STUDY ON ADMICELLAR POLYMERIZATION OF STYRENE ON SILICA FROM RICE HUSK

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ธนวัต อู่อุดมยิ่ง: การศึกษากระบวนการแอดไมเซลลาร์ พอลิเมอไรเซชั่น ของสไตรีนบนซิลิกาจากแกลบข้าว (Study on Admicellar Polymerization of Styrene on Silica from Rice Husk) อ. ที่ปรึกษา: ผศ. ดร. รัตนา รุจิรวนิช, ดร. มานิตย์ นิธิธนากุล และ ศ. ดร. ริชาร์ด เอ็ม เลน 64 หน้า ISBN 974-17-2342-3

อสัญฐานซิลิกาที่มีความบริสุทธิ์ของซิลิกาสูงถึงร้อยละ 97.46 มีพื้นที่ผิวจำเพาะ 349 ตารางเมตรต่อกรัม และมีขนาดรูพรุน 52.80 อังสตรอม สามารถเตรียมได้จากแกลบข้าวโดยผ่านกระบวนการล้างด้วยกรดก่อนที่จะนำไปเผาที่อุณหภูมิ 600°C ปริมาณอสัญฐานซิลิกาที่เตรียมได้คิดเป็นปริมาณร้อยละ 19 โดยน้ำหนัก และพบว่าอุณหภูมิการเผาและการล้างด้วยกรดมีผลต่อความเป็นผลึกของซิลิกาที่เตรียมมาจากแกลบข้าว จากการศึกษาการดูดซับของสารลดแรงตึงผิวบนพื้นผิวของซิลิกา และการปรับปรุงพื้นผิวของซิลิกาที่ได้จากแกลบข้าวเปรียบเทียบกับซิลิกาทางการค้า (Hi-Sil®255) โดยผ่านกระบวนการแอดไมเซลลาร์ พอลิเมอไรเซชั่น ที่ใช้สไตรีนและเซติลไตรเมทธิลแอมโมเนียมโบรไมด์ เป็นมอนอเมอร์และสารลดแรงตึงผิวตามลำดับ พบว่าการปรับปรุงพื้นผิวของซิลิกาโดยกระบวนการแอดไมเซลลาร์ พอลิเมอไรเซชั่นส่งผลให้พื้นที่ผิวของซิลิกาลดลง พอลิสไตรีนที่ถูกสกัดออกมาจากซิลิกาที่ผ่านกระบวนการแอดไมเซลลาร์ พอลิเมอไรเซชั่น โดยตัวทำละลายเทตทระไฮโดรฟูแลน ได้ถูกตรวจสอบคุณสมบัติด้วยเครื่องฟูเรียทรานฟอร์มอินฟาเรดสเป็คโตรสโคป และเครื่องเจลเพอมิเอชั่นโครมาโตรกราฟฟี่ พบว่าน้ำหนักโมเลกุลของพอลิสไตรีนที่ถูกสกัดออกมาจากซิลิกาที่ได้จากแกลบข้าว และซิลิกาทางการค้ามีค่า 832 และ 885 กรัมต่อโมลตามลำดับ

ABSTRACT

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Amorphous silica with high purity and high specific surface area was prepared from rice husk by calcination at 600°C with acid leaching pretreatment. The purity of the silica obtained was 97.46% SiO_2 with a yield of about 19% on a dry weight basis. The specific surface area and porosity diameter of the rice husk silica were 349 m^2/g and 52.80 Å, respectively. The calcination temperature and acid leaching pretreatment were found to affect the crystallinity of the rice husk silica. Surface modification of the rice husk silica by admicellar polymerization using styrene monomer was investigated and the results were compared with those obtained from Hi-Sil®255, a commercially available or precipitated silica. Cetyl trimethylammonium bromide (CTAB) and 2,2'-azobis-2-methylpropionitrile (AIBN) were used as surfactant and initiator, respectively. The adsorption isotherm of CTAB on the rice husk silica and Hi-Sil®255 were determined. After admicellar polymerization, the decreases in specific surface area of both types of silica were measured. Polystyrene was extracted from the silica and characterized by FTIR and GPC. The weight average molecular weight of polystyrene extracted from the rice husk silica and Hi-Sil®255 were 832 and 885, respectively.

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