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Changes of Nanoscopic Morphology of Various Bioresources by Different Milling Systems

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Abstract

It is important to be aware that the kind of lignocellulosic biomass can vary significantly between e.g. softwoods, hardwoods and herbaceous resources, and this can have a significant bearing on the mechanical fibrillation process as well as the final product. The objective of this study is to investigate the nanoscopic morphological changes of eight different bioresources by different milling systems. Red pine, Korean white pine, Japanese poplar, Willows were used as woody source and Kenaf, Evening prim rose and Corn stover were used as herbaceous source. Furthermore, power consumption during milling and the filtration time, tensile properties of nanopaper of the resulting products were also compared in different raw sources and milling systems. The nanoscopic morphological changes of eight different bioresources by different milling systems were investigated. Morphological characteristics of ground products are different in different milling systems. Mechanical grinding in herbaceous bioresources was more effective than that in woody bioresources with lower energy consumption, showing the finer morphology. The tensile properties of nanopaper from wet disk-milled products were better than those of copy paper, even though they contained all lignocellulosic components.

Key words: nanocellulose, cellulose nanofibril, microfibrillated cellulose, disk-milling