

ผลของสารเชื่อมขวางต่อสมบัติสารชั้นกราฟต์โคพอลิเมอร์ของแป้งมันสำปะหลังและกรดอะคริลิก
สำหรับคุณภาพภาพพิมพ์สกรีนฐานน้ำบนแผ่นพลาสติก

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EFFECT OF CROSSLINKER ON THICKENER PROPERTIES OF ACRYLIC ACID-
CASSAVA STARCH GRAFT COPOLYMER FOR WATER-BASED SCREEN
PRINT QUALITY ON PLASTIC SHEETS

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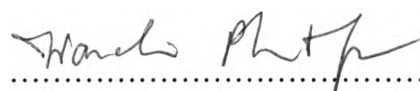
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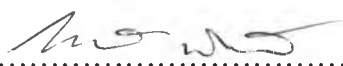
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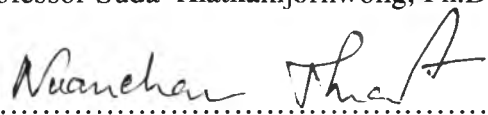
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เปรมสุดา ฤทัยเจตน์เจริญ : ผลของสารเชื่อมขวางคอสบัตินสารชั้นกราฟต์โคพอลิเมอร์ของแป้งมันสำปะหลังและกรดอะคริลิกสำหรับคุณภาพภาพพิมพ์สกรีนฐานน้ำบนแผ่นพลาสติก. (EFFECT OF CROSSLINKER ON THICKENER PROPERTIES OF ACRYLIC ACID-CASSAVA STARCH GRAFT COPOLYMER FOR WATER-BASED SCREEN PRINT QUALITY ON PLASTIC SHEETS) อาจารย์ที่ปรึกษา: ศาสตราจารย์ ดร. สุดา เกียรติกำจรวงศ์ 151 หน้า. ISBN 974-13-0433-1.

งานวิจัยนี้ได้สังเคราะห์กราฟต์โคพอลิเมอร์ของแป้งมันสำปะหลังและกรดอะคริลิกเพื่อเป็นสารชั้นสำหรับการพิมพ์ฟิล์มพลาสติก ด้วยการทำปฏิกิริยากราฟต์โคพอลิเมอร์เซชันของกรดอะคริลิกในโครงสร้างหลักของแป้งมันสำปะหลัง โดยผ่านกลไกการริเริ่มปฏิกิริยาดว้ยไฮโดรเจนเพอร์ออกไซด์และกรดแอสคอร์บิก ได้ศึกษาความเข้มข้นของสารเชื่อมขวางที่มีผลต่อการดูดซึมน้ำและสมบัติทางวิทยากระแสของสารชั้นกราฟต์โคพอลิเมอร์ที่สังเคราะห์ได้ นำผลิตภัณฑ์สารชั้นกราฟต์โคพอลิเมอร์ที่ได้มาเตรียมหมึกพิมพ์สกรีนฐานน้ำ 2 สูตร สำหรับการพิมพ์ฟิล์มพอลิโพรพิลีน โดยใช้สารลดฟองประเภทไรโซลิโคนและซิลิโคนในองค์ประกอบของหมึกพิมพ์ I และ II ตามลำดับ ตรวจสอบสมบัติของหมึกพิมพ์ทั้งสองสูตร ได้แก่ สมบัติทางวิทยากระแส การกระจายตัวของหมึกพิมพ์ และแรงดึงผิวของหมึกพิมพ์ ปรับผิวหน้าฟิล์มพอลิโพรพิลีนด้วยวิธี코로나 โดยศึกษาตัวแปรที่มีผลต่อพลังงานผิวของฟิล์มพลาสติก ได้แก่ พลังงานในการปรับผิว และระยะเวลาในการเก็บฟิล์มพลาสติกที่ปรับผิวแล้ว นำหมึกพิมพ์ฐานน้ำที่ได้ทั้ง 2 สูตร พิมพ์แผ่นฟิล์มพลาสติกที่ปรับผิวหน้าแล้วโดยกระบวนการพิมพ์สกรีน ตรวจสอบคุณภาพภาพพิมพ์ ได้แก่ เม็ดสกรีนบวม (หรือเม็ดสกรีนกร่อน) การผลิตน้ำหนักสี ลักษณะของเม็ดสกรีน ความเปรียบต่างของภาพพิมพ์ ความมันวาว และการยึดติดของภาพพิมพ์ ประเมินผลที่ได้โดยวิธีทางสถิติ เพื่อหาสูตรหมึกพิมพ์ที่เหมาะสมที่สุดในการพิมพ์ฟิล์มพลาสติก

ความเข้มข้นของสารเชื่อมขวางที่เหมาะสมในการผลิตสารชั้นกราฟต์โคพอลิเมอร์ คือ ความเข้มข้นของสารเชื่อมขวางร้อยละ 0.5 โดยน้ำหนัก เนื่องจากผลิตภัณฑ์ที่ได้ให้ค่าการดูดซึมน้ำค่าที่สุด และมีสมบัติความเสถียรของหมึกพิมพ์ ปริมาณความเข้มข้นของสารชั้นมีผลทำให้ความหนืดของสารชั้นเปลี่ยนแปลงไป และมีสมบัติด้านการไหลแบบซูโดพลาสติก หมึกพิมพ์ 2 สูตรที่เตรียมได้มีสมบัติด้านวิทยากระแส การกระจายตัวของหมึกพิมพ์ และแรงดึงผิวของหมึกพิมพ์ แตกต่างกันเล็กน้อย ภาพพิมพ์ของหมึกพิมพ์ฐานน้ำที่ใช้สารลดฟองประเภทไรโซลิโคนดีกว่าเล็กน้อย งานวิจัยนี้ได้อธิบายความสัมพันธ์ของระดับการปรับผิว ระดับของพลังงานผิวของแผ่นฟิล์มพอลิโพรพิลีน และคุณภาพของภาพพิมพ์ รวมทั้งความเหมาะสมของหมึกพิมพ์สกรีนที่มีสารเชื่อมขวางในสารชั้นต่อคุณภาพของภาพ

ภาควิชา วิทยาศาสตร์ทางภาพถ่ายและเทคโนโลยีทางการพิมพ์
สาขาวิชา เทคโนโลยีทางภาพ
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ลายมือชื่อนิสิต.....
ลายมือชื่ออาจารย์ที่ปรึกษา.....
ลายมือชื่ออาจารย์ที่ปรึกษาพร้อม.....

4072318623 : MAJOR IMAGING TECHNOLOGY

KEY WORD: THICKENER / CASSAVA STARCH / CORONA TREATMENT / WATER-BASED INK / RHEOLOGY

PREMSUDA RUTHAIJETJARUOEN : EFFECT OF CROSSLINKER ON THICKENER PROPERTIES OF ACRYLIC ACID-CASSAVA STARCH GRAFT COPOLYMER FOR WATER-BASED SCREEN PRINT QUALITY ON PLASTIC SHEETS. THESIS ADVISOR : PROF. SUDA KIATKAMJORNWONG, Ph.D., 151 pp. ISBN 974-13-0433-1.

Cassava starch grafted copolymers as a thickener for cast polypropylene film was carried out under a grafting copolymerization of acrylic acid onto cassava starch via a hydrogen peroxide-ascorbic acid initiation method. The effect of crosslinking agent concentration on water absorption capacity and rheological properties of the cassava starch grafted acrylic acid thickener was investigated. The cassava starch graft copolymer thickener was used in the preparation of two water-based screen inks. Non-silicone and silicone defoamers were used as an ingredient in the inks I and II, respectively. The properties of the two ink, namely, rheological properties, dispersion, and surface tension were examined. Cast polypropylene film was treated by corona treatment. The effects of treatment energy and corona ageing of the film on surface energy of the treated plastic films were studied. The two inks were printed on the corona treated plastic films by screen printing. The dot gain (or dot loss), tone reproduction, dot characteristics, print contrast, gloss and adhesion of printed plastic films were evaluated. The results obtained were evaluated statistically in order to obtain the optimum ink formulation for the plastic film printing.

The suitable crosslinking concentration used in the synthesis of the cassava starch graft copolymer thickener was 0.5 wt% based on the monomer concentration because of the product so obtained gave the minimum water absorption capacity and stable ink properties. The concentrations of the crosslinked thickener governed the viscosity and the rheology of the inks having pseudoplastic behavior. Besides, the rheological properties, pigment dispersion, and surface tension of the two inks were insignificantly different. The qualities of the plastic film printed by the ink with the non-silicone defoamer slightly better than the another one. This research elucidates the relationship of corona treatment level, the surface energy of polypropylene films, and print qualities as well as the suitability of screen printing ink containing cassava starch-acrylic acid thickener/crosslinking agent for print quality.

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Field of study. Imaging Technology.....

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Academic year. 2000.....

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Premsuda Ruthaijetjaroen

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ABBREVIATIONS

N,N' -MBA	: N,N' -methylenebisacrylamide
CPP	: cast polypropylene
CMC	: critical micelle concentration
τ	: shearing stress
F	: force
A	: area
η	: viscosity
D	: shear rate
γ_{sv}	: solid-vapor interfacial tension
γ_{lv}	: liquid-vapor interfacial tension
γ_{sl}	: solid-liquid interfacial tension
γ_s	: surface energy of solid
γ_l	: surface tension of liquid
γ_s^d	: dispersion surface energy of solid
γ_s^p	: polar surface energy of solid
γ_l^d	: dispersion surface tension of liquid
γ_l^p	: polar surface tension of liquid
γ_c	: critical surface tension

ABBREVIATIONS (continued)

π_e	: spreading pressure
r	: roughness factor
H	: hysteresis
θ_w	: Wenzel angle
θ_y	: Young angle
θ_a	: advancing contact angle
θ_r	: receding contact angle
W_A	: work of adhesion
W_C	: work of cohesion
vol%	: percent by volume
wt%	: percent by weight
SPAA	: saponified starch-g-poly(acrylic acid)
ASTM	: American Standard of Testing Materials
ACA	: advancing contact angle
RCA	: receding contact angle
D_s	: density of the shadow area
D_t	: density at 70 percent tint