

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



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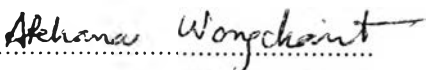
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ABSTRACT

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In past years, many polymers have been applied to electrospinning as pure nanofibers. Interestingly, it has been reported that metal nanoparticles have been incorporated into polymer nanofibers by this process. In this study, Poly (vinylalcohol) (PVA) nanofibers containing Platinum (Pt) and Ruthenium (Ru) nanoparticles were prepared by chemical reduction and electrospinning. PVA was used as both a stabilizer to prevent Pt–Ru nanoparticle agglomeration and as the template for fiber formations. The Pt–Ru precursors in a PVA aqueous solution were investigated by UV-visible spectrophotometer. The UV absorption peaks of Pt and Ru disappeared as soon as the Pt and Ru precursors were reduced to metallic Pt and Ru. Scanning electron microscopy (SEM) and transmission electron microscopy (TEM) were used to study the morphology of the PVA/Pt–Ru nanofibers and distribution of the Pt–Ru nanoparticles. It was found that the average diameter of the fibers decreased with increasing amounts of Pt–Ru precursors. The Pt–Ru nanoparticle size distribution was in the range of 2 to 5 nm. The platinum and ruthenium existence was confirmed by energy dispersive X-ray and X-ray diffraction techniques. Moreover, the interactions between the as-formed Pt–Ru nanoparticles and PVA matrix were studied by FTIR spectroscopy.

บทคัดย่อ

วิไล ศิริวัชรไพบูลย์ : การเตรียมคอมพอสิตจากเส้นใยพอลิไวนิลแอลกอฮอล์และอนุภาคของแพลทตินัมและรูทีเนียมในระดับนาโน (Preparation of Poly(vinylalcohol)/Platinum-Ruthenium Nanoparticle Nanocomposite Nanofibers) อ. ที่ปรึกษา : รศ.ดร. พิชญ์ สุภผล
62 หน้า

การเตรียมนาโนคอมพอสิตจากเส้นใยของพอลิไวนิลแอลกอฮอล์และอนุภาคแพลทตินัมและรูทีเนียมในระดับนาโนสามารถเตรียมได้จากปฏิกิริยารีดักชันด้วยสารเคมีและกระบวนการอิเล็กโตรสปินนิง ซึ่งพอลิไวนิลแอลกอฮอล์ที่เติมลงในระบบนั้นจะทำหน้าที่เป็นสารสร้างเสถียรภาพป้องกันไม่ให้อนุภาคที่เกิดขึ้นมารวมตัวกันกลายเป็นอนุภาคที่มีขนาดใหญ่ขึ้นและ พอลิไวนิลแอลกอฮอล์ยังเป็นวัสดุที่ก่อให้เกิดเส้นใยอีกด้วย ผลจากการนำสารละลายที่มีอนุภาคของแพลทินัมและรูทีเนียมไปวัดการดูดกลืนแสงด้วยเครื่อง UV-Vis spectrophotometer พบว่าก่อนที่อนุภาคของโลหะจะเกิดขึ้นนั้นสเปกตรัมการดูดกลืนอยู่ในช่วง 260-265 นาโนเมตร หลังจากที่ถูกรีดิวซ์ด้วย citrate ไอออนแล้วสเปกตรัมดังกล่าวหายไปพร้อมการเกิดของอนุภาคโลหะ เมื่อนำเส้นใยที่สังเคราะห์ได้ไปศึกษาด้วยกล้องจุลทรรศน์อิเล็กตรอนแบบส่องกราด (SEM) และกล้องจุลทรรศน์อิเล็กตรอนแบบส่องผ่าน (TEM) พบว่าขนาดเส้นผ่านศูนย์กลางของเส้นใยที่เกิดขึ้นจากการสังเคราะห์ได้นั้นมีขนาดลดลงเมื่อเพิ่มปริมาณของ กรดคลอโรแพลตินิก เฮกซะไฮเดรต และ รูทีเนียม คลอไรด์ และยังพบว่าขนาดของอนุภาคโลหะที่เกิดขึ้นนั้นมีขนาดตั้งแต่ 2-5 นาโนเมตร นอกจากนี้ยังสามารถยืนยันการเกิดขึ้นของอนุภาคแพลทินัมและรูทีเนียมด้วยเทคนิค Energy Dispersive X-Ray และ X-Ray Diffraction รวมทั้งศึกษาพันธะระหว่างอนุภาคนาโนของแพลทินัมและรูทีเนียมและเส้นใยพอลิไวนิลแอลกอฮอล์ระดับนาโนด้วยเทคนิค Fourier transformed Infrared Spectroscopy.

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