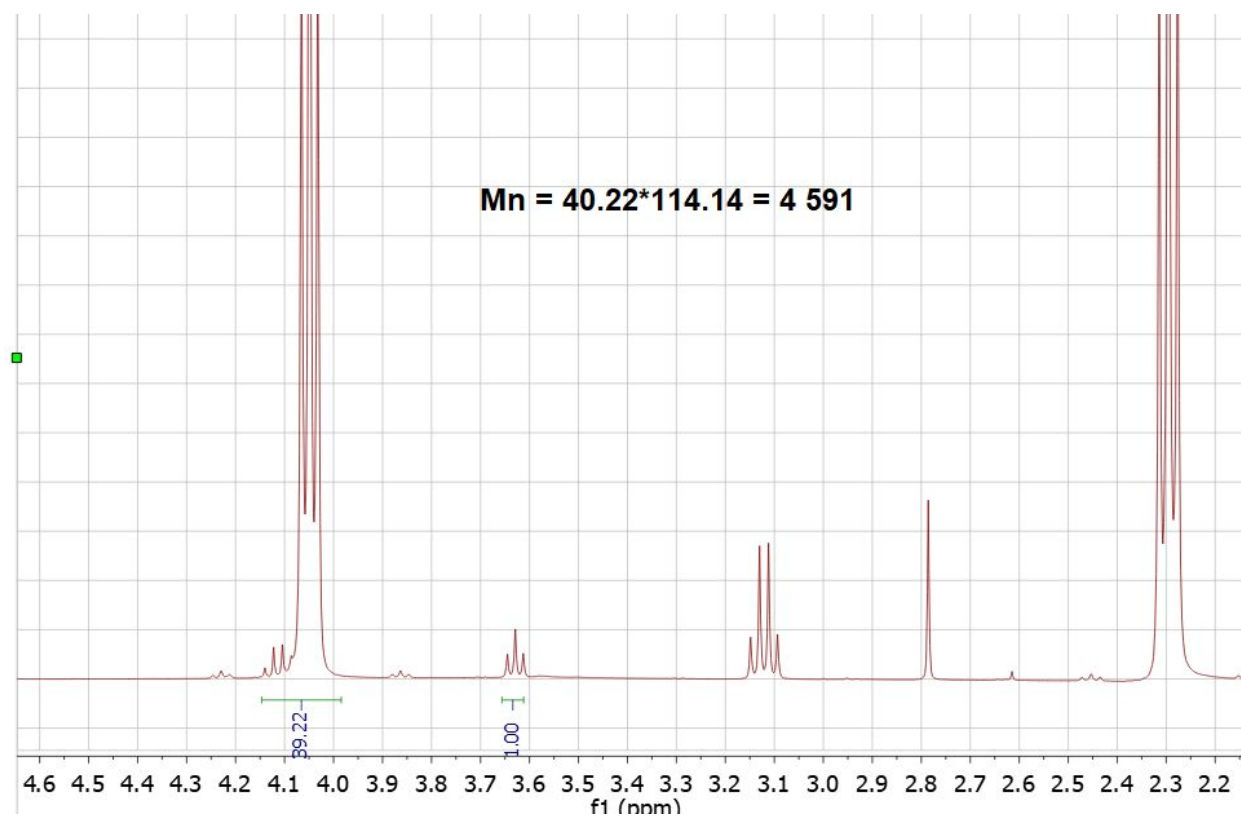


Figure S16. ^1H NMR for the free chains after SI-ROP in chloroform as a solvent

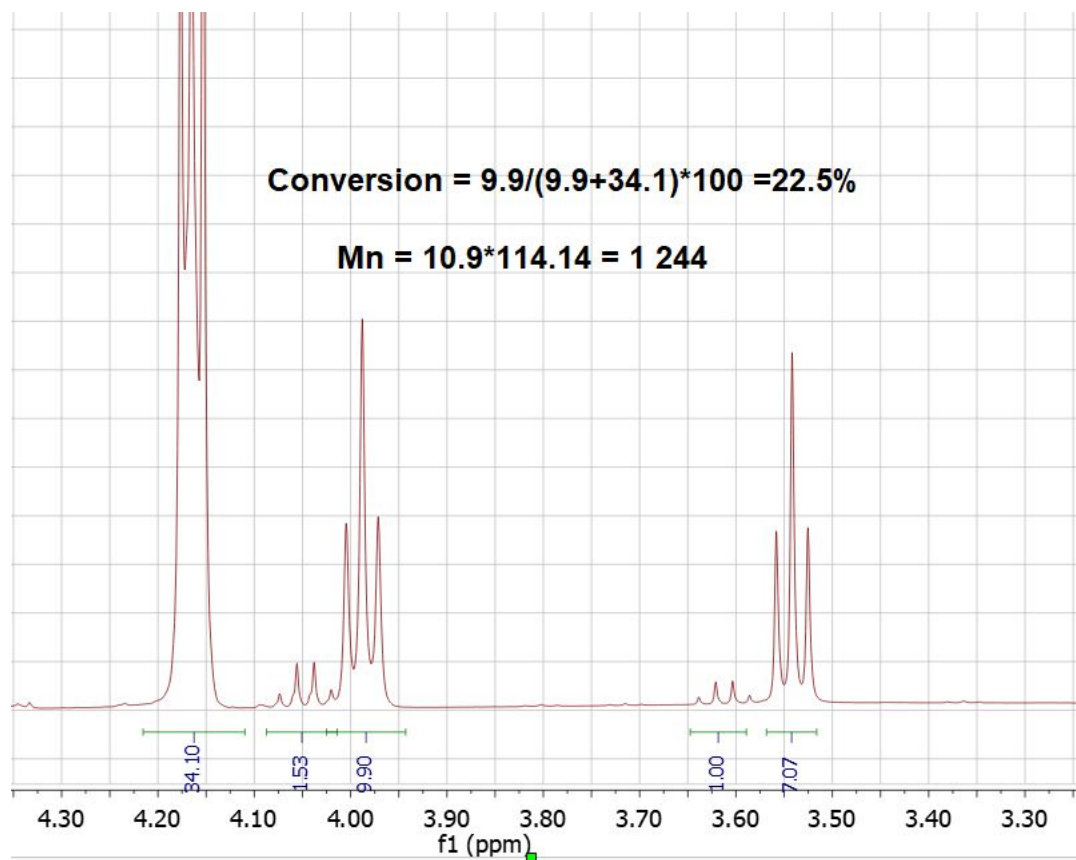


Figure S17. ^1H NMR for the free chains after SI-ROP in DMSO as a solvent

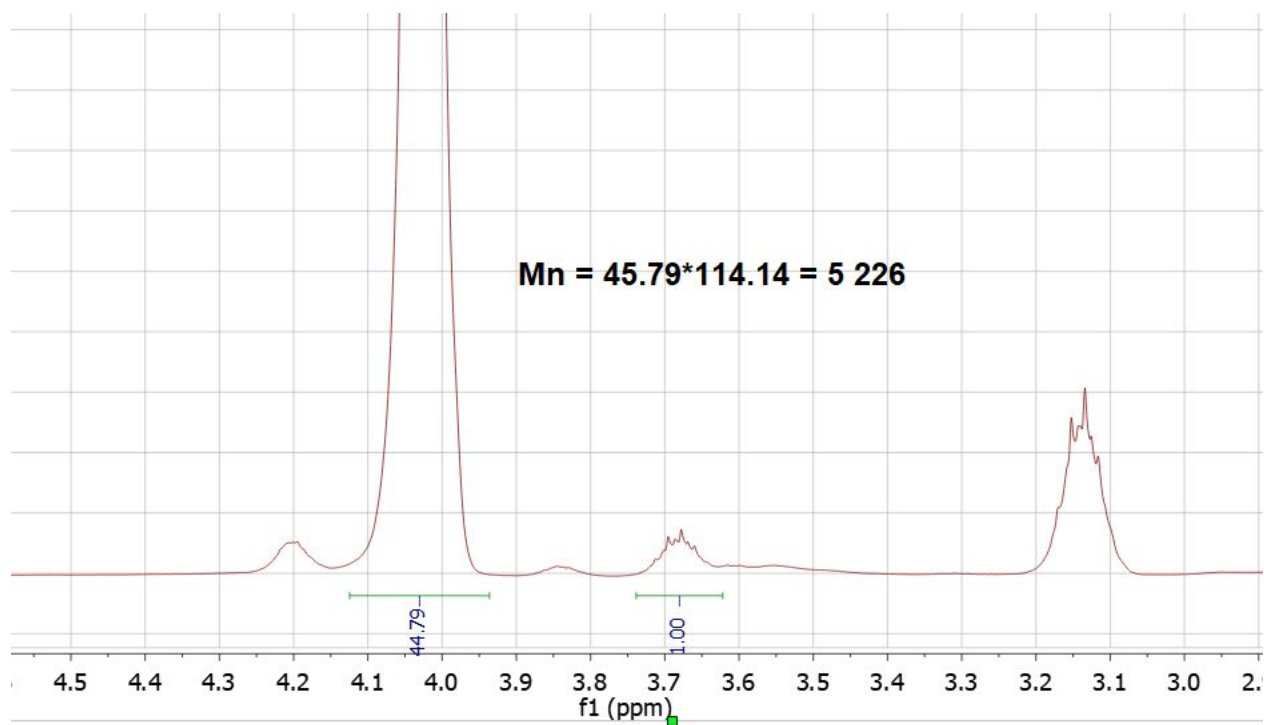


Figure S18. ^1H NMR for the free chains after SI-ROP in AcOH as a solvent

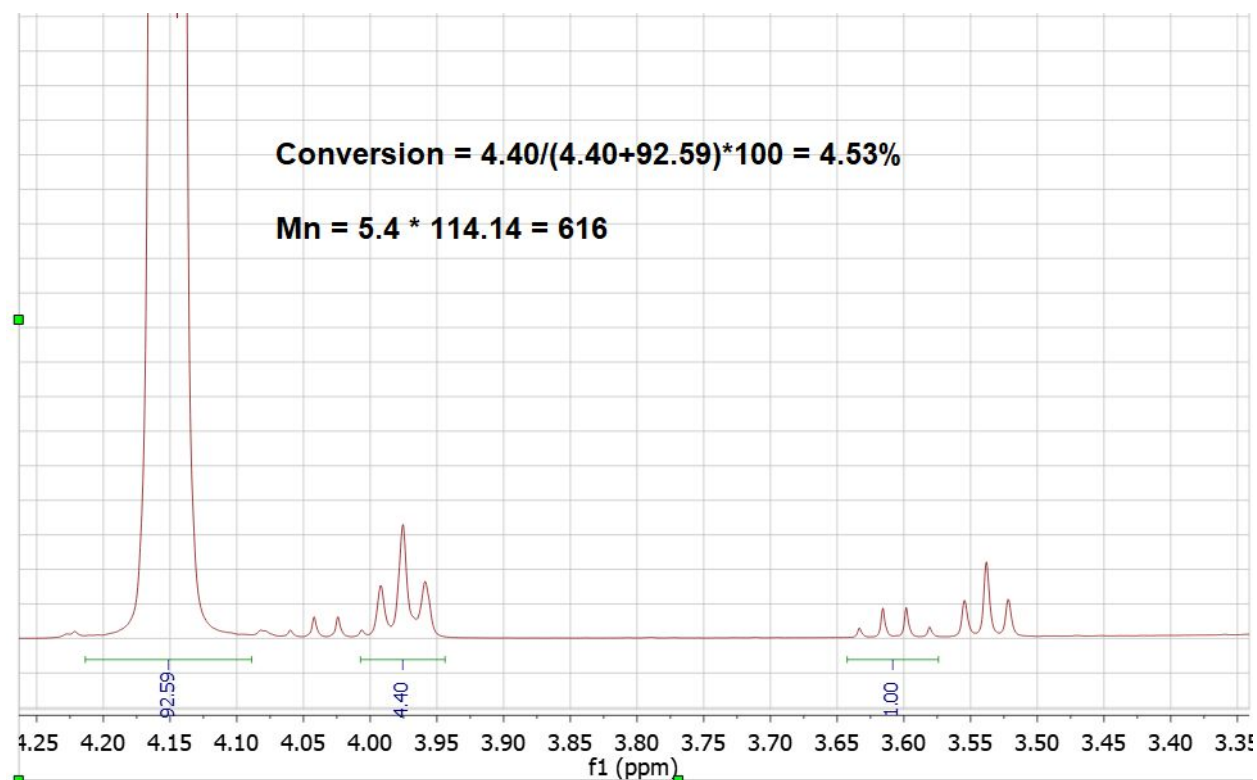


Figure S19. ^1H NMR for the free chains after SI-ROP in DMAc as a solvent

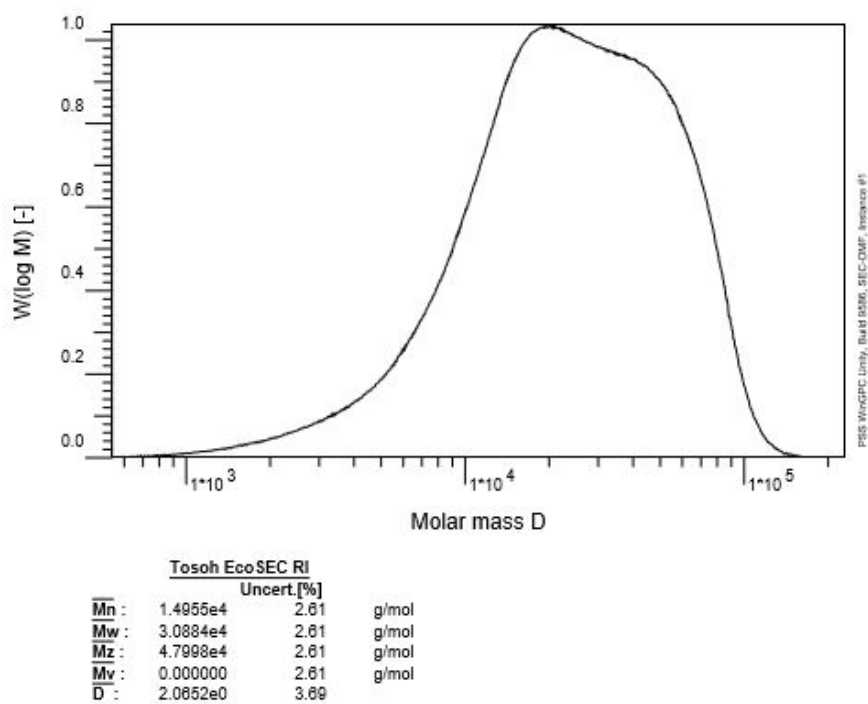


Figure S20. GPC traces for the free chains after SI-ROP under neat conditions

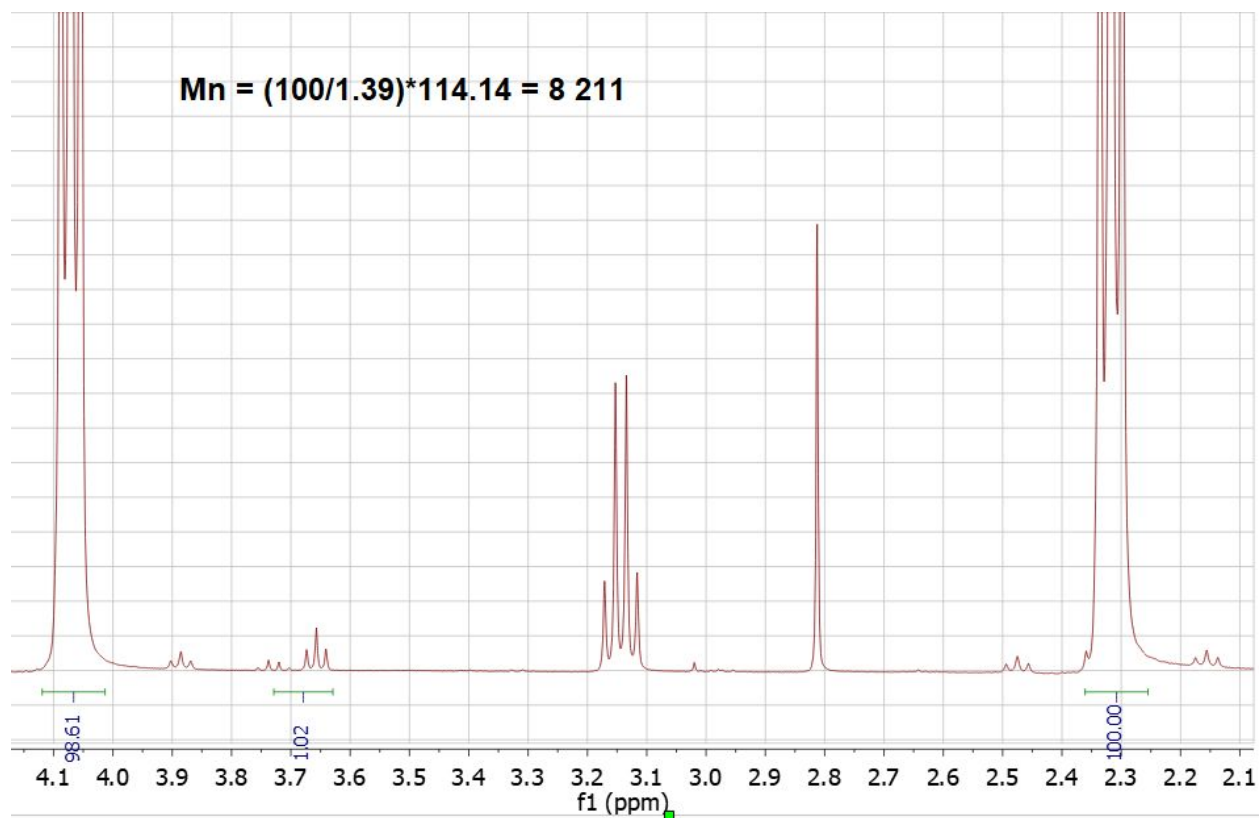


Figure S21. ^1H NMR for the free chains after SI-ROP under neat conditions

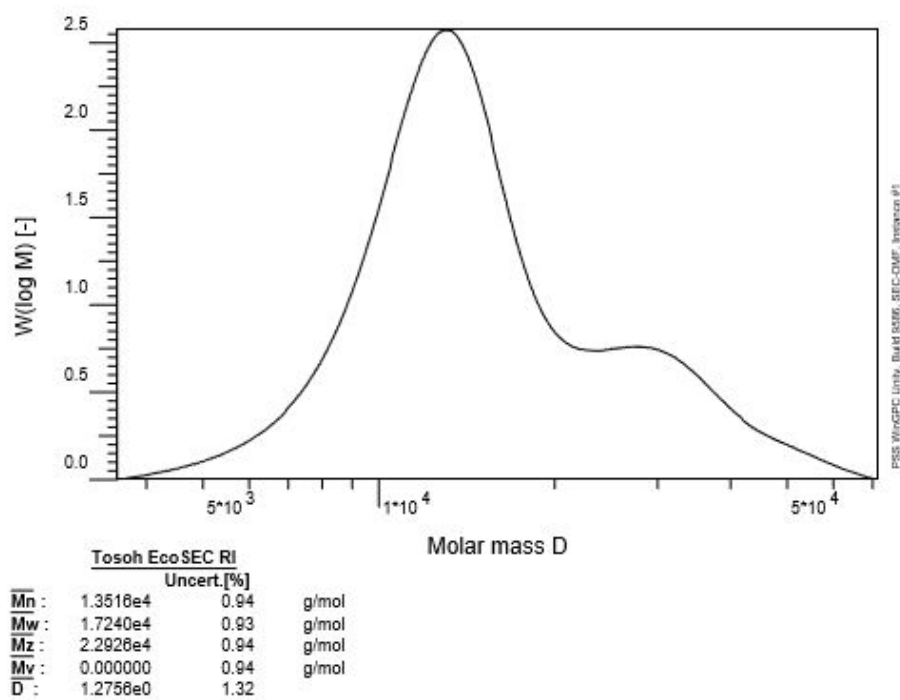


Figure S22. GPC traces for the free chains after SI-ROP in THF as a solvent

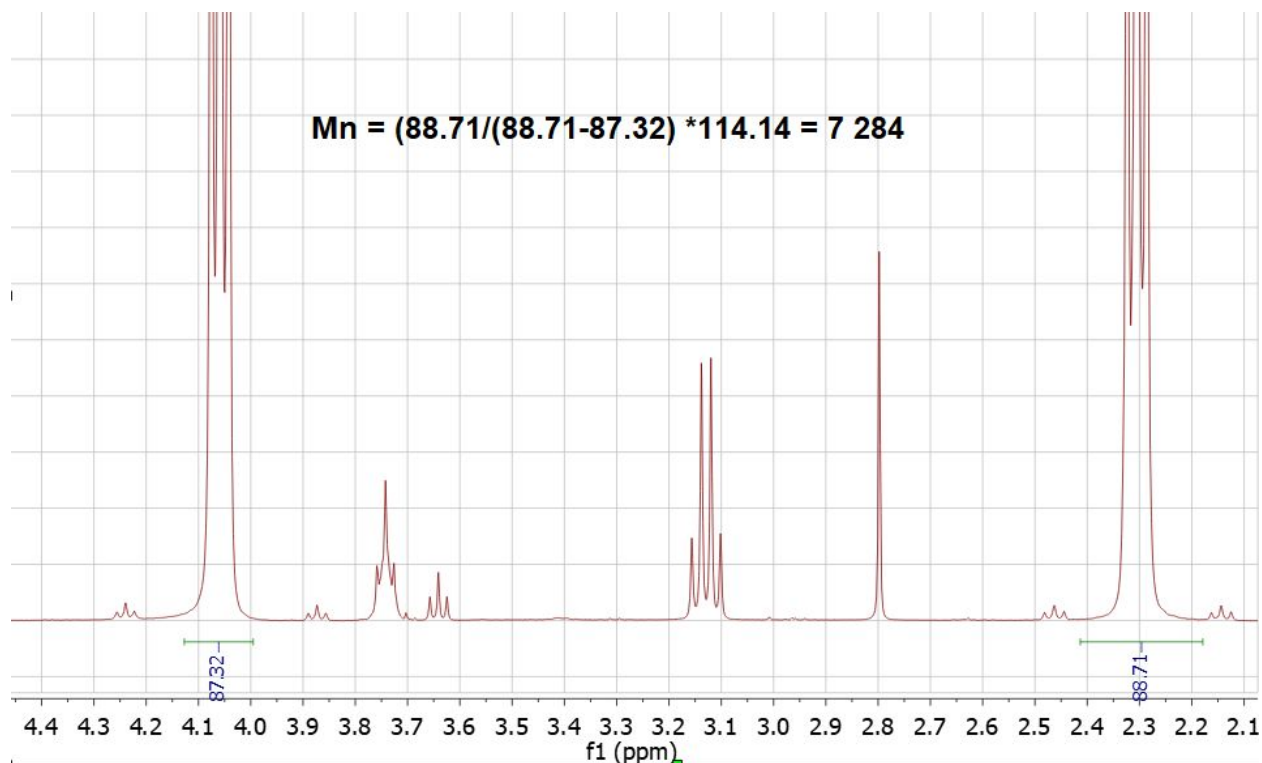


Figure S23. ^1H NMR for the free chains after SI-ROP in THF as a solvent

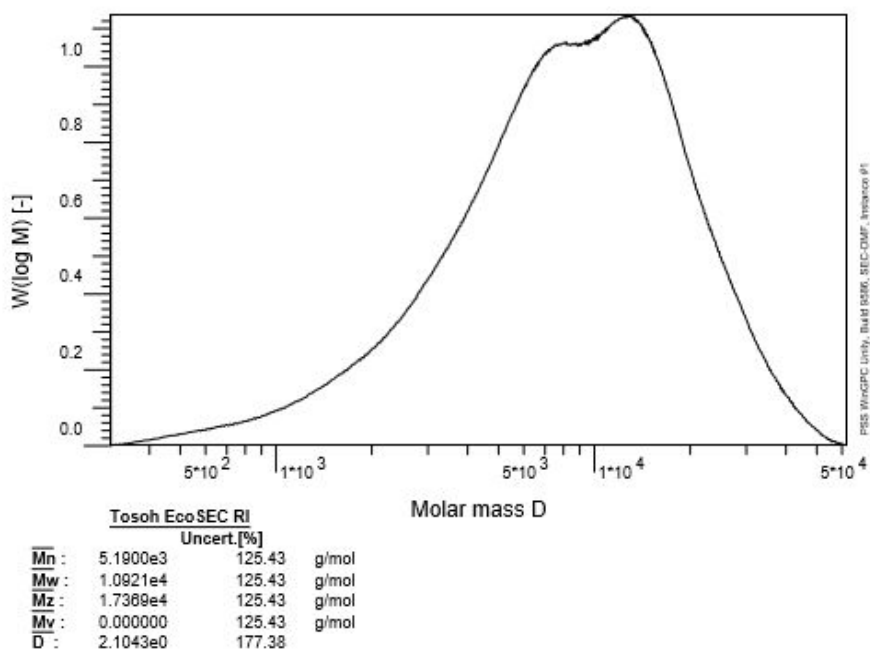


Figure S24. GPC traces for the free chains after SI-ROP in Acetone as a solvent

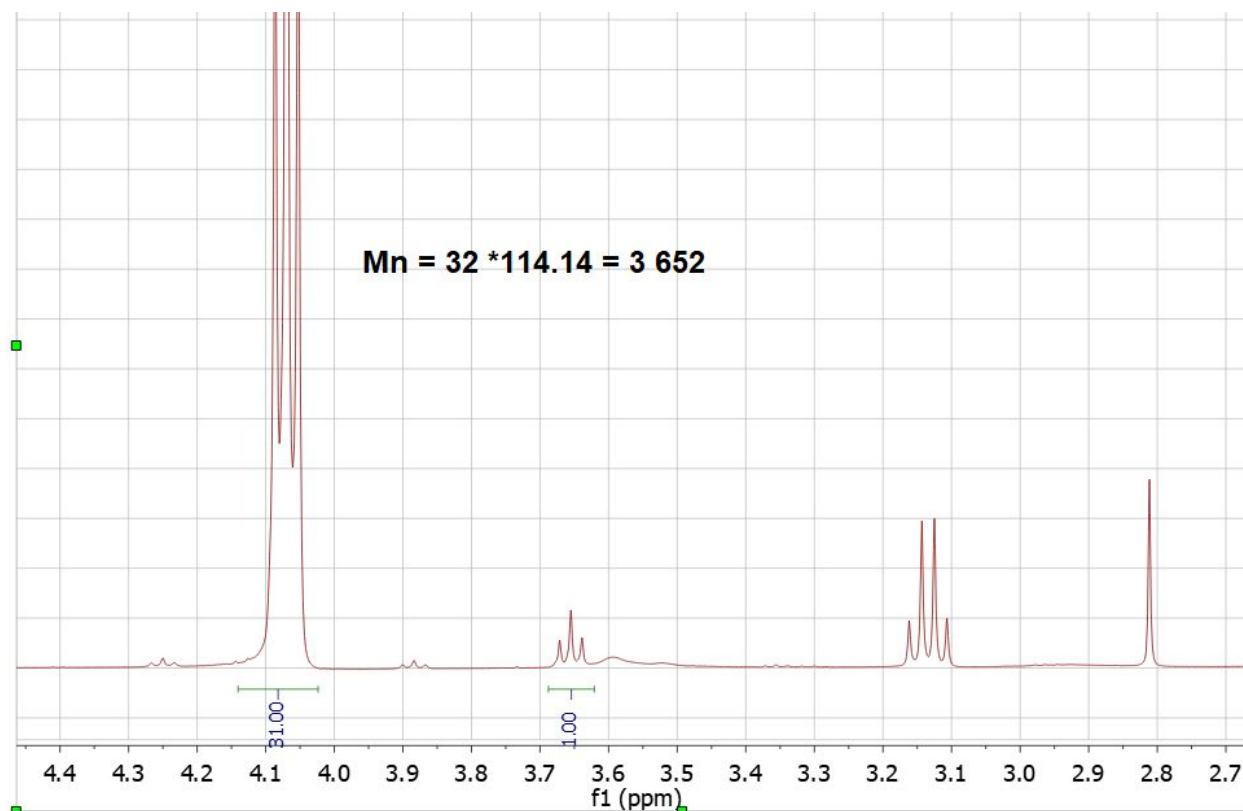


Figure S25. ^1H NMR for the free chains after SI-ROP in Acetone as a solvent

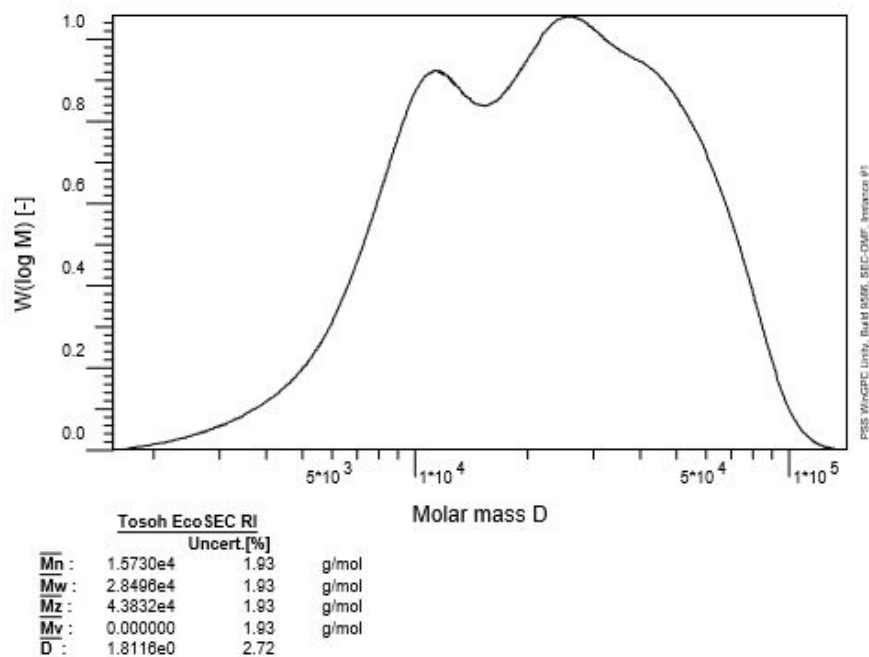


Figure S26. GPC traces for the free chains after SI-ROP in MeCN as a solvent

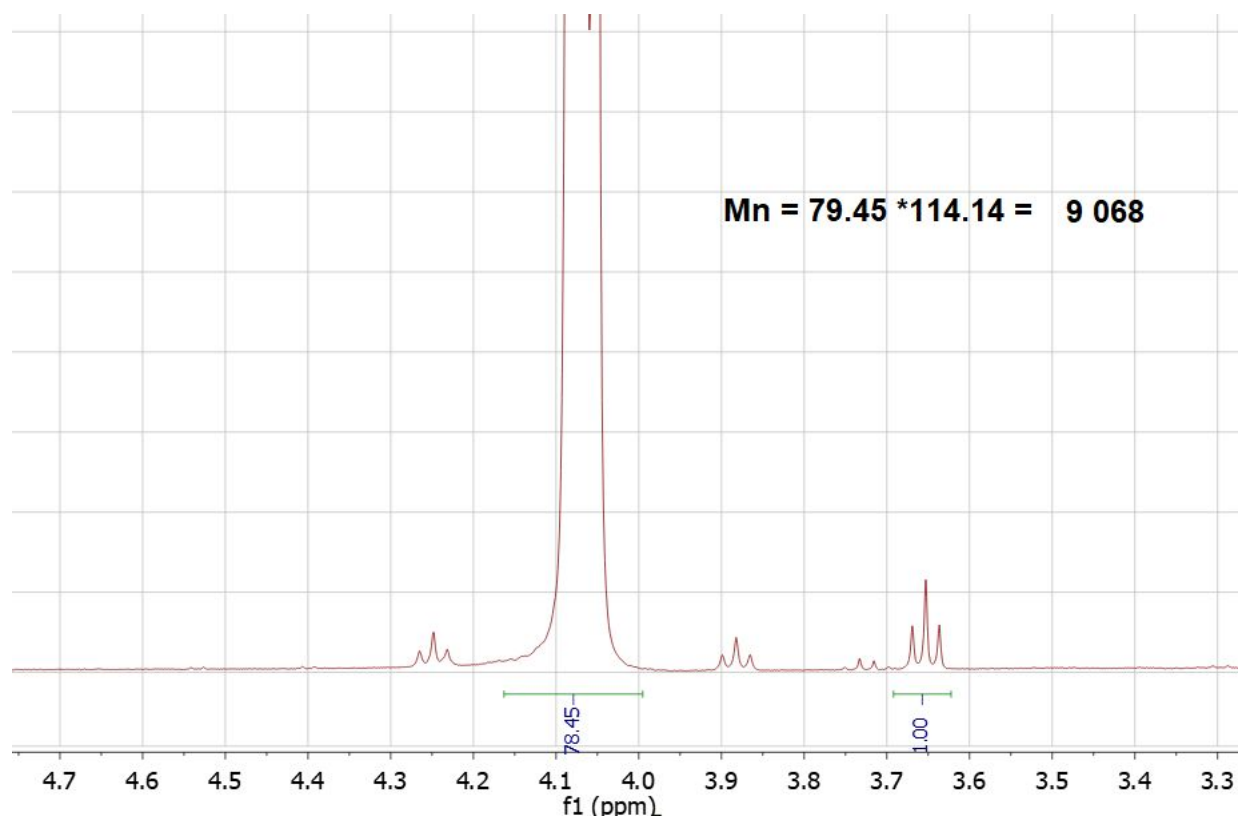


Figure S27. ^1H NMR for the free chains after SI-ROP in MeCN as a solvent

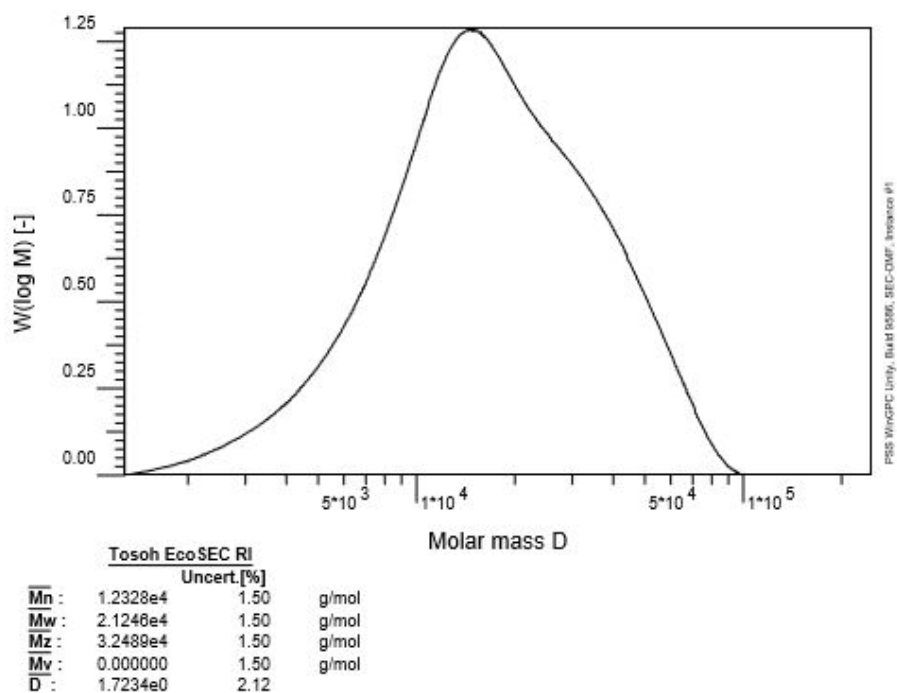


Figure S28. GPC traces for the free chains after SI-ROP in PC as a solvent

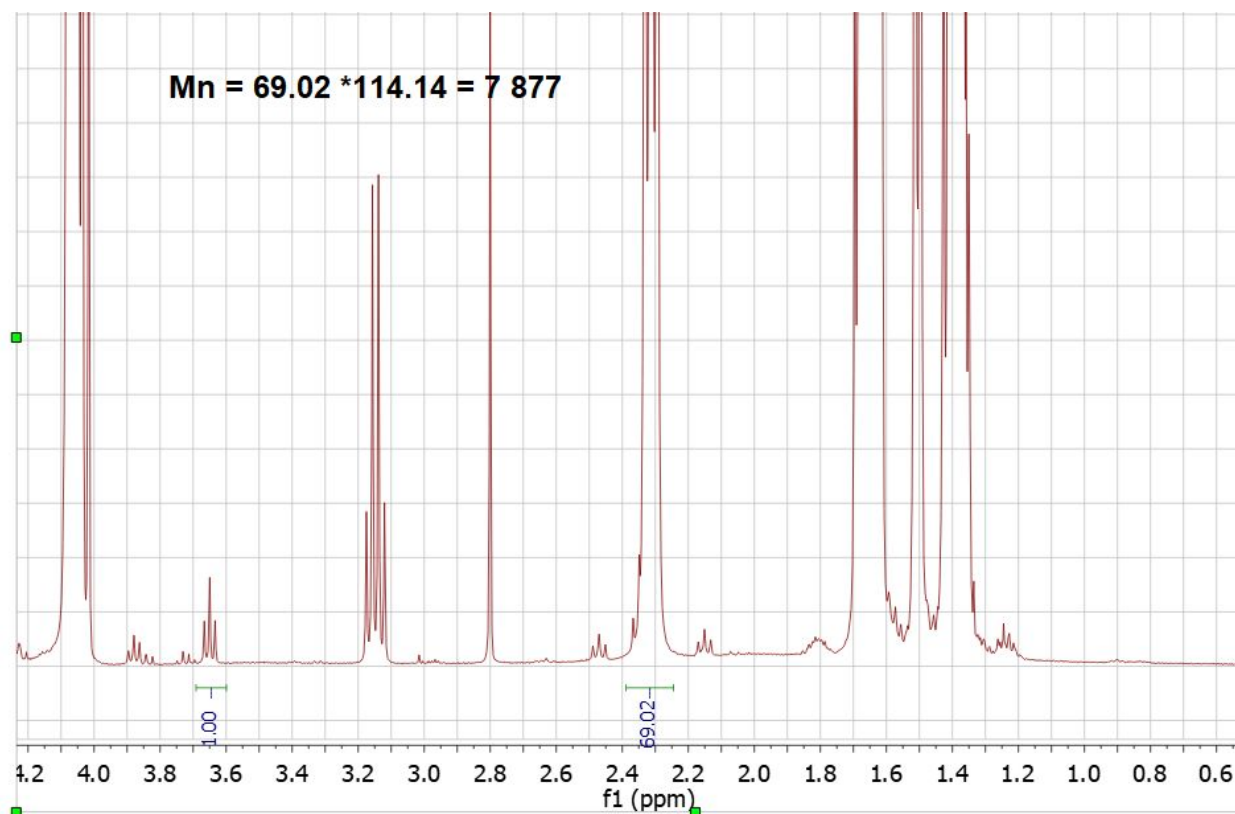


Figure S29. ^1H NMR for the free chains after SI-ROP in PC as a solvent

Equation S1

Equation used for calculation of the surface density.

$$(\text{Weight Change in gram}) / ((DP \cdot M_{cl} \cdot N \cdot \text{Surface area}))$$

The calculation was performed under the assumption that the surface area of the holo-cellulose fiber was $200\text{m}^2/\text{g}$ and that the weight loss during purification was the same for all fibers.