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

ELECTROCHEMICALLY SYNTHESIS AND CHARACTERIZATION OF POLYANILINE THIN FILM

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Abstract: *In the present investigation, electrochemical behavior of polyaniline (PANI) thin films which is synthesized by galvanostatic technique on platinum substrate as working electrode in three electrode system. Various process parameters Viz. applied current density, concentration of dopant and time of deposition were optimized during the deposition of PANI thin films. The Surface morphology was characterized by Scanning probe technique Viz. Atomic Force Microscopy (AFM) which confirms the deposition of thin films.*
Keywords: *Polyaniline Thin films, galvanostatic technique, surface modification. Atomic ForceMicroscopy,*

1 INTRODUCTION

In this era world is going to developed due to liberalization, Privatization and globalization which can produce adverse effect on flora and fauna. So it is very important to nurture the nature for our future. Therefore scientists were attracted towards the Conducting polymers Polyaniline [1], polypyrrole [2] and polythiophene [3] which can play a vital role to monitor the environment due to its ease of synthesis, low power consumption, tunable conductivity [4 - 8]. conducting polymer synthesized by chemical oxidative polymerization techniques [9, 10] which produce thick film with the help of oxidizing agents and require large amount of time to carry out, as well as an interfacial polymerization technique is utilize to produced composite film of polyaniline with

the help of oxidizing agent which is quite complicated to carry out [11]. PANI films synthesize by electrochemical polymerization techniques [12, 13].

In present work, keeping the idea of electrochemical polymerization technique by lower applied current density, PANI thin film synthesize and deposited on platinum working electrode (vs Ag/AgCl reference electrode) by chronopotentiometry and the topographical image of PANI thin film is recorded by Atomic Force Microscopy (Park XE 7). The electrochemical characterization performed by utilizing CH 600C electrochemical work station. A three electrode cell containing platinum plates of dimensions 20 * 5 *0.5 mm^3 were used as working & counter electrodes and saturated Ag/AgCl used as reference electrode. In the preparation of electrolyte, aniline monomer distilled once before to used and stored in cool environment were purchase from Sigma Aldrich. The reagent used as hydrochloric acid (HCl) of laboratory grade. In the electrolyte preparation 1 M of HCl is added drop wise with continuous stirring in 0.1 M of aniline for half an hour. This solution is used for electrochemical deposition of PANI thin films on platinum working electrode at room temperature.

II RESULT AND DISCUSSION:

PANI thin films synthesized by applying constant current density of 1 mA/cm^2 for 10 minutes to introduced PANI nuclei on to the platinum working electrode, at this current density effective potential at working electrode at which anodic peak potential remains at 0.61 v (vs Ag/AgCl reference electrode). After anodic peak there is a decrease in potential which confirms a uniform polymerized mass of PANI deposited on platinum working electrode. In the process of deposition, first the oligomers with smaller in size are deposited on the working electrode which acts as a seeds and help to deposited PANI polymers on the platinum working electrode. The modification in the topographic surface of the substrate after deposition of PANI thin film on working electrode is confirmed by Atomic Force Microscopy (AFM).

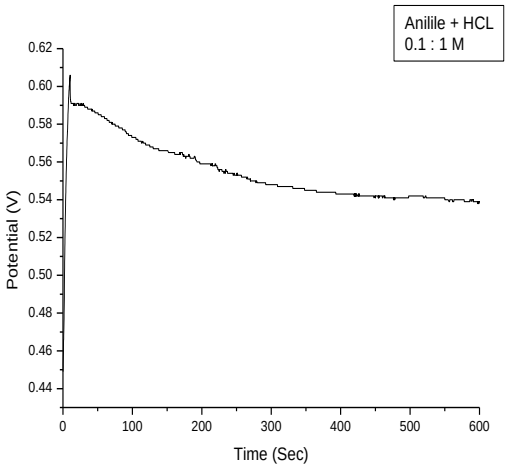

Fig.1: Chronopotentiogram of 0.1 : 1 M aniline/HCL thin film.

The modification in the topographic surface of the substrate after deposition of PANI thin film on working electrode was confirmed by Atomic Force Microscopy (AFM).

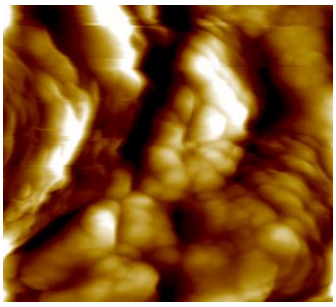

Fig. 2: Surface morphology of PANI thin film by AFM.

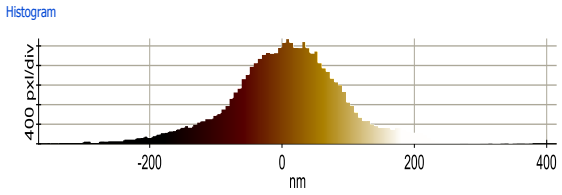

Fig 3. Histogram of PANI Thin film.

III. CONCLUSION :

Electrochemical polymerization technique is utilized to synthesis and characterization of PANI thin film on platinum working electrode at room temperature. A chronopotentiogram is recorded which required less reaction time with lower applied current density as well as do not require any oxidant compare to the chemical oxidative polymerization technique. Surface morphology of deposited PANI thin film was studied by Atomic Force Microscopy, which confirms the deposition of PANI thin film on the working electrode due to roughness of topographic image.

IV . ACKNOWLEDGEMENT

The authors are grateful to RUSA – Centre For Advanced Sensor Technology Dr. Babasaheb Ambedkar Marathwada University, Aurangabad for providing a synthesis & characterization technology.

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