

A fully bio-based wood adhesive valorising hemicellulose-rich sidestreams from the pulp industry

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Supplementary material

Table S1. Formulations of the adhesives prepared with hemicelluloses and PVAm to accomplish 20 wt% dry content.

Sample		Components (g)							pH	
Components	Ratio	HW (49 % in H ₂ O)		SW (40 % in H ₂ O)		Xyl (solid)	PVAm (20 % in H ₂ O)			Added water
		Added amount	Dry amount	Added amount	Dry amount	Added amount	Added amount	Dry amount		
PVAm							4.0	0.8	0.0	9.2
Xyl						0.8			3.2	4.8
Xyl : PVAm	3 : 1					0.6	1.0	0.2	2.4	7.8
	1 : 1					0.4	2.0	0.4	1.6	8.7
	1 : 3					0.2	3.0	0.6	0.8	9.1
HW		1.6	0.8						2.4	6.4
HW : PVAm	3 : 1	1.2	0.6				1.0	0.2	1.8	7.8
	1 : 1	0.8	0.4				2.0	0.4	1.2	7.6
	1 : 3	0.4	0.2				3.0	0.6	0.6	8.7
SW				2.0	0.8				2.0	6.2
SW : PVAm	3 : 1			1.5	0.6		1.0	0.2	1.5	8.1
	1 : 1			1.0	0.4		2.0	0.4	1.0	8.1
	1 : 3			0.5	0.2		3.0	0.6	0.5	8.8

Table S2. Formulations of the adhesives prepared with hemicelluloses and chitosan to accomplish 20 wt% dry content.

Sample		Components (g)							pH
Components	Ratio	HW (49 % in H ₂ O)		SW (40 % in H ₂ O)		Xyl (solid)	CS (in acetic acid)		
		Added amount	Dry amount	Added amount	Dry amount	Added amount	CS solid amount	Acetic acid (10 wt% in water)	
CS							0.8	3.2	4.0
Xyl						0.8			4.8
Xyl : CS	3 : 1					0.6	0.2	3.2	4.5
	1 : 1					0.4	0.4	3.2	4.7
	1 : 3					0.2	0.6	3.2	6.0
HW		1.6	0.8						6.4
HW : CS	3 : 1	1.2	0.6				0.2	2.6	4.0
	1 : 1	0.8	0.4				0.4	2.8	4.1
	1 : 3	0.4	0.2				0.6	3.0	4.3
SW				2.0	0.8				6.2
SW : CS	3 : 1			1.5	0.6		0.2	2.3	3.6
	1 : 1			1.0	0.4		0.4	2.6	3.8
	1 : 3			0.5	0.2		0.6	2.9	4.0

Table S3. Carbohydrate composition, including the main saccharides, of hardwood hydrolysate (HW) and softwood ultrafiltrate (SW).

	Hardwood hydrolysate [%]	Softwood ultrafiltrate [%]
Arabinose	0.9	2.0
Galactose	6.4	11.4
Glucose	8.1	19.3
Xylose	78.5	0.3
Mannose	6.1	67.0

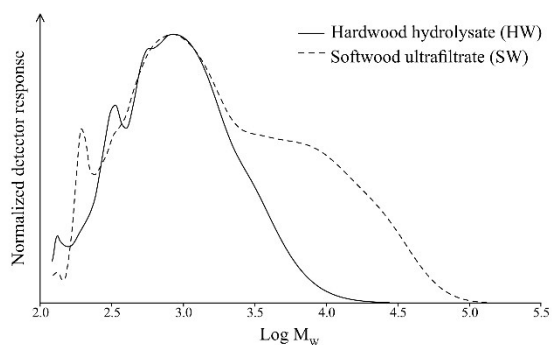


Figure S1. Chromatograms of molecular weight distributions of lignin in the hardwood hydrolysate (HW) and softwood ultrafiltrate (SW).

Table S4. Molecular weights of lignin in the hardwood hydrolysate (HW) and softwood ultrafiltrate (SW).

	M_n [g/mol]	M_w [g/mol]	\bar{D}
Hardwood hydrolysate	450	1 000	2.5
Softwood ultrafiltrate	570	4 000	7.0

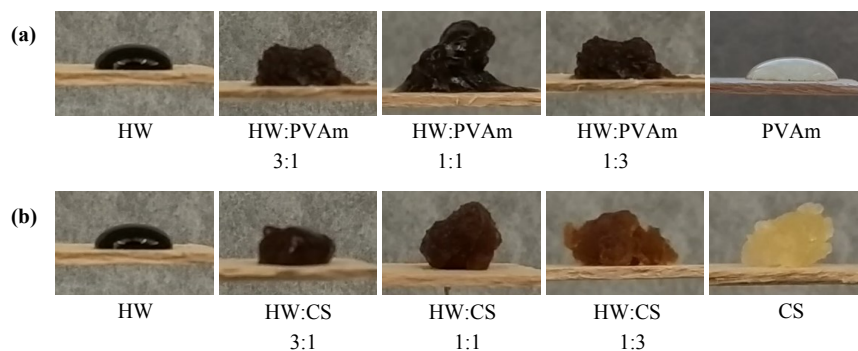


Figure S2. Dispersions containing (a) hardwood hydrolysate (HW) and poly(vinyl amine) (PVAm), and (b) hardwood hydrolysate (HW) and chitosan (CS).

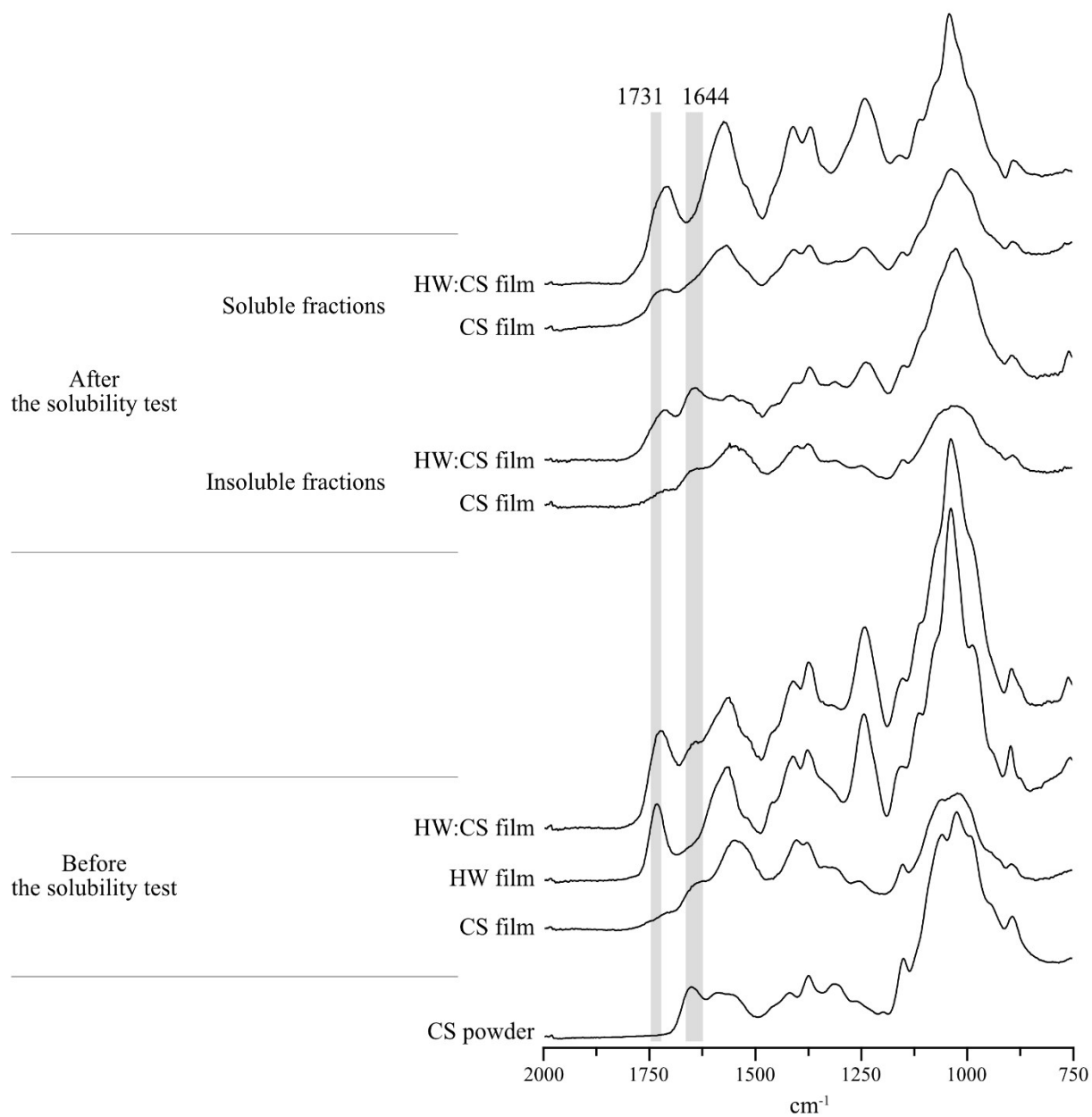


Figure S3. FTIR spectra of hardwood hydrolysate (HW), chitosan (CS), and HW:CS ratio 3:1, before and after the solubility tests.