

## **PHYSICAL PROPERTIES OF LACCASE-MEDIATOR DELIGNIFIED PULPS (1998)**

**A Dissertation by Kaaren Haynes**

**ABSTRACT:** This research is a detailed study of the effects of laccase-mediator delignification on the pulp and paper properties of kraft Loblolly pine and fully bleached industrial Douglas-fir kraft pulp. In this study, the mediator N-hydroxybenzotriazole (HBT), and the recently reported mediators H-acetyl-N-phenylhydroxylamine (NHAA) and violuric acid (VIO) are used. Kappa 23 and kappa 50 loblolly-pine kraft pulps and an industrial fully bleached Douglas-fir kraft pulp were used in this research. Comparisons were made between oxygen delignified and the laccase-mediator delignified pulps. The effects of carboxylic acid groups on pulp properties was explored. Surface carboxylic acid groups were measured using ESCA and bulk acid group content was measured using conductometric titration. In addition, the effects of carboxylic acid groups in lignin versus carbohydrates were explored. The hypothesis was that the laccase-mediator system could be used to introduce surface acid groups to pulp, and increase the specific bond strength. Laccase-mediator treatments were selective with respect to lignin. Extractives also played a role and may have affected the selectivity of the process. The laccase-mediator systems introduced carboxylic acid groups exclusively to lignin. The Scott bond strength of laccase-mediator delignified pulps was similar to that of oxygen delignified pulps. When kappa 50 pulp was treated with the laccase-mediator systems, the density of the resulting handsheets was reduced. The presence of lignin or extractives, modified by the laccase-mediator system, negatively impacted paper physical properties. The laccase mediator system had no effect on fully bleached pulp properties above that of a standard alkaline extraction stage. Acid groups in lignin did not increase the specific bond strength.