

# Improvement of durability of paper made of non-wood fibers

## 비목재 섬유로 제조된 종이의 내구성 향상

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### Abstract

In this study, diverse approaches to enhance durability of paper were examined to find critical factors affecting the durability of durable papers and to find the most efficient method to improve the durability. In evaluating paper durability a wet soiling test consisted of crumpling treatment and wet soiling in harsh conditions was used.

Critical factors that affect the paper durability were examined from the wet soiling experiment. It was found that bulk and wet strength of the durable paper after crumpling treatment were two most important factors for durable paper.

The effect of using non-wood fibers such as noil, abaca, flax and linter on paper durability was examined. Abaca fibers showed detrimental effects on paper properties mostly because the fibers were too long to make papers with good formation. Papers containing abaca fibers showed lower improvement in paper properties after impregnation because the pick-up weight was lower than other papers. The paper containing abaca fibers, however, showed the strongest crumpling resistance.

Penetration of polyvinyl alcohol (PVA) into paper decreased proportionally as concentration of PVA increased. Opacity decreased as PVA concentration increased. Tensile strength of impregnated paper with PVA solution increased as

curing agent concentration increased. On the other hand, folding endurance of PVA impregnated paper decreased as the curing agent concentration increased. The results showed that the concentration of PVA and curing agent should be carefully controlled to meet the specifications of physical properties. Crumpling treatment causes partial folding and rupture of fiber bonding, which ultimately ruins the paper structure. In general, porosity was increased while tensile strength was decreased with crumpling treatments. Results showed that the optimum concentrations of PVA and curing agent was needed to obtain the most advantageous effects in paper properties for durable papers.

Based on the experimental results, mill trial was carried out to produce durable paper. Bulk and wet strength of the paper dramatically improved. Furthermore, the paper showed strong wet soiling resistance for more than 20 minutes.