Supplementary Information

Structure and Properties of All-Cellulose Composites Prepared by Controlling the Dissolution Temperature of NaOH/Urea Solvent

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Figure S1 shows the effects of dissolution time on the mechanical properties of ACCs-10. It is obvious that the mechanical properties of ACCs-10 obtained after one minute of dissolution are inferior to those of the ACCs-10 obtained after five minutes of dissolution. As the dissolution time exceeds five minutes, the mechanical properties of the ACCs-10 begin to decrease because more cellulose is dissolved. After ten minutes, the cellulose reaches the maximum solubility. As the dissolution time increases, the mechanical properties of the ACCs no longer decline. Therefore, 5 min is set as the optimal dissolution time for the preparation of ACCs-10. To guarantee single variable, the dissolution time for the other ACCs are all set to 5 min.

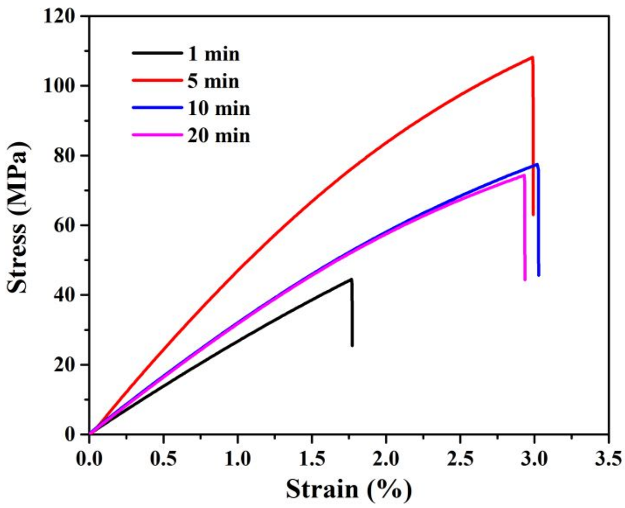

Figure S1. The effects of dissolution time on mechanical properties of ACCs-10.

Figure S2 shows the XRD profiles of ACCs-10 and the corresponding peak deconvolution process. The degree of crystallinity is determined by resolving the diffraction profile into cellulose I, cellulose II and amorphous diffraction peaks, which are fitted by Gaussian curves. Specifically, the (0 -1 0), (1 1 0) and (2 0 0) peaks of cellulose I are set at 2θ = 14.8°, 16.5° and 22.8°, respectively[1], the (0 -1 0), (1 1 0), (0 2 0) peaks of cellulose II are set at 2θ =12.1°, 19.8° and 21.8°, respectively,[2,3] white the central position of the amorphous peak is set at 18.6°, according to Segal et al.[4]

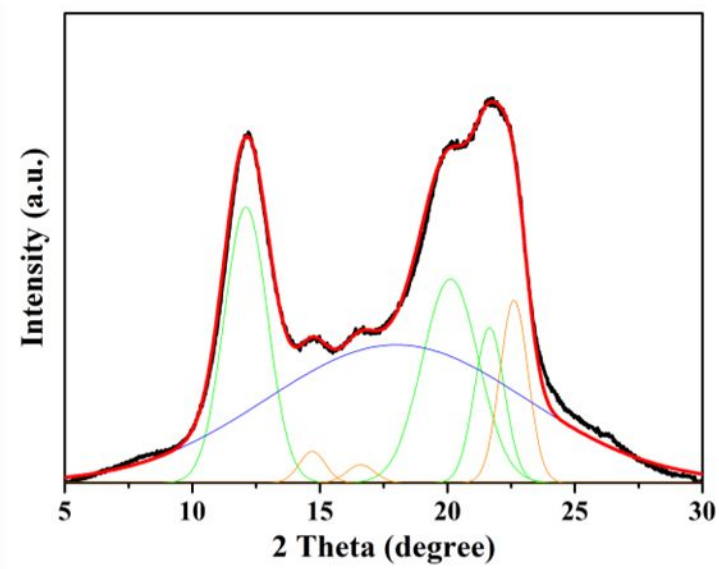

Figure S2. XRD profiles of ACCs-10 and the corresponding peak deconvolution process to estimate the crystallinity. The measured pattern (black line), simulated pattern (red line) and simulated curves for cellulose I (orange line), cellulose II (green line) and amorphous cellulose (blue line) are shown.

Table S1. Comparison of tensile strength of the ACCs prepared by different methods

Raw materials	Methods	Solvents	Reinforcements	Tensile strength (MPa)	References
Cotton linter pulps	One-step	NaOH/urea/H_2O	Self-reinforcing	108.1	This work
Softwood sulphite dissolving and abaca pulp	One-step	NaOH/urea/H_2O	Self-reinforcing	48	5
Cotton linter pulps	One-step	NaOH/urea/H_2O	Self-reinforcing	135	6
Bleached spruce	One-step	NaOH/urea/H_2O	Self-reinforcing	24	7
Eucalyptus	One-step	NaOH/urea/H_2O	Self-reinforcing	24.6	7
Bleached pine	One-step	NaOH/urea/H_2O	Self-reinforcing	39.4	7
Unbleached pine	One-step	NaOH/urea/H_2O	Self-reinforcing	20.3	7
Filter paper	One-step	NaOH/urea/H_2O	Self-reinforcing	53	8
Softwood sulphite dissolving wood pulp	One-step	NaOH/urea/H_2O	Self-reinforcing	52.4	9
Rayon textile	One-step	NaOH/urea/H_2O	Self-reinforcing	114.1	10
Cotton fabric	One-step	Ionic liquid	Self-reinforcing	22	11
Lyocell fabric	One-step	Ionic liquid	Self-reinforcing	102.6	12
rayon fiber textile	One-step	Ionic liquid	Self-reinforcing	77.7	13
Filter paper	One-step	LiCl/DMAc	Self-reinforcing	211.8	14
Filter paper	One-step	PEG/NaOH	Self-reinforcing	74.7	15
Cotton linter pulps	Two-step	NaOH/urea/H_2O	Cellulose nanofibrils	167	16
Cotton linter pulps	Two-step	NaOH/urea/H_2O	Cellulose nanowhiskers	124	1
Cotton linter pulps	Two-step	NaOH/urea/H_2O	Ramie fibers	124.3	17
Alfa pulp	Two-step	NaOH/H_2O	Alfa fibers	16	18
Filter paper	Two-step	Ionic liquid	Rice husk	89.0	19
Cellulose diacetate	Two-step	Acetone	Nanofibrillated cellulose	102.3	20
Unbleached hardwood craft pulp	Two-step	Water	Nanofibrillated cellulose	53.2	21

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