ELECTROCHEMICAL BEHAVIOUR OF POLYANILINE ELECTRODEPOSITED ON A REDOX ION-EXCHANGER MODIFIED ELECTRODE.

By

KARIUKI BENSON
Bed. Sci. (Hons)
KENYATTA UNIVERSITY

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other university.

Sign.....
Kariuki Benson

This thesis has been submitted for examination with our approval as university supervisors.

Sign..... 8/11/96.
DR. D.O. ORATA.
DEPT. OF CHEMISTRY,
UNIVERSITY OF NAIROBI.

Sign.....
PROF. G.N. KAMAU.
DEPT. OF CHEMISTRY,
UNIVERSITY OF NAIROBI.

ABSTRACT

Polyaniline is one of the most widely studied conducting polymer. It's domain of application is however limited by the fact that it crystallises if large amounts of it are electrodeposited on a bare electrode surface. One method that has already been tried to overcome the problem is the use of an insulating host matrix for example Nafion. This method has however adversely reduced the rate of polymerization of the aniline monomers.

Also, bilayer electrodes so far known have been made from a combination of redox polymers. No bilayer electrodes have however been made from a combination of a redox and a conducting polymer. It is these areas that this research project seeked to address.

All electrochemical analysis were carried out using the cyclic voltammetric technique. A PAR model 173 Potentiostat/Galvanostat was used in conjunction with a model 175 Universal programmer. The output was fed into a PAR model RE-0089 X-Y recorder. A three electrode assembly was used in an undivided cell.

The results obtained showed that lead redox chemistry can be studied in sulphuric acid for cases where the lead has been exchanged in a clay mineral (bentonite) or a cation exchange resin (amberlite).

The redox peaks of polyaniline and lead been shown to be about 500 mV apart and thus independent of each other. The presence of lead in the host matrix was however observed to cause electrocatalyses in the deposition of polyaniline.

Experiments also revealed the versatility of bentonite and amberlite modified electrodes in the detection of very low concentrations of lead i.e., upto 10^{-5} M.

When copper was exchanged for the protons in amberlite, and the copper loaded amberlite used as a host matrix for electrodeposition of polyaniline, an interface whose electrochemical features are characteristic of bilayer electrodes was formed.

On the contrary, when a copper loaded bentonite was used as a host matrix, distinct copper and polyaniline redox peaks are observed (no features of bilayer electrodes). Nevertheless a remarkable improvement in the copper peak currents was observed.