

# **DIELECTRIC BEHAVIORS OF A NOVEL POLYMER NANOCOMPOSITE**

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**Thesis Advisors:** Dr. Hathaikarn Manuspiya  
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**ABSTRACT**

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This research attempted to develop a novel nanocomposite polymer by using polybenzoxazine as a polymer matrix and barium strontium titanate (BST) as a filler for potential uses in electrical application at microwave frequency range. Barium strontium titanate was prepared by sol-gel process and the temperatures of the synthetic process were studied. The electrical properties of both pure materials and composites were investigated.. XRD patterns showed that after the proportion of strontium was increased, the temperature required for thermal decomposition in the sol-gel process was also increased. All nano-BST compounds were measured the dielectric properties by the independence analyzer. TEM was used in order to study particle size and dispersion of nano-BST. The compression molding technique was employed to form the composite. The ratio of BST (filler) to polybenzoxazine (matrix) was 1% and 5% by weight. The nanocomposites were measured for their dielectric constants and thermal properties.

## บทคัดย่อ

นางสาวศิริเพชร แก้ววาดะ : พฤติกรรมทางไดอิเล็กทริกของพอลิเมอร์นาโนคอมพอสิตชนิดใหม่ (Dielectric behaviors of a novel polymer nanocomposite) อ. ที่ปรึกษา : ดร.หทัยกานต์ มั่นสปียะ และ ศ.ดร.ฮัทชีโอะ อิซึดะ 78 หน้า ISBN 974-9990-03-x

ในการวิจัยนี้ทำการพัฒนาพอลิเมอร์นาโนคอมพอสิต โดยใช้พอลิเบนซอกซาซีนเป็นส่วนของเมทริกซ์และแบเรียมस्टรอนเทียมไททานตเป็นสารเติมแต่ง (filler) เพื่อที่จะนำไปใช้ต่อในงานด้านไฟฟ้าที่ใช้งานในช่วงของคลื่นความถี่ไมโครเวฟ โดยทำการเตรียมแบเรียมस्टรอนเทียมไททานตโดยวิธีโซลเจลและทำการศึกษาอุณหภูมิที่ใช้ในกระบวนการสังเคราะห์และ สมบัติทางไฟฟ้า ในการวิเคราะห์ทางเอกซเรย์ดิฟแฟรกชัน พบว่าหลังจากทำการเพิ่มปริมาณของस्टรอนเทียมใน स्टรอนเทียมแบเรียมไททานต แล้ว อุณหภูมิที่ใช้ในการสังเคราะห์ก็เพิ่มขึ้นตามไปด้วย กล้องจุลทรรศน์อิเล็กตรอนแบบส่องผ่านถูกนำมาใช้ในการศึกษาขนาดของอนุภาคและการกระจายตัวของแบเรียมस्टรอนเทียมไททานต เทคนิคการขึ้นรูปแบบกอัดถูกนำมาใช้ในการขึ้นรูปของวัสดุคอมพอสิต โดยสัดส่วนของสารเติมแต่ง (แบเรียมस्टรอนเทียมไททานต) และเมทริกซ์ (พอลิเบนซอกซาซีน) เท่ากับ 1 และ 5 เปอร์เซ็นต์โดยน้ำหนัก วัสดุนาโนคอมพอสิตถูกนำมาศึกษาค่าคงที่ไดอิเล็กทริกและสมบัติทางความร้อนต่อไป

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