XVII[th] World Congress of the International Commission of Agricultural and Biosystems Engineering (CIGR)

Hosted by the Canadian Society for Bioengineering (CSBE/SCGAB)
Québec City, Canada June 13-17, 2010

DETERMINATION OF THE OPTIMUM COMBINATION OF PROCESSES IN NANO-SIZING FLAX FIBRES FOR USE AS SUSTAINABLE REINFORCEMENT IN BIONANOCOMPOSITES

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CSBE100559 – Presented at the Nanotechnologies Applied to Biosystems Engineering and the Environment Symposium

ABSTRACT Renewable materials have been getting a lot of attention lately especially in the light of replacing feedstock from fossil fuel-based products with environmentally friendly or "green" renewable materials without compromising engineering properties. These materials, like flax, hemp, jute, and a lot more, have been studied and proven to be effective in the reinforcement of composites at the millimeter or, at least, the micrometer scale. In the area of composite reinforcement, the advent of nanotechnology is necessitated by the fact that the smaller the dimensions (especially the diameter), the higher the aspect ratio and, therefore, the better the engineering properties. Moreover, at this size, quality inconsistency due to the intermittent presence of weak points such as nodes in millifibres and microfibres are eliminated. This study delves into the process of resizing flax fibres into nanometer scale using acid hydrolysis, homogenization, and beating in a PFI mill solely and in different combinations to find the optimized process or combination of processes based on the size, quality, and composition of the final product of nano-sizing. It is hoped that a novel flax nanofibre which is biodegradable, biorenewable, and biosustainable can be produced with consistent nano-size, consistent quality, and consistent composition to sustainably reinforce bionanocomposites with diverse applications.

Keywords: bionanocomposites; flax nanofibres; nano-sizing