DEVELOPMENT
OF POLYANILINE CONDUCTING POLYMER SYSTEMS
FOR
SENSOR APPLICATIONS

A THESIS PRESENTED BY

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To the Board of Study in Chemical Sciences of the

POSTGRADUATE INSTITUTE OF SCIENCE

In partial fulfillment of the requirement

for the award ofthe degree of

MASTER OF PHILOSOPHY

of the

UNIVERSITY OF PERADENIYA

SRI LANKA

2004

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Polyaniline (PANI), a conducting polymer can exist in six different structural forms. The six forms are interconvertible and they have their own characteristic properties. In this study the polymer was developed for use as an electrocatalytic substance and as a gas sensor.

The electrochemistry of L-Ascorbic Acid in 0.1 mol dm^{-3} of NaCl(aq) in the potential range -0.4 V to +1.0 V at pH 2 shows that one oxidation peak centered at + 0.55 V and 0.38 V with respect to SCE on Glassy Carbon and Pt electrodes in contrast the Polyaniline modified electrode shows a oxidation peak centered at 0.33 V. Thus the PANI modification on Pt and Glassy carbon bare electrodes has resulted in 0.22 V and 0.15 V negative shifts for the Ascorbic Acid oxidation compared to glassy carbon and Pt bare electrodes. The latter system follows the Langmuir adsorption isotherm and the monolayer coverage of ascorbic acid on PANI surface facilitates the oxidation reaction at a lower potential. The fact that relatively low potential is sufficient to oxidize ascorbic acid on PANI indicates the suitability of a PANI modified electrode as an electrochemical catalyst to sense ascorbic acid in biological samples.

The qualitative changes of different forms of PANI when exposed to various gases such as NH_3, HCl vapor, H_2S, and Cl_2 were studied. The adsorption of the above gases were accompanied by colour and conductivity changes in the PANI.

Exposure of emeraldine salt form of PANI deposited on glass plates to NH_3 gas results in decreasing of conductivity as increase of the concentration of NH_3 gas and the colour

changes from green to blue. When the emeraldine base forms of PANI on glass plates are exposed to HCl vapor, conductivity is increased in a systematic way with the concentration of HCl vapor with no visible colour change. The exposure of pernigraniline base form of PANI to various doses of H_2S gas results in an initial decrease followed by an increase of the resistance. The colour changes from violet, blue, green and finally to yellowish green. When emeraldine salt form of the polymer is exposed to an oxidizing gas such as Cl_2 the polymer gets oxidized resulting in the reduction of its conductivity with the colour changing from green to violet.

These conductivity and colour changes of the polymer film with the concentration of gas indicate the applicability of the polymer as a gas sensor for quantitative and qualitative determination of acidic, basic and redox gases.