Supporting Information

Reaction Engineering Implications of Cellulose Crystallinity and Water-Promoted Recrystallization

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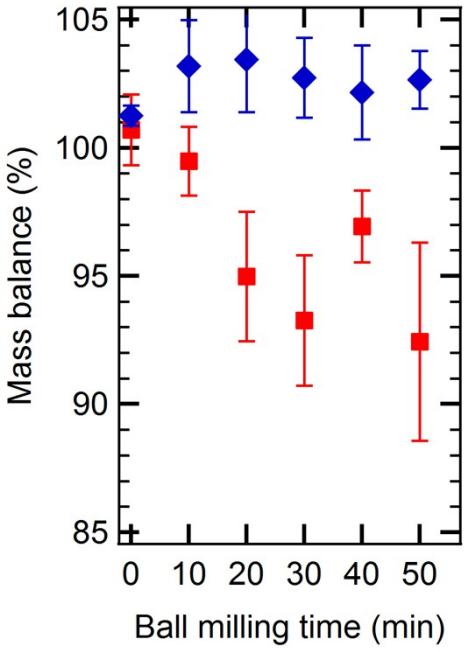

Figure S1. Mass balance closure for acid (red squares) and hot liquid water (blue diamonds) treated ball-milled cellulose samples.

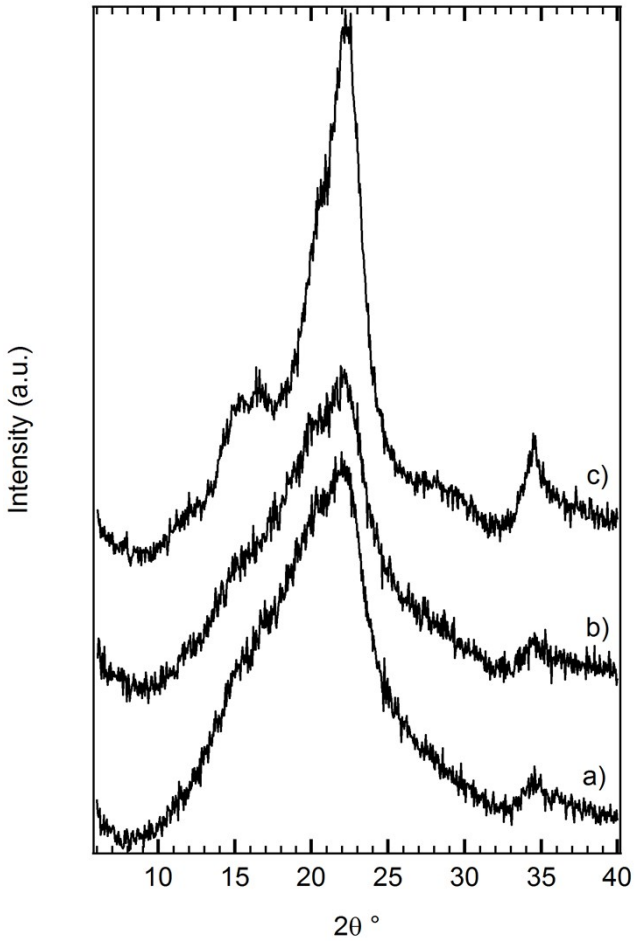

Figure S2. X-ray diffractograms of a) MCC-BM50, b) MCC-BM50 washed with acetone and dried at 65 °C, c) MCC-BM50 washed with water and dried.

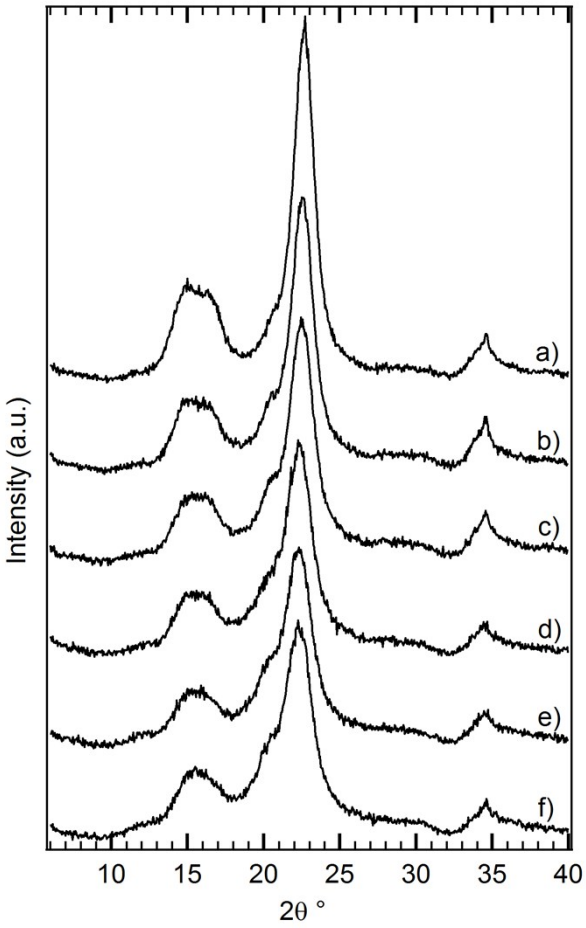

Figure S3. X-ray diffractograms of progressively ball-milled cellulose samples after liquid hot water treatment at 150 °C for 1 hour: a) Avicel-PH101, b) MCC-BM10-HLW, c) MCC-BM20-LHW, d) MCC-BM30- HLW, e) MCC-BM40-HLW, f) MCC-BM50-HLW.

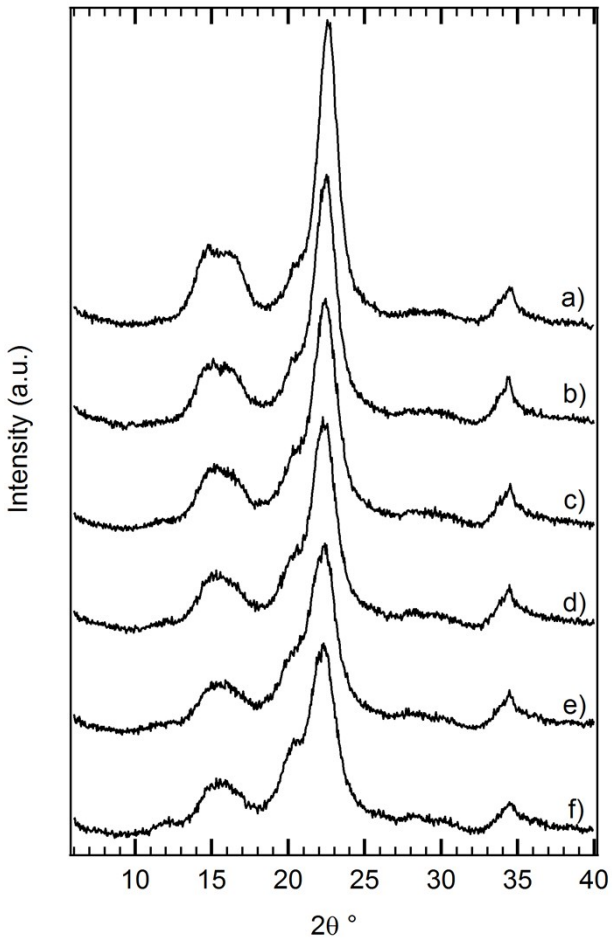

Figure S4. X-ray diffractograms of progressively ball-milled cellulose samples after sample preparation simulated conditions: a) Avicel-PH101, b) MCC-BM10-SP, c) MCC-BM20-SP, d) MCC-BM30-SP, e) MCC-BM40-SP, f) MCC-BM50-SP.

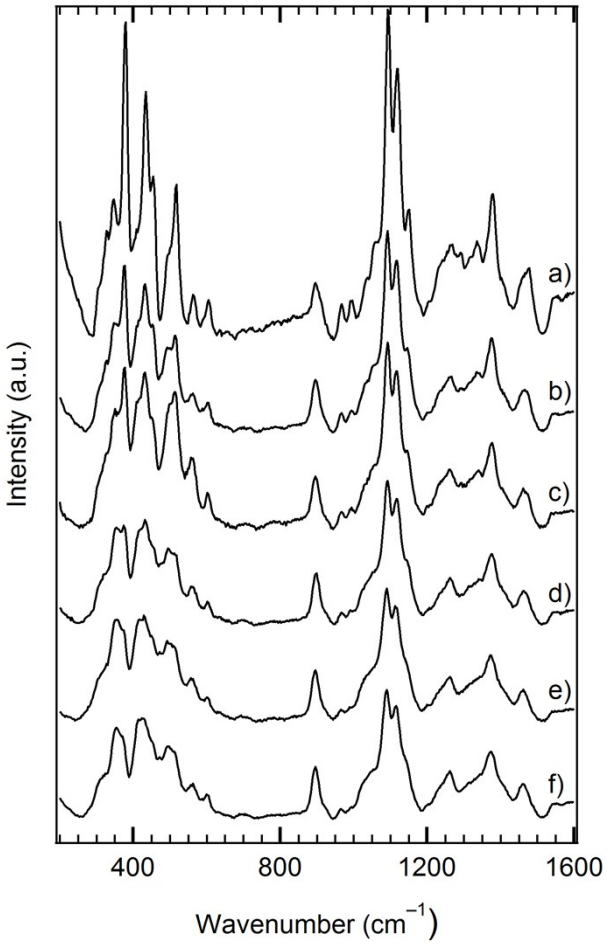

Figure S5. Raman spectra of progressively ball-milled cellulose samples: a) Avicel-PH101, b) MCC-BM10, c) MCC-BM20, d) MCC-BM30, e) MCC-BM40, f) MCC-BM50.

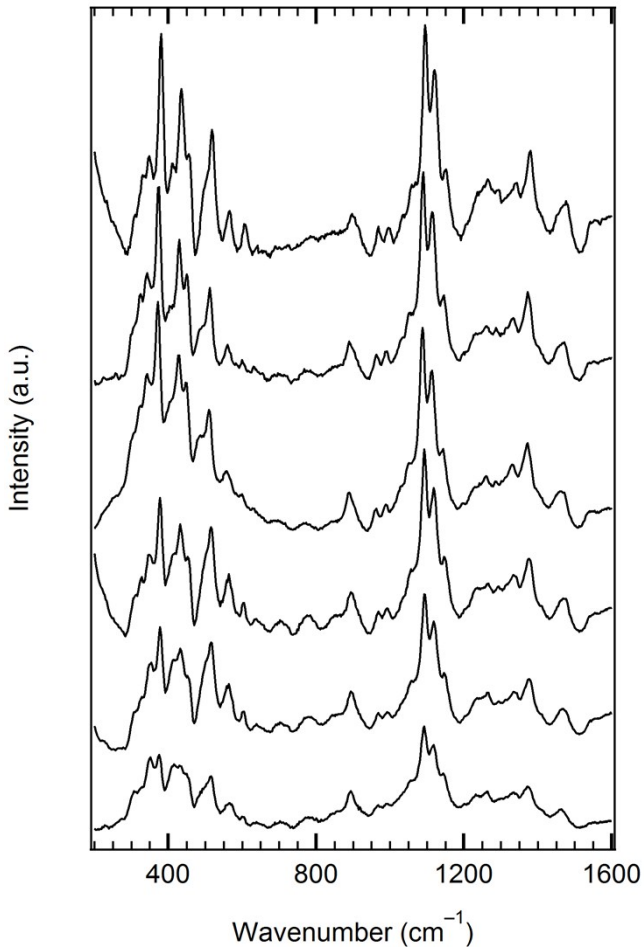

Figure S6. Raman spectra of progressively ball-milled cellulose samples after 0.1 M HCl acid treatment at 150 °C for 1 hour: a) Avicel-PH101, b) MCC-BM10-AC, c) MCC-BM20-AC d) MCC-BM30-AC, e) MCC-BM40-AC, f) MCC-BM50-AC.

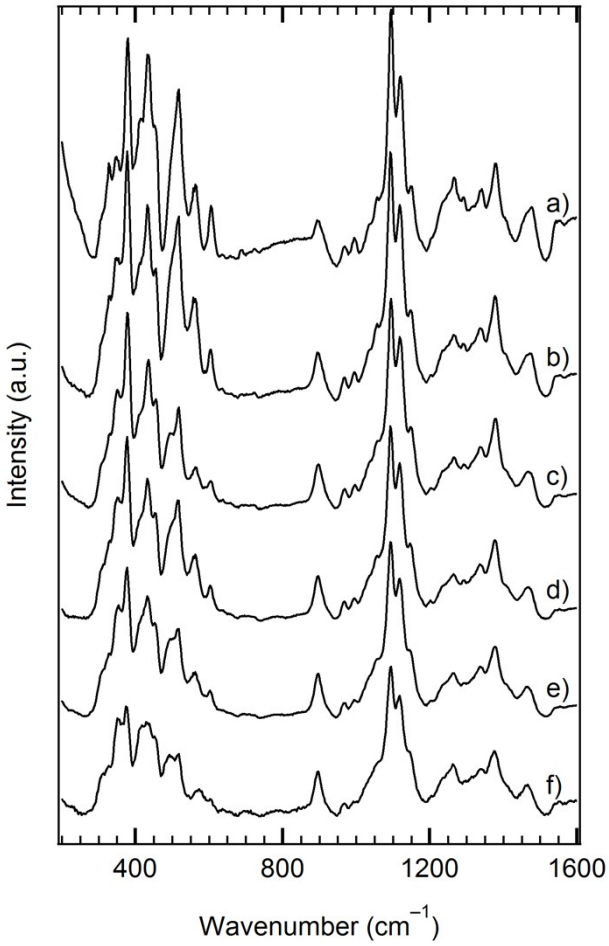

Figure S7. Raman spectra of progressively ball-milled cellulose samples after liquid hot water treatment at 150 °C for 1 hour: a) Avicel-PH101, b) MCC-BM10- HLW, c) MCC-BM20- HLW, d) MCC-BM30- HLW, e) MCC-BM40- HLW, f) MCC-BM50- HLW.

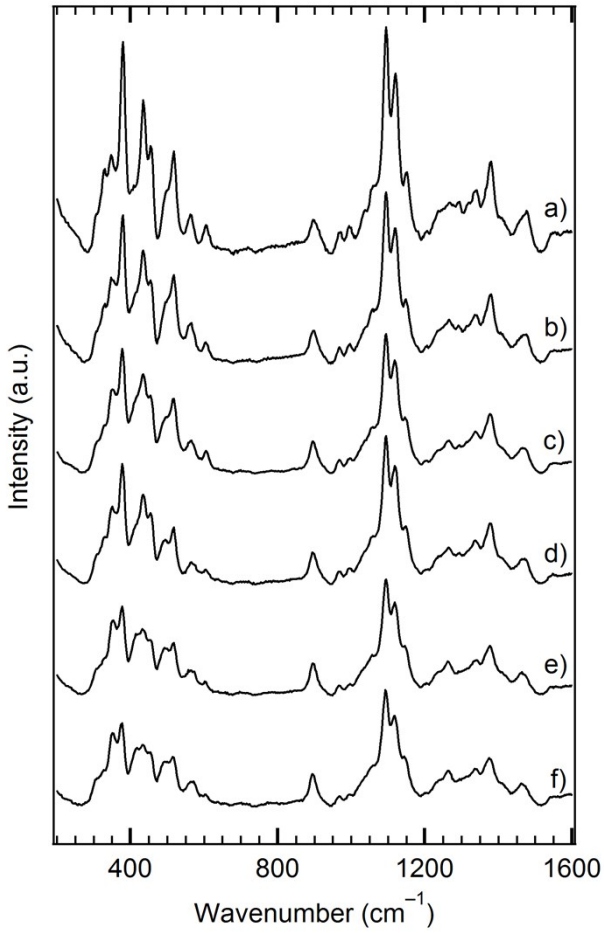

Figure S8. Raman spectra of progressively ball-milled cellulose samples after samples after sample preparation simulated conditions: a) Avicel-PH101, b) MCC-BM10-SP, c) MCC-BM20-SP, d) MCC-BM30-SP, e) MCC-BM40-SP, f) MCC-BM50-SP.

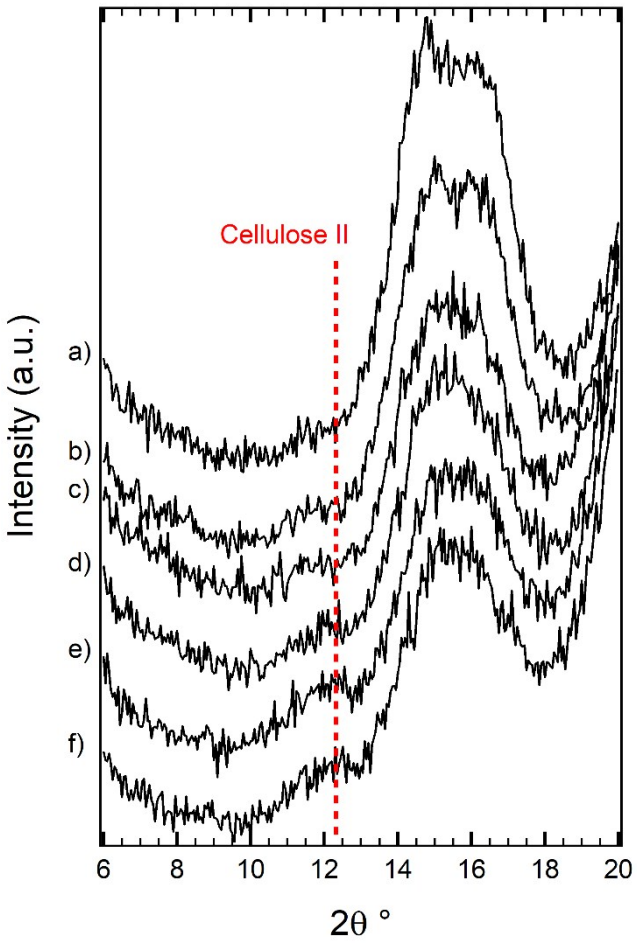

Figure S9. Expanded region of the X-ray diffractograms of progressively ball-milled cellulose samples after sample preparation simulated conditions: a) Avicel-PH101, b) MCC-BM10-SP, c) MCC-BM20-SP, d) MCC-BM30-SP, e) MCC-BM40-SP, f) MCC-BM50-SP. The peak at approximately 12.2° is identified as cellulose II.

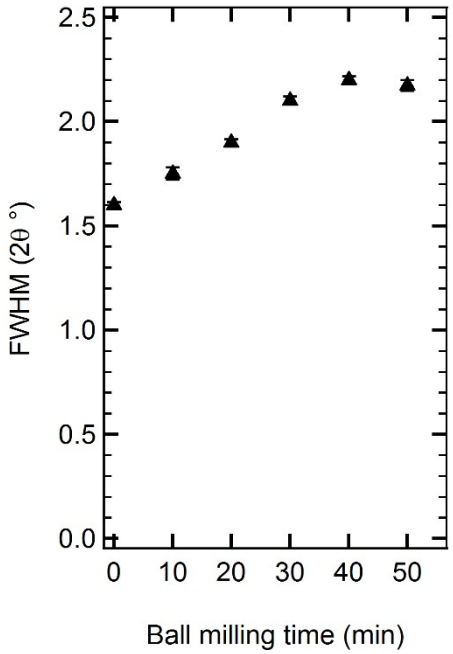

Figure S10. Full-width-halfmax (FHWM) of 200 diffraction peak plotted versus ball milling time for ball-milled cellulose samples recrystallized by sample preparation and heat up treatment.

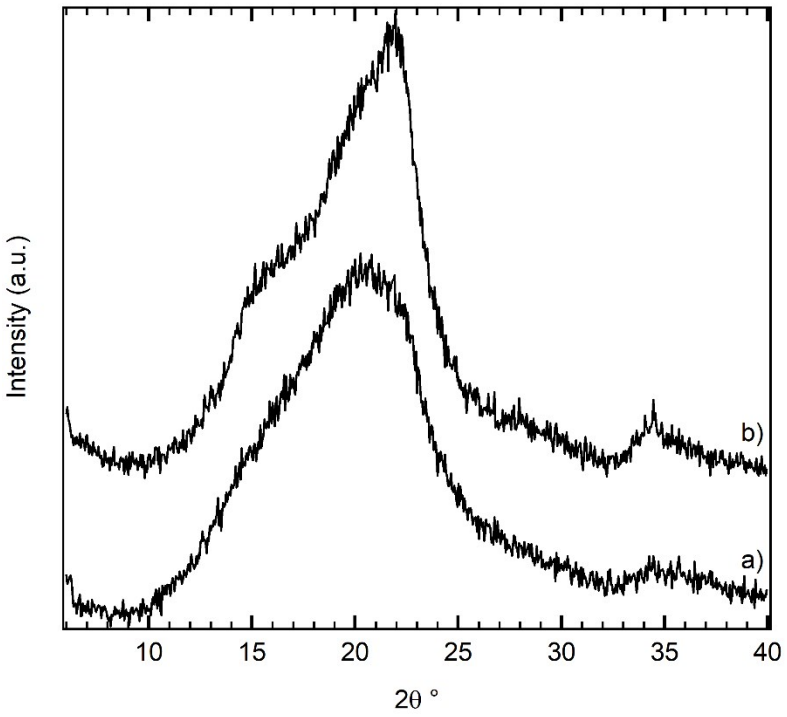

Figure S11. X-ray diffractograms of selected samples: a) MCC-BM50 and b) MCC-B50 after treatment in ethanol (130 °C, 1 hour).

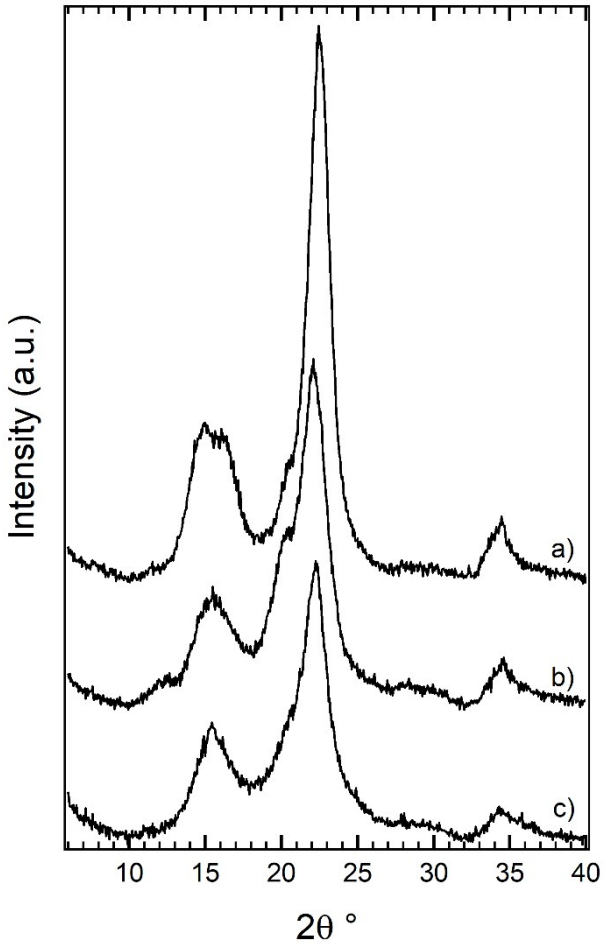

Figure S12. X-ray diffractograms after ethanolysis of selected cellulose samples: a) MCC, b) MCC-BM50-HLW, and c) MCC-BM50.