

อิทธิพลของตัวเร่งปฏิกิริยาต่อเวลาการขึ้นรูปโพลีเอสเตอร์เอสเอ็มซี

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Effect of Catalysts on Cure Time of
Polyester SMC Processing

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การวิจัยนี้ได้ศึกษาตัวเร่งปฏิกิริยา 3 ชนิด คือ เทอเชียรี-บิลทิลเปอร์เบนโซเอต (ทีบีพี), 1,1-ได-(เทอเชียรี-บิลทิลเปอร์ออกซี) ไซโคลเฮกเซน (ดีทีบีซี), เบนโซิล เปอร์ออกไซด์ (บีพีโอ) และตัวเร่งปฏิกิริยาผสมระหว่างทีบีพีกับดีทีบีซี เพื่อศึกษาอิทธิพลของตัวแปรต่าง ๆ ได้แก่ ชนิดและปริมาณของตัวเร่งปฏิกิริยาต่ออายุการเก็บรักษาของแผ่นเอสเอ็มซี และลักษณะการบ่มในแม่พิมพ์ที่เวลา 1 และ 2 นาที การทดลองใช้ทีบีพีเป็นตัวเร่งปฏิกิริยา สามารถเก็บแผ่นเอสเอ็มซีได้นานถึง 45 วัน โดยมีระยะเวลาเก็บรักษาที่เหมาะสมต่อการนำไปขึ้นรูปที่ประมาณ 17-30 วัน ความเข้มข้นที่เหมาะสม 2 ส่วนในร้อย ที่อุณหภูมิแม่พิมพ์ 150°ซ. การใช้เวลาบ่ม 1 นาที วัสดุจะมีความแข็งแรงเชิงกลต่ำกว่าเมื่อใช้เวลาบ่ม 2 นาที แต่สามารถทำให้วัสดุมีความแข็งแรงสูงขึ้นได้ โดยการผสมพารา-เบนโซควิโนโน (พีบีคว) ความเข้มข้น 0.025 ส่วนในร้อย ในทำนองเดียวกับการใช้ดีทีบีซีเป็นตัวเร่งปฏิกิริยา แผ่นเอสเอ็มซีจะมีอายุการเก็บรักษาได้นานประมาณ 30 วัน การใช้ตัวเร่งปฏิกิริยาผสมระหว่างทีบีพีกับดีทีบีซี จะเร่งให้วัสดุเกิดการบ่มได้เร็วขึ้นเล็กน้อย ส่วนการใช้บีพีโอเป็นตัวเร่งปฏิกิริยาให้ข้อดีคือ สามารถใช้อุณหภูมิขึ้นรูปต่ำเพียง 120°ซ. แต่มีข้อเสียที่ของผสมเอสเอ็มซีมีความหนืดสูงจนเร็วมาก ความเข้มข้นที่เหมาะสมของบีพีโอประมาณ 1 ส่วนในร้อย และสามารถเก็บแผ่นเอสเอ็มซีได้นานเพียง 10 วันเท่านั้น วัสดุที่บ่มเพียง 1 นาทีมีความแข็งแรงต่ำกว่าการใช้เวลาบ่ม 2 นาทีเพียงเล็กน้อย แต่การใช้บีพีโอเป็นตัวเร่งปฏิกิริยา วัสดุที่ได้มีความแข็งแรงเชิงกลต่ำกว่าการใช้ทีบีพีและดีทีบีซีเป็นตัวเร่งปฏิกิริยาประมาณร้อยละ 10 ดังนั้น ตัวเร่งปฏิกิริยาที่เหมาะสมสำหรับเอสเอ็มซีของโพลีเอสเตอร์ในงานวิจัยนี้คือ ทีบีพีและดีทีบีซี โดยมีการผสมพีบีควความเข้มข้น 0.025 ส่วนในร้อย ในองค์ประกอบของเอสเอ็มซีด้วย ส่วนบีพีโอมีความไม่เหมาะสมที่จะนำมาใช้เป็นตัวเร่งปฏิกิริยาเพียงลำพังในโพลีเอสเตอร์เอสเอ็มซี

ภาควิชา.....สหสาขาวิชาปิโตรเคมี-โพลีเมอร์.....
สาขาวิชา.....ปิโตรเคมี.....
ปีการศึกษา.....2534.....

ลายมือชื่อนิสิต.....
ลายมือชื่ออาจารย์ที่ปรึกษา.....
ลายมือชื่ออาจารย์ที่ปรึกษารวม.....

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In this research, three types of catalysts: t-butyl perbenzoate (TBPB), 1,1-di-(t-butyl peroxy) cyclohexane (DTBC), and benzoyl peroxide (BPO), and the effect of added parabenzoquinone (PBQ) were studied. The effect of types and concentration of catalysts on storage life of the SMC, mechanical properties, and curing characteristics in the mold of the SMC at 1 and 2 minutes were investigated. When the TBPB catalyst was used, the storage time of SMC could be as long as 45 days. Between 17-30 days the hardness of SMC was suitable for molding at 150°C and 2 minutes curing time. The shorter curing time (1 minute) gave lower strength to the composite but with an addition of PBQ of 0.025 phr, the strength was enhanced. So did the SMC with the DTBC catalyst and the storage life of SMC was about 30 days. The dual catalysts system of the DTBC catalyst in conjunction with the TBPB catalyst provided a faster cure than did the TBPB catalyst alone. By using the BPO catalyst, it was found that the molding temperature was reduced to 120°C but the viscosity of paste was increased rapidly and the sheet could be stored for only 10 days. After a 1 minute of cure, the strength of composite became somewhat lower than that of a 2 minutes curing time, and was also lower than those by TBPB and DTBC catalysts by 10%. Therefore, the most suitable catalysts for the SMC in this research were TBPB and DTBC, in the presence of 0.025 phr of PBQ in the SMC component, the BPO cannot be used as the sole catalyst in the SMC.

ภาควิชา..... สหสาขาวิชาปิโตรเคมี-โพลีเมอร์.....
สาขาวิชา..... ปิโตรเคมี.....
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ลายมือชื่อนิสิต..... *สุชล มานุกриан*.....
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