

**PROCESSING, STRUCTURE, AND PROPERTIES OF
REACTIVE PLASTIC-SILK BLENDS**

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ABSTRACT

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Blending silk with high density polyethylene (HDPE) to obtain required properties was carried out by the conventional blending (two-step blending) and reactive blending (one-step blending). Graft-copolymerization of methyl methacrylate (MMA) onto HDPE matrix was done to modify interfacial interactions between two phases of HDPE and silk in the presence of dicumyl peroxide (DCP) by one-step reactive blending compared to conventional blending (two-step blending). Mechanical properties of the final blends were enhanced compared to those of the untreated blends. Moreover, the mechanical properties from one-step reactive blending were higher than those of conventional blending (two-step blending) based on the optimum conditions of both techniques. The optimum condition was found at 10% of MMA on HDPE by weight, and the ratio of DCP to MMA was 1:40. The specific interactions between MMA-g-HDPE and silk were studied by FTIR spectra. Thermal properties and morphology of the blends were studied to explain the blend properties.

บทคัดย่อ

นางสาวบารมี โมฆคารา: การขึ้นรูป โครงสร้าง และคุณสมบัติของพลาสติกผสมไหม แบบรีแอกทีฟ (Processing, Structure, and Properties of Reactive Plastic-Silk Blends) อ.ที่ปรึกษา : ผศ.ดร. เดวิด ซี มาติน และอาจารย์ดร. รัตนวรรณ มกรพันธุ์ 52 หน้า ISBN 974-331-164-1

พอลิเอทิลีนชนิดความหนาแน่นสูง(HDPE) ที่ผสมเส้นไหมแสดงสมบัติต่างๆที่เป็นที่ต้องการโดยกระบวนการผสมเสร็จในสองขั้นตอน ซึ่งเป็นกระบวนการที่นิยมใช้ในปัจจุบันและกระบวนการผสมแบบรีแอกทีฟ(ขั้นตอนเดียว) ได้ศึกษากระบวนการผสมเสร็จในขั้นตอนเดียวเปรียบเทียบกับกระบวนการผสมสองขั้นตอน โดยใช้การต่อกิ่งเมทิลเมทาครีเลตบนสายโซ่ของพอลิเอทิลีนชนิดความหนาแน่นสูงมีไคควิมิลเปอร์ออกไซด์เป็นสารเริ่มต้นปฏิกิริยาส่งผลให้เกิดการปรับปรุงปฏิกิริยา ระหว่างพื้นผิวของพอลิเมอร์กับเส้นไหม พบว่าสมบัติเชิงกลของพอลิเมอร์ผสมเมื่อใช้ สารต่อกิ่งให้ผลดีกว่าสมบัติเชิงกลเมื่อไม่ได้ผสมสารต่อกิ่ง นอกจากนี้เมื่อทำให้สารผสมทั้งหมดเกิดปฏิกิริยาในขณะเดียวกันกับกระบวนการผสมเสร็จในขั้นตอนเดียว ปรากฏว่าสมบัติเชิงกลต่างๆมีสมบัติดีขึ้นเปรียบเทียบกับสมบัติที่ได้จากกระบวนการที่นิยมใช้ในปัจจุบันที่สภาวะการผสมที่เหมาะสมเดียวกัน คือการผสมเพื่อให้เกิดการต่อกิ่งบนพอลิเอทิลีนชนิดความหนาแน่นสูงด้วยปริมาณ10%ของเมทิลเมทาครีเลตและอัตราส่วนของไคควิมิลเปอร์ออกไซด์ต่อเมทิลเมทาครีเลตเป็น 1 ต่อ 40 จะให้ผลที่ดีที่สุด ซึ่งเทคนิคการใช้รังสีอินฟราเรดได้ถูกนำมาใช้ในการตรวจสอบปฏิกิริยา ที่เกิดขึ้นระหว่างเมทิลเมทาครีเลตกับเส้นไหม คุณสมบัติทางกายภาพของพอลิเมอร์ผสมสามารถอธิบายได้จากสมบัติทางความร้อน และสมบัติทางออสัญฐานวิทยา

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