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Improving Paper Mechanical Properties and Printing Quality by Using Carboxymethyl Cellulose as a Strength Agent

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Abstract : Carboxymethyl cellulose (CMC) is an anionic water soluble polymer that has been introduced in paper coating as a strength agent. One of the main objectives of this research is to investigate the influence of CMC concentration in improving the strength properties of paper fiber. In this work, we coated the paper sheets; Xerox paper sheets by different concentration of carboxymethyl cellulose solution (0.1, 0.5, 1, 1.5, 2, 3%) w/v. The mechanical properties; breaking length and tearing resistance (tear factor) were measured for the treated and untreated paper specimens. The retained polymer in the coated paper samples were also calculated. The more the concentration of the coating material; CMC increases, the more the mechanical properties; breaking length and tear factor increases. It can be concluded that CMC enhance the improvement of the mechanical properties of paper sheets result in increasing paper stability. The aim of the present research was also to study the effects on the vessel element structure and vessel picking tendency of the coated paper sheets. In addition to the improved strength properties of the treated sheet, a significant decrease in the vessel picking tendency was expected whereas refining of the original paper sheets (untreated paper sheets) improved mainly the bonding ability of fibers, CMC effectively enhanced the bonding of vessels as well. Moreover, film structures were formed in the fibrillated areas of the coated paper specimens, and they were concluded to reinforce the bonding within the sheet. Also, fragmentation of vessel elements through CMC modification was found to be important and results in a decreasing picking tendency which reflects in a good printability. Moreover, Scanning – Electron Microscope (SEM) images are represented to specifically explain the improved bonding ability of vessels and fibers after CMC modification. Finally, CMC modification enhance paper mechanical properties and print quality.

Keywords : carboxymethyl cellulose (CMC), breaking length, tear factor, vessel picking, printing, concentration
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