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

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Abstract

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

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