

CONDUCTIVE POLYMER AS GAS SENSOR

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ABSTRACT

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Polyaniline emeraldine base (EB) powder, a non-conductive form, was synthesized by chemical oxidative polymerization in HCl medium by using ammonia peroxydisulfate as an oxidant. In order to convert EB powder to emeraldine salt (ES) powder, a conductive form, EB powder was doped by using the acid doping process. Three different types of acid were chosen, hydrogen bromide (HBr), camphorsulfonic acid (CSA), and maleic acid (MA) to investigate the effect of acid dopant and concentration on the electrical conductivity of polyaniline film. The emeraldine salt films were prepared by hydraulic pressing for studying the film conductivity. In this work, it is found that the electrical conductivity of ES film increases dramatically with doping ratio less than 40 and then decreases gently, and finally, the conductivity is constant at higher doping ratios. It shows also that the CSA doped polyaniline is unsuitable to use as CO detector. While the electrical conductivity of the MA doped polyaniline at doping ratio 1000 decreased when exposed to CO gas. The MA doped polyaniline, hence, is appropriate to be used as CO detector. The minimum CO concentration that the MA doped polyaniline showed response was about 1 ppm.

บทคัดย่อ

นางสาวจิรณา แสงสว่าง :พอลิเมอร์นำไฟฟ้าสำหรับตรวจจับก๊าซ (Conductive Polymer as Gas Sensor) อ.ที่ปรึกษา : ศ. ดร.โจฮานเนส ชเวงก์, รศ.ดร.อนุวัฒน์ ศิริวัฒน์ ISBN 974-13-0735-7

ผงพอลิอะนิลีนเอมเมอราลดีนเบส (สถานะไม่นำไฟฟ้า) ถูกสังเคราะห์ขึ้นโดยกระบวนการเคมีคอลออกซิเดชันที่พอลิเมโรโรเซชัน ซึ่งมีกรดไฮโดรคลอริกเป็นตัวกลางและใช้แอมโมเนียมเปอร์ออกไซด์ซัลเฟตเป็นสารออกซิแดนท์ ผงเอมเมอราลดีนเบสจะถูกเปลี่ยนให้อยู่ในรูปผงเอมเมอราลดีนซอลท์(สถานะนำไฟฟ้า) โดยกระบวนการได้ปด้วยกรด ในงานวิจัยนี้ เลือกใช้กรดไฮโดรเจนโบรไมด์, กรดแคมเฟอร์ซัลโฟนิคและกรดมาเลอิก เพื่อศึกษาผลกระทบของชนิดและความเข้มข้นของกรดต่อค่าการนำไฟฟ้าของแผ่นพอลิอะนิลีน แผ่นเอมเมอราลดีนซอลท์จะถูกขึ้นรูปโดยใช้เครื่องอัดไฮดรอลิก จากการวิจัยพบว่า ค่าการนำไฟฟ้าของแผ่นเอมเมอราลดีนซอลท์จะเพิ่มขึ้นอย่างรวดเร็ว เมื่อใช้อัตราส่วนโดยโมลของกรดต่อพอลิเมอร์ในการได้ปน้อยกว่า 40 หลังจากนั้นจะลดลงเล็กน้อยและจะให้ค่าการนำไฟฟ้าที่คงที่เมื่อใช้อัตราส่วนโดยโมลของกรดต่อพอลิเมอร์ในปริมาณสูง นอกจากนี้ยังพบว่า พอลิอะนิลีนที่ได้ปด้วยกรดแคมเฟอร์ซัลโฟนิคไม่เหมาะสมในการนำมาใช้เป็นตัวตรวจสอบก๊าซคาร์บอนมอนอกไซด์ ในขณะที่ พอลิอะนิลีนที่ได้ปด้วยกรดมาเลอิกมีการนำไฟฟ้าลดลงเมื่ออยู่ในสภาวะที่มีก๊าซคาร์บอนมอนอกไซด์ ดังนั้น พอลิอะนิลีนที่ได้ปด้วยกรดมาเลอิกจึงสามารถใช้เป็นตัวตรวจสอบก๊าซคาร์บอนมอนอกไซด์ได้ปริมาณก๊าซคาร์บอนมอนอกไซด์ที่น้อยที่สุดที่สามารถถูกตรวจจับได้คือที่ประมาณ 1 ส่วนต่อล้านส่วน

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