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ELECTROCHEMICAL PROPERTIES OF CHEMICALLY AND ELECTROCHEMICALLY SYNTHESIZED POLYANILINE

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Polyaniline(PANI) is one of the most promising electronically conducting polymers for technological applications such as rechargeable batteries, electrochromic displays and sensors. Further, PANI is highly electroactive and it has relatively high doping levels than the other electronically conducting polymers. Therefore it is a suitable candidate for cathode materials in plastic batteries.

The PANI system differs from other conducting polymers because of the presence of more than one redox process and because of the possibility of protonation of the polymer chain itself, in addition to the negative counterions more loosely doped to the chain. Therefore, its properties depend on both the pH of the solution it is treated with and on the oxidation potential. Due to this complexity, the reported results on PANI in the literature differ considerably. Unlike many other conducting polymers, PANI can be prepared by chemical or electrochemical synthesis. The work reported in the literature is mostly confined to systems prepared by one of these methods.

In this study, electrochemical behaviour of PANI films prepared by both process are reported. Electrochemical synthesis was carried out in 0.1 M aqueous ethanedisulfonic acid (EDSA) solution. PANI films of 0.25 μm thickness were obtained galvanostatically at a constant current density of 62.5 $\mu A/cm^2$ using the standard two compartment, three electrode cell arrangement. Films were also prepared by momentarily dipping a clean platinum wire in solution containing chemically synthesised PANI in formic acid. Cyclic voltametry and in-situ electrical conductivity variation studies were carried out in aqueous electrolytes containing ethanedisulfonic acid.

The cyclic voltammograms for both type of films have identical features indicating the films obtained may be the same form. PANI changes from non conducting state to conducting state on partial oxidization and reverts back to non conducting state when it is fully oxidized. In the conducting state the electrical conductivity seemed to vary with applied potential. The conductivity has the highest value at a potential close to the first anodic peak of the corresponding voltammograme.