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**AN ELECTROCHEMICAL STUDY OF  
POLYPYRROLE BASED COMPOSITE CONDUCTING  
POLYMERS AND THEIR APPLICATIONS**

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## Abstrak

Kaedah Voltametri Berkitar telah digunakan untuk menyedilik pemolimeran pirola secara elektrokimia dalam beberapa jenis elektrolit (poli stirena sulfonat, poli vinilsulfonik asid dan p-toluenasulfonik asid). Pengkajian terhadap pengekstrakan ion-ion logam berat telah dilakukan dengan menggunakan elektrod filem komposit polipirola.

Sifat-sifat filem polipirola-polivinil sulfonat seperti ketumpatan, kekonduksian elektrik permukaan dan kekonduksian pukal telah dikaji.

Filem polipirola elektrolit yang mengandungi kumpulan sulfonik telah digunakan untuk mengekstrakkan ion-ion logam berat (kuprum, nikel dan kobalt) dari larutan yang sangat cair. Kepekatan akhir ion-ion logam berat dalam larutan sampel yang digunakan telah mencapai satu takat yang menghampiri 1 mg/L.

Sifat-sifat permukaan bagi polipirola-poli vinilsulfonat dan polipirola-p-toluenasulfonat dalam keadaan pengoksidaan dan penurunan juga dikaji dengan menggunakan perkakas-perkakas ESCA dan ToF-SIMS. Selain daripada itu, penurunan filem polipirola elektrolit dalam larutan yang mengandungi ion-ion logam berat (kuprum, nikel dan kobalt) juga diselidiki.

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## Abstract

A cyclic voltammetry study of the electropolymerization of polypyrrole in different types of electrolyte solutions (polystyrene sulphate, poly vinylsulfonic acid and p-toluenesulfonic acid) had been carried out. A study of heavy metal ions (copper, nickel and cobalt) removal was carried out using the polypyrrole-dopants films as electrodes for ion-exchange and electrodeposition.

Some the characteristics of polypyrrole-poly vinylsulfonic films have been studied, which include the density, surface and bulk conductivities over a range of concentration of monomer pyrrole used.

Sulphonated conducting polypyrrole-dopants films were applied in the heavy metal ions (copper, nickel and cobalt) removal from very dilute simulated effluent solutions. The final concentrations of the heavy metal ions attained in the treated samples were about or less than 1 mg/L.

Some surface characteristics studies of polypyrrole-poly vinylsulfonate and polypyrrole- p-toluenesulfonate in the oxidised and reduced forms were carried out using ESCA and ToF-SIMS techniques. Films reduced in heavy metal ions (copper, nickel, cobalt) solutions were also studied using these UHV spectrometry techniques.

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