Supporting Information

Polyvinyl alcohol/propylene glycol facilitates reversible thermochromism of passive energy-saving flexible wood films at low (brightness) to high (depth) temperatures

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2 Experimental sections

2.1 Preparation of delignified eucalyptus wood fiber backbone

The eucalyptus wood chips (EWs) were treated in a mixed solution of 3.0 wt% NaOH/3.0 wt% Na_2SiO_3/0.1 wt% $MgSO_4$/0.1 wt% DTPA/4.0 wt% H_2O_2/89.8 wt% H_2O, maintained in a water bath at 70 °C for 24 h, in which a certain amount of H_2O_2 was added every 2 h to ensure a constant H_2O_2 concentration in the mixed solution. The treated EWs were washed with distilled water to neutrality and freeze-dried to obtain delignified eucalyptus wood fiber backbone (DEWs).

2.2 Preparation of binary fatty acid eutectics

In this experiment, a single fatty acid (MA, PA, SA) was chosen as phase change materials. The DSC curves and parameters for endothermic and exothermic processes, as well as the eutectic phase diagrams, mass ratios and phase change temperatures for binary fatty acid eutectic mixtures determined using the Schrader equation, refer to previous work.[s1] Binary eutectic PCMs (MA-PA, MA-SA, PA-SA) can be obtained by adding theoretically calculated single-component mass ratios, heated at 75 °C and stirred for 30 min to achieve homogeneity.

3 Results and Discussion

Table 1 DSC parameters of FE, FEC, and FT-PCMs.

Binary eutectics	Endothermic process			Exothermic process		
	T_m (°C)	T_p (°C)	$\triangle H_m$ (J g^{-1})	T_s (°C)	T_p (°C)	$\triangle H_s$ (J g^{-1})
MA-PA	46.5	52.2	196.4	43.7	38.8	193.1
MA-SA	46.5	50.5	203.8	41.6	35.4	197.2
PA-SA	58.4	61.0	239.4	52.0	46.8	236.6
MPR	46.7	51.6	162.2	42.4	37.7	158.4
MSR	44.7	49.6	181.9	40.7	34.1	176.2
PSR	55.1	59.9	212.1	51.1	46.6	209.8
MPG	46.1	51.3	201.1	43.2	38.0	198.7
MSG	44.0	48.9	198.4	41.4	36.2	184.6
PSG	54.7	60.1	221.1	51.6	46.4	219.1
MPR-DEW	42.1	53.1	130.3	41.9	35.3	130.9
MSR-DEW	41.7	48.9	124.5	39.5	33.3	121.3
PSR-DEW	54.4	61.4	149.8	50.7	45.1	149.1
MPG-DEW	42.3	51.5	130.6	42.3	36.1	131.6
MSG-DEW	39.8	50.9	119.1	39.8	30.0	123.0
PSG-DEW	55.2	60.5	143.3	51.2	46.3	142.6

Table 2 DSC parameters of FT-PCMs-2 (Red).

samples	Endothermic process			Exothermic process		
	T_m	T_p	$\triangle H_m$	T_s	T_p	$\triangle H_s$

	(°C)	(°C)	(J g^{-1})	(°C)	(°C)	(J g^{-1})
MPR-DEW-4PVA	43.0	55.7	65.94	38.0	29.1	78.91
MPR-DEW-6PVA	41.6	51.2	46.59	37.6	30.7	54.31
MPR-DEW-8PVA	41.8	52.0	42.59	35.8	29.4	49.14
MSR-DEW-4PVA	38.7	47.9	66.99	37.8	29.9	72.43
MSR-DEW-6PVA	38.6	51.5	59.82	36.6	26.8	69.05
MSR-DEW-8PVA	39.2	49.0	48.1	36.5	29.0	55.25
PSR-DEW-4PVA	50.9	60.5	52.28	46.9	40.9	61.29
PSR-DEW-6PVA	50.1	58.3	51.22	45.6	40.0	55.9
PSR-DEW-8PVA	52.4	61.7	49.82	45.6	37.9	58.2

Table 3 DSC parameters of FT-PCMs-2 (Green).

samples	Endothermic process			Exothermic process		
	T_m (°C)	T_p (°C)	$\triangle H_m$ (J g^{-1})	T_s (°C)	T_p (°C)	$\triangle H_s$ (J g^{-1})
MPG-DEW-4PVA	40.3	51.1	64.07	39.1	32.5	64.40
MPG-DEW-6PVA	41.1	51.3	65.85	38.5	32.5	65.24
MPG-DEW-8PVA	40.9	52.8	60.78	37.3	29.3	62.26
MSG-DEW-4PVA	38.3	49.7	60.68	36.0	27.5	66.08
MSG-DEW-6PVA	36.6	47.4	57.41	36.0	30.0	61.23
MSG-DEW-8PVA	38.9	49.6	59.93	37.2	28.5	63.10
PSG-DEW-4PVA	50.7	60.2	56.92	45.3	37.5	62.31
PSG-DEW-6PVA	51.9	62.2	58.40	46.2	37.2	62.63

PSG-DEW-8PVA	51.1	60.1	58.12	45.1	36.3	61.14

Table S4 Color parameters and photographs of FT-PCMs-1 and FT-PCMs-2 (red).

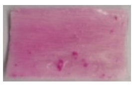
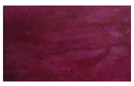
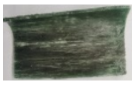
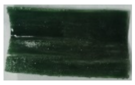
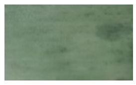
Samples	Color parameters before heating					Color parameters after heating				
	L	*a*	*b*	*ΔE*	Images	*L*	*a*	*b*	*ΔE*	Images
MPR-DEW-4PVA	68.15	33.15	0.54	75.79		40.92	45.79	10.39	62.28	
MPR-DEW-6PVA	61.62	41.78	0.01	74.45		32.39	55.86	6.63	64.91	
MPR-DEW-8PVA	67.58	34.44	3.03	75.91		34.82	52.18	8.57	63.32	
MSR-DEW-4PVA	61.84	34.57	2.23	70.88		35.11	57.3	2.91	67.26	
MSR-DEW-6PVA	59.72	41.93	1.94	73.00		32.5	62.16	9.42	70.78	
MSR-DEW-8PVA	63.73	37.68	2.78	74.08		36.44	59.31	8.36	70.11	
PSR-DEW-4PVA	71.64	26.53	4.58	76.53		40.9	54.8	6.37	68.67	
PSR-DEW-6PVA	75.02	27.91	4.34	80.16		42.31	56.69	5.59	70.96	
PSR-DEW-8PVA	77.01	26.5	5.8	81.65		40.53	45.14	6.01	60.96	
MSR-DEW-6	30.75	30.01	-1.81	43.01		46.18	39.76	-12.54	62.21	

Table S5 Color parameters and photographs of FT-PCMs-1 and FT-PCMs-2 (green).

Samples	Color parameters before heating					Color parameters after heating				
	L	*a*	*b*	ΔE	Images	*L*	*a*	*b*	ΔE	Images
MPG-DEW-4PVA	48.58	0.13	12.92	50.26		33.24	-15.09	18.71	41.02	
MPG-DEW-6PVA	31.56	-5.13	17.41	36.41		33.19	-12.2	14.81	38.33	
MPG-DEW-8PVA	44.45	-1.44	12.98	46.33		35.75	-14.7	12.71	40.69	
MSG-DEW-4PVA	39.19	4.52	12.62	41.42		20.23	5.73	16.96	27.01	
MSG-DEW-6PVA	45.37	-1.62	11.54	46.84		20.08	-14.9	24.89	35.3	
MSG-DEW-8PVA	32.16	5.45	15.5	36.12		20.54	-13.3	17.98	30.37	
PSG-DEW-4PVA	50.24	1.75	15.19	52.52		30.92	-12.7	17.57	37.75	
PSG-DEW-6PVA	49.15	-3.51	15.31	51.6		39.17	-20.8	21.36	49.25	
PSG-DEW-8PVA	51.17	3.94	13.82	53.15		33.21	-2.73	6.06	33.86	

MSG-DEW-6	29.52	-3.80	1.70	29.81		51.74	-10.88	8.81	53.60	

References

S1 N. Feng, Z. Kang and D. Hu, Solar Energy, 2022, 236, 522-532.