

**MISCIBLE BLENDS OF ESCOR™ ACID TERPOLYMER
AND EAA COPOLYMERS**

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ABSTRACT

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Ethylene-methyl acrylate-acrylic acid terpolymers (ESCOR™) and Ethylene-acrylic acid copolymers (EAA) were studied crystallization kinetics in nonisothermal conditions using Differential Scanning Calorimetry (DSC). The nonisothermal crystallization of ethylene-methyl acrylate-acrylic acid terpolymers (ESCOR™) and Ethylene-acrylic acid copolymers (EAA) data were analyzed for their kinetic parameters using Avrami, Ozawa, Ziabicki and Friedman models. In addition, the blends of ESCOR™ 325 terpolymers and four different grades of EAA copolymers containing different amount of acrylic acid at various blend compositions were prepared by melt mixing on a twin-screw extruder. The miscibility of blends was investigated by dynamic mechanical measurements. Rheological, thermal, mechanical, and dynamic mechanical properties of the ESCOR™ 325/EAA blends were also studied. The results showed that the rheological properties such as the storage and loss modulus of the blends were slightly increased with increased EAA contents, but the complex viscosity of the blend decreased with increased EAA contents. In addition, most blends exhibited improvement in tensile strength at break, Young's modulus, hardness (shore-D), and a reduction in elongation at break with the increase in EAA content. The Escor™/EAA5 blends consisted EAA5 content from 80 to 95%wt in blends showed synergistic behavior (tensile strength, young's modulus and hardness) due to higher percent crystallinity, whereas most of blends at low EAA contents showed property values below a linear relationship because of phase separation.

บทคัดย่อ

ณัฐพร สมร่วง: การศึกษาการผสมเข้าเป็นเนื้อเดียวกันระหว่าง ESCOR™ เทอร์พอลิเมอร์ และ EAA โคพอลิเมอร์ (Miscible Blend of ESCOR™ Acid Terpolymer and EAA Copolymers) อ.ที่ปรึกษา: ดร. มานิตย์ นิธิธนากุล และ รศ. ไบรอัน แกรดี 114 หน้า ISBN 974-17-2331-8

งานวิจัยนี้มุ่งถึงการศึกษาจลศาสตร์การตกผลึกแบบอุณหภูมิไม่คงที่ของเอทิลีนเมททิลอะคริเลทอะคริลิกเอซิดและเอทิลีนอะคริลิกเอซิดโดยใช้เทคนิค DSC ข้อมูลการทดลองจากการตกผลึกแบบอุณหภูมิแบบไม่คงที่ถูกระบุโดยการเปรียบเทียบค่าที่ได้จากการทดลองกับค่าที่ได้จากแบบจำลองของ Avrami Ozawa Ziabicki และ Friedman นอกจากนี้คุณสมบัติต่างๆ และการผสมเข้าเป็นเนื้อเดียวกัน ได้แก่ คุณสมบัติเชิงกล (Mechanical properties) คุณสมบัติเชิงความร้อน (Thermal analysis) คุณสมบัติไดนามิกส์เชิงกล (Dynamic mechanical properties) และคุณสมบัติการไหล (Rheological properties) ของพอลิเมอร์ผสมระหว่าง ESCOR™ เทอร์พอลิเมอร์และ EAA โคพอลิเมอร์ ค่าคุณสมบัติเชิงกล ได้แก่ ความต้านทานต่อการดึงยึด (Tensile strength) ความแข็ง (Hardness) ค่าความใส (Gloss) และค่าโมดูลัส (Young's modulus) พบว่ามีค่าเพิ่มขึ้นเมื่อเพิ่มอัตราส่วนของ EAA โคพอลิเมอร์ ขณะที่บางอัตราส่วนมีค่าสูงกว่าความสัมพันธ์นี้ เนื่องจากเกิดปริมาณผลึกเพิ่มขึ้น อย่างไรก็ตามบางอัตราส่วนได้มีค่าต่ำกว่าความสัมพันธ์นี้ เพราะว่าการแยกเฟสของพอลิเมอร์ผสม ค่าความต้านทานต่อการดึงยึดตามความยาว (Elongation at break) ของพอลิเมอร์ผสมนี้มีค่าลดลงเมื่อเพิ่มอัตราส่วนของ EAA โคพอลิเมอร์ แสดงว่าพอลิเมอร์ผสมมีความเปราะเพิ่มขึ้นเมื่ออัตราส่วนของ EAA โคพอลิเมอร์เพิ่มขึ้น ส่วนค่าคุณสมบัติเชิงความร้อน (Thermal analysis) และคุณสมบัติการไหล (Rheological properties) ของพอลิเมอร์ผสมมีคุณสมบัติดีขึ้นเมื่ออัตราส่วนของ EAA โคพอลิเมอร์เพิ่มขึ้น นอกจากนี้คุณสมบัติการแสดงการเข้าเป็นเนื้อเดียวกันได้ดี จากงานวิจัยนี้สามารถสรุปว่าพอลิเมอร์ผสมระหว่าง ESCOR™ กับ EAA1 และ EAA5 ที่อัตราส่วนระหว่าง 80 ถึง 90 เปอร์เซ็นต์โดยน้ำหนัก EAA แสดงค่าคุณสมบัติเชิงกลค่อนข้างสูง เนื่องจากมีความเป็นผลึกสูงขึ้น

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