

**ELECTRO-OPTICAL PROPERTIES OF POLYANILINE MULTILAYERS  
THIN FILM CONTAINING IN SITU SILVER NANOPARTICLES**

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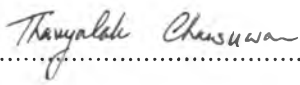
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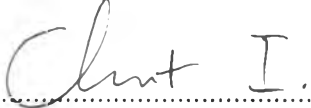
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**ABSTRACT**

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Polyaniline multilayer thin films were fabricated by an alternated layer-by-layer deposition of polyaniline-polystyrene sulfonate complex (PANI-PSS) and Poly(diallyldimethylammonium chloride) (PDADMAC). PANI-PSS was synthesized through an interfacial polymerization of aniline by using PSS as a template. The in situ synthesis of silver nanoparticles was achieved by loading silver nitrate into the film followed by sodium borohydride reduction. The films with silver showed a difference in optical sensing properties and an increasing of conductivity of the film. The film became more metallic and more shiny after multiple silver reduction. The optical and electrical properties of the film were analyzed by Ultraviolet–Visible spectroscopy (UV-Vis) and 4-points probe measurement. The surface and bulk morphology were observed by scanning electron microscope (SEM). The thickness of the film was measured by atomic force microscopy (AFM). Fourier transform infrared spectroscopy (FTIR) was used to confirm the chemical structure of the film and X-ray diffraction (XRD) was used to characterize silver.

## บทคัดย่อ

พฐทิพย์ ทองตัน : สมบัติเชิงไฟฟ้าและแสงของฟิล์มบางหลายชั้นของพอลิอะนิลีนที่ประกอบไปด้วยอนุภาคเงินระดับนาโน (Electro-Optical Properties of Polyaniline Multilayers Thin Film Containing In Situ Silver Nanoparticles) อาจารย์ที่ปรึกษา : ผศ.ดร.สเตฟาน ที ดูบาส 67 หน้า

ฟิล์มบางหลายชั้นพอลิอะนิลีนถูกสร้างขึ้นโดยเทคนิคการเคลือบผิวทีละชั้นระหว่างคอมเพล็กซ์พอลิอะนิลีน-พอลิสไตรีนซัลโฟเนตและพอลิไคยัลลิลไดเมทิลเอมโมเนียมคลอไรด์ โดยใช้เทคนิคพอลิเมอไรเซชันระหว่างผิวในการสังเคราะห์คอมเพล็กซ์ระหว่างพอลิอะนิลีน-พอลิสไตรีนซัลโฟเนต จากนั้นสังเคราะห์อนุภาคเงินลงในฟิล์มโดยให้ซิลเวอร์ไนเตรตซึมเข้าไปในฟิล์ม และรีดิวซ์ด้วยโซเดียมโบโรไฮไดรด์ จากผลการทดสอบฟิล์มที่ได้มีสมบัติทางแสงที่แตกต่างกันและมีค่านำไฟฟ้ามากขึ้นหลังจากสังเคราะห์อนุภาคเงินลงในฟิล์ม เมื่อสังเคราะห์อนุภาคเงินลงในฟิล์มมากขึ้นฟิล์มจะเปลี่ยนสีเป็นสีเงินและมีความมันเงามากขึ้น เครื่องมือที่ใช้ในการวิเคราะห์สมบัติของฟิล์มประกอบไปด้วย ยูวี-วิเบิล สเปกโทรสโกปี วัดค่านำไฟฟ้าด้วยเข็ม 4 จุด กล้องจุลทรรศน์อิเล็กตรอนแบบส่องกราด กล้องจุลทรรศน์แรงอะตอม ฟลูอริสเซนซ์สเปกโทรสโกปี และเครื่องวิเคราะห์การเลี้ยวเบนรังสีเอกซ์

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