

FIRE RESISTANCE OF WOOD TREATED BY EMULSION FROM KRAFT LIGNIN

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Objectives

This study was aimed to assess the strength of wood after impregnation with emulsion of Kraft lignin using the full cell method. For this purpose the following properties were measured: the specific mass, wettability and Brinell hardness and Fire resistance.

Materials and methods

Tests were performed on *Pinus* sp. sapwood (DBH height, 1.30 m) treated with a preservative emulsion of Kraft Lignin (EKL) (2g/L of Kraft lignin, 1% of NaOH and 97% of water). The treatment was carried out a laboratory autoclave with a 2 L capacity. The different properties were measured for treated and untreated wood.

Results and discussion

The basic characteristics of aqueous preservative emulsion of Kraft Lignin (EKL), were pH 6.8, density 0.97 g.ml⁻¹ and black colour. Samples presented a weight percentage gain (10.5%) after 24 hours with the treatment utilized (Table 1).

Table 1. Weight percent gains (WPG) and hardness (Brinell) after treatment of wood *Pinus* sp. with EKL

Samples	WPG (%)	Density 12% (kg.m ⁻³)	Brinell hardness (HB) [N/mm ²]
Untreated	-	453.8(7.2)a	5.70 (1.38) a
Treated	10.5(0.15)	476.6 (8.4)b	13.44 (1.73) b

The values in parentheses are SD. Mean values in the same column followed by the same letter are not statistically different at level of 5% by the Tukey test

The hardness increase which was approximately 135% in *Pinus* after treatment. Table 2 shows that the ignition time was significantly different for both timber treated (26.6 s) and untreated (13.2 s).

The EKL emulsion retarded the ignition over to 10 seconds compared to untreated wood. The flame was longer in the treated wood (172 s) and with glowing longer time (714 s).

Table 2. Short time fire test and ignition time of the three species studied.

Samples	Ignition time (s)	Flame time (s)	Ember time (s)	Weight loss (%)
Untreated	13.2(1.6)a	137.7 (18.0)a	335.2 (31.3)a	33.5(1.4)b
Treated	26.6(0.9)b	172.2 (10.2)b	714.2 (24.0)b	26.9(1.3)a

The values in parentheses are SD. Mean values in the same column followed by the same letter are not statistically different at level of 5% by the Tukey test



Fig. 1. Fire test in wood treated.

Nevertheless, the treated wood presented lower weight loss (26.9%) compared with the untreated wood (33.5%). The differences in the wetting characteristics of wood treated and untreated by sessile droplet method are presented in Figure 2.

The treatment reduces the rate of moisture uptake, with increase of contact angle.

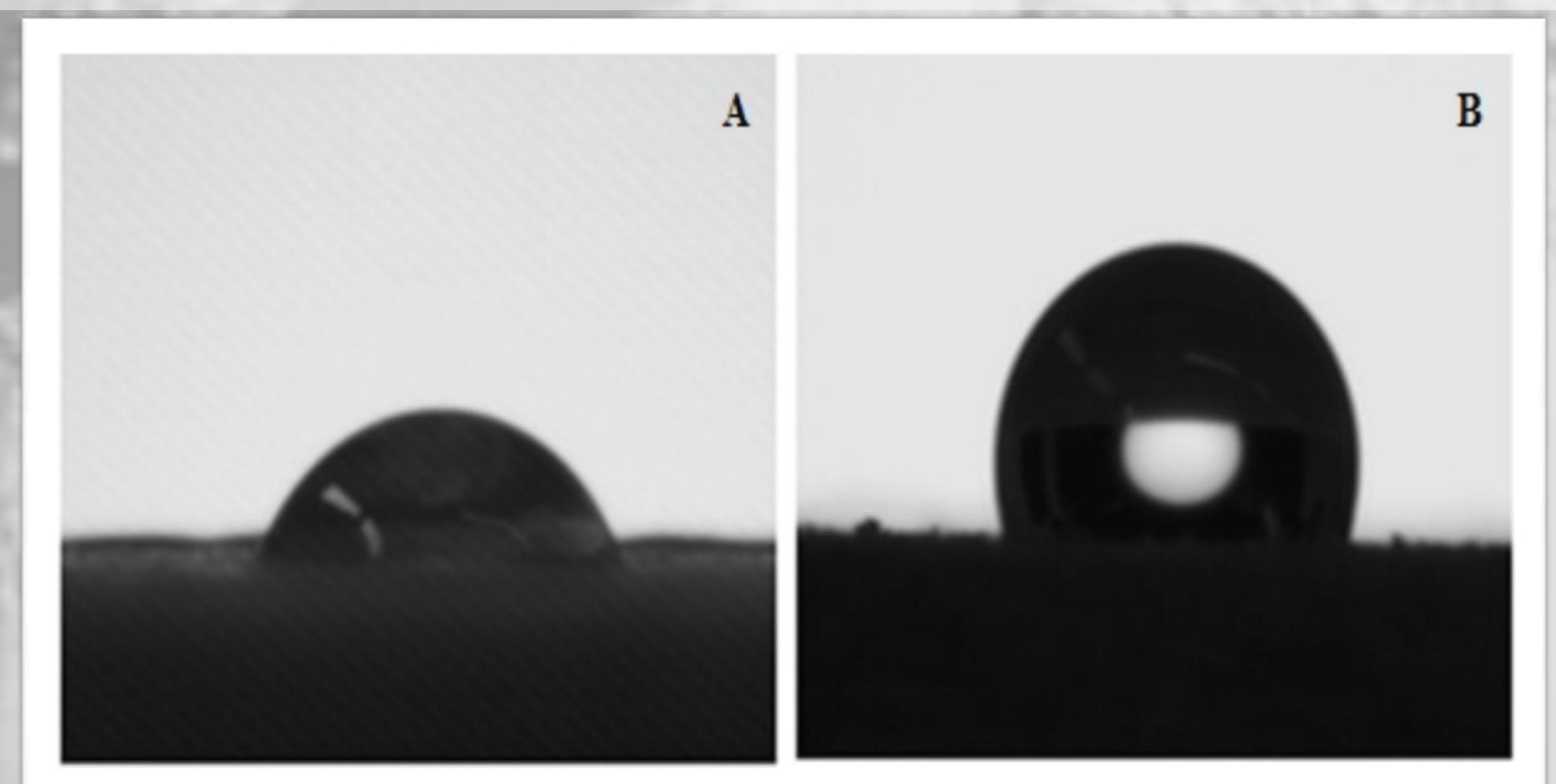


Fig. 2 The image droplet water in wood surface. A: Untreated wood (time= zero), B: Treated wood with EKL (time= zero)

Conclusion

The impregnation with EKL by full cell method improved the performance of wood in relation to ignition of fire and the hardness of the wood, when compared with the untreated wood. Further, improve the hydrophobic properties of wood *Pinus* sp.