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Comparison between the properties of husk green coconut and curaua cellulose fibers chemically treated for compatibility with polypropylene matrix

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Abstract – Cellulose fibers have been used for the purpose of obtaining polymer composites that have properties of engineering materials. Thus, it is necessary to overcome the challenge of making such fibers, which are hydrophilic, to mix into polymer matrices, such as polypropylene, which is extremely hydrophobic. For that reason, different chemical methods can be applied to remove extractable amorphous components, changing the fiber surface, morphology, and thus its properties. In this paper, both husk green coconut and curaua fibers were chemically treated to remove the amorphous phase of the fiber and afterwards, they were functionalized so that they possess groups capable of promoting chemical compatibility between fiber and matrix.

Cellulose fibers have been used as fillers in various polymer materials to reduce cost and density [1]. However, the main objective when adding natural fibers to a polymer matrix is to improve its properties. Therefore, by means of chemical treatments it is possible to obtain composites whose properties are improved in relation to those of pure matrix. For composites with polyolefin, like polypropylene, it is especially difficult to develop better mechanical properties since the capacity of fibers for compatibilizing with a polypropylene is very low [2].

In this work, chemical treatments were used to modify both husk green coconut and curaua fibers. The fibers of coconut were cut and grounded, and later, the fiber was subjected to a treatment with NaOH 5%, and named ACTB, while another part of the same fiber was subjected to a treatment with H_2SO_4 63.5%, named ACTA. These treatments were applied for the removal of extractable amorphous components of the fibers, such as lignin, hemicellulose, waxes and others, and to physically modify the surface of the fibers, promoting the interpenetration of the polymer matrix into the fiber. Samples of ACTB and ACTA were subjected to treatments with a silane, for improving the chemical compatibility between fiber and matrix.

The same treatments were applied to the curaua fibers. According to the literature, this fiber shows excellent properties due to its composition in cellulose [3], the crystalline phase of the fiber, with about 70%. The fibers of coconut were subjected to analysis of scanning electron microscopy (SEM), which showed significant changes on its surface according to the chemical treatment (Figure 1).

Curaua fibers, as well as coconut shell, were also subjected to thermogravimetric analysis, and X-ray diffractometry to assess the degree of crystallinity of those materials.

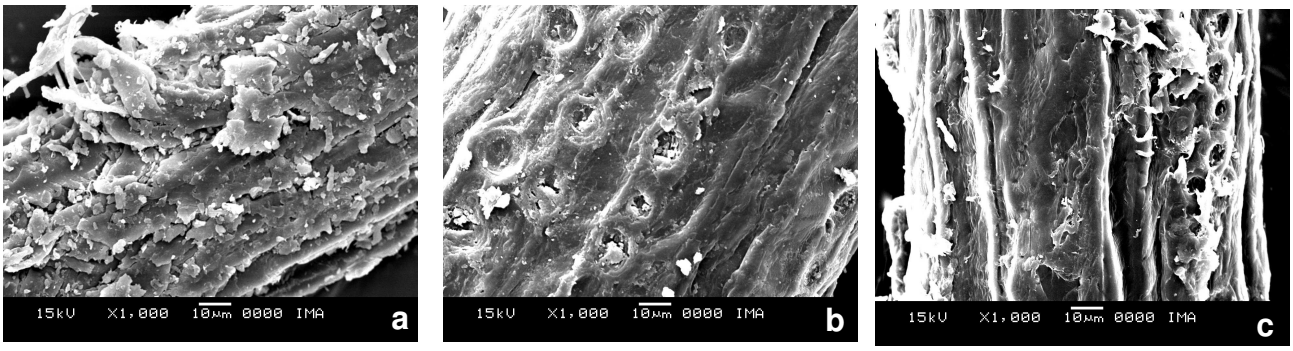

Figure 1: Scanning electronic microscopy of the coconut fibers a) *in nature* (without treatment); b) ACTA - Fiber of coconut treated with H_2SO_4 63.5%; c) ACTB - Fiber coconut treated with NaOH 5%.

[1] J.M. Park, P.-G. Kim, J.-H. Jang, Z. Wang, B.-S. Hwang and K.L. DeVries. Comp.: Part B 39 (2008) 1042.

[2] L. Ghali, S. Msahli, M. Zidi and F. Sakli. Mater. Letters 63 (2009) 61.