

Study of interactions between PVAC adhesives and wood after thermo-mechanical (TM) modification



ModWoodLife

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Aim of work

In this work tests results of the impact of thermo-mechanical processing parameters on the formation the wettability of beech veneer (*Fagus sylvatica* L.) and pine veneer (*Pinus sylvestris* L.) and indicators determined based on the adsorption theory of surface interactions such as surface free energy (γ_s) and work of adhesion (Wa) is presented.



Materials & Methods



Pine wood veneer
(*Pinus sylvestris* L.)



Beech wood veneer
(*Fagus sylvatica* L.)

- Each veneer was thermo-mechanically densified between the smooth and carefully cleaned heated plates of a laboratory press at temperatures of 150, 180, and 210°C and pressure of 3 MPa. Samples were densified for 3 minutes.
- For all tests adhesive was applied with the applicator on the modified surface of veneers at thickness of layers of 120 μ m.
- The dynamic contact angle of unmodified veneers and TM sample veneers were measured with PG-3 goniometer using distilled water as the wetting liquid. A drop of water with a volume of 3.5 μ l was applied on veneers by integrated micro-dispensing pump. After 60 seconds of contact with the substrate, the camera recorded its behaviour.



Results

Pine wood veneer (*Pinus sylvestris* L.)

Beech wood veneer (*Fagus sylvatica* L.)

Kind of the adhesive	Temperature [°C]	Time [s]			
		5	10	30	60
EVA	control				
	150				
	180				
	210				

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1. AIM OF WORK

In this work tests results of the impact of thermo-mechanical processing parameters on the formation of the wettability of beech veneer (*Fagus sylvatica* L.) and pine veneer (*Pinus sylvestris* L.) and indicators determined based on the adsorption theory of surface interactions such as surface free energy (γ_s) and work of adhesion (W_a) is presented.



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2. MATERIALS & METHODS

Pine wood veneer
(*Pinus sylvestris* L.)

Beech wood veneer
(*Fagus sylvatica* L.)

3 PVAC adhesives (standard, EPI, EVA)

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The measurements and theoretical formulas (γ_s , W_a , γ_{s2}) were used to calculate dispersive and polar components.

3. RESULTS

Effect of temperature modification of veneers on W_a PVAC adhesives

Kind of wood species	Kind of adhesive	Temperature of TM modification [°C]	Time [s]			
			5	10	30	60
Beech wood	EVA	control	125,23	129,00	132,85	133,44
		150	128,46	130,68	133,79	134,79
		180	127,78	131,28	134,06	134,86
		210	128,84	131,15	135,55	134,13
Pine wood	EVA	control	124,19	130,00	132,40	133,09
		150	127,73	132,01	135,89	136,45
		180	128,79	132,61	136,20	136,80
		210	130,00	133,56	136,20	136,80

Kind of the adhesive	Temperature [°C]	Time [s]			
		5	10	30	60
Pine wood veneer (<i>Pinus sylvestris</i> L.) EVA	control				
	150				
	180				
	210				
Beech wood veneer (<i>Fagus sylvatica</i> L.) EVA	control				
	150				
	180				
	210				

4. CONCLUSIONS

All included in the experiments bonding agents were characterized by high values of W_a , exceeding the level of 100 mJ/m^2 , which is a very positive result. For beech and pine wood W_a ranks in the range of 109-125; 105-124 mJ/m^2 respectively. Most preferred relationships were obtained for the EVA adhesive.

Thank you for your attention

I invite you to look at my poster

Question



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