URN etd-0407109-183709-649
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Statistics This thesis had been viewed 41 times. Download 118 times.
Department
Year 2004
Semester 1
Degree Master
Type of Document Master's Thesis
Language zh-TW.Big5 Chinese
Title Electrochemical Polymerization of Aniline Copolymer and Its Electrochromic Device
Date of Defense 0000-00-00
Page Count 94
Keyword
electrochemical
experimental design of mixture
aniline derivatives
electrochromic device

Abstract
A systematic analysis for electrochemical polymerization of aniline
(AN), o-toluidine (OTO) and m-toluidine (MTO) ternary components on an indium-tin oxide (ITO) electrode was performed.Using an
experimental design of mixture, empirical models are fitted and plotted as contour diagrams, which facilitate revealing the synergestic/antagonistic effects between these mixed aniline derivatives. Copolymer produced by electropolymerization of these aniline derivatives in 1 M HCl aqueous solution was investigated by cyclic voltammetry, UV-visible spectroelectrochemical study and scanning electron spectroscopy (SEM). The cyclic voltammogram of the copolymer growth is significantly affected by the composition of monomers. As shown by CV, the mechanism and the rate of the copolymer growth are significantly affected by the composition and concentration of monomers. The SEM results show that a fiber-like form will be changed as a consequence of incorporation of OTO/MTO units into the polymer structure. UV-visible spectrum of the copolymer showed three optical transitions at λmax= 300, 440,and 800 nm for different applied potentials. At isosbestic points of ca. 350 and 480 nm, a fixed stoichiometric ratio of oxidized to reduced form exists when the polymer film is oxidized successively by applying potentials from 0 to 1 V vs. Ag/AgCl.

On the other hand, the electrochemical copolymerization of diphenylamine (DPA) with 2,5-dimethoxyaniline (DMA) was performed in 4 M H2SO4 aqueous solution for different feed ratios of DPA using cyclic voltammetry. The deposition rate of DPA-DMA copolymer is higher than that of homopolymers (PDPA and PDMA). X-ray photoelectron spectroscopy (XPS) results clearly demonstrate an increased portion of DMA in the copolymer with an increase in the molar ratio of DMA in the feed. P(DMA-co-DPA) film was deposited using electrochemical polymerization as conducting film on indium tin oxide (ITO) electrode and used as an electrode in an electrochromic device. Poly(3,4-ethylenedioxy-
thiophene):poly(4-styrenesulfonate) (PEDOT:PSS) was spin-coated on ITO as the other electrode. Polyurethane ionomer (PUI) blended with LiClO4 was used as solid polymer electrolyte. A total solid electrochromic device was assembled as follows:

ITO │ P(DMA-co-DPA) ‖ LiClO4-PUI ‖ PEDOT:PSS │ ITO

The columbic efficiency of the devices reached to 84 % for P(DMA-co-DPA) film with DPA feed ratio of 0.5. The optical contrast (ΔT, %) of the single electrode and the device were determined by UV-visible spectroelectrochemical studies. A value (31%) of ΔT in color upon switching the

potential from -1.0 to +1.0 V (vs. PEDOT) was
noticed for this device. The device was pale yellow at -1.0 V and blue at +1.0 V.
Advisory Committee Yang Chien Hsin - advisor

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etd-0407109-183709-649-001.pdf

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Date of Submission 0000-00-00