

Tita Archaviboonyobul 2012: Influence of Poly(lactic acid) Electro spraying Technique on Properties of Paperboard. Master of Science (Packaging Technology), Major Field: Packaging Technology, Department of Packaging and Materials Technology.

Thesis Advisor: Assistant Professor Tunyarut Jinkarn, Ph.D. 172 pages.

The main objective of this research was to improve water and oil resistance properties of paperboard for packaging application by electro spraying technique using poly (lactic acid), PLA, solution and mixture of poly (lactic acid) and poly (butylene adipate-co-terephthalate), PBAT, solution. These two selected coating substances are biodegradable polymers which will not obstruct the biodegradation process of paperboard. Paperboard used for the research was a 300 g/m<sup>2</sup> single-side coated duplex board. Properties of paperboard that were investigated composed of water and oil resistance properties, mechanical properties and barrier properties to water vapor and oxygen (WVTR and OTR). Surface of coated paperboard was also characterized. The study composed of three sections. First section was to find optimum electro spraying conditions. Four conditions to be studied included high voltage power at 6, 7, 8 and 9 kV, flow rate at 3, 4 and 5 ml/hr and distance between needle to paperboard at 10 and 20 cm. PLA concentration were set at 0.5, 1, 2, 3 and 4 % (w/v). The solution volume was fixed at 10 ml for this section and throughout all electro spraying trails. The second section of the study was to monitor the effects of PLA solution concentration on properties of coated paperboard using optimum condition from first section. Finally, last section of the research was to investigate the effects of adding PBAT into PLA spraying solution on properties of paperboard. According to the results, optimum condition for electro spraying was at high voltage power of 8 kV, flow rate of 4 ml/hr and distance between needle and paperboard at 20 cm. According to the second section of the study, PLA concentration at 1% (w/v) showed the best result. Water and oil resistance as well as barrier properties were significantly improved ( $p \leq 0.05$ ) without any deterioration on mechanical properties. For the last part of the research, mixture ratio of PLA and PBAT solution were set at 100:0, 80:20, 50:50, 20:80 and 0:100. The total solid content of the mixture for each treatment was set constant at 0.1 g in 10 ml chloroform solution. The results showed that adding of PBAT into PLA spraying solution caused no changes in water and oil resistance properties but can significantly increase mechanical and barrier properties of coated paperboard ( $p \leq 0.05$ ). This is because short fiber of PBAT derived from electro spraying can reinforce the paperboard structure. In addition, electro spraying particles derived from mixture of PLA and PBAT also showed less porous structure and this might contribute to less gas and water vapor transmission.

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Student's signature

Thesis Advisor's signature