

Supporting Information

Physical and/or Chemical Compatibilization of Extruded Cellulose Nanocrystal Reinforced Polystyrene Nanocomposites

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Table S1. Composition of the various extruded nanocomposites.

CN (or CN-g-PEG) : PEO5M = 65 : 35 (w/w);

PEG-grafting efficiency for CN-g-PEG from elemental analysis: 21.77 wt %

nanocomposites	PS	CN	PEO	PEG	nanocomposites	PS	CN	PEO	PEG
PS-F	100	0	0	0	PS-F	100	0	0	0
CN-PS-2	98	2	0	0	CN/PEO-PS-2	96.9	2	1.1	0
CN-PS-5	95	5	0	0	CN/PEO-PS-5	92.3	5	2.7	0
CN-PS-8	92	8	0	0	CN/PEO-PS-8	90.7	8	4.3	0
CN-PS-12	88	12	0	0	CN/PEO-PS-12	81.5	12	6.5	0
CN-PS-15	85	15	0	0	CN/PEO-PS-15	76.9	15	8.1	0
CN-g-PEG-PS-2	97.4	2	0	0.6	CN-g-PEG/PEO-PS-2	96.0	2	1.4	0.6
CN-g-PEG-PS-5	93.6	5	0	1.4	CN-g-PEG/PEO-PS-5	90.2	5	3.4	1.4
CN-g-PEG-PS-8	89.8	8	0	2.2	CN-g-PEG/PEO-PS-8	84.3	8	5.5	2.2
CN-g-PEG-PS-12	84.7	12	0	3.3	CN-g-PEG/PEO-PS-12	76.5	12	8.2	3.3
CN-g-PEG-PS-15	80.8	15	0	4.2	CN-g-PEG/PEO-PS-15	70.5	15	10.3	4.2
CN-g-PEG-PS-20	74.4	20	0	5.6	CN-g-PEG/PEO-PS-20	60.6	20	13.8	5.6

Table S2. Surface functional group composition as obtained from the decomposition of the C1s signal; carbon, oxygen, hydrogen and nitrogen elements content from elemental analysis.

Samples	C1	C2	C3	C4	C5
	C-C/C-H	C-N	C-O	O-C-O/C=O	O-C=O
BE (eV)	285	286.2	286.5±0.1	288.05±0.05	289.0±0.1
CN	22.4	0.0	60.1	15.6	1.9
CN-COONa	7.9	0.0	17.5	58.4	16.2
CN-g-PEG	15.9	12.2	57.3	13.7	0.9
Samples	Carbon	Oxygen	Hydrogen	Nitrogen	GE ^a
	%	%	%	%	%
MPEG-NH ₂	55.37	36.31	9.29	0.10	—
CN	44.44	49.38	6.17	—	—
CN-COONa	44.13	48.80	6.13	—	—
CN-g-PEG	46.82	45.52	6.57	0.43	21.77

^a GE% is the grafting efficiency of PEG on nanocrystals according to the calculation using Equation (1).

Table S3. Composition, adsorption ratio, and viscosity for CN-g-PEG/PEO (or CN/PEO) suspensions.

CN-g-PEG (or CN)	H ₂ O	PEO5M	PEO%	PEO:CN-g-PEG (or PEO:CN) ^a	Viscosity ^b (CN-g-PEG/PEO)	Viscosity ^b (CN/PEO)
g	g	g	wt%	w/w	Pa·s	Pa·s
0.10	5.38	0	0	0	16.16	0.31
		0.015	0.28	0.15	24.93	0.17
		0.030	0.56	0.30	19.37	0.24
		0.045	0.84	0.45	14.61	1.09
		0.054	1.00	0.54	18.39	5.60
		0.060	1.12	0.60	27.98	7.51
		0.070	1.30	0.70	63.43	25.85
		0.085	1.58	0.85	95.47	198.80

^a The ratio of PEO:CN-g-PEG (or PEO:CN) reflects the capacity of 1.0 g CN-g-PEG (or CN) to adsorb PEO5M chains.

^b Steady shear viscosity of CN-g-PEG/PEO (or CN/PEO) suspension measured for a shear rate of 0.3 s⁻¹.