

Supplementary materials

Table S1. Results of visual evaluation: Defect quantities (mold, flaking, cracks) evaluated on scale of 0-5, where 0 = no visible defects and 5 = dense pattern of defects, median value of three replicates. Flaked area has been estimated as percentage of whole surface. Number of cracks is the number of largest cracks, averaged between 3 replicates with standard deviation in parenthesis. Depth of deepest cracks is evaluated on a scale 1-3, where 1 = checking, 2 = penetrates top-coat, 3 = penetrates whole system.

Sample, Birch	Mold	Flaking	Flaked area, %	Cracks, quantity (0-5)	Cracks, No. of	Cracks, depth (1-3)
Ref	4	4	60.0	0	0.0	1
Ref-O	5	4	45.0	5	9.7 (2.3)	3
Paint	0	0	6.7 (2.9)	0	0.0	1
320	0	0	0.0	5	15.0 (2.6)	3
320-O	0	0	0.3 (0.6)	5	16.7 (4.0)	3
F	0	2.5	21.3 (24.8)	1.5	10.0	2
F-O	0	1	3.0 (1.7)	3	7.3 (4.6)	3
FB	0	0	8.0 (1.7)	5	10.3 (2.5)	3
FB-O	0	0	8.0 (1.7)	3	7.3 (2.5)	3

Sample, Spruce	Mold (0-5)	Flaking (0-5)	Flaked area, %	Cracks, quantity (0-5)	Cracks, No. of	Cracks, depth (1-3)
Ref	2	3	18.3 (10.4)	5	5.3 (2.9)	3
Ref-O	2	1	5.0	5	4.0	3
Paint	0	2	6.7 (7.6)	3	2.0 (1.0)	1
320	1	0	1.7 (2.9)	5	7.3 (1.2)	3
320-O	1	0	0.0	5	6.7 (2.1)	3
F	0	2	20.0	4	1.3 (0.6)	1
F-O	0	2	2.5 (3.5)	0.5	0.5 (0.7)	0.5
FB	1	0	28.3 (2.9)	3	2.3 (1.5)	1
FB-O	1	0.5	10.0	3	4.0	2

Sample, Pine	Mold	Flaking	Flaked area, %	Cracks, quantity (0-5)	Cracks, No. of	Cracks, depth (1-3)
Ref	4	3	2.3 (2.5)	5	8.0	3
Ref-O	4	3	8.3 (10.4)	5	5.7 (1.2)	3
Paint	0	0	0.3 (0.6)	0	0.0	3
320	0	0	0.0	5	6.0	0
320-O	0	0	0.0	5	3.3 (1.2)	3
F	0	3	40.0	5	4.0 (1.0)	3
F-O	0	3	20.0 (5.0)	4	2.3 (1.2)	3
FB	1	0	0.0	5	4.7 (0.6)	3
FB-O	2	0	0.0	4	2.7 (0.6)	3

Table S2. Detailed color measurements.

	Before weathering				After weathering				ΔE
	Color	L*	a*	b*	Color	L*	a*	b*	
Birch	Color	L*	a*	b*	Color	L*	a*	b*	ΔE
Ref	Beige	74.5 (2.1)	6.8 (0.9)	27.9 (4.5)	Gray	50.0 (15.6)	2.1 (0.4)	3.3 (3.9)	35.0
Ref-O	Beige/Yellow	74.2 (2.3)	8.2 (1.8)	46.2 (3.0)	Gray/Black	30.9 (4.1)	2.4 (0.4)	5.6 (1.4)	59.7
Paint	Black	3.6 (0.2)	0.0 (0.0)	0.1 (0.1)	Black	4.1 (0.5)	0.25 (0.1)	0.0 (0.2)	0.6
320	Black/Brown	5.4 (1.6)	2.7 (1.7)	3.5 (2.1)	Black	21.8 (6.3)	4.3 (0.3)	6.9 (0.8)	16.8
320-O	Black	5.2 (0.8)	0.9 (0.7)	1.5 (0.8)	Black	17.5 (3.1)	2.6 (0.5)	4.7 (0.7)	12.8
F	Black	5.5 (1.4)	0.2 (0.2)	1.3 (0.6)	Black	4.9 (0.8)	0.2 (0.1)	0.8 (0.2)	0.8
F-O	Black	5.2 (1.2)	0.2 (0.1)	1.5 (0.5)	Black	6.7 (1.4)	0.0 (0.1)	1.3 (0.5)	1.6
FB	Black	4.7 (0.8)	1.5 (0.6)	2.4 (0.7)	Black	10.7 (4.4)	2.3 (0.9)	4.5 (0.2)	6.4
FB-O	Black	5.1 (0.9)	0.4 (0.2)	1.4 (0.3)	Black	12.3 (3.4)	1.9 (0.5)	4.2 (1.1)	7.9

	Before weathering				After weathering				ΔE
	Color	L*	a*	b*	Color	L*	a*	b*	
Spruce	Color	L*	a*	b*	Color	L*	a*	b*	ΔE
Ref	Beige	80.3 (2.1)	3.3 (0.6)	24.1 (1.3)	Gray/Beige	58.6 (11.9)	2.8 (0.8)	4.8 (2.1)	29.0
Ref-O	Beige	81.2 (3.0)	3.4 (1.0)	31.6 (1.8)	Gray	45.8 (6.6)	2.3 (0.3)	3.9 (1.0)	45.0
Paint	Black	3.6 (0.7)	0.1 (0.1)	0.0 (0.2)	Black	4.8 (1.0)	0.3 (0.1)	0.0 (0.2)	0.9
320	Black/Brown	7.3 (2.8)	5.3 (3.6)	6.8 (8.6)	Brown/Gray	27.4 (6.3)	5.4 (0.9)	8.3 (1.5)	20.2
320-O	Black/Brown	5.1 (1.6)	3.3 (2.4)	3.4 (2.3)	Brown	31.0 (6.8)	5.0 (0.6)	8.1 (1.1)	26.4
F	Black	3.7 (2.5)	0.3 (1.1)	0.7 (0.8)	Black	5.6 (1.0)	0.9 (0.3)	1.4 (0.4)	2.1
F-O	Black	4.1 (0.9)	0.3 (0.1)	1.2 (0.6)	Black	5.2 (1.0)	0.6 (0.3)	1.1 (0.4)	1.1
FB	Brown/Black	10.5 (2.5)	6.3 (1.1)	10.1 (2.8)	Brown/Gray	35.9 (7.5)	4.4 (0.9)	7.2 (1.5)	25.6
FB-O	Brown/Black	8.8 (1.5)	5.7 (1.2)	7.9 (2.3)	Brown/Gray	31.6 (6.2)	4.4 (1.0)	7.0 (1.7)	22.9

Pine	Before weathering				After weathering				ΔE
	Color	L*	a*	b*	Color	L*	a*	b*	
Ref	Beige	79.3 (1.4)	4.1 (0.9)	28.1 (1.9)	Gray	42.2 (8.8)	2.4 (0.7)	4.2 (1.6)	44.2
Ref-O	Beige	80.7 (2.2)	5.3 (1.4)	37.2 (4.2)	Gray	36.5 (6.2)	2.2 (0.3)	4.2 (1.1)	55.2
Paint	Black	3.9 (0.6)	-0.1 (0.1)	0.1 (0.2)	Black	4.6 (1.2)	0.3 (0.1)	0.0 (0.1)	0.8
320	Black/Brown	6.7 (2.7)	4.9 (2.1)	6.1 (3.4)	Brown/Black	19.5 (3.6)	5.5 (1.5)	8.0 (1.5)	13.0
320-O	Black/Brown	7.9 (2.4)	4.6 (2.1)	5.8 (2.7)	Brown/Gray	27.6 (6.3)	5.0 (0.8)	8.1 (1.5)	19.9
F	Black	3.9 (0.8)	0.2 (0.2)	0.7 (0.3)	Black	4.3 (0.9)	0.6 (0.3)	0.8 (0.5)	0.6
F-O	Black	3.7 (0.4)	0.1 (0.1)	1.0 (0.2)	Black	5.7 (1.2)	0.5 (1.1)	1.1 (1.1)	2.0
FB	Black/Brown	7.8 (1.3)	3.5 (0.9)	6.0 (1.6)	Black/Gray	22.3 (9.1)	2.7 (0.8)	4.3 (1.3)	14.6
FB-O	Black	4.3 (0.8)	1.4 (1.1)	2.0 (1.1)	Black/Gray	26.0 (10.5)	3.2 (0.6)	4.6 (1.2)	22.0

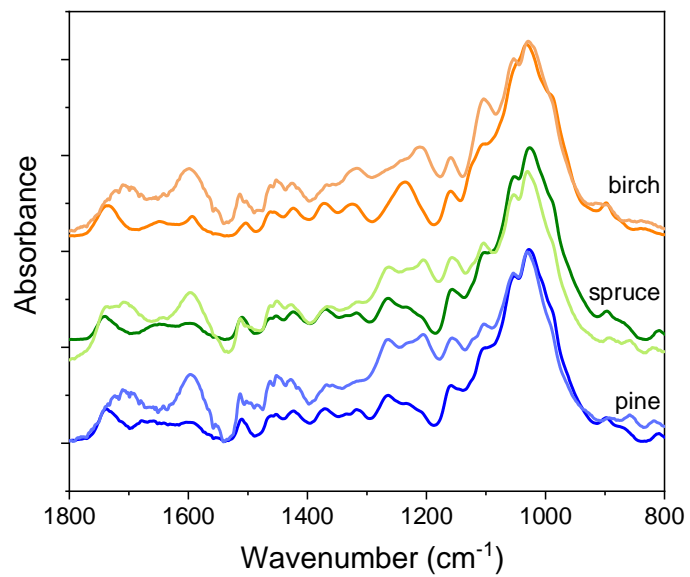


Figure S3. FTIR spectra of unmodified and contact charred samples. Darker color indicates unmodified and lighter color contact charred samples.

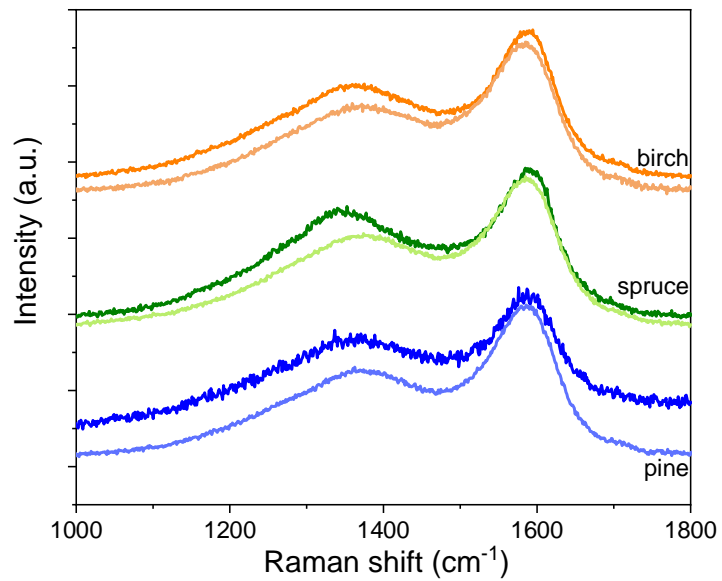


Figure S4. Raman D and G bands of contact and flame charred samples. Darker color indicates flame charring and lighter contact charring.