

Accepted Manuscript

Towards a good interphase between bleached kraft softwood fibers and poly(lactic) acid

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PII: S1359-8368(16)30578-9

DOI: [10.1016/j.compositesb.2016.05.008](https://doi.org/10.1016/j.compositesb.2016.05.008)

Reference: JCOMB 4290

To appear in: *Composites Part B*

Received Date: 13 February 2016

Revised Date: 19 April 2016

Accepted Date: 1 May 2016

Please cite this article as: Granda L, Espinach FX, Tarrés Q, Méndez JA, Delgado-Aguilar M, Mutjé P, Towards a good interphase between bleached kraft softwood fibers and poly(lactic) acid, *Composites Part B* (2016), doi: 10.1016/j.compositesb.2016.05.008.

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1 Towards a good interphase between bleached 2 kraft softwood fibers and poly(lactic) acid

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13 Abstract

14 An increasing environmental consciousness on society led to the development of
15 materials with a lower environmental impact. In this sense, in the recent years, the
16 substitution of synthetic or mineral fibers by natural fibers, as polyolefin matrices
17 reinforcement, has been an active and interesting topic of research, as well as the
18 development of competitive matrices based on renewable resources. PLA is a
19 biodegradable polymer with higher mechanical properties than polypropylene (PP).
20 Moreover, the interphase between polylactic acid (PLA) and natural fibers, in order to
21 obtain relevant mechanical properties, is still unsolved. Nowadays, and to the best
22 knowledge of the authors, there are few relevant works published about these
23 biodegradable material reinforced showing satisfactory mechanical properties. The
24 present work pretends to obtain PLA biocomposites with a good interphase that allow
25 a relevant improvement on mechanical properties when reinforced. Thus, different
26 amounts of diglyme were added to bleached kraft softwood fibers with the purpose of
27 avoiding fiber agglomeration during compounding. Moreover, stone groundwood
28 (SGW) and fluff pulps were also used as reinforcements. Then, and the results were
29 compared to the previous ones in order to determine the influence both of the lignin
30 on fiber surface, via XPS analysis, and the dispersion within the matrix. The fiber
31 treated with 2/3 of diglyme followed a lineal and positive progression of the tensile
32 strength when increasing reinforcement contents were added. Moreover, the 30wt%
33 reinforced PLA biocomposite exhibited a tensile strength of the same magnitude than
34 20wt% of glass fibers reinforced PP composites, bringing to light the feasibility of
35 substituting the synthetic matrix commodities and obtaining new and biodegradable
36 generation of composites.

37 **Keywords:** A. Fibres; A. Polymer-matrix composites (PMCs); B. Mechanical properties;
38 D. Photoelectron spectroscopy (XPS); E. Injection moulding

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