PUNE RESEARCH TIMES (ISSN 2456-0960)
AN INTERNATIONAL JOURNAL OF CONTEMPORARY STUDIES SPECIAL ISSUE FEB 2019

POLYANILINE MATRIX FOR THE DEVELOPMENT OF CYBERNETICS

P. D. GAIKWAD

Dept. of Physics Sunderrao Solanke Mahavidyalaya Majalgaon,dist. Beed ***(MS) INDIA.***

Abstract: *Polyaniline matrix has been investigated .In the present work the polyaniline matrixes were synthesized by using electrochemical polymerization technique. The matrix were deposited on platinum electrode using Potentiostatic Conditions at room temperature. The synthesized matrix were characterized by using electrochemical technique, conductivity measurement and scanning electron microscopy (SEM).. It has been observed that the polyaniline matrix behaves like Semiconductor which could be better structure for immobilization of biocomponent, so that it can be used for the development of cybernetics.*

INTRODUCTION

Polymeric materials are considered to arise from the strength, elasticity, plasticity and toughness their electrical properties; the conductivity of these materials arises from conjugated $\prod$ - electrons distributed along the polymer backbone[1].The technique we employ to synthesize conducting polymers is electrochemical polymerizations. It allows us to use simple monomers and electrolytes, and to produce good quality polymermatrix on the metal substrates (Platinum). This technique allow for the incorporation of dopant into polymer at the same time in synthesis at the dopant molecules can be used as part of the supporting electrolytes[2-5].The doped polymers have delocalized electron on the backbone, as well as being conductive they have other unusual electronic properties. Polyaniline exists two oxidation states and can also be readily protonated and deprotonated. During protonation and deprotonation the number of electron on the polymer chain remain constant.i.e there is no charge transfer. Electronic changes will occur during doping and protonation. Polyaniline is most conductive in its green state i.e. poly emeraldine, formation of polaron conduction band which is responsible for high

conductivity in the state of polymer see figure1.

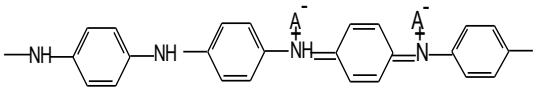

Figure.1. Emeraldine salt

Figure 1: The idealized structure of Pani (base) with x=0 representing the fully reduced form of the polymer x = ½ 'polyemeraldine' and x =1 fully oxidized Pani.

Experimental

Chemicals used during synthesis of PANI matrix

The aniline monomer was distilled twice before use, Hydrochloric acid (HCl) were used as supporting electrolyte above reagents were obtain from Rankhem, Ranbaxy, and New Delhi (INDIA).

Synthesis of PANI-HCl matrix

The PANI-HCl film was synthesized from an aqueous solution of distilled water containing 0.2 M aniline and 1 M of Hydrochloric acid (HCl) using electrochemical deposition method. It was carried out by potentiostatic technique at 27 ºC. The applied current density 1 mA/cm^2 and the 1.0 pH were kept constant during synthesis of PANI-HCl film. The pH was adjusted by adding nitric acid (HNO_3) or sodium hydroxide (NaOH). After synthesis, polymer coated electrodes were rinsed thoroughly in distilled water and dried in cold air and then used for subsequent characterization.

Results and Discussion

Amperometric studies of PANI-HCl matrix

The chronoamperogram of synthesized PANI-HCl matrix is shown in Figure. 2.

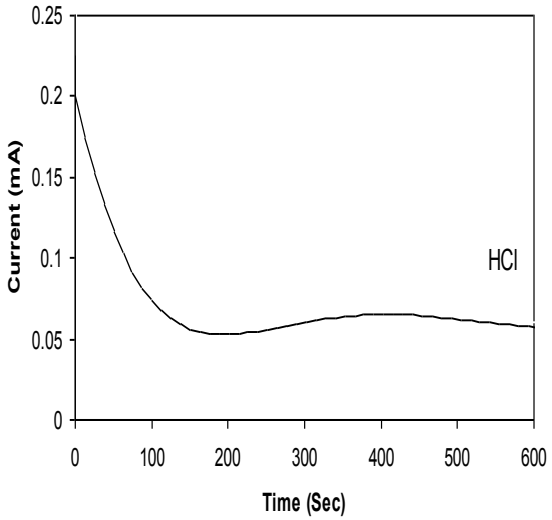

Figure..2. Chronoamperogram of PANI-HCl matrix

The behavior of the amperometric synthesis overshoot during first few second probably indicates difficult formation of dimmers and oligomers. After this, current remain constant suggesting that building up of the films proceeds according to the same reaction along the full thickness of the polymer.

SEM studies of PANI- HCl film

The scanning electron micrograph was recorded using JEOL, JSM-6360A SEM

machine. The Scanning electron micrograph of synthesized PANI-HC lfilm is shown in Figure. 3.

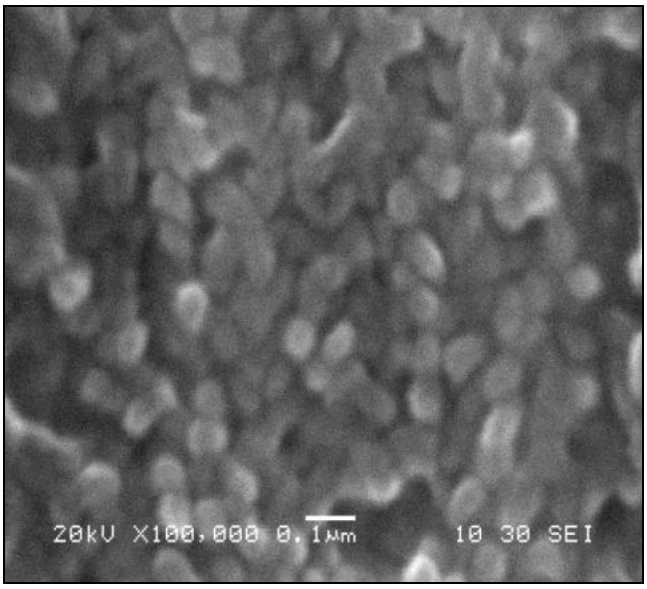

Figure.3. Scanning electron micrograph of PANI-HCl matrix

It is granular like structure, it show very good uniformity and porosity, which is suitable for immobilization of biocomponent**.**

Conductivity studies of PANI- HCl matrix

The electrical conductivity of synthesized PANI-HCl matrix was measured by four probe technique and it was 0.4 7 S/cm

CONCLUSIONS

Polyaniline-HCl matrix behaves like semiconductor, which could be better structure for immobilization of biocomponent so that it can be used for the development of cybernetics.

Acknowledgement

Authors are thankful to authorities of University Grants Commission, Punei, for providing the financial assistance.

REFERENCE

[1] A. P Monkman, D Bloor, G S Steven, and J C S Steven " Electronic energy level of polyaniline". J Phys. D. APPl.Phys, 20(1987) 1937-1945.

[2]. Manju Gerard[a], Asha Chaubey[b] "Application of conducting polymers to biosensors". Biosensors and bioelectronics 17(2002) 345-359.

[3].Genies E.M and Viel E 1987 Synth.Met. 20 97.

[4]. Genies E.M and Tsintarvis S 1985 J. Electronal.Chem.195 109.

[5]. P D Gaikwad, D J Shirale, V K Gade, P A Savale, K P Kakde, H J Kharat and M D Shirsat, "Optimization of various electrochemical process parameter for synthesis of polyaniline doped with inorganic supporting electrolyte on platinum substrate" Transaction of The SAEST 41(2006) 52-58