

Co-funded by the Eco-innovation
Initiative of the European Union

Laminated Strong Eco-Material for Building Construction Made of Cellulose-Strengthened Wood

FINAL WORKSHOP

Developement of lignin based glue

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The CELLUWOOD project

The role of CHIMAR

- To develop a glue with “greener” character capable of setting in the cold in order to be used as binder for building materials.

We have used LIGNIN as building block
for a resin in combination with existing
PF technology

- Lignin is renewable
- Lignin can easily replace phenol when properly activated
- Lignin is available from other processes and could therefore be cheap
- Lignin based resins however are dark in color

Glue mix formulations

tests at 6/12/2013

sample's code name:	S1		S2		S3	
mixtures	847R2(49%sol)	50	847R2(49%sol)	50	847R2(49%sol)	50
	CaCO3	15	CaCO3	15	Catalyst 2 solid	3
	parHCHO	0.8	parHCHO	0.8	parHCHO	0.8
	Catalyst 1 solid	0.5			CaCO3	7
H. type :	H6040		H6040		H6040	
Glue loading :	150g/m2 (sol resin)		150g/m2 (sol resin)		150g/m2 (sol resin)	
Hardener loading:	~100g/m2 (liq)		~120g/m2 (liq)		~100g/m2 (liq)	
exothermic r. :	YES		YES		YES	
Time under pressure:	~12h		~12h		~12h	
Average wood f.:	100%		100%		100%	
Average shear str.:	2,9N/mm2		3,0N/mm2		3,3N/mm2	

Hundreds of tests





Application of glue mix (150g/m²)



Application of the hardener



Application of hardener(100g/m²)



The hardener stays on surface



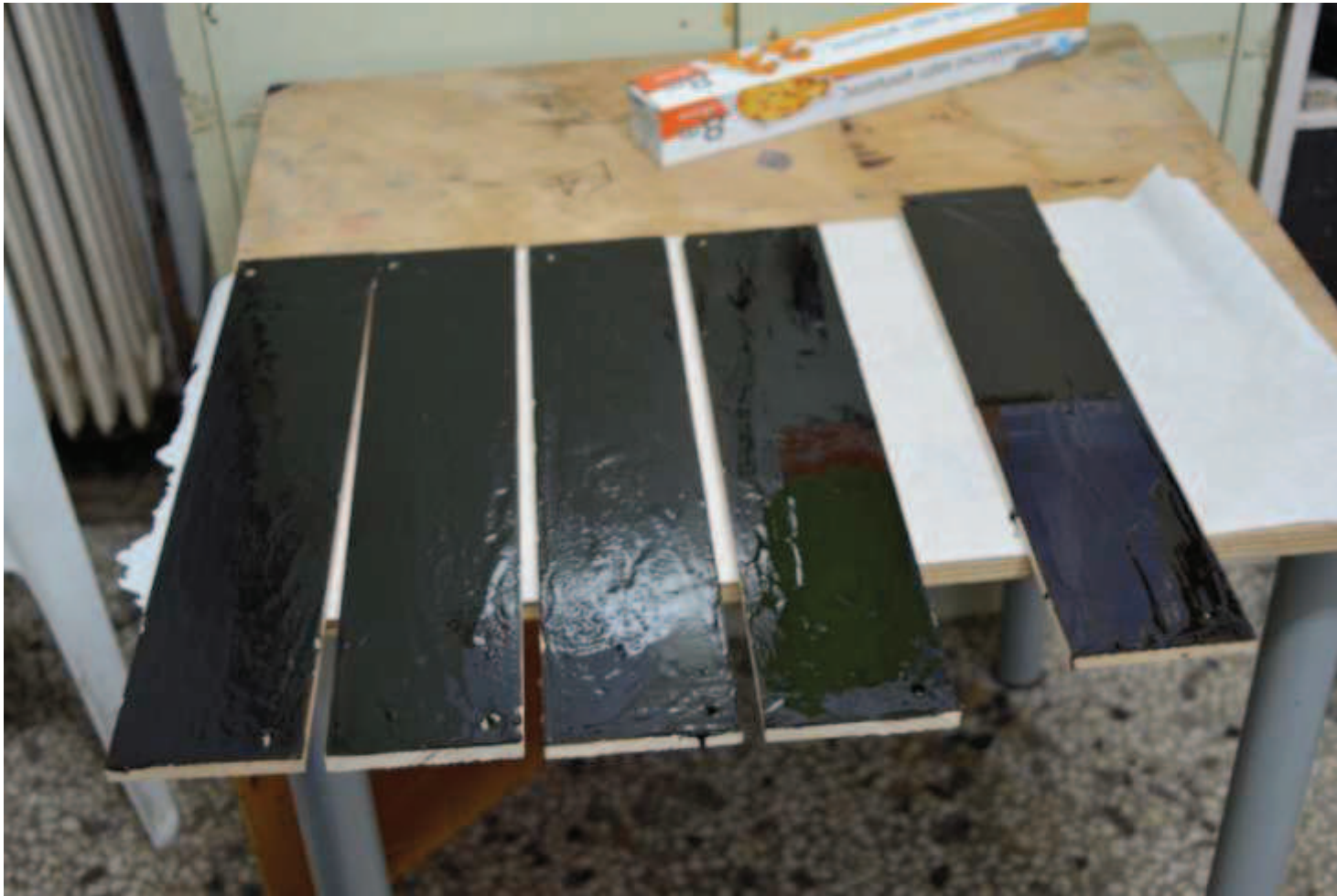
Using a “whiter” gluemix



Applying the std mix



The normal mix



Using spacer to avoid early contact



PRESSING



Pressing



Testing the samples



Preparing the industrial glue mix



Applying the industrial glue-mix



Applying the hardener



Final assembly



Putting things together



TESTING



The glue stands the test !!!!



Industrial test in Slovenia



The element



Ready for testing



Trimmed to fit the testing machine



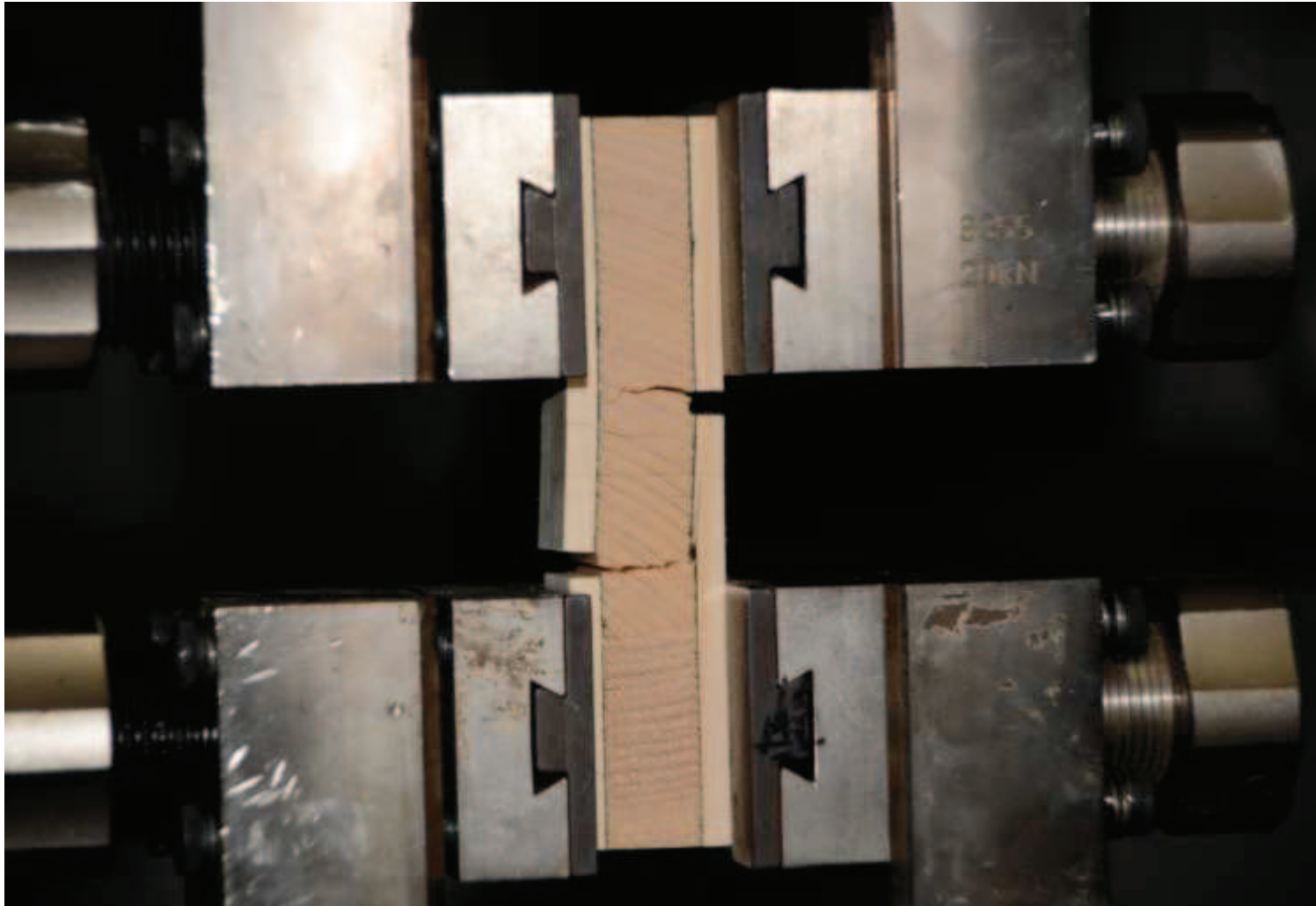
Ready for boiling test



After boiling

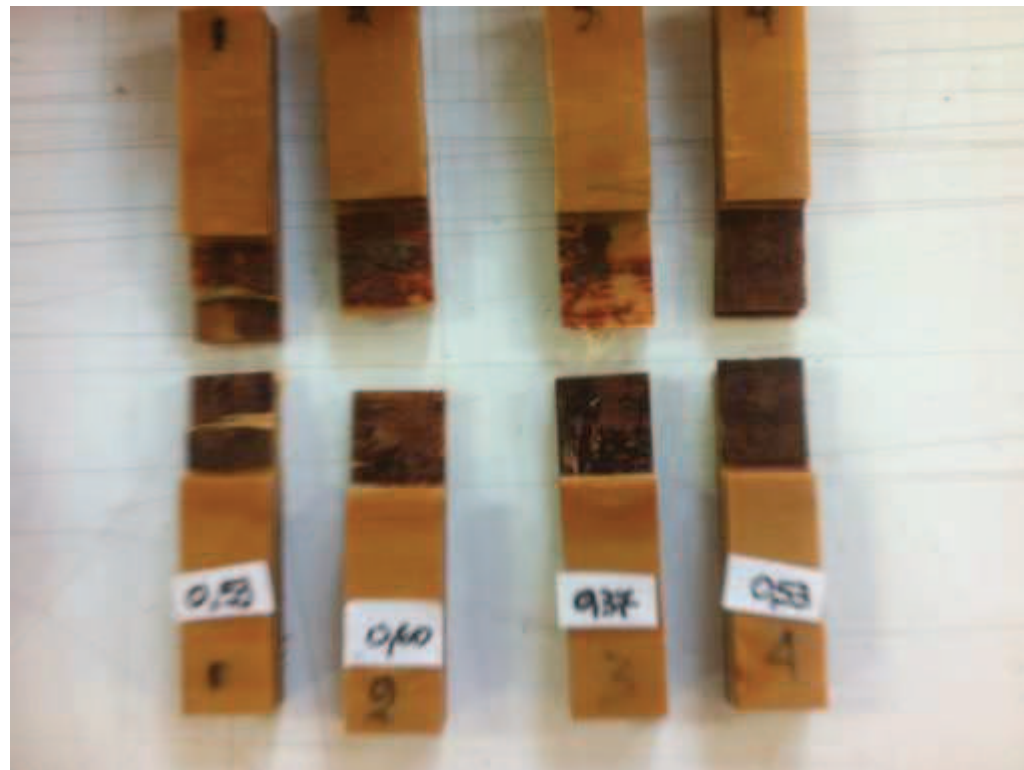


The wood fails





Plywood testing



LVL testing



Formaldehyde emissions of Cold setting system in plywood application with low pressure

Celluwood plywood cold curing (by Chris)								
	Test 1				Test 2			
Small Dimension (cm)	5.1	5.1			5.0	5.1		
Big Dimension (cm)	39.2				39.2			
Area (m ²)	0.0200				0.0198			
Combined area (m ²)	0.0400				0.0396			
	1st hour	2nd hour	3rd hour	4th hour	1st hour	2nd hour	3rd hour	4th hour
Conc Blank (mg/l)	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Average	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Conc Sample (mg/l)	0.392	0.376	0.296	0.348	0.371	0.374	0.313	0.270
Average	0.392	0.376	0.296	0.348	0.371	0.374	0.313	0.270
Individual value (mg/m ² h)	2.46	2.36	1.86	2.18	2.35	2.37	1.98	1.71
Gas Analysis value (mg/m ² h)	2.21				2.10			
Difference	0.11							
Average	2.16							

Formaldehyde emissions of Cold setting system in LVL application with low pressure

Celluwood LVL cold curing (by Chris)								
	Test 1				Test 2			
Small Dimension (cm)	4.5		4.6		4.5		4.5	
Big Dimension (cm)	39.9				39.9			
Area (m ²)	0.0182				0.0180			
Combined area (m ²)	0.0363				0.0359			
	1st hour	2nd hour	3rd hour	4th hour	1st hour	2nd hour	3rd hour	4th hour
Conc Blank (mg/l)	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Average	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Conc Sample (mg/l)	0.108	0.101	0.087	0.077	0.073	0.082	0.078	0.074
Average	0.108	0.101	0.087	0.077	0.073	0.082	0.078	0.074
Individual value (mg/m ² h)	0.75	0.70	0.61	0.54	0.52	0.58	0.55	0.52
Gas Analysis value (mg/m ² h)	0.65				0.54			
Difference	0.11							
Average	0.60							

We also tried to produce columns





Thank you