



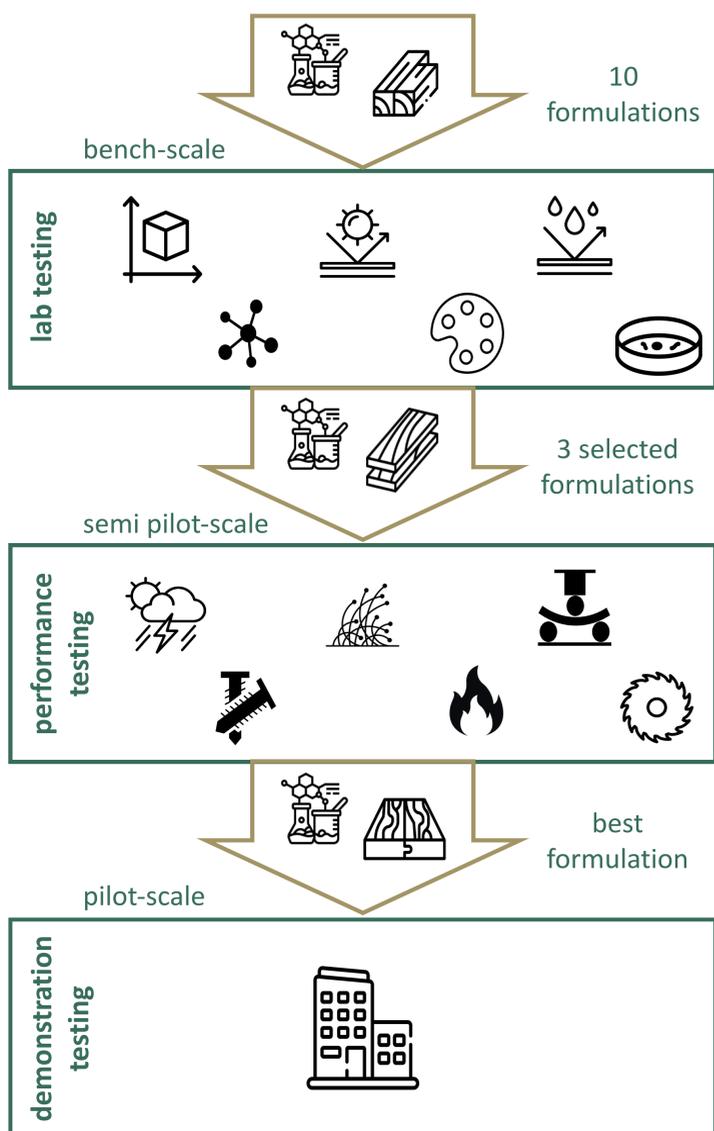
Modification of Wood by Fast Pyrolysis Bio-Oil – results from the screening test

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This research focuses on the modification of wood with FPBO to develop an entirely biobased alternative to currently used toxic and fossil-based preservation agents such as copper salts, organic biocide ingredients, and creosote.

Schema of the workflow in the NewWave project



Characterization method	REF	A	B	C	D	E	F	G	H	I	J
Weight percent gain (%)	-	41	129	89	93	85	58	70	70	58	60
Density (kg/m ³)	520 (SD±88)	713 (SD±24)	902 (SD±63)	778 (SD±50)	785 (SD±29)	743 (SD±56)	789 (SD±84)	851 (SD±99)	776 (SD±89)	813 (SD±40)	812 (SD±76)
Leaching test (g/m ²)	-	265 (SD±18)	930 (SD±42)	342 (SD±35)	449 (SD±20)	262 (SD±15)	316 (SD±15)	462 (SD±36)	316 (SD±43)	276 (SD±55)	318 (SD±17)
Moisture uptake - absorption coefficient (A _w)	0.208	0.379	0.189	0.319	0.305	0.322	0.285	0.292	0.287	0.285	0.301
Dimensional stability - volumetric shrinkage (%)	12	6	4	5	4	6	7	7	5	6	6
Hygroscopic properties - EMC at the fibre saturation point (97%RH) (%)	18.0	14.1	15.5	12.5	12.3	10.7	10.4	10.3	10.0	12.3	15.0
Impact bending strength (kJ/m ²)	41 (SD±10)	11 (SD±6)	14 (SD±3)	7 (SD±2)	17 (SD±3)	28 (SD±7)	19 (SD±5)	15 (SD±4)	14 (SD±4)	18 (SD±6)	22 (SD±5)
Contact angle H ₂ O (°)	23	87	37	82	81	81	88	83	83	79	76
Surface energy γ _{tot} [mN/m]	66	78	60	87	67	68	65	50	47	52	57
Appearance (color)											
UV stability color (ΔE)	19.4	3.7	2.6	5.4	2.5	1.5	3.5	1.3	0.6	4.3	4.9
UV stability gloss (ΔE)	2.3	0.2	0.5	0.4	0.4	0.6	0.7	0.4	0	1	1
Durability class (<i>Rhodonia</i>)	5	3	4	4	4	4	4	4	3*	4	4
Durability class (<i>Trametes</i>)	5	2	4	3	3	2	3	3	2	3	2
Mold index (<i>Cladosporium</i>)	5	3	0	2	2	3	2	1	2	2	1
Mold index (<i>Aureobasidium</i>)	5	2	0	1	1	2	1	2	1	2	1
VOCs emission (% reduction)	-	92.6	82.1	78.8	87.2	88.8	99.4	82.8	72.4	78.8	35.9
Adlehydes						+	+	+		+	
Ketones		+		+	+	+	+				+
Alcohols		+	+	+	+	+	+		+	+	+
Esters		+		+	+	+	+	+	+	+	+
Acids		+		+	+	+	+	+	+	+	
Heterocycles			+	+	+	+			+		+
Aromatics		+	+	+	+	+	+	+	+	+	+
Thermal conductivity λ (W/mK)	0.15	0.13	0.13	0.13	0.12	0.13	0.14	0.12	0.13	0.12	0.13
Specific heat C (J/m ³ K)	1051566	1156450	1407026	1162619	1186959	1188770	1249151	1050593	1227465	1002988	1251066
Specific heat capacity Cp (J/kgK)	1542.71	1615.40	1742.85	1648.25	1608.04	1557.72	1548.95	1358.73	1469.25	1557.18	1443.57

Based on screening tests best-performing formulations are now selected and used for the modification of larger amounts of wood. Samples will be evaluated regarding weathering, durability, fire, and mechanical performance. After extensive laboratory tests, new construction products will be manufactured at an industrial scale and used at a demonstration site at the InnoRenew CoE building.

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New Wave Project



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