

**PREPARATION AND CHARACTERIZATION OF CELLULOSE PULP
REINFORCED-NATURAL RUBBER/TAPIOCA STARCH COMPOSITE
FOAM**

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ABSTRACT

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Cellulose pulp-reinforced natural rubber/tapioca starch composite foams were prepared by baking process. The effect of storage relative humidity on the physical and flexural properties of composite foams was investigated. For nonreinforced system, both specific flexural strength and specific flexural modulus were found to decrease with increase the natural rubber content while maximum flexural strain appeared to be improved with addition of 50% by weight of natural rubber. For reinforced system, the 30% by weight of natural rubber content composite foams were reinforced with cellulose pulp. All flexural properties, specific flexural strength, specific flexural modulus and maximum flexural strain were found to increase with increase fiber content. Moreover, the scanning electron micrographs revealed that the average cell sizes for all foam compositions decrease with the increasing of natural rubber and cellulose pulp contents. As a result of the smaller average cell size, thicker cell wall, higher density, and the presence of reinforcing fibers, cellulose pulp-reinforced natural rubber /tapioca starch composite foams appeared to exhibit much improvement in the mechanical properties.

บทคัดย่อ

ชัชพฤกษ์ เกตุเพชร : การเตรียมและวิเคราะห์สมบัติต่าง ๆ ของโฟมเชิงประกอบจากยางธรรมชาติและแป้งมันสำปะหลัง โดยใช้เยื่อกระดาษเป็นวัสดุเสริมแรง (Preparation and Characterization of Cellulose Pulp Reinforced Natural Rubber/Tapioca Starch Composite Foam) อ. ที่ปรึกษา : ผศ. ดร. รัตนา รุจิรวนิช ศ. ดร. เซอิชิ โทคุระ และ ผศ. ดร. พิชญ์ สุภผล 90 หน้า

โฟมเชิงประกอบซึ่งเตรียมโดยใช้แป้งมันสำปะหลังและยางธรรมชาติเป็นส่วน ประกอบหลัก และใช้เยื่อกระดาษเป็นวัสดุเสริมแรงถูกขึ้นรูปเป็นโฟมโดยวิธีการอบ ในงานวิจัยนี้ได้ ทำการศึกษาผลของปริมาณความชื้นสัมพัทธ์ในบรรยากาศที่มีผลต่อสมบัติทางกายภาพและสมบัติเชิงกลของโฟมเชิงประกอบ กรณีของโฟมจากแป้งมันสำปะหลังและยางธรรมชาติที่ไม่มีการเสริมแรงพบว่า ค่าความเค้นจำเพาะ และค่าโมดูลัสจำเพาะมีค่าลดลงเมื่อเพิ่มปริมาณสัดส่วนยางธรรมชาติ ในขณะที่ ค่าความเครียดสูงสุดของโฟมเชิงประกอบ ได้รับการปรับปรุงขึ้นอย่างมากจากการเติมยางธรรมชาติในปริมาณร้อยละ 50 โดยน้ำหนัก ในกรณีที่จะศึกษาผลกระทบบของปริมาณเยื่อกระดาษต่อสมบัติเชิงกลของโฟมที่เตรียมได้นั้นจะกำหนดปริมาณสัดส่วนยางธรรมชาติคงที่ที่ร้อยละ 30 โดยน้ำหนัก พบว่า สมบัติเชิงกลทั้งหมดไม่ว่าจะเป็นค่าความเค้นจำเพาะ ค่าโมดูลัสจำเพาะและค่าความเครียดสูงสุดของโฟมเชิงประกอบจะเพิ่มขึ้นเป็นสัดส่วน โดยตรงกับปริมาณเยื่อกระดาษ นอกจากนี้คุณภาพถ่ายอิมัลชันแบบสองกราดบนผิวหน้าตัดของโฟมเชิงประกอบยังแสดงให้เห็นอย่างชัดเจนว่า ขนาดของเซลล์ของโฟมเชิงประกอบมีค่าลดลงเมื่อเพิ่มปริมาณสัดส่วนของยางธรรมชาติและเยื่อกระดาษ ซึ่งการลดลงของขนาดเซลล์ของโฟมนั้นส่งผลให้ผนังเซลล์หนาขึ้น ความหนาแน่นของโฟมสูงขึ้น รวมถึงผลของการการเสริมแรงด้วยเยื่อกระดาษนั้น ทำให้สมบัติเชิงกลของโฟมเชิงประกอบมีค่าสูงขึ้นอย่างเห็นได้ชัด

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