

**PREPARATION OF POLY(VINYL ALCOHOL)/PLATINUM  
NANOPARTICLE NANOCOMPOSITE NANOFIBERS**



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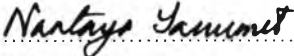
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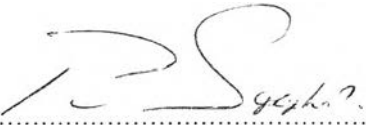
**Thesis Title:** Preparation of Poly(vinyl alcohol)/Platinum  
Nanoparticles Nanocomposite Nanofibers  
**By:** Narissara Tinnarat  
**Program:** Polymer Science  
**Thesis Advisors:** Assoc. Prof. Pitt Supaphol


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## ABSTRACT

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Nanocomposites based on poly(vinyl alcohol) (PVA) nanofibers filled with platinum (Pt) nanoparticles were prepared by electrospinning technique. PVA was used as both the stabilizer to prevent Pt nanoparticles agglomeration and the template for fiber formation. The diameter of platinum nanoparticles obtained was between 2 to 5 nm. The UV absorption peak at 260 nm corresponding to chloroplatinic acid hexahydrate, the platinum precursor, disappeared as soon as the substance was reduced to metallic Pt. Increasing the chloroplatinic acid hexahydrate, a precursor, content causes decreasing in as-spun fiber diameters. Morphology of the composite PVA/Pt nanofibers was investigated by both scanning and transmission electron microscopy. Platinum existence was confirmed by energy dispersive X-ray and X-ray diffraction techniques. Interaction between the as-formed Pt nanoparticles and the PVA matrix was studied by Fourier-transformed infrared spectroscopy.

## บทคัดย่อ

นริศรา ตินรัตน์ : การเตรียมนาโนคอมพอสิตจากเส้นใยพอลิไวนิลแอลกอฮอล์นาโน และอนุภาคระดับนาโนของแพลทตินัม (Preparation of Poly(vinyl alcohol)/Platinum Nanoparticles Nanocomposite Nanofibers) อ. ที่ปรึกษา : รศ.ดร. พิชญ์ สุขผล 50 หน้า

นาโนคอมพอสิตจากเส้นใยระดับนาโนของพอลิไวนิลแอลกอฮอล์และอนุภาคแพลทตินัมนาโนสามารถผลิตได้ด้วยกระบวนการอิเล็กโตรสปินนิง พอลิไวนิลแอลกอฮอล์ที่เติมลงในระบบนั้นนอกจากจะทำหน้าที่เป็นสารสร้างเสถียรภาพป้องกันไม่ให้อนุภาคที่เกิดขึ้นมารวมตัวกัน กลายเป็นอนุภาคที่มีขนาดใหญ่ขึ้นแล้วนั้น พอลิไวนิลแอลกอฮอล์ยังเป็นวัสดุที่ก่อให้เกิดเส้นใยอีกด้วย เส้นผ่านศูนย์กลางของอนุภาคแพลทตินัมที่สังเคราะห์ได้นั้นมีขนาดตั้งแต่สองถึงห้านาโนเมตร จากการนำสารละลายก่อนและหลังการรีดิวซ์ไปทดสอบด้วยเครื่อง UV-Vis พบว่าก่อนรีดิวซ์นั้นมีสเปกตรัมการดูดซับคลื่นในช่วงยูวีที่ 260 นาโนเมตร หลังจากการรีดิวซ์ด้วย Citrate ไอออนแล้ว สเปกตรัมดังกล่าวหายไปพร้อมการเกิดของอนุภาคโลหะแพลทตินัม นอกจากนี้พบว่าเมื่อเพิ่มปริมาณ chloroplatinic acid hexahydrate ในระบบพบว่าค่าการนำไฟฟ้าของสารละลายดังกล่าวเพิ่มขึ้น ซึ่งส่งผลทำให้ขนาดของเส้นใยอิเล็กโตรสปินมีขนาดเล็กลง เราศึกษาลักษณะทางสัณฐานวิทยาของนาโนคอมพอสิตที่สังเคราะห์ขึ้นด้วยเทคนิค Scanning Electron Microscopy (SEM) และ Transmission Electron Microscopy (TEM) ยืนยันว่ามีอนุภาคแพลทตินัมที่เกิดขึ้นจริงด้วยเทคนิค Energy Dispersive X-Ray และ X-Ray Diffraction รวมทั้งศึกษาพันธะระหว่างอนุภาคแพลทตินัมนาโนและเส้นใยพอลิไวนิลแอลกอฮอล์ระดับนาโนด้วยเทคนิค Fourier-transformed Infrared Spectroscopy.

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