A sustainable biomass adhesive based on the biomimetic "sea-island" structure, featuring boiling water resistance and antibacterial properties

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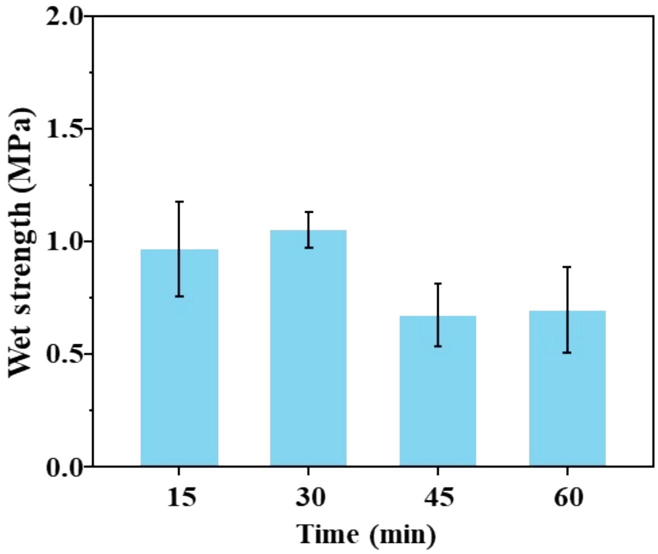

Fig. S1. The wet strength in boiling water of CS-5%RAE adhesives with different reaction time.

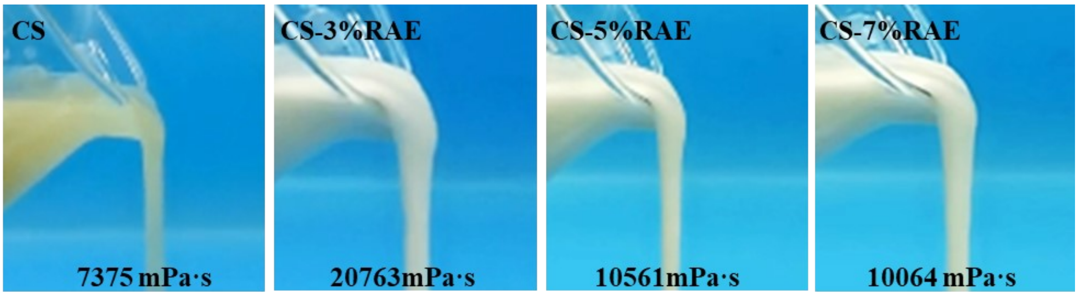

Fig. S2. The viscosity of CS-based adhesives with different RAE addition amounts.

Table. S1. The detailed components of CS and CS-RAE adhesive.

Sample	CS powder (g)	Acetic acid (g)	RAE (g)	Deionized water (mL)
CS	5	1	0	94
CS-3%RAE	5	1	3	91
CS-5%RAE	5	1	5	89
CS-7%RAE	5	1	7	87

Table. S2. The detailed data of TG, DTG, and DSC curves of chitosan adhesives with different contents of RAE.

Sample	**TG**			**DTG**	**DSC**		
	$T_{5\%}$ (°C)	**$T_{50\%}$ (°C)**	**Residue at 500 °C (%)**	**T_{max} (°C)**	**T_g (°C)**	**T_m (°C)**	**T_{cc} (°C)**
CS	116.5	341.7	38.56	290.2	125.7	306.8	/
CS-3%RAE	113.8	361.2	35.28	294.4	116.6	328.6	447.8
CS-5%RAE	110.5	358.9	35.83	295.4	112.7	324.3	447.5
CS-7%RAE	113.6	366.7	35.90	290.4	110.3	327.1	443.7

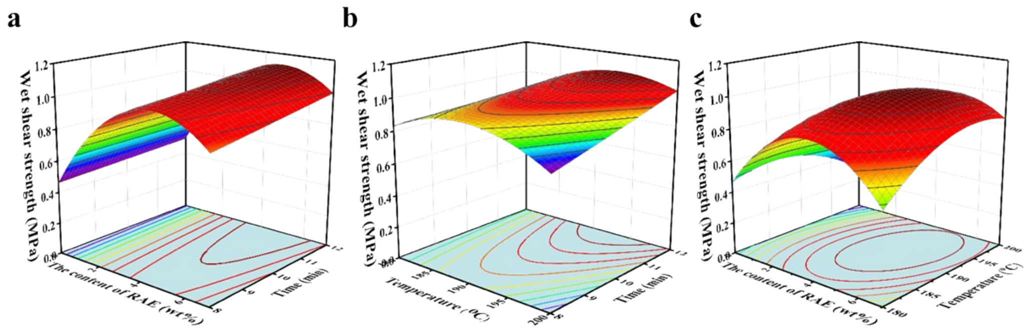

Fig. S3. The effects of hot-pressing time, temperature, and the content of RAE on wet bonding strength in boiling water were investigated by using the response surface test method. The influence of (a) hot-pressing time and the content of RAE, (b) hot-pressing time and hot-pressing temperature, and (c) the content of RAE and hot-pressing temperature on bonding strength.

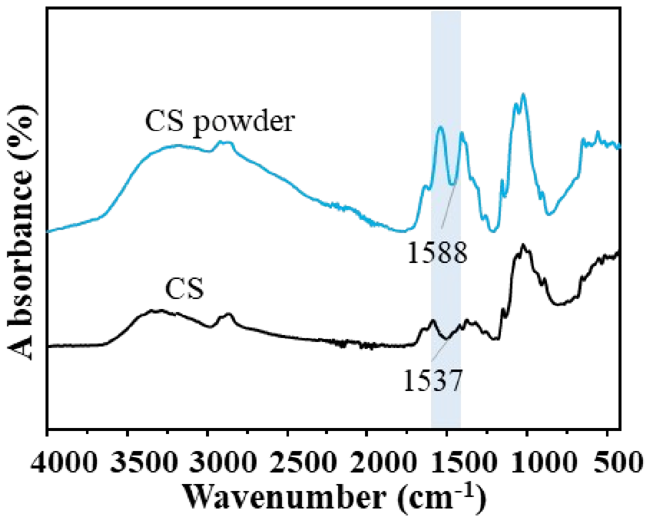

Fig. S4. FTIR spectra of CS powder and CS.

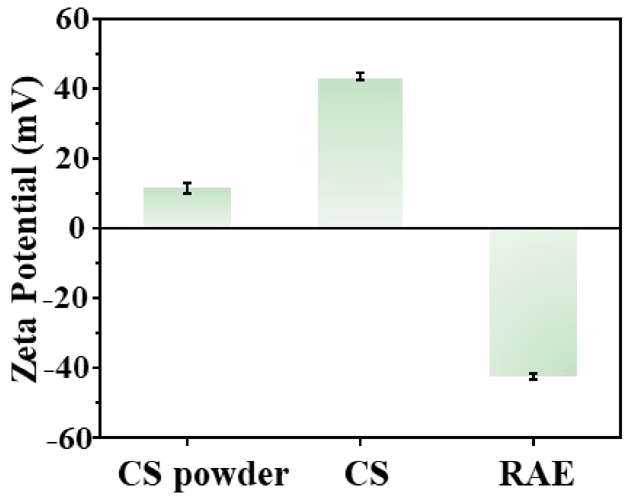

Fig. S5. The Zeta potential of CS powder, CS and RAE.

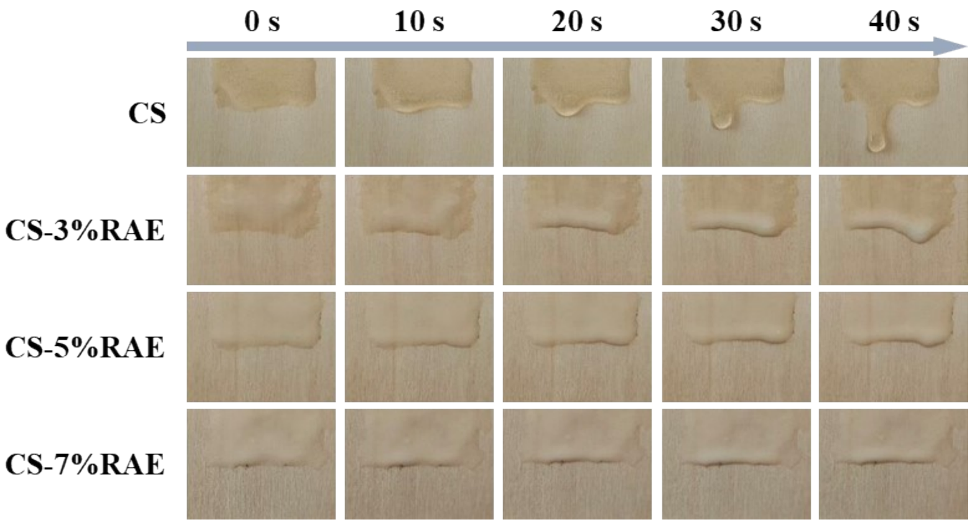

Fig. S6. The coating performance of CS, CS-3%RAE, CS-5%RAE, and CS-7%RAE, respectively.

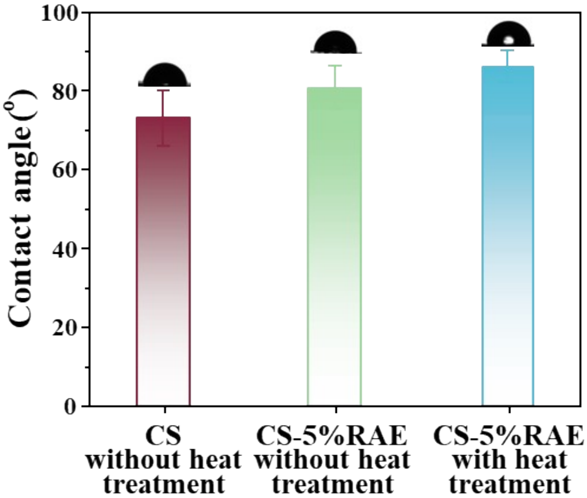

Fig. S7. The contact angle of (a) CS adhesive film without heat treatment, (b) CS-5%RAE adhesive film without heat treatment and (c) CS-5%RAE adhesive film with heat treatment, respectively.

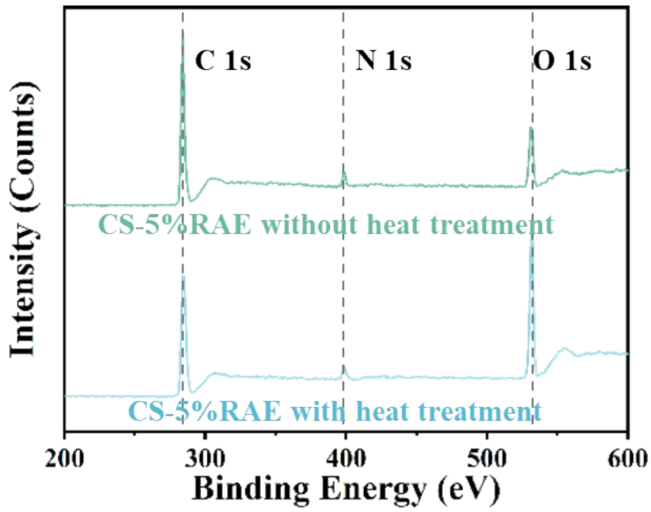

Fig. S8. The XPS survey spectra of CS-5%RAE without heat treatment and CS-5%RAE with heat treatment.

Table. S3. The detailed data of high- resolution XPS C1s spectra of CS, CS-5%RAE without heat treatment, and CS-5%RAE with heat treatment, respectively.

Sample	284.8 eV	286.4 eV	288.1 eV
CS	C-C/C-H:49.52%	C-N:39.01%	C-O:11.47%
CS-5%RAE without heat treatment	C-C/C=C/C-H:70.61%	C-N:24.23%	C-O:5.16%
CS-5%RAE with heat treatment	C-C/C=C/C-H:42.49%	C-N:46.35%	C-O:11.16%

Table. S4. Results of the multiplication of the signs of each cross-peak in 2D COS synchronous and asynchronous spectra of CS-RAE.

1148	-	+	
1730	-		-
3380		+	+
Wavenumber (cm^{-1})	3380	1730	1148

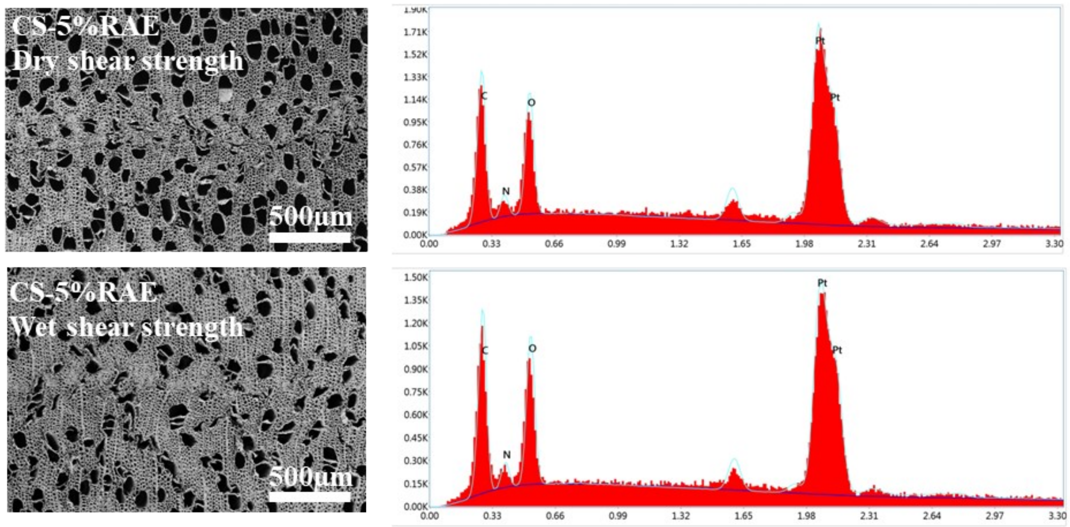

Fig. S9. SEM and EDS of the cross-sections of dry glued laminated timber and wet glued laminated timber immersed in boiling water.

Fig. S10. The appearance diagrams of CS-RAE respectively applied to birch, eucalyptus and poplar plywood.