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Production and Characterization of Regenerated Cellulose Fiber from Pineapple Leaf Waste Using Dry-Jet-Wet Spinning

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Abstract : Thailand, a world leader in pineapple production and export, generates substantial amounts of pineapple leaf waste, a valuable source of cellulose fiber. This study investigates the production of high-quality dissolving pulp and regenerated cellulose fiber from pineapple leaf fiber using the eco-friendly lyocell process, which utilizes non-toxic, recyclable chemicals. The findings indicate that KOH can effectively replace NaOH in the pulping process, producing pulp with properties suitable for fiber spinning. Optimized bleaching sequences employing chlorine dioxide and hydrogen peroxide stages yielded bright, high-purity pulp with alpha-cellulose content comparable to commercial softwood pulp, along with higher viscosity and degree of polymerization. Lyocell fibers were successfully produced via dry-jet-wet spinning and compared to commercial lyocell fibers. These fibers exhibited similar density, color, and chemical structure but had larger dimensions, greater shrinkage, improved thermal stability, enhanced tensile strength, and superior methylene blue adsorption capacity. A market survey highlighted consumer interest in T-shirts made from sustainable lyocell fibers derived from agricultural waste, underscoring their environmental advantages. This study demonstrates a sustainable and innovative solution for repurposing agricultural waste into high-value textile products. Future work will focus on addressing the scalability and cost-efficiency of the process to facilitate its industrial application and expand its impact on sustainable textile manufacturing.

Keywords : pineapple leaf fiber, dissolving pulp, regenerated cellulose, dry-jet wet spinning
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