Rewriting the Industry: A Novel Approach to 100% Biodegradable Ink Production and Recyclability

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Printable inks, both synthetic and soy-based, require chemical separation during the recycling process resulting in contaminated wastewater and the release of dangerous volatile organic compounds (VOCs). I formulated ink from food grade ingredients and tested the hypothesis that biodegradable ink can adhere and subsequently be separated from Kraft paper substrates during recycling without the use of chemicals. The formulated ink was sprayed onto three recyclable paper substrates: uncoated Kraft paper, cardboard, and paper grocery bags to test for absorption. The ink was tested against an impregnated inked logo on grocery bags and cardboard. Each ink was analyzed for dry and wet abrasion resistance and submerged water separation. Blending test materials into pulp validated chemical free ink separation during recycling. The formulated ink tested equally for 240 cycles of dry abrasion and four days of water submersion. Water abrasion tests showed formulated ink separation at 30 seconds but no separation of impregnated ink from the grocery bag and cardboard at 30 days. This study showed the formulated biodegradable ink produced equal results in dry abrasion resistance and limited exposure to moisture tests creating a viable alternative to packaging inks. Water agitation tests proved formulated ink separation from substrates during recycling in a chemical free environment. Further experiments of colored formulated inks may increase separation time in the presence of water and enhance UV resistance.

Awards Won:
NC State College of Engineering: Award to attend NC State Engineering Summer Camp