

***A Binder-free Method to Produce Heat-sealable and Transparent Cellulose Films Driven by  
Confined Green Solvent***

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**Table S1.** The DP of cotton and cellulose film.

Sample	$t/s$	$t_0/s$	$\eta_{sp}$	DP
cotton	$96 \pm 2$	55	$0.75 \pm 0.03$	$1643 \pm 54$
cellulose film	$85 \pm 1$	55	$0.55 \pm 0.01$	$632 \pm 10$

**Table S2.** The total weight concentration of elements Zn and Cl in the cellulose films after 35, 40, 45, 50, 55, and 60 min of residual solvent restriction.

Sample	Element- Zn and Cl (%) <sup>a</sup>					
	35 min	40 min	45 min	50 min	55 min	60 min
CF-0	28.43	20.29	11.27	8.84	5.84	5.23
CF-15	34.92	28.11	22.32	15.84	13.10	12.21

<sup>a</sup> The total weight concentration of elements Zn and Cl in the cellulose films.

**Table S3.** The initial water, initial ZnCl<sub>2</sub>, and initial co-mixing agent weight before solvent restriction, and residual weight of CF-0, CF-10, CF-15, and CF-20 after solvent restriction.

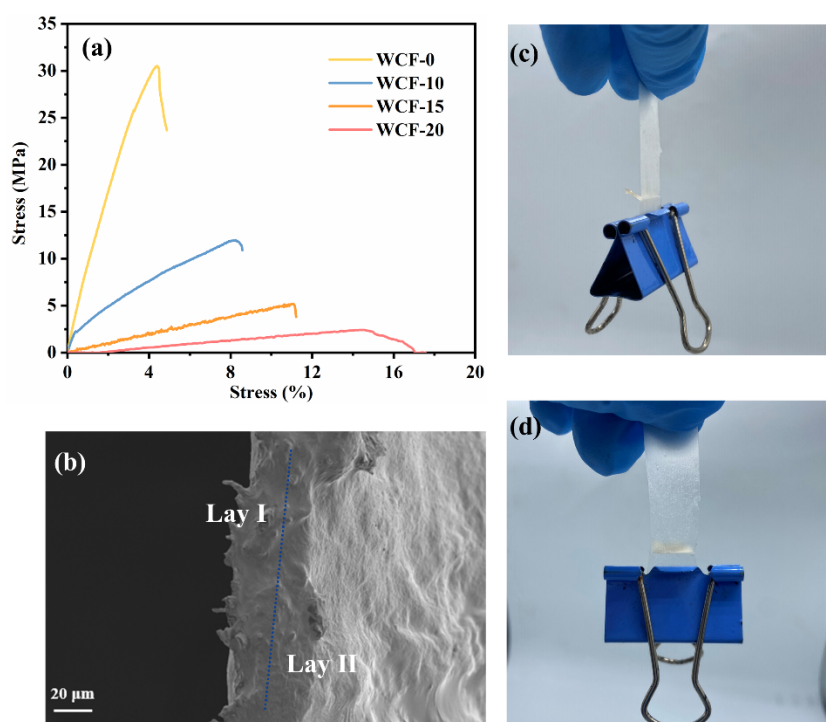
Sample	CF-0	CF-10	CF-15	CF-20
Initial water weight/g	5.6	5.6	5.6	5.6
Initial ZnCl <sub>2</sub> weight/g	14.0	14.0	14.0	14.0
Initial co-mixing agent weight/g	0.0	2.0	3.0	4.0
Residual Weight/g	$8.9 \pm 0.1$	$9.4 \pm 0.3$	$9.6 \pm 0.1$	$10.0 \pm 0.2$

**Table S4.** The percentage of cellulose, ZnCl<sub>2</sub>, glycerol, sorbitol, and ethanol/water in the air-dried films.

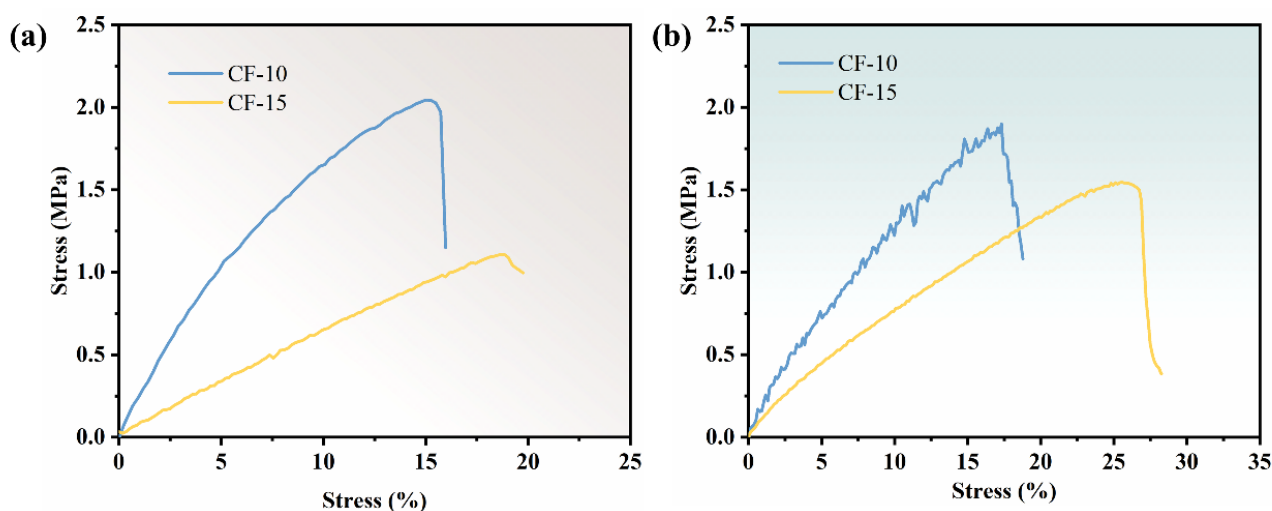
Components	cellulose	ZnCl <sub>2</sub>	water	Co-mixing agent
CF-10	45	32	12	11
CF-15	46	27	15	12
CF-20	42	32	12	14

**Table S5.** The residual weight of CF-0, CF-10, CF-15, and CF-20 after solvent restriction and the recycling efficiency of solvents from the residual products.

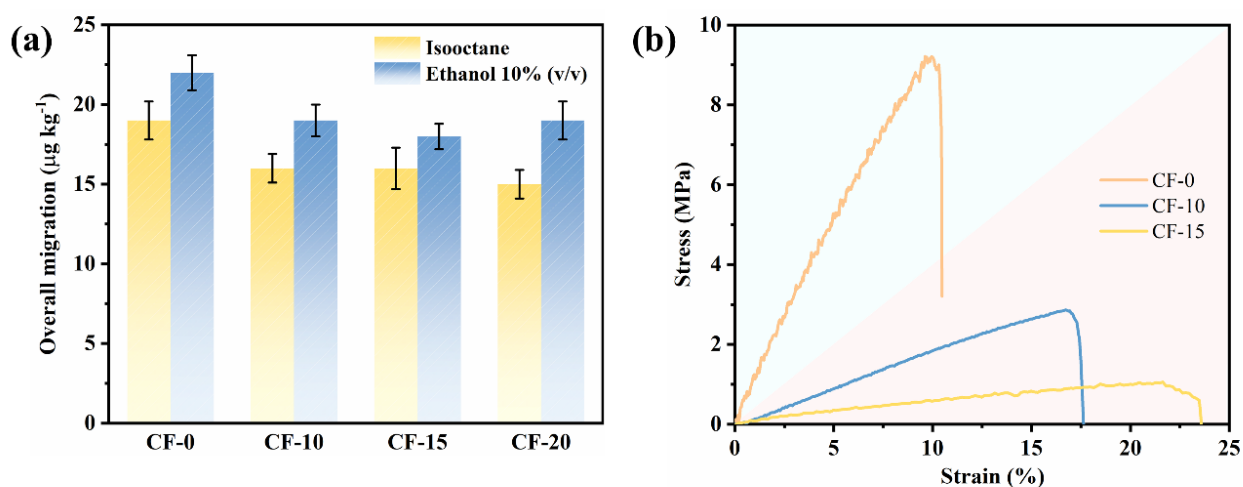
Sample	CF-0	CF-10	CF-15	CF-20
Initial ZnCl <sub>2</sub> weight/g	14.0	14.0	14.0	14.0
Residual Weight/g	8.9 ± 0.1	9.4 ± 0.2	9.6 ± 0.1	10.0 ± 0.2
Recycling efficiency/%	63.5 ± 0.8	67.1 ± 1.5	68.6 ± 0.7	71.4 ± 1.5



**Figure S1.** (a) The mechanical performance of WCF-0, WCF-10, WCF-15, and WCF-20 films, (b) the sectional SEM picture of WCF-15 after self-bonded, and (c, d) the actual pictures of WCF-15 films after self-bonded.



**Figure S2.** The mechanical performance of CF-10 and CF-15 films (a) after water soaking for at least 30 min and (b) in a 65% humidity environment for at least 12 h.



**Figure S3.** (a) Overall migration data in ethanol 10%(v/v) and isooctane and (b) mechanical performance of cellulose films for storing at ambient conditions for more than six months.

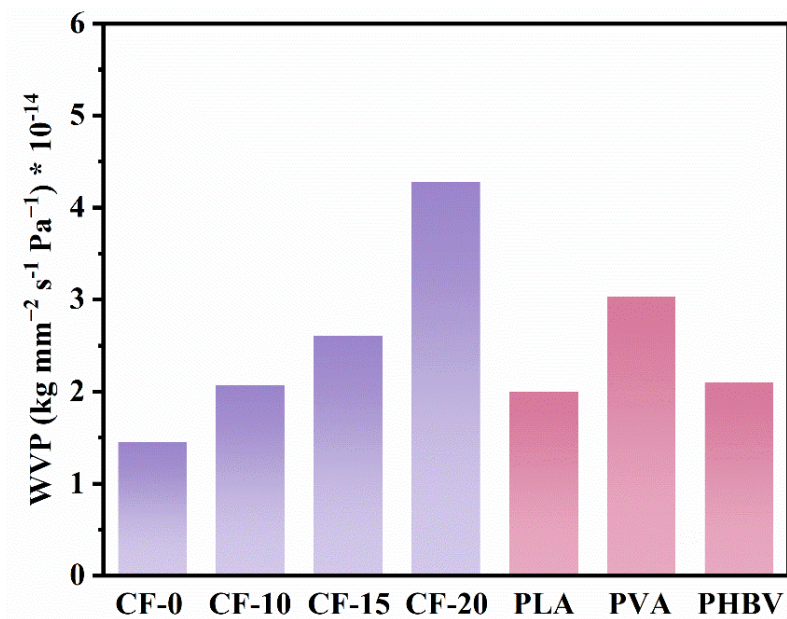


Figure S4. Water vapor permeability (WVP) of CF-0, CF-10, CF-15, CF-20, PLA<sup>1</sup>, PVA<sup>2</sup>, and PHBV<sup>3</sup> films.

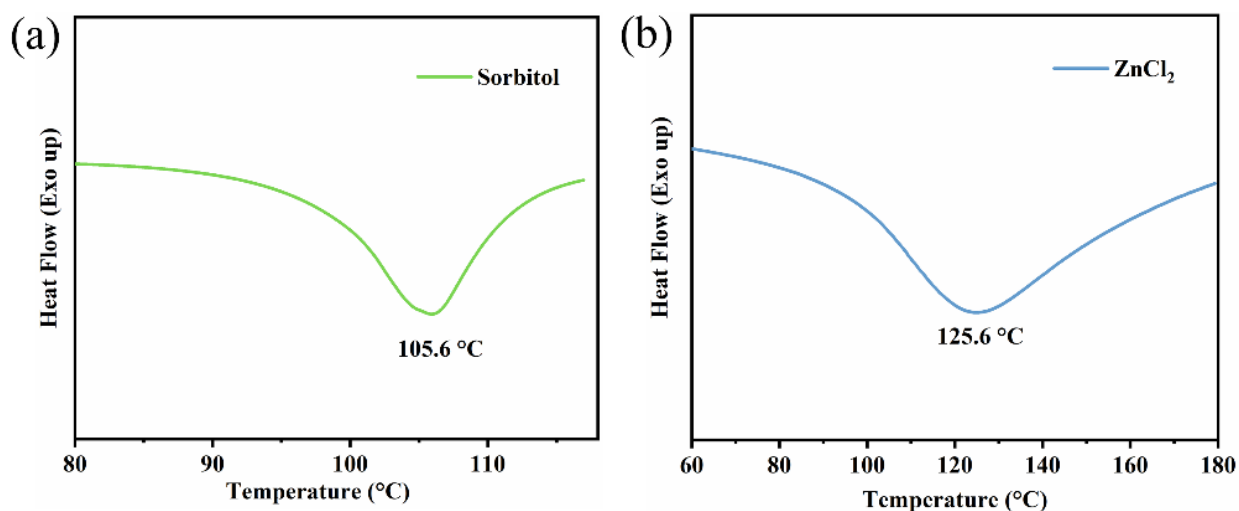


Figure S5. DSC curves of (a) sorbitol, (b) ZnCl<sub>2</sub>.

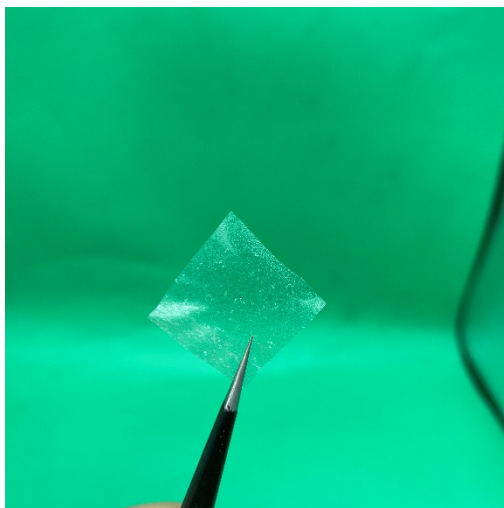


Figure S6. The cellulose film fabricated by the recycled  $\text{ZnCl}_2$ .

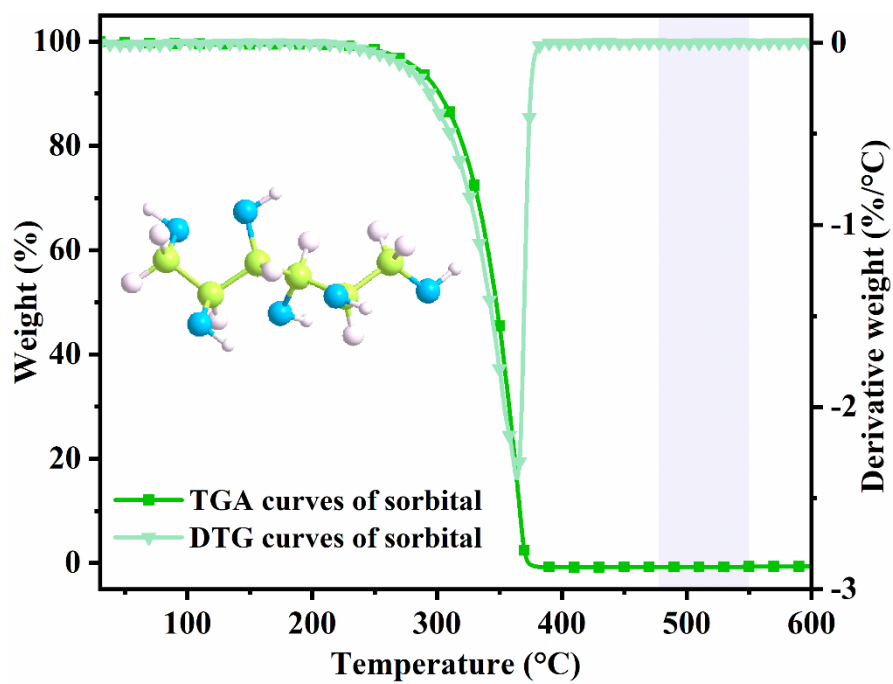
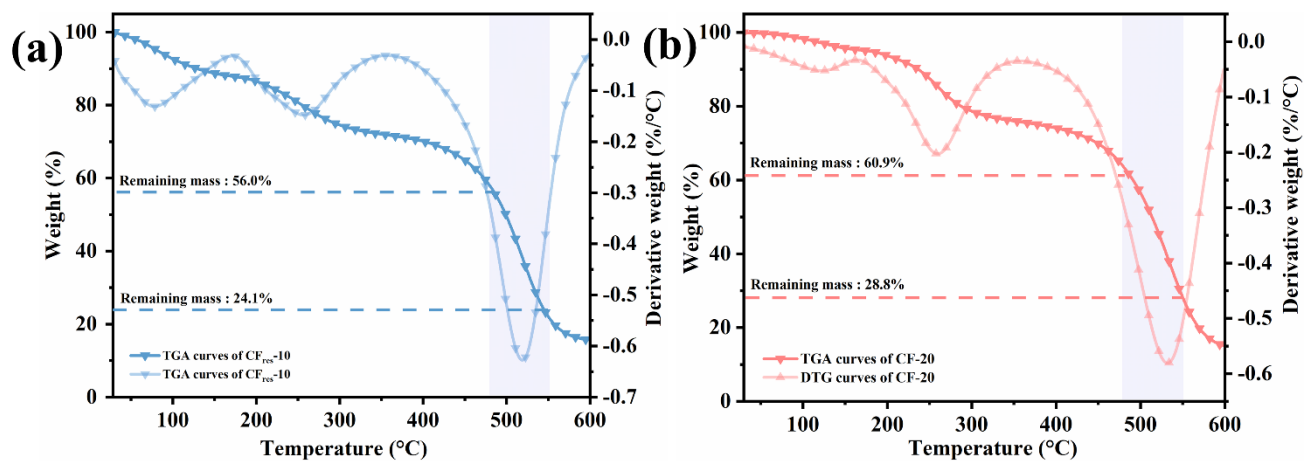
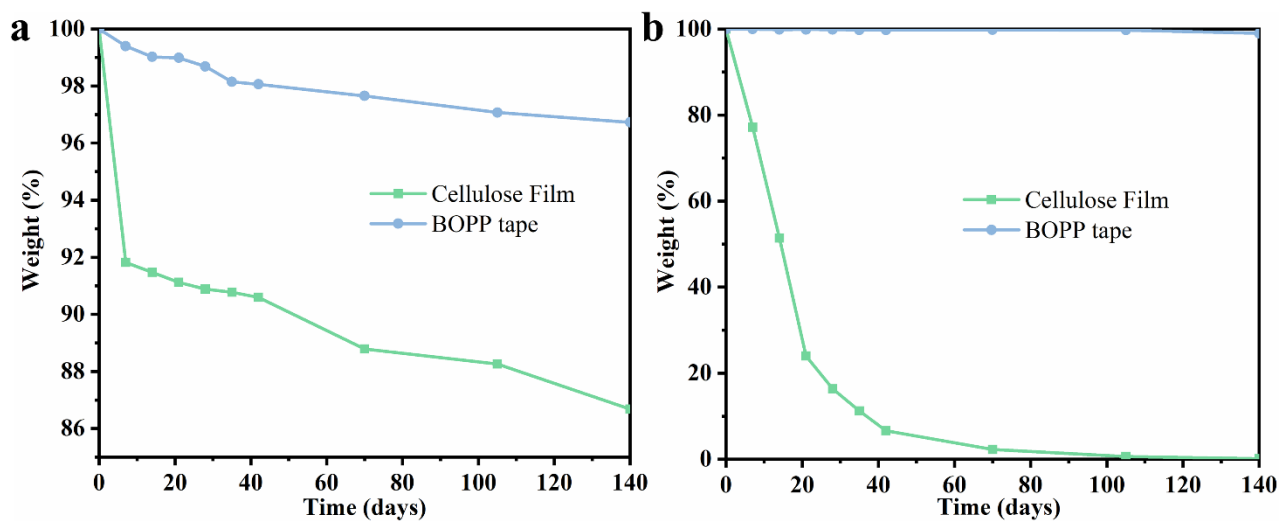


Figure S7. TGA and DTG curves of sorbitol



**Figure S8.** TGA and DTG curves of (a) CF<sub>res</sub>-10 and (b) CF<sub>res</sub>-20



**Figure S9.** Weight loss curves of the cellulose film and BOPP tape in (a) hydrolytic and (b) soil degradation<sup>4</sup>.

## References

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