

**ABSTRACT SYMPOSIUM NAME:** Valorization of Renewable Resources & Residuals into New Materials & Multiphase Systems

**ABSTRACT SYMPOSIUM PROGRAM AREA NAME:** CELL

**CONTROL ID:** 2848207

**PRESENTATION TYPE:** Oral Preferred : Do not consider for Sci-Mix

**TITLE:** Synthesis and mechanical characterization of high pressure laminates modified with Kraft lignin

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**ABSTRACT BODY:**

**Abstract:** Phenol-formaldehyde resins (PF) are thermosetting polymers used as adhesives for plywoods and other structural wood products including high pressure laminates (HPLs). HPLs are composite materials comprised of a paper-based decorative surface and a substrate impregnated with PF resin.

PF adhesives are synthesized using two reagents made from petrochemicals: phenol and formaldehyde. The substitution of such substances by natural products including lignin, tannin, and furfural among others has been increased in the last 20 years due to environmental and economic benefits [1]. Lignin is an inexpensive, abundant and non-toxic by-product from pulp production, used as replacement of P, due to its similar structure to PF resins.

In this work, the industrial synthesis and characterization of three resol-type phenol-formaldehyde resins modified with 10, 20 and 30 wt% of Kraft lignin from hardwood were studied. The Kraft lignin was activated by hydroxymethylation in all cases. The resols characterization involved industrial measurements of free formaldehyde, viscosity, total solids and density. The resins were used for the industrial impregnation of Kraft-type paper and the production of laboratory laminates. The mechanical and thermal properties of the laminates were measured. Mechanical measurements included tensile, flexural, impact and interlaminar tests. Thermogravimetric and dynamic mechanical analysis were used for the thermal characterization. In addition, the aging of materials in water was studied.

No significant differences in mechanical and thermal properties between traditional and modified materials were found with replacement up to 20 wt% of phenol. Modified laminates exhibited better water resistance due to the lignin hydrophobicity. For practical applications, this study suggests that resols modified with 20 wt% of Kraft lignin could be used for the production of HPLs, while resols modified with 30 wt% of lignin for postformable laminates.

Industrial tests were carried out at Centro S.A, San Francisco, Córdoba.

(No Image Selected)