Supporting Information

Effect of the Lignin Type on the Gas/UV Barrier Properties of Lignin–Polyethyleneimine Based Composite Films

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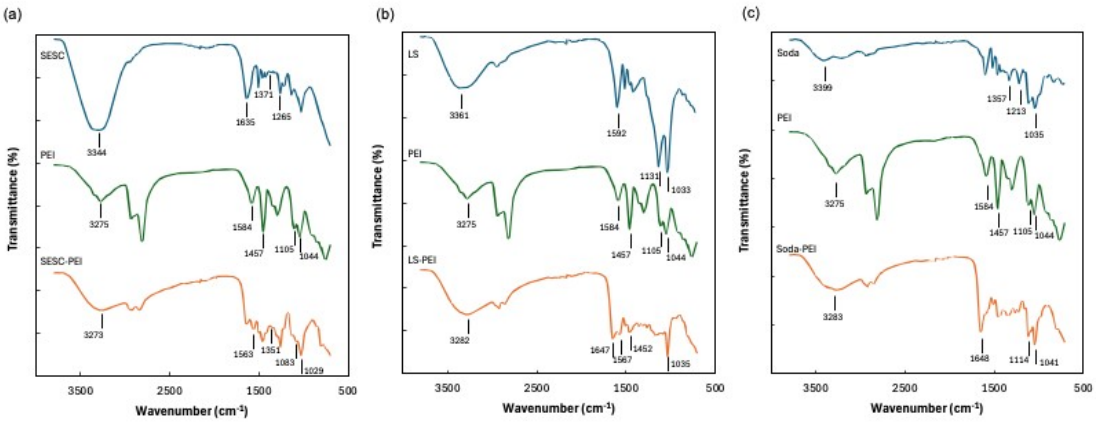

Fig. S1 FTIR spectra of the lignin derivatives, PEI, and their composite materials, prepared at a lignin/PEI ratio of 50:50 using PEI with a M_w of 10000. (a) SESC, PEI, and SESC-PEI; (b) LS, PEI, and LS-PEI; (c) Soda, PEI, and Soda-PEI.

Table S1. Zeta potentials of the lignin derivatives, PEI (M_w = 10000), and lignin-PEI dispersions

SESC	LS	Soda	PEI	SESC/PEI			LS/PEI	Soda/PEI
				17:83	50:50	75:25	50:50	50:50
-26.50	-33.90	-33.29	0.75	-0.27	-2.69	0.41	1.54	-0.83

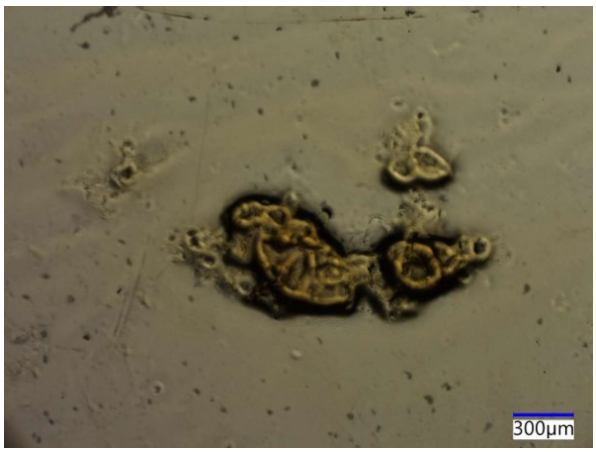

Fig. S2 Digital microscopy image for the specimen prepared using a PEI M_w 70000 and SESC. A lignin/PEI ratio of 50:50 was employed.

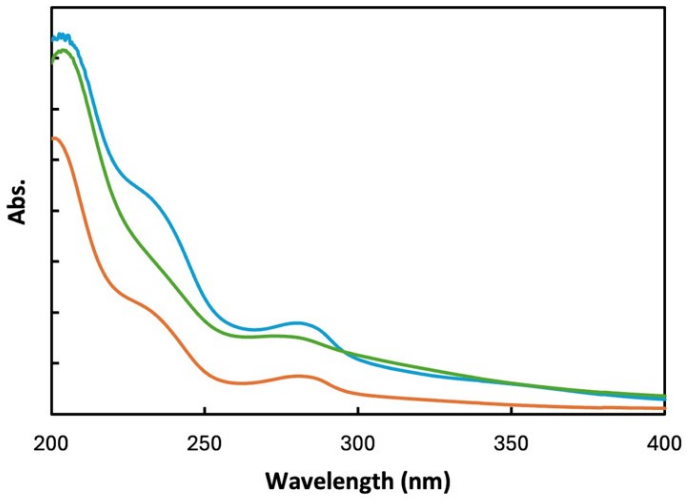

Fig. S3 UV-Vis adsorption spectra recorded for the SESC (blue), LS (green), and Soda (orange) specimens in aqueous solution (0.05 mg/mL).

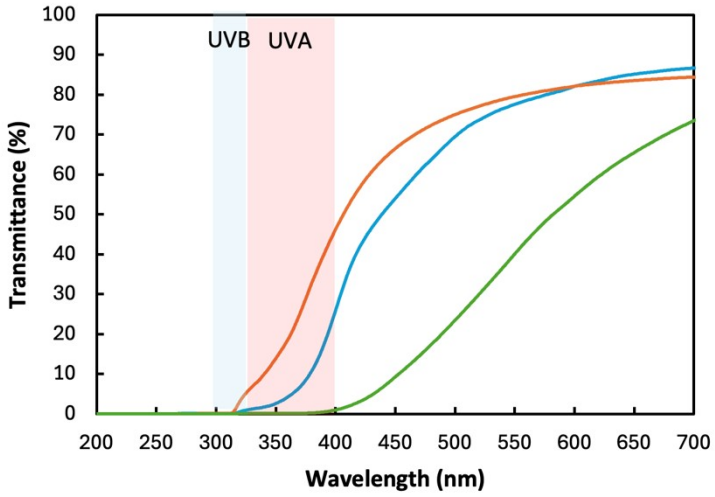

Fig. S4 UV-Vis transmittance spectra of the best-performing lignin/PEI films: SESC/PEI ratio of 17/83 with a PEI M_w 70000 (blue), LS/PEI ratio of 50/50 with a PEI M_w 600 (orange), and Soda/PEI ratio of 50/50 with a PEI M_w 70000 (green).

Table S2. UV transmittance results, CIELAB ($L^*a^*b^*$) color spaces, and mandrel bend radii for the SESC/PEI, LS/PEI, and Soda/PEI specimens before and after weathering. Samples were prepared using a lignin/PEI ratio of 50:50 and a PEI M_w of 10000

	Before weather resistance test			After weather resistance test		
	SESC/PEI	LS/PEI	Soda/PEI	SESC/PEI	LS/PEI	Soda/PEI
UVA transmittance (%)	15	29	0.10	6.1	3.1	0.24
UVB transmittance (%)	0.1	0.03	0.17	0.10	0.10	0.10
L^*	34.60	36.15	31.67	35.07	34.38	34.02
a^*	0.18	-0.25	3.71	0.31	0.46	3.16
b^*	4.59	5.49	4.91	6.39	6.01	8.08
Mandrel bend radius (mm)	<1	2	<1	<1	2	<1