

Extraction of Cellulose Nanofibrils from Pulp Using Enzymatic Pretreatment and Evaluation of Their Papermaking Potential

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Abstract : Cellulose nanofibrils (CNF) have shown potential of their extensive use in various fields, including papermaking, due to their unique characteristics. In this study, CNF's were prepared by fibrillating the pulp obtained from raw materials e.g. bagasse, hardwood and softwood using enzymatic pretreatment followed by mechanical refining. These nanofibrils, when examined under FE-SEM, show that partial fibrillation on fiber surface has resulted in production of nanofibers. Mixing these nanofibers with the unrefined and normally refined fibers show their reinforcing effect. This effect is manifested in observing the improvement in the physical and mechanical properties e.g. tensile index and burst index of paper. Tear index, however, was observed to decrease on blending with nanofibers. The optical properties of paper sheets made from blended fibers showed no significant change in comparison to those made from only mechanically refined pulp. Mixing of normal pulp fibers with nanofibers show increase in $^{\circ}\text{SR}$ and consequent decrease in drainage rate. These changes observed in mechanical, optical and other physical properties of the paper sheets made from nanofibrils blended pulp have been tried to explain considering the distribution of the nanofibrils alongside microfibrils in the fibrous network. Since usually, paper/boards with higher strength are observed to have diminished optical properties which is a drawback in their quality, the present work has the potential for developing paper/boards having improved strength alongwith undiminished optical properties utilising the concepts of nanoscience and nanotechnology.

Keywords : enzymatic pretreatment, mechanical refining, nanofibrils, paper properties

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