

Article

The weathering of the beech and spruce wood impregnated by pigmented linseed oil

Supplementary materials

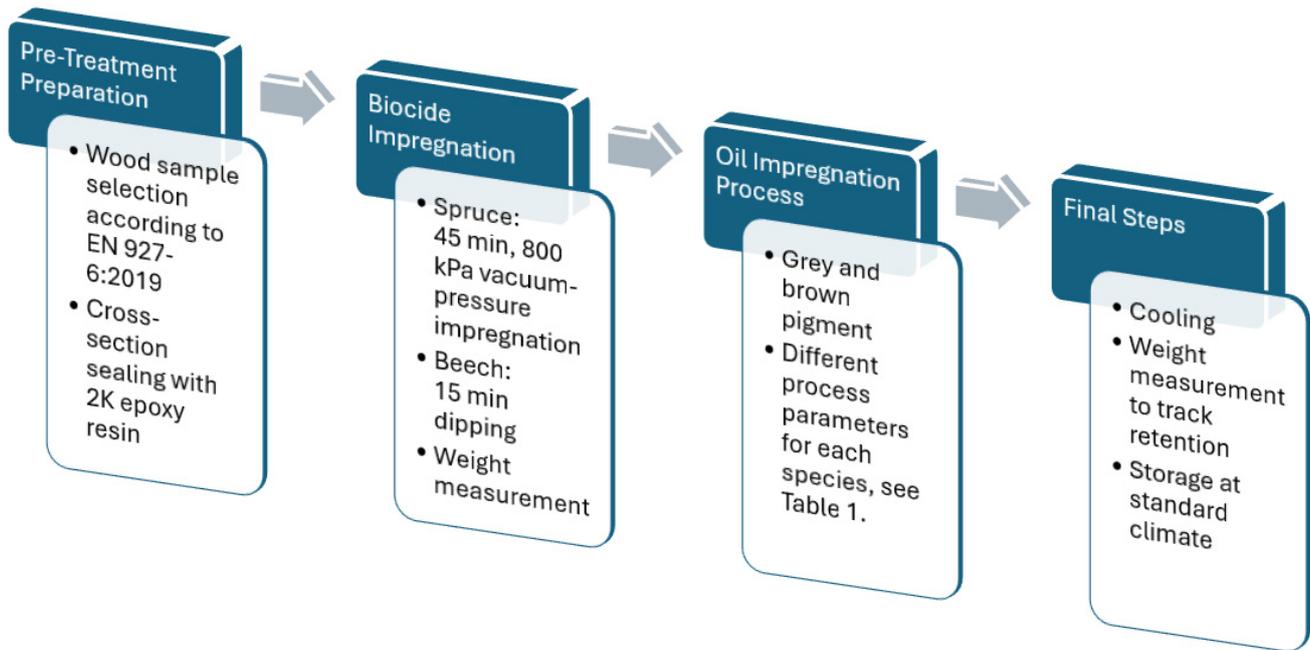


Figure S1. Schematic representation of the test methodology, highlighting the main steps and materials used

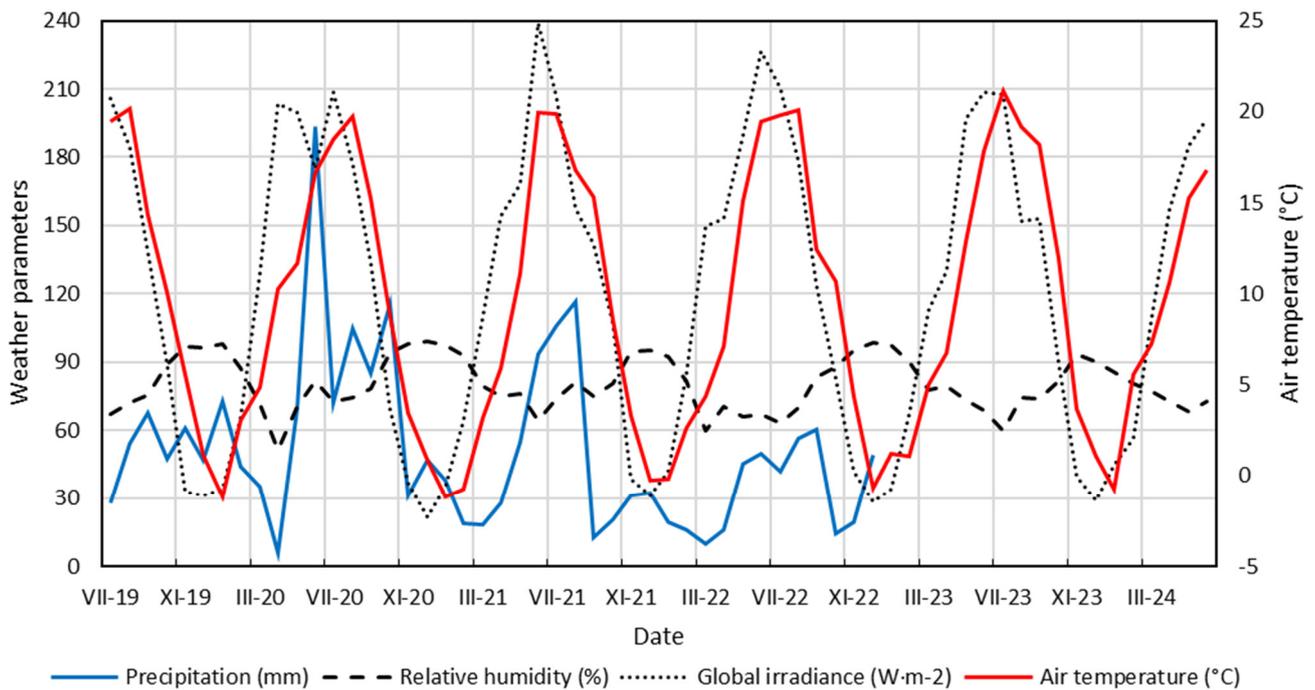


Figure S2. Monthly mean climatic data for Útěchov (Czech Republic) for test period (July 2019 – July 2024). Precipitation (mm), global irradiance ($\text{W}\cdot\text{m}^{-2}$), relative humidity (%) and air temperature ($^{\circ}\text{C}$) were tracked every month. Unfortunately, the rain gauge was non-functional from January 2023.

Table S1. Lightness (L^*), redness (a^*), yellowness (b^*) parameters and overall color difference (ΔE^*) change during 5 years of natural weathering. S – spruce, B – beech, R – reference, IG – impregnated with grey oil, IB – impregnated with brown oil, CB – coated by brown oil

		Exposure time (years)					
		0	1	2	3	4	5
L^*	SIB	36.5	30.5	29.6	29.5	32.1	33.9
	SIG	40.3	37.7	38.7	37.2	38.5	39.8
	SCB	38.8	26.4	27.3	27.6	32.1	36.7
	SR	83.9	44.2	46.6	44.8	44.9	43.7
	BIB	33.6	36.3	43.1	44.8	48.6	48.5
	BIG	42.0	42.0	47.2	49.7	51.3	51.8
	BCB	38.1	39.6	41.8	41.8	39.4	39.8
	BR	71.9	44.8	47.7	45.9	44.0	42.0
	a^*	SIB	15.3	6.2	5.4	3.7	3.6
SIG		3.6	1.8	1.7	1.4	1.7	1.9
SCB		9.3	5.6	4.5	3.5	2.9	2.6
SR		3.8	0.9	1.1	1.2	1.3	1.6
BIB		8.8	3.6	2.6	2.2	2.3	2.6
BIG		3.1	1.0	0.8	1.0	1.3	1.6
BCB		16.9	3.4	2.8	2.7	2.5	2.5
BR		9.4	1.5	1.8	1.4	1.3	1.3
b^*	SIB	19.8	10.3	9.1	7.1	6.9	6.7
	SIG	10.3	5.5	5.7	5.4	6.3	7.0
	SCB	13.6	7.6	6.5	5.4	4.9	5.2
	SR	23.0	2.0	3.0	3.5	3.8	4.9

	BIB	13.3	8.4	6.3	5.0	5.3	7.0
	BIG	9.2	3.6	3.6	3.7	4.4	5.9
	BCB	22.0	6.7	5.3	5.1	4.7	4.8
	BR	21.2	3.8	5.0	4.6	4.0	4.1
ΔE^*	SIB	–	14.4	16.1	18.6	18.0	18.1
	SIG	–	5.8	5.3	6.2	4.8	3.8
	SCB	–	14.2	14.4	15.0	12.8	11.0
	SR	–	45.0	42.5	43.8	43.6	44.1
	BIB	–	7.6	13.3	15.4	18.2	17.4
	BIG	–	6.0	8.0	9.6	10.6	10.4
	BCB	–	20.4	22.1	22.3	22.5	22.4
	BR	–	33.2	30.1	31.9	33.8	35.4

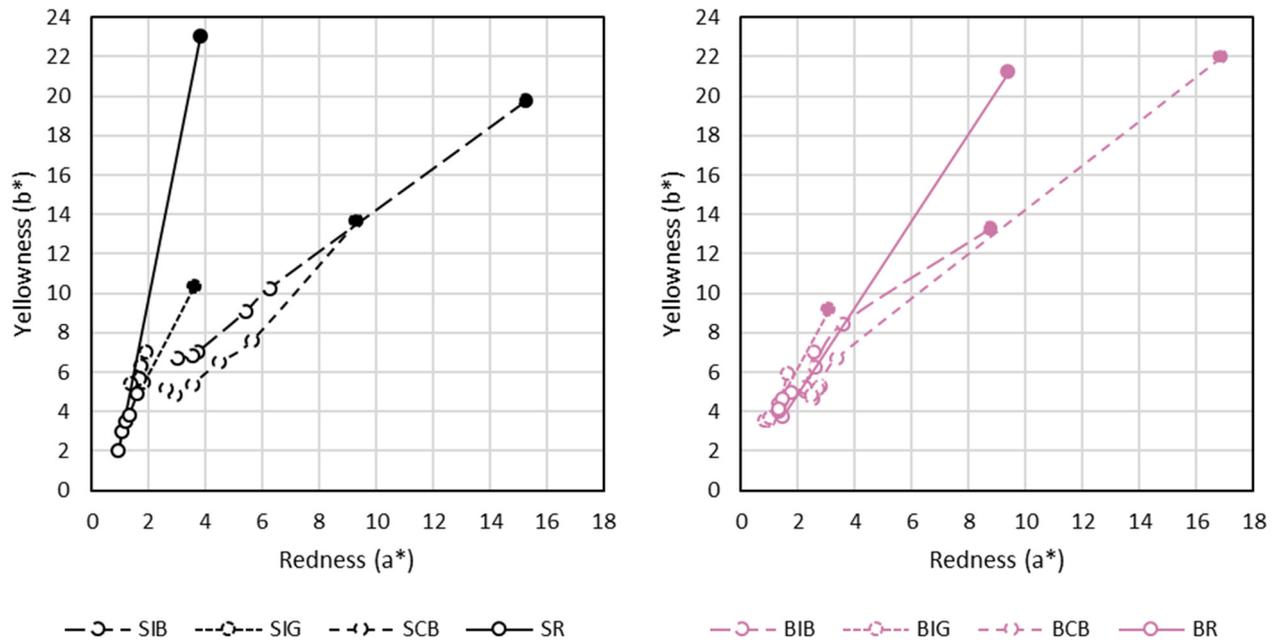


Figure S3. Chromacity diagram of reference and treated spruce and beech samples. The diagram shows the color shifting of redness (a^*) and yellowness (b^*) during natural weathering of five years. Each dot represents the color of each year, showing the initial color point with filled circle. As the values of a^* and b^* decrease, the color of each sample become more pale and grey. Spruce (S) is marked with black, beech (B) is marked with grey. R – reference, IG – impregnated with grey oil, IB – impregnated with brown oil, CB – coated by brown oil

Table S2. Lightness (L^*), redness (a^*), yellowness (b^*) meters (L^* , a^* , b^*) and overall color difference (ΔE^*) change during 1900 hours of irradiation. S – spruce, B – beech, R – reference, IG – impregnated with grey oil, IB – impregnated with brown oil, CB – coated by brown oil

		Irradiation time (hours)										
		0	4	14	24	50	100	200	300	500	900	1900
L^*	SIB	39.1	38.0	37.6	37.4	37.3	39.0	40.1	40.7	41.3	40.0	37.4
	SIG	40.3	40.9	41.1	41.3	42.1	42.3	42.7	43.6	42.5	39.0	40.0
	SCB	41.2	40.4	41.4	39.5	39.3	38.9	37.1	37.7	38.0	39.6	43.0
	SR	82.8	79.0	75.1	73.2	70.6	71.2	74.7	75.9	77.0	81.2	81.2
	BIB	37.3	38.0	38.2	39.3	40.8	44.3	47.4	50.9	53.7	56.8	60.3
	BIG	43.2	43.7	44.5	45.1	45.9	47.7	50.2	52.0	54.4	57.2	60.6
	BCB	39.1	39.1	39.8	40.7	41.6	45.0	47.7	50.0	51.5	52.5	51.8
	BR	72.7	68.6	66.8	67.0	69.0	73.6	78.9	81.5	84.9	87.6	88.4
a^*	SIB	15.8	15.4	14.1	14.0	13.8	12.8	12.4	12.1	11.4	8.3	7.2
	SIG	3.8	3.7	3.5	3.5	3.9	3.5	3.8	4.2	3.8	4.8	5.6
	SCB	17.2	16.3	16.7	16.5	16.2	15.7	12.7	12.0	10.7	5.8	3.6
	SR	3.8	4.8	8.4	9.9	10.8	10.5	7.0	6.1	5.0	2.4	1.8
	BIB	8.5	8.5	8.8	9.2	9.5	9.8	9.1	8.7	7.7	4.6	4.2
	BIG	2.8	3.0	3.1	3.3	3.5	3.7	3.3	3.0	2.5	1.5	1.3
	BCB	10.5	10.1	10.6	10.1	9.5	9.0	7.5	7.6	7.2	5.1	4.7
	BR	8.3	9.7	11.0	10.7	9.2	7.3	4.6	3.6	2.6	1.3	0.9
b^*	SIB	23.6	21.6	20.3	20.1	19.2	19.2	18.9	18.7	17.3	13.9	12.5
	SIG	11.8	10.6	10.7	10.8	11.1	10.1	9.7	10.5	9.0	9.4	11.2
	SCB	23.6	22.1	23.6	21.7	21.2	19.9	16.1	16.1	15.1	10.9	7.8
	SR	23.2	27.5	35.1	36.3	32.5	26.0	14.7	12.4	10.7	8.6	6.6
	BIB	14.9	15.2	15.7	16.7	17.5	18.5	18.0	18.3	16.6	10.9	9.9
	BIG	9.8	9.3	9.5	10.0	10.2	10.4	10.2	10.2	9.2	6.6	5.5
	BCB	15.3	15.2	16.0	16.0	15.5	15.8	14.7	14.9	13.7	10.1	9.0
	BR	20.4	23.9	26.7	26.7	23.4	18.7	12.2	9.5	7.8	8.0	4.8
ΔE^*	SIB	0	2.4	4.1	4.4	5.2	5.4	5.9	6.4	8.1	12.4	14.3
	SIG	0	1.4	1.4	1.5	2.0	2.7	3.2	3.6	3.6	2.9	2.0
	SCB	0	2.0	0.6	2.6	3.2	4.7	9.7	9.9	11.2	17.2	20.9
	SR	0	5.8	14.9	17.4	16.9	13.7	12.2	13.0	13.8	14.7	16.8
	BIB	0	0.7	1.3	2.8	4.5	7.9	10.6	14.0	16.5	20.2	23.9
	BIG	0	0.8	1.4	2.0	2.8	4.6	7.0	8.8	11.2	14.4	17.9
	BCB	0	0.4	1.0	1.7	2.7	6.1	9.1	11.3	13.0	15.3	15.3
	BR	0	5.5	9.1	8.8	4.9	2.1	10.9	14.7	18.4	20.6	23.3

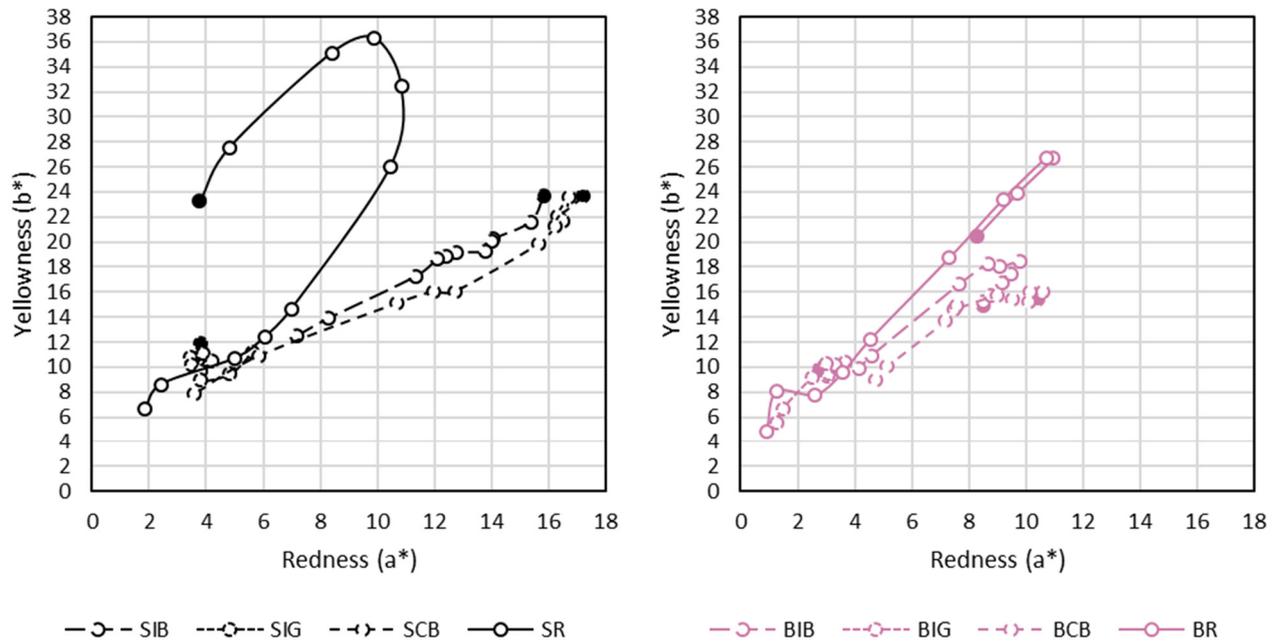


Figure S4. Chromacity diagram of reference and treated spruce and beech samples. The diagram shows the color shifting of redness (a^*) and yellowness (b^*) during natural weathering of five years. Each dot represents the color of each year, showing the initial color point with filled circle. As the values of a^* and b^* decrease, the color of each sample become more pale and grey. Spruce (S) is marked with black, beech (B) is marked with grey. R – reference, IG – impregnated with grey oil, IB – impregnated with brown oil, CB – coated by brown oil

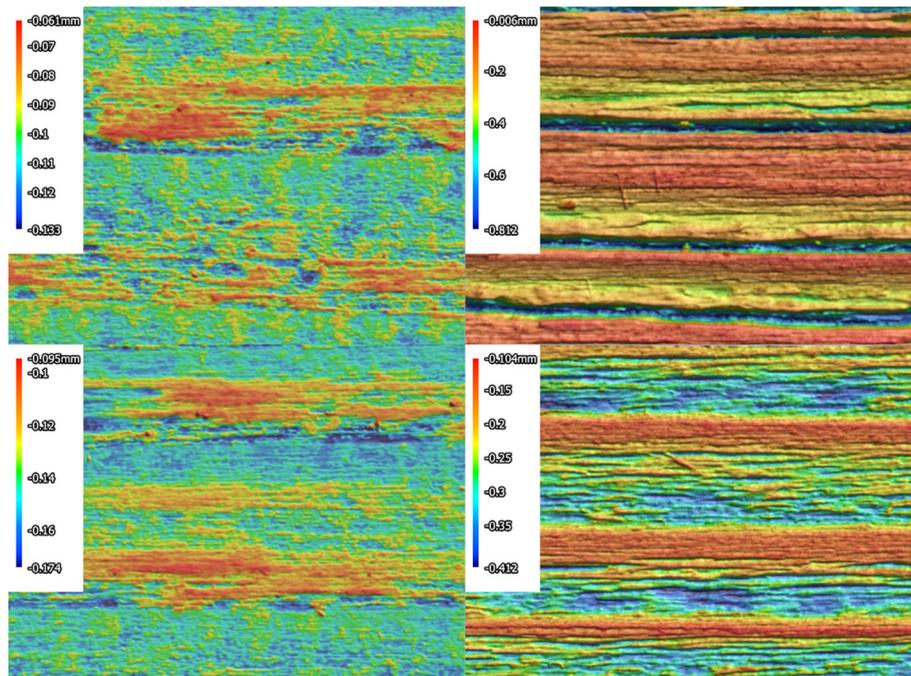


Figure S5. Surface roughness profiles of the reference spruce wood (up) and oil impregnated wood (below) before (left) and after exposure (right). The color coding indicates the height or depth of the peaks and valleys with respect to a reference plane of the roughness profile.

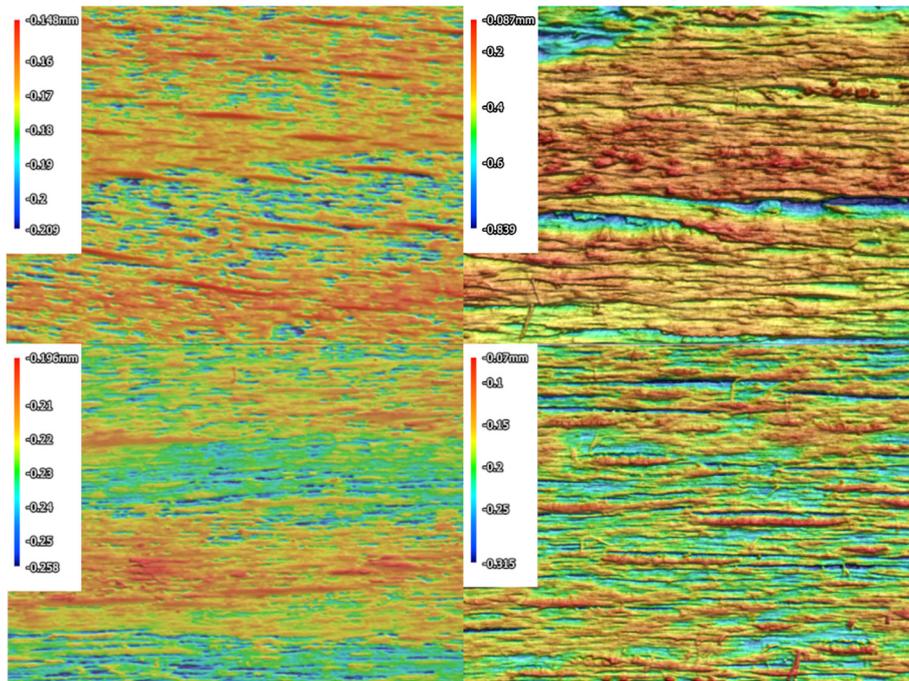


Figure S6. Surface roughness profiles of the reference beech wood (up) and oil impregnated wood (below) before (left) and after exposure (right). The color coding indicates the height or depth of the peaks and valleys with respect to a reference plane of the roughness profile.

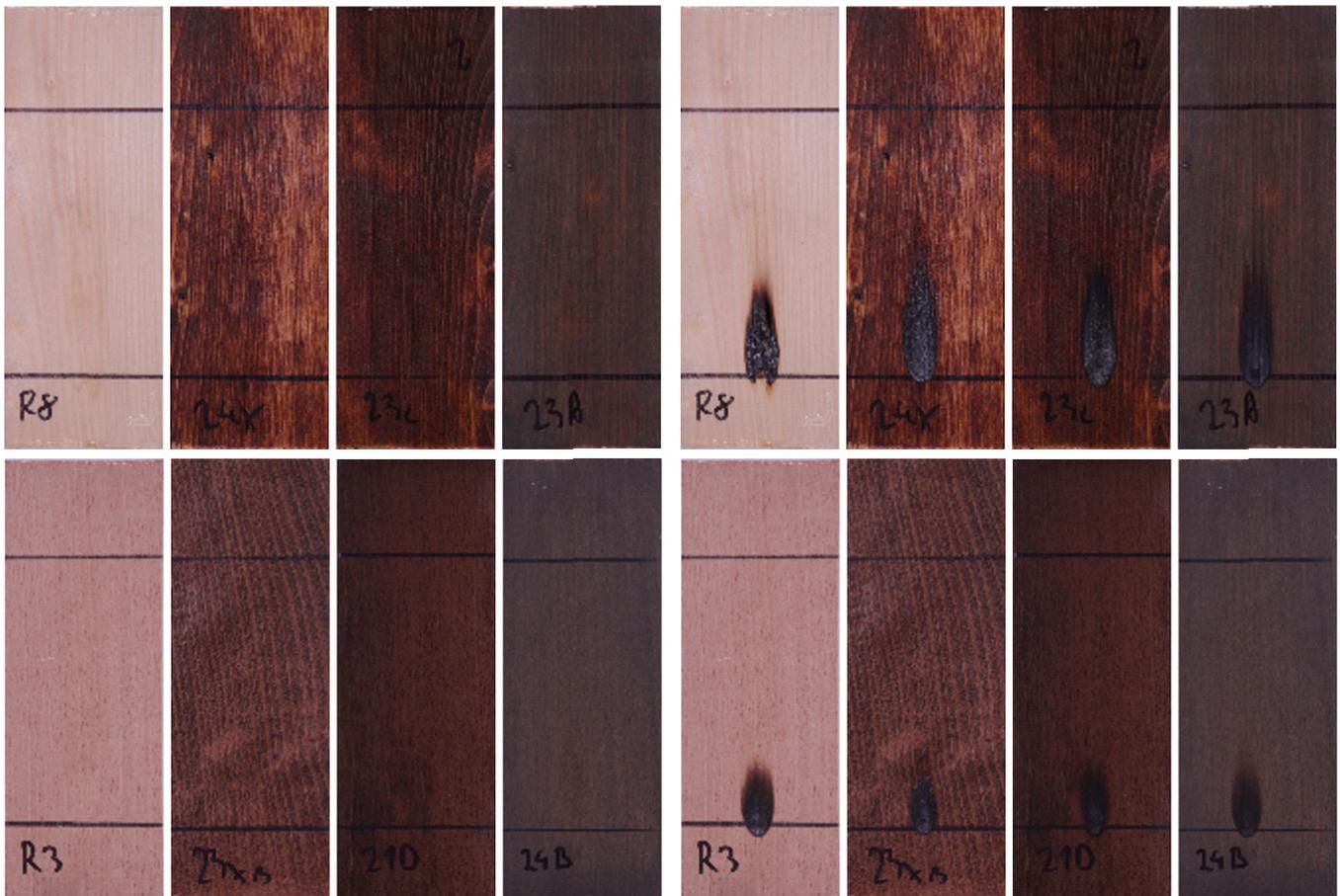


Figure S7. Fire resistance samples of spruce (above) and beech (bottom) before (left) and after (right) the fire resistance test. The samples are from left to right: reference, coated with brown oil,

impregnated with brown oil, impregnated with grey oil. The flame height was bigger for spruce than beech, but the treatments did not influence the ignition or mass loss significantly.