A Plant With Promise: Using Engineering Principles To Create an Eco-Friendly Manufacturing Process for a Biodegradable Piezoelectric Transducer

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This project used scientific principles to collect statistically relevant data and develop a feasible manufacturing process for piezoelectric transducers with minimal environmental impact. This was accomplished by eliminating hazardous caustic soda, optimizing the concentration of Rochelle salt (RS), and finding the minimal amount of time needed to infuse the fibers. Two chemicals were evaluated in the lignin breakdown process of the cornhusks to replace caustic soda. Washing soda was an effective lignin decomposer and worked almost as well as caustic while reducing the negative environmental impact. RS concentration was tested to reduce the amount of excess RS crystals. The highest concentration tested, 2.66 mol/kg, had the highest output (400.5mV), but had a high deviation and many crystals formed outside the fibers. The concentration chosen was 1.33 mol/kg, which had an average voltage of 329mV and a much more solid structure with less deviation. The substrates were soaked for different time intervals (1, 2, and 4 hours) to reduce the amount of energy put into the soaking process. Their averages were very similar, and there was no significant increase when soaked for longer. Optimal soaking was determined to be one hour. Concentration was re-tested to find the plateau at which the maximum amount of RS that entered the fibers. 1.33 mol/kg had the highest average value, so it was confirmed to be the optimal concentration. Finally, a process flow diagram was fashioned to create a waste treatment plan for all steps of the process for an eco-friendly production of the substrates.

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