Electronic Supplementary Material (ESI) for Green Chemistry.
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Electronic Supplementary Material (ESI) for Green Chemistry.:

Mechanical Milling as a technology to produce structural and functional bio-nanocomposites

Table S1: Mechanical properties of for PCL and its nano-composites [15,143,145,146,148,150,151].

Sample	E(MPa)	σ_y(MPa)	ε_y(%)	σ_b(MPa)	ε_b(%)	Reference
Unmilled PCL	200	4.86	9.82	10.08	608	[143]
Milled PCL	185	9.95	11.50	15.88	616	[15]
PCL1%L_SE	194	n.d.	n.d.	2.50	674	[145]
PCL3%L_SE	197	n.d.	n.d.	0.10	342	[145]
PCL10%L_SE	268	n.d.	n.d.	0.15	227	[145]
PCL20%L_SE	317	n.d.	n.d.	4.30	80	[145]
PCL30%L_SE	509	n.d.	n.d.	12.50	21	[145]
PCL40%L_SE	512	n.d.	n.d.	7.30	7	[145]
PCL10%L_SE+10% compatibilizer	420	n.d.	n.d.	1.50	92	[146]
PCL10%LS	253	n.d.	n.d.	9.90	955	[146]
PCL20%LS	200	n.d.	n.d.	5.40	838	[146]
PCL/MgAl-HDA2.8	380	13	n.d.	15.78	620	[15]
PCL/ZnAl-Bz3	218	7.54	9.85	9.78	784	[148]
PCL/ZnAl-BzDC3	300	8.88	7.60	12.31	692	[148]
PCL/ZnAl-p-BzOH4	266	6.22	4.33	10.16	714	[148]
PCL/ZnAl-o-BzOH4	270	10.04	10.88	12.71	751	[148]
PCL/ZnAl-Bz6	243	8.96	13.66	11.02	754	[148]
PCL/ZnAl-BzDC6	280	9.63	8.00	12.73	625	[148]
PCL/ZnAl-p-BzOH7	284	8.76	9.86	10.20	754	[148]
PCL/ZnAl-o-BzOH6	304	7.83	9.66	12.27	686	[148]
PCL/MgAl-HDA6	270	8.70	n.d.	6.20	120	[15]
PCL60/ Starch37/ Clay3 mill 4 h	420	7.06	0.04	n.d.	1.36	[150]
PCL60/ Starch37/ Clay3 mill 7 h	490	5.37	0.01	n.d.	0.81	[150]
PCL60/ Starch37/ Clay3 mill 10 h	543	5.45	0.01	n.d.	0.73	[150]
PCL/AmorphousCellulose 90/10	463	13.9	n.d.	n.d.	630	[151]
PCL/AmorphousCellulose 80/20	598	12.5	n.d.	n.d.	426	[151]
PCL/AmorphousCellulose 70/30	703	10.5	n.d.	n.d.	315	[151]
PCL/ShortLenghtCellulose 90/10	489	13.4	n.d.	n.d.	546	[151]
PCL/ShortLenghtCellulose 80/20	665	11.5	n.d.	n.d.	248	[151]
PCL/ShortLenghtCellulose 70/30	917	9.5	n.d.	n.d.	15	[151]
PCL/MediumLenghtCellulose 90/10	494	13.2	n.d.	n.d.	485	[151]
PCL/MediumLenghtCellulose 80/20	714	10.1	n.d.	n.d.	18.6	[151]
PCL/MediumLenghtCellulose 70/30	1063	12.2	n.d.	n.d.	2.5	[151]

SE: Steam Explosion lignin
LS: Lignin sulfonated

Table S2: Thermodynamic diffusion parameters, D_0(cm^2/s) for PCL and its nano-composites [15,148,150].

Sample	D_0 (cm^2/s)	Reference
Unmilled PCL	5.43×10^{-8}	15
Milled PCL	2.36×10^{-7}	15
PCL/MgAl-HDA2.8	6.31×10^{-10}	15
PCL/ZnAl-Bz3	1.11×10^{-7}	148
PCL/ZnAl-BzDC3	3.38×10^{-8}	148
PCL/ZnAl-p-BzOH4	7.47×10^{-8}	148
PCL/ZnAl-o-BzOH4	9.00×10^{-8}	148
PCL/ZnAl-Bz6	6.92×10^{-8}	148
PCL/ZnAl-BzDC6	9.77×10^{-9}	148
PCL/ZnAl-p-BzOH7	3.06×10^{-8}	148
PCL/ZnAl-o-BzOH6	5.76×10^{-8}	148
PCL/MgAl-HDA6	1.02×10^{-7}	15
PCL60/ Starch37/ Clay3 mill 4 h	7.50×10^{-9}	150
PCL60/ Starch37/ Clay3 mill 7 h	2.60×10^{-9}	150
PCL60/ Starch37/ Clay3 mill 10 h	2.23×10^{-9}	150

Table S3: Mechanical properties of Pectin and its nano-composites [155–157].

Sample	E (MPa)	Reference
Pectin	1600	155
Pectin/3MMT	2950	155
Pectin/3OMMT	1780	155
Pectin/5LDH-Bz	1496	156
Pectin/5LDH-o-OH-Bz	1500	156
Pectin/5LDH-DCBz	1505	156
Pectin/5LDH-p-OH-Bz	1510	156
Pectin/5NH	4.33	157
Pectin/10NH	4.44	157
Pectin/20NH	3.14	157

Table S4: Thermodynamic diffusion parameters, D_0(cm^2/s), of Pectin and its nano-composites [155–157].

Sample	D_0(cm^2/s)	Reference
Pectin	2.30×10^{-8}	156
Pectin/3MMT	4.82×10^{-10}	155
Pectin/3OMMT	9.67×10^{-10}	155
Pectin/5LDH-Bz	1.97×10^{-8}	156
Pectin/5LDH-o-OH-Bz	3.20×10^{-9}	156
Pectin/5LDH-DCBz	3.10×10^{-8}	156
Pectin/5LDH-p-OH-Bz	1.35×10^{-9}	156
Pectin/5NH	7.26×10^{-10}	157
Pectin/10NH	1.39×10^{-11}	157
Pectin/20NH	2.53×10^{-12}	157