

**POLYAMIDE/BACTERIAL CELLULOSE NANOCOMPOSITE FILMS
FOR TOUCHSCREEN APPLICATION**

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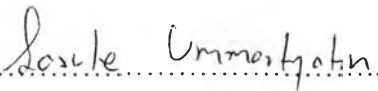
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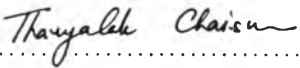
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ABSTRACT

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The flexible piezoelectric film of polyamide 11 (PA11)/bacterial cellulose (BC) was successfully prepared via a solution casting method and compressed to a thin film. The various weight percentage of extracted BC (0.2, 0.4, 0.6, 0.8, 1 wt% for PA11 and 1 wt% for PA6) were incorporated into PA11 matrix using formic acid as a solvent. The results indicated that the higher amount of BC can slightly increase the thermal stability, crystallinity and mechanical properties of the nanocomposite films. Besides, the dielectric constant was enhanced to 24% compared to that of neat PA11 due to the interfacial polarization between the interfaces of fiber and polymer matrix. Consequently, the noncentrosymmetry structure of odd-numbered polyamide and the dipole orientation under an applied field induce the polarization yielding the good dielectric and piezoelectric properties. The tensional behavior of nanocomposite films was also improved with the increase in Young's modulus from 678 to 749 MPa compared to neat PA11. However, the obtained films were less transparent. This nanocomposite film can further develop to be an alternative motional for the touchscreen sensor.

บทคัดย่อ

วีระศักดิ์ เดโชพล : วัสดุเชิงประกอบพอลิเอไมด์และแบคทีเรียเซลลูโลสสำหรับการนำไปใช้งานทางด้านจอสัมผัส (Polyamide/Bacterial Cellulose Nanocomposite Films for Touchscreen Applications) อ.ที่ปรึกษา : ผศ.ดร. หทัยกานต์ มนต์ปิยะ 66 หน้า

ฟิล์มเพียโซอิเล็กทริกแบบยืดหยุ่นถูกเตรียมจากพอลิเมอร์ผสมระหว่างพอลิเอไมด์และแบคทีเรียเซลลูโลสโดยผ่านกระบวนการขึ้นรูปด้วยสารละลายและกระบวนการอัดด้วยความร้อน วัสดุผสมถูกเตรียมโดยการใช้สารละลายกรดฟอร์มิก โดยมีการศึกษาผลของสัดส่วนของแบคทีเรียเซลลูโลสตั้งแต่ 0.2, 0.4, 0.6, 0.8 จนถึง 1 เปอร์เซ็นต์โดยมวล สำหรับพอลิเอไมด์ 11 และ 1 เปอร์เซ็นต์โดยมวล สำหรับพอลิเอไมด์ 6 ซึ่งพบว่าเมื่อปริมาณของแบคทีเรียเซลลูโลสเพิ่มขึ้นทำให้ผลของการต้านทานทางความร้อน ความเป็นผลึก และสมบัติเชิงกลของวัสดุเชิงประกอบระดับนาโนเพิ่มขึ้น นอกจากนี้ค่าไดอิเล็กทริกถูกเพิ่มขึ้น 24 เปอร์เซ็นต์ เมื่อเทียบกับพอลิเอไมด์ที่ไม่มีการเติมแบคทีเรียเซลลูโลสเนื่องจากการเหนี่ยวนำการเกิดขั้วที่ผิวสัมผัสระหว่างพอลิเอไมด์และเส้นใย เพราะฉะนั้น โครงสร้างผลึกไม่มีสมมาตรของศูนย์กลางของพอลิเอไมด์ 11 และการจัดเรียงขั้วภายใต้กระแสไฟฟ้าเป็นผลให้ค่าไดอิเล็กทริกและเพียโซอิเล็กเพิ่มขึ้น นอกจากนี้สมบัติเชิงกลของวัสดุเชิงประกอบระดับนาโนยังเพิ่มขึ้นอีกด้วย สำหรับค่ายังโมดูลัสเพิ่มขึ้นจาก 678 เป็น 749 เมกะพาสคาลเมื่อเทียบกับพอลิเอไมด์ 11 ที่ไม่มีการเติมแบคทีเรียเซลลูโลส อย่างไรก็ตามค่าการส่องผ่านของแสงของวัสดุเชิงประกอบระดับนาโนนี้มีค่าลดลง และวัสดุเชิงประกอบระดับนาโนนี้สามารถพัฒนาเพื่อใช้สำหรับหน้าจอตชสกรีนต่อไป

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