

**SYNTHESIS AND CHARACTERIZATION OF
POLY (2, 5 – DIMETHOXYANILINE)
FOR USE AS AN ELECTROCHROMIC SMART MATERIALS**

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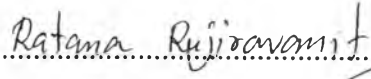
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บทคัดย่อ

พัชรินทร์ มังคโลดม : การสังเคราะห์และวิเคราะห์ลักษณะเฉพาะของโพลี 2, 5 ไดเมทอกซีอะนิลีน สำหรับใช้งานกับวัสดุอัจฉริยะทางอิเล็กทรอนิกส์ที่มีคุณสมบัติในการเปลี่ยนแปลงสีของวัสดุเมื่อได้รับแรงดันไฟฟ้า (Synthesis and Characterization of Poly (2, 5 – dimethoxyaniline) for Use as an Electrochromic Smart Materials) อ. ที่ปรึกษา : ศ. ดร. อนุวัฒน์ ศิริวัฒน์ 96 หน้า

วัสดุอัจฉริยะชนิดนี้จะเกิดการเปลี่ยนแปลงสีของวัสดุ เมื่อมีการให้แรงดันไฟฟ้าเพียงเล็กน้อย ในปัจจุบันได้มีการนำวัสดุนี้ไปใช้งานอย่างหลากหลาย เช่น การนำไปใช้เป็นจอแสดงผล, เป็นส่วนประกอบหนึ่งในอุตสาหกรรมยานยนต์, งานทางด้านสถาปัตยกรรม, ผลิตภัณฑ์ และ หน้าต่างอัจฉริยะ เนื่องจาก โพลี 2, 5 ไดเมทอกซีอะนิลีน (PDMA) มีคุณสมบัติเด่นหลายประการ เช่น นำหนักเบา, สามารถนำไฟฟ้าได้, สามารถทนต่อสภาวะแวดล้อมสูง, สามารถเติมเข้า (doping) และนำออก (de-doping) ทางปฏิกิริยาเคมีง่าย รวมถึงมอนอเมอร์มีราคาถูก ทำให้เลือกโพลิเมอร์ชนิดนี้มาผลิตเป็นวัสดุอัจฉริยะ ในงานวิจัยนี้ ใช้การสังเคราะห์โพลิเมอร์ด้วยวิธีปฏิกิริยาไฟฟ้าเคมี โดยใช้กรดออกซาลิกเป็นสารละลายอิเล็กโทรไลต์ โดยมีวัตถุประสงค์เพื่อศึกษาอิทธิพลของความแรงของสนามไฟฟ้า และ ชนิดของสารละลายอิเล็กโทรไลต์ต่อคุณสมบัติการเปลี่ยนแปลงสีของโพลิเมอร์ด้วยแรงดันไฟฟ้า, คุณสมบัติการตอบสนองทางไฟฟ้า รวมถึง ระยะเวลาในการตอบสนอง จากผลการศึกษาพบว่า เมื่อให้แรงดันไฟฟ้าที่ 0.8, 1.0, 1.2, 1.4 และ 1.6 V โพลี 2, 5 ไดเมทอกซีอะนิลีน (PDMA) ที่อยู่ในสารละลายอิเล็กโทรไลต์ของกรดไฮโดรคลอริก และกรดซัลฟิวริก เกิดการเปลี่ยนแปลงของสีของโพลิเมอร์ ซึ่งมีระยะเวลาในการตอบสนองที่แตกต่างกัน โดยที่เมื่อแรงดันไฟฟ้าสูงขึ้นจะใช้เวลาในการเปลี่ยนแปลงสีของโพลิเมอร์ลดลง

ABSTRACT

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Colors of electrochromic smart materials are reversible when burst of charges are applied. These materials are widely used in displays, automotive industry, smart windows, and architecture. Poly (2, 5-dimethoxyaniline) or PDMA possesses excellent properties: light weight, high electrical conductivity, environmental stability, simple doping and de-doping chemistry, and using a relatively inexpensive monomer. Due to their properties, PDMA is a candidate as electrochromic materials. The polymer was synthesized via the electrochemical polymerization method by using an oxalic acid as the supporting electrolyte. This work aims to investigate the effects of electric field strength and electrolyte type on electrochromic properties, electrical properties, and the response time. PDMA was submerged into HCl and H₂SO₄ electrolytes, and then submitted to various voltages of 0.8, 1.0, 1.2, 1.4 and 1.6 V. The transient color change was observed in both electrolytes and the time for material undergoing this change was recorded. It was observed that the response time was reduced as applied voltage increased for both HCl and H₂SO₄ electrolytes.

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