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Properties studies of starch/PCL/Sisal biocomposites to be applied with sisal nanocellulose.

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Abstract - Sisal fibers water washed and after treatment with alkaline peroxide (bleaching) were incorporated into the TPS / PCL blends. Morphological properties, mechanical and thermal analysis of TPS/PCL/Sisal biocomposites were analyzed. The composites with the bleached fiber showed the best results of tensile strength and thermal stability. There was also improvement in the fiber-matrix in the composite with fiber bleached by SEM. This work enables studies of this matrix with sisal nanocellulose fibers.

Composites reinforced with sisal fibers stand out due to their high impact resistance, good properties and tensile strength [1,2]. This is attributed to the fact of the fiber present one of the highest values of modulus tensile and resistance of natural fibers [1]. Effects on morphology and thermal stability of the biocomposites with washed water sisal fibers and sisal fiber bleached have been investigated. Sisal fibers have been previously submitted to two different treatments: bleaching process and water washed sisal fibers. Biocomposites were processed in a Haake rheometer, 60 rpm, 150 ^{0}C. Biocomposites morphology was investigated by scanning electron microscopy (SEM) (figure 1), mechanical properties by tensile test (table 1). Biocomposites with bleached fibers showed better fiber-matrix adhesion. Results showed that both tensile strength of the composite using treated fibers (bleaching) increased in comparison with the composite using water washed fiber. These results allow biocomposites studies with nanofibers sisal, after bleaching fiber with alkaline peroxide.

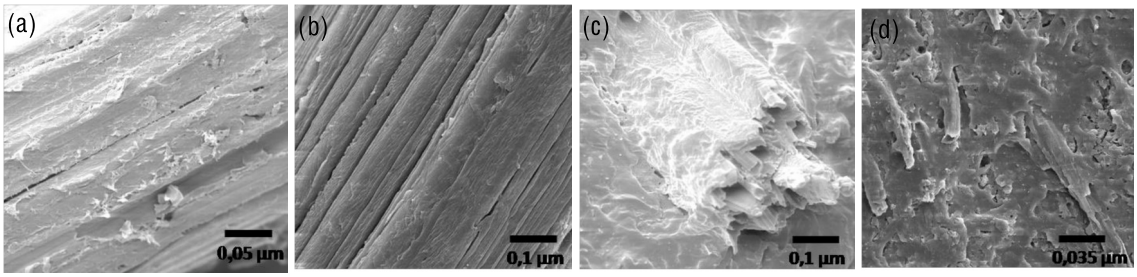

Figure 1. SEM of sisal fibers (a) water washed (b) bleached and composites with sisal fiber (c) water washed and (d)bleached.

Table 1. Mechanical properties of biocomposites with washed fibers and sisal bleaching fibers.

Samples	*Tensile strenght (MPa)*	*Elongation at break (%)*	*Modulus Tensile (MPa)*
TPS	*0,83 ± 0,05*	*12,5 ± 2,65*	*154,6 ± 11,7*
PCL	*33,12 ± 8,48*	*798,2 ± 119,04*	*214,8 ±56,14*
TPS/PCL	*2,19 ± 0,09*	*11,9 ± 0,24*	*152,0 ± 9,69*
TPS/PCL/Sisal (H_2O)	*2,58 ± 0,37*	*6,55 ± 0,44*	*133,0 ±16,32*
TPS/PCL/Sisal ($NaOH+H_2O_2$)	*3,75 ± 0,27*	*3,62 ± 0,21*	*137,0 ± 23,5*

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