

**APPLICATION OF POLYBENZOXAZINE FOR NATURAL FIBER
REINFORCED PLASTICS**

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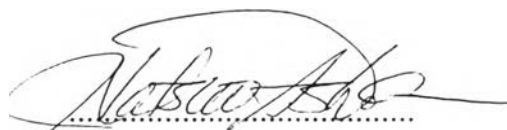
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ABSTRACT

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VITURUCH GOODWIN : APPLICATION OF POLYBENZOXAZINE FOR NATURAL FIBER REINFORCED PLASTICS. THESIS

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Phenolic resins have played an important role in many areas of daily applications. However, to overcome the shortcomings of phenolic resins Ishida et al. proposed a novel type of phenolic resin, polybenzoxazines, which are easy to prepare, inexpensive and show excellent mechanical properties. Due to the many applications of phenolic composite materials, natural fiber reinforced materials are an interesting topic of research. Through this viewpoint the present work is concentrated on polybenzoxazine paper composite materials.

The benzoxazine resins chosen for this study are based on (a) bisphenol-A with aniline and (b) bisphenol-A with methylamine. Composites from these polymers can be prepared easily, using 8 plies of paper, the composites have been evaluated for their mechanical and physical properties. Dynamic mechanical analysis reveals that these composites have high modulus and glass transition temperatures whilst the water absorption property was found to be controlled by the role of the cellulose fiber which is the main component in paper. The water absorption is substantially reduced when compared with other types of cellulose-reinforced polymers.

บทคัดย่อ

วิฑูรช์ กู๊ดวิน : การประยุกต์พอลิเบนซอกซาซีน สำหรับการเป็นพลาสติกเสริมแรงด้วยเส้นใยธรรมชาติ (Application of Polybenzoxazine for Natural Fiber Reinforced Plastics) อ. ที่ปรึกษา : ศ. ฮัตสุโอะ อิชิดะ (Prof. Hatsuo Ishida) และ ดร. สุวบุญ จิระชาญชัย, 52 หน้า ISBN 974-636-177-5

สารประเภทฟีนอลิกเรซิน (phenolic resin) เป็นสารที่มีราคาถูก และทึบเทาที่สำคัญในอุตสาหกรรมหลายประเภท อย่างไรก็ตามข้อบกพร่องอันเกิดจากการใช้สารประเภทฟีนอลิกเรซินยังมีอยู่อีกหลายประการ ศ. อิชิดะ และผู้ร่วมงานได้ทำการสังเคราะห์สารประเภทฟีนอลิกเรซินชนิดใหม่ คือ พอลิเบนซอกซาซีน ซึ่งสามารถสังเคราะห์ได้โดยง่าย มีราคาถูก และมีสมบัติที่ดีเยี่ยมกว่าสารฟีนอลิกโดยทั่วไป จากการประยุกต์ใช้งานของวัสดุเสริมแรงด้วยสารฟีนอลิกที่หลากหลาย ทำให้วัสดุเสริมแรงด้วยเส้นใยธรรมชาติเป็นวัสดุเสริมแรงฟีนอลิกอีกประเภทหนึ่งที่น่าสนใจ ด้วยมุมมองดังกล่าว งานวิจัยนี้จึงเน้นถึงการพัฒนาวัสดุเสริมแรงของพอลิเบนซอกซาซีนด้วยใยกระดาษ

สารพอลิเบนซอกซาซีนที่ศึกษา คือ ประเภทที่สังเคราะห์จากอนุพันธ์ของฟีนอล คือ บิสฟีนอล-เอ (Bisphenol-A) และ อนิลิน (Aniline) และประเภทที่สังเคราะห์จาก บิสฟีนอล-เอ และ เมทิลอามีน (Methylamine) ชิ้นงานวัสดุเสริมแรงถูกเตรียมด้วยสารเบนซอกซาซีนและกระดาษ โดยกระดาษ 8 ชั้น เรียงสลับกับสารเบนซอกซาซีน และนำไปให้ความร้อน แล้วอัดลงแม่พิมพ์ตามขนาดที่ต้องการ จากการศึกษาสมบัติทางจลนกลศาสตร์ (Dynamic mechanical property) พบว่า วัสดุเสริมแรงชนิดนี้มี มอดุลัส (Modulus) และอุณหภูมิการเปลี่ยนสถานะคล้ายแก้ว (Tg) ที่สูง ในขณะที่การดูดซึมน้ำจะขึ้นอยู่กับเส้นใยกระดาษที่สามารถดูดซึมน้ำได้ดี

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