

**REACTIVE COMPATIBILIZED PLA/MODIFIED EVA BLENDS FOR  
INJECTION PRODUCTS**

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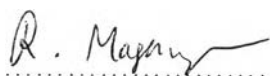
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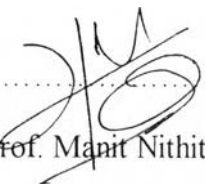


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## ABSTRACT

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Keywords: Catalytic reactive extrusion/ Compatibilizer/ Ethylene (vinyl acetate)  
(EVA)/ Poly(lactic acid) (PLA)

Transesterification of ethylene(vinyl acetate) or EVA via catalytic reactive extrusion in the presence of 1-dodecanal and dibutyl tin dilaurate (DBTL) catalyst was completely occurred in a twin-screw extruder at a screw speed of 10 rpm in order to alter the vinyl acetate groups in the chains to be hydroxyl groups. The result from FTIR and dynamic mechanical test revealed that the increment of hydroxyl groups to EVA chains was successfully obtained via catalytic reactive extrusion. The synthesis of modified EVA (mEVA) via the effective methods as mentioned earlier was blended with PLA and four different type of compatibilizers; i.e. Ethylene-glycidyl methacrylate copolymer (E-GMA), ethylene-methyl acrylate-glycidyl methacrylate terpolymer (T-GMA), Ethylene-acrylic acid copolymer (PE-AA), and Poly(2-ethyl-2-oxazoline) (Oxa) at various amounts of mEVA (10, 20, 30, and 40 wt%) and at 5, 10 and 15 phr of compatibilizers loading. The PLA/mEVA/compatibilizers blends were prepared in a co-rotating twin-screw extruder with a screw speed of 30 rpm. Morphological interpretation through FE-SEM revealed the separation between PLA and mEVA phases in the presence of mEVA. On the other hand, FE-SEM images presented the improvement in compatibility of the PLA/mEVA blends in the presence of compatibilizers.

## บทคัดย่อ

นางสาวจุฑาภรณ์ วิชาชนม์ : การเชื่อมประสานแบบเกิดปฏิกิริยาของพอลิเมอร์ผสมระหว่างเอทิลีนไวนิลอะซีเตตกับพอลิแลกติกแอซิดด้วยกระบวนการอัดรีดแบบเกิดปฏิกิริยาภายในสำหรับผลิตภัณฑ์ที่ใช้ขึ้นรูปด้วยวิธีการฉีด (Reactive Compatibilized PLA/Modified EVA Blends for Injection Products)

อ. ที่ปรึกษา : รศ. ดร. รัตนาวรรณ มกรพันธุ์ 181 หน้า

ปฏิกิริยาทรานเอสเทอร์ฟิเคชันของเอทิลีนไวนิลอะซีเตตผ่านกระบวนการอัดรีดแบบเกิดปฏิกิริยาภายใน เกิดขึ้นอย่างสมบูรณ์เมื่อมีโคโคเคซิลแอลกอฮอล์และตัวเร่งปฏิกิริยาไดบิวทิลทินไดลอเรท ภายในเครื่องอัดรีดแบบเกลียวหนอนคู่ที่ความเร็ว 10 รอบต่อนาที เพื่อเปลี่ยนหมู่ไวนิลอะซีเตตบนสายโซ่เป็นหมู่ไฮดรอกซิล ผลการวิเคราะห์ทางเคมีด้วยเทคนิคอินฟราเรดสเปกโทรสโคปีและการวิเคราะห์สมบัติเชิงกลแบบพลวัตยืนยันว่า การเพิ่มขึ้นของหมู่ไฮดรอกซิลบนสายโซ่ของเอทิลีนไวนิลอะซีเตตเกิดขึ้นสำเร็จผ่านกระบวนการอัดรีดแบบเกิดปฏิกิริยาภายใน การสังเคราะห์เอทิลีนไวนิลอะซีเตตดัดแปรด้วยวิธีการที่มีประสิทธิภาพดังที่ได้กล่าวมาข้างต้น ถูกนำมาผสมเข้ากับพอลิแลกติกแอซิดและสารเพิ่มความเข้ากันได้ 4 ชนิดแตกต่างกัน โดยใช้อัตราส่วน โดยน้ำหนักของพอลิแลกติกแอซิดกับเอทิลีนไวนิลอะซีเตตที่อัตราส่วนต่างๆคิดเป็น 90:10, 80:20, 70:30 และ 60:40 และใช้ปริมาณสารเพิ่มความเข้ากันได้ที่ปริมาณ 5, 10 และ 15 phr พอลิเมอร์ผสมระหว่างพอลิแลกติกแอซิด เอทิลีนไวนิลอะซีเตตดัดแปร และสารเพิ่มความเข้ากันได้ถูกเตรียมขึ้นภายในเครื่องอัดรีดแบบเกลียวหนอนคู่ที่หมุนในทิศทางเดียวกัน ทำปฏิกิริยาที่ความเร็วรอบ 30 รอบต่อนาที ผลการทดสอบมาตรฐานวิทยาแสดงให้เห็นว่าการแยกเฟสเกิดขึ้นระหว่างพอลิแลกติกแอซิดกับเอทิลีนไวนิลอะซีเตต อย่างไรก็ตามขนาดอนุภาคกระจายของเอทิลีนไวนิลอะซีเตตจะมีขนาดเล็กลงเมื่อผสมสารเพิ่มความเข้ากันได้ลงไป ซึ่งแสดงให้เห็นว่าพอลิแลกติกแอซิดผสมเข้ากับเอทิลีนไวนิลอะซีเตตได้ดียิ่งขึ้น

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