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MECHANICAL CARACTERISATION OF POLYESTER RESIN AND CORN NATURAL FIBERS COMPOSITE

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ABSTRACT

The use of natural fibers as reinforcement in polymer matrix composites is gaining popularity in the development of renewable products. Although glass and other synthetic fiber-reinforced plastics possess high specific strength, their fields of application are very limited because of their inherent higher cost of production.
The work deals with the characteristics of fiber composites that can offer several advantages, like low cost, weight savings and relatively good mechanical properties. It focuses on the effects of corn fibers as reinforcement agents in composites. Mechanical testing was performed to qualify the reinforcement properties of the corn fibers and consequently to compare with fiberglass composites.

INTRODUCTION

The objective of this study was to evaluate the use possibility of natural fibers from autochthones plants without commercial value in the production of "green" composites once the higher value-in-use may mean increasing the content of a local material (a natural fiber) in the local production of a part (a composite) for the assembly of an otherwise international product (a car) (Wallenberger and Weston, 2004).

Fiber-reinforced polymer composites have played a dominant role for a long time in a variety of applications for their high specific strength and modulus. The mechanical properties of a natural fiber-reinforced composite depend on many parameters, such as fiber strength, modulus, fiber length and orientation, in addition to the fiber-matrix interfacial bond strength (Hussien et al., 2009)

Fig. 1 Corn stems and Corn extracted fibers.

For the production of corn fiber reinforced composite, year plants stems have been collected some days after corn ear crop. The stems have been stored for about a month and then have been cut between nodes. For fiber extraction these pieces have been rehydrated by submersion in water in a period of 24 hours and then smashed to allow tender plant tissues to separate from plant fibers. To help and accelerate this process that intends to be like traditional maceration processes a brushing operation has been performed. After extraction, these fibers have been naturally air dried.

Corn fibers were cut into pieces with length varying from 25 mm to 40 mm to allow better impregnation when producing the composite plates. This way, there had been produced polymeric composites plates constituted by polyester resin reinforced with corn fibers with random disposition but controlling the fiber weight content. For comparison, had been produced plates of polyester resin composites reinforced with glass fiber. In both cases, test samples have been cut according the applicable standard.

A total of 10 individual tests were performed for each type. The tensile tests were performed according to ASTM D3039 at room temperature. Load-elongation curve, braking load, peak stress were acquired in real time by testing machine and provided at the end of each test. Flexural tests were performed according to ASTM D790 to determine flexural strength and the elastic modulus in flexure of the composites.

RESULTS AND CONCLUSIONS

As conclusion we can affirm that the produced polymeric corn fiber composite has adequate mechanical properties for lots of industrial applications even, as expected, these are lower than glass fiber composites. Using this natural fiber content this product become an more ecological substitute and environment friendly that the traditional polymeric glass fiber composites.

For other way, once stems from corn plants are wastes that traditionally are left in the field until starting decomposing and then are shredded and incorporated in to the soil, acting like natural low cost substrate, by collecting them and giving them some commercial value will make crops more profitable.

As further work, other wastes from autochthone species natural fiber composites are also in study and in the way to be characterized.

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