

A STUDY OF ELECTROCHEMICAL DEGRADATION OF POLYANILINE
USING CYCLIC VOLTAMMETRIC TECHNIQUE.

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ABSTRACT

Cyclic voltammetry scans were obtained using a PAR model 175 Universal programmer in conjunction with PAR 173 potentiostat/galvanostat. The output signal were fed into a PAR RE 0089 X-Y recorder. The three electrodes assembly used were, carbon graphite as the working electrode, saturated calomel electrode(SCE) as reference electrode and platinum wire as the counter electrode.

The polyaniline film used in all the experiments were electrodeposited by cycling the potential between -0.2v to 0.75v and scan rate of 20mV/Sec. In a solution containing 1M sulphuric acid and 0.1M aniline monomer.

When a fresh polyaniline was transferred to 1M sulphuric acid(no aniline monomer) and the potential window varied, it was found that anodic peak current is directly proportional to time at low potential windows (below 0.75v, positive limit) since the plots of anodic peak current versus time gave straight line graphs.

This relationship did not hold for higher potential windows(above 0.75v) since the plots of anodic peak current versus time gave curves. Also at higher potential windows a second peak which is due to formation of quinone derivatives was observed. The appearance of quinone derivative peak resulted to faster polyaniline degradation, since the conversion of polyaniline to quinones is irreversible.

The electron charge transfer was found to be faster at high acid concentrations (low pH). This was proposed to be due to decrease in solution conductivity as the solution concentration is lowered. It was further found that the rate of degradation of polyaniline in acid media depends on the type of acid (media), but independent of pH of the solution, since in all the concentrations of sulphuric acid used the slopes of anodic peak current versus time was the same (2.6 MilliAmperes per second), and that for the ranges of Hydrochloric acid used was 1.3 milliAmperes per second.

Degradation of polyaniline in salt solution was found to be totally suppressed. This was proposed to be due to the fact that, the anions from the salt solutions formed an ion-pair compound with the imine, and this leads to stabilization of the imine to hydrolysis. When the electrode was transferred to acidic media, the voltammetric response obtained was of the same magnitude as the originally deposited polyaniline.