

Studies on Kinetics and Spectroscopic Characterisation of Acetylated Pulps

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ABSTRACT

Acetylation is expected to reduce the hydrogen bond density between -OH groups, increase water-repelling characteristics and enhance paper-making characteristics. The experimental acetylation procedure using DMF solvent and related calculation has been described. The reaction was monitored by determination of hydroxyl value at regular reaction intervals. The observation showing effect of acetylation on paper making properties have been reported. Kinetics of acetylation has also been reported by using integral method of analysis. The empirical observations were strengthened by IR spectrophotometer analysis using Shimadzu IR-800. The acetylation reaction was carried out at room temperature at 30 °C at a time. The time for the reaction varied between 5 to 8 hours, which depends on hydroxyl value of acetylated pulp. The acetyl content of acetylated bagasse, bamboo and waste paper pulp were estimated and found to contain 5.26 %, 4.96 % and 5.11 % respectively.

Characterization of acetylated pulp was conducted and hydroxyl values were determined at regular interval. Considerable reduction in hydroxyl value with time was observed using bagasse pulp, bamboo pulp and wastepaper pulp. As per hydroxyl value obtained, bagasse pulp acetylation equilibrium was established after 8 hours and low hydroxyl value was found. In case of bamboo pulp highest hydroxyl value, equilibrium established after 6 hours., and had waste paper pulp observed intermediate hydroxyl value and equilibrium established after 7 hours. The first order rate constant, for bagasse pulp, bamboo pulp and waste paper pulp were 0.177 0.188 and 0.196 hr⁻¹ respectively.

The changes in properties of paper after acetylation were visualized. The acetylation did not bring any change in weight per unit area of pulp as indicated by GSM value. Acetylated waste paper pulp and bagasse pulp did not exhibit change in burst factor, at 80 GSM. . Acetylated bamboo pulp exhibited 33 % increase in burst factor. The effect of acetylation on tear force, tear factor and tearing strength of pulp was found to be remarkable. At lower degree of acetylation, the enhancement in tear factor was very high. With further acetylation, the tear factor increases was small and at further increase in degree of acetylation, tear strength decreased. The folding endurance of acetylated bamboo pulp was found to be excellent (almost 100 % increase), The acetylated product was characterized by IR Spectroscopy to conform the acetylation of cellulose pulp. In this case, the -OH group of bagasse pulp was expected to convert to



Key words: Degree of acetylation, kinetics, spectra, folding endurance and acetyl content