Water Sorption Properties of Thermo-modified Wood

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Task

to investigate the change in the microstructure and hydrophilic properties of wood due to thermal treatment by a water vapour sorption method

Experimental

Wood samples: pine *Pinus sylvestris*

Thermal treatment:
- hydrothermal (Thermowood Finnforest, t^o =180^{o}C and extra 2 days, , t^o = 220^{o}C)
- treatment in an inert (N_2) medium (New Option Wood, t^o = 200^{o}C)

The measurement of sorption-desorption isotherms in three cycles, its analysis by the comparative method in combination with the BET method

Structural characteristics of thermo-treated wood

Sample	Sorption cycle	A, m^2/g	ΔA, %	a_m, mMol/g	Δa_m, %	α, groups/nm^2	Δα, %
untreated	I	320		2.67		5.02	
	II	333	4.0	2.85	6.7	5.16	2.4
NOW, 200°C	I	175	45.3	1.56	41.6	5.38	7.2
	II	218	31.9	2.27	15.0	5.80	15.5
Finnforest 180°C	I	165	48.4	1.46	45.3	5.33	6.2
	II	216	32.5	1.83	31.5	5.10	1.6
Finnforest 220°C	I	147	54.1	1.19	55.4	4.87	-3.0
	II	215	32.8	2.18	18.3	6.10	21.5

Results

1. The exposure of thermally treated samples in saturated water vapours results in the stabilization of their structure.
2. The decrease in the hydrophility of wood upon thermal treatment makes up 45-54% (depending on the medium and temperature) and is connected mainly with the decrease of the accessible surface.
3. In the second cycle of sorption the concentration of the surface hydrophilic centres in the samples increases considerably.
4. Among the samples under study, the highest hydrophobisation effect is reached for Finnforest, $t^o = 220^oC$.
5. The structure of the thermally treated wood obtained in the N_2 atmosphere (NOW $t^o = 200^oC$) is less tense and more open.