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Supplementary Information

Tunable poly(lauryl methacrylate) surface grafting via SI-ATRP on one-pot synthesized cellulose nanofibril macroinitiator core as shear-thinning rheology modifier and drag reducer

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Br-CNF-g-PLMA Characterization

Table. S1 SI-ATRP of LMA on Br-CNF characterizations and final copolymer DP estimations under various macroinitiator concentrations and polymerization time at 70 °C. LMA conversion (%) was determined by mass gain divided by initial LMA mass. CNF (w %) was determined by mass of Br-CNF divided by mass of Br-CNF-g-PLMA.

Time	[M]	[I]	Conversion	Br-CNF	DP eqn (1)
h	mM	mM	%	w%	
1	800	9.6	4.0	28.1	3
3			19.5	7.4	16
4.5			39.1	3.8	32
6			48.6	3.1	40
24			52	2.9	43
1	800	16	36.7	6.6	18
3			51.4	4.8	25
4.5			63.5	3.9	31
6			74.8	3.4	37
12			80.3	3.1	39
24			92.7	2.7	46
1	1600	16	26.9	4.7	26
2			31.2	4.0	31
3			35.2	3.6	35
6			40.6	3.1	40
24			41.3	3.0	41

Table. S2 SI-ATRPs of LMA ($[M]_o$=800 mM) on Br-CNF to Br-CNF-g-PLMA: DP_{mass}, $DP_{NMR,}$ WCA, M_n characterizations.

Time	[I]	Conversion	Br-CNF	DP_{mass}	DP_{NMR}	WCA	M_n
(h)	(mM)	(%)	(w%)			(°)	KDa
1	9.6	4	28.1	3	2	80.9	-
3		19.5	7.4	16	14	84.6	264
4.5		39.1	3.8	32	24	84.2	332
6		48.6	3.1	40	31	86.2	616
24	16	92.7	2.7	46	29	110.6	1381

	Pyridine	Ethyl Acetate	Chloroform	Toluene	Hexane
δd $(MPa)^{(1/2)}$	19.0	15.8	17.8	18.0	14.9
δp $(MPa)^{(1/2)}$	8.8	5.3	3.1	1.4	0.0
δh $(MPa)^{(1/2)}$	5.9	7.2	5.7	2.0	0.0
Relative Polarity	0.302	0.228	0.259	0.099	0.009

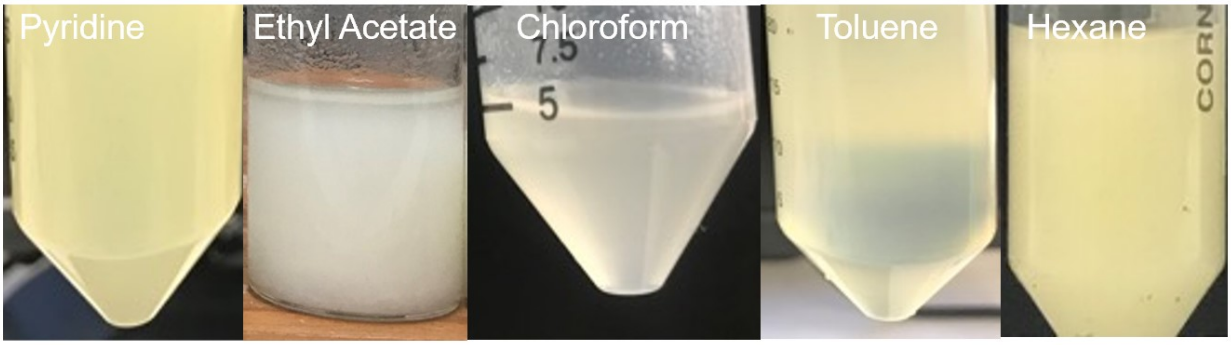

Fig. S1 Redispersion of Br-CNF-g-PLMA (DP=46) into different solvents at 5 w/v%.

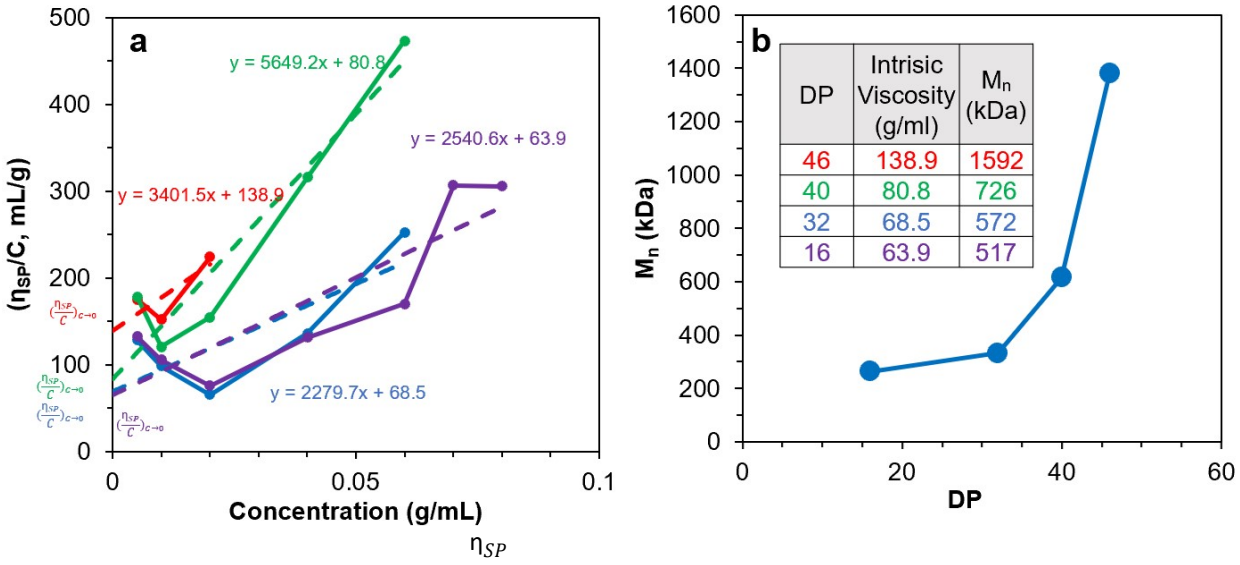

Fig. S2 Plot of (a) reduced viscosity ($\frac{\eta_{SP}}{C}$) verse concentration; (b) M_n verse estimated DP determined by eqn (1). Calculated intrinsic viscosities and M_n determined by eqn (2) were displayed in b.

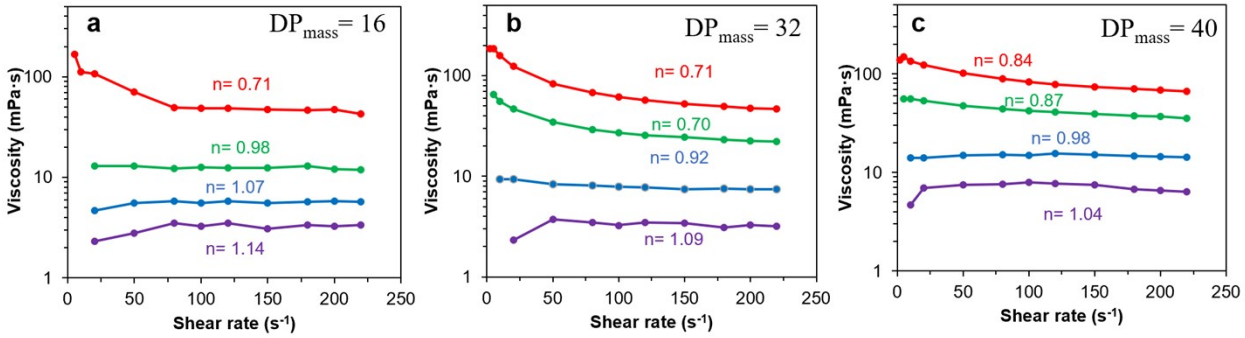

Figure. S3 Viscosity of Br-CNF-g-PLMA in toluene verse shear rates at 25 ^{o}C with DP_{mass} of (a) 16, (b) 32, and (c) 40 at 4 w/v% (purple), 6 w/v% (blue), 8 w/v% (green) and 10 w/v% (red). The flow behavior index (n) indicated.

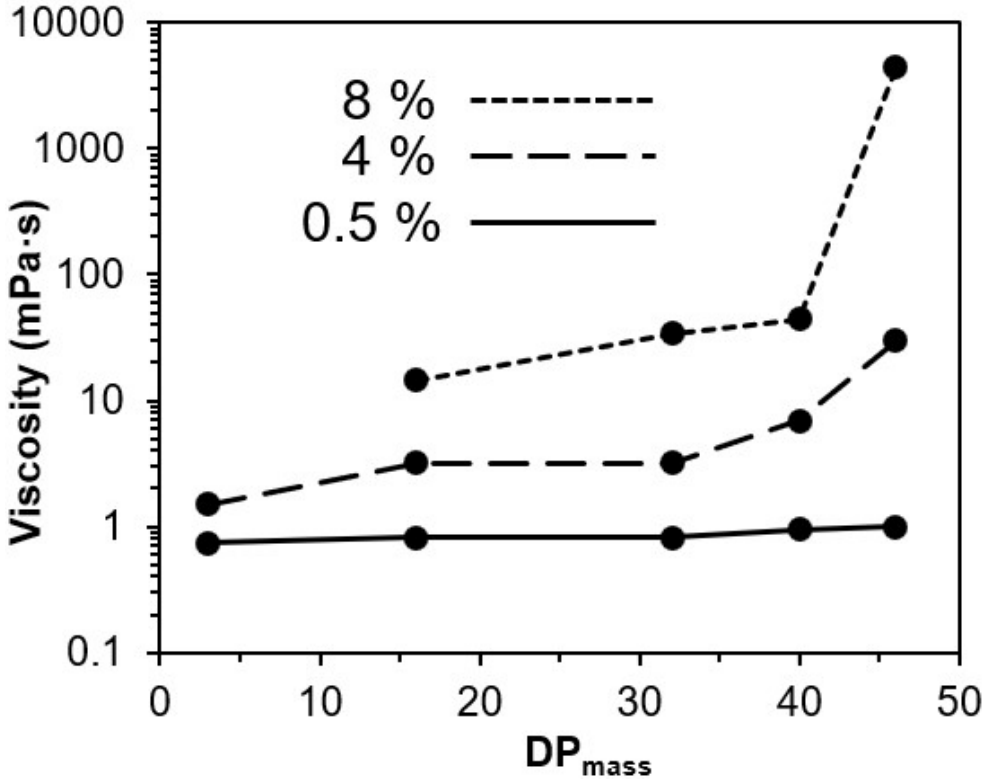

Figure. S4 Br-CNF-g-PLMA in toluene viscosity as effect by DP (25 °C) at varied concentrations.

Average viscosity at shear rates from 1 to 220 s-1 were used for all data points.