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A Special Category of Electrolyte Prepared By Complexation of Zinc With Conducting Poly Aniline

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Abstract- Complexes of Poly Aniline with Metal ions generally have versatile tendency in salt containing crystalline phase and soluble salts containing amorphous amorphous elastomeric phase exhibits conductivity of poly Aniline Polymeric material. Conducting Poly Aniline can be obtained by two methods 1) by electrochemical doping 2) Complexation with mono,di, trivalent metal ions. Due to great conducting environmental stability ,Poly Aniline is an important electroactive material. The chemical and electrochemically induced doping process greatly modifies the conducting properties of the polyaniline.Its conductivity on complexation is arousing considerable commercial interests. The Application of Poly Aniline and the related composite materials in polymer electronics is analyzed briefly.[1] The another category of includes those polymeric material that offer reversible electrochemical devices with unique characteristics of great importance in the presently developing technology. These days study and implementation of various types of conducting polymers have been carried out in India and all over the world. It is observed that conductivity of Poly Aniline can be modified by changing its method of synthesis. The Application of Poly Aniline and the related composite materials in polymer electronics is analyzed briefly.[1] The another category of includes those polymeric material that offer reversible electrochemical devices with unique characteristics of great importance in the presently developing technology. The Application of Poly Aniline and the related composite materials in polymer electronics is analyzed briefly.[1] The another category of includes those polymeric material that offer reversible electrochemical devices with unique characteristics of great importance in the presently developing technology.[1] The other type includes those polymers which offer reversible electrochemical devices with unique characteristics of great importance in the presently developing technology.

Keywords- Conducting Poly Aniline Polarography, half wave potential, diffusion current dropping mercury electrode

I. INTRODUCTION

Before illustrating the most promising applications, however the properties of and the characteristics of the polyaniline electrolytes and the polyaniline electrodes materials have to be described [2,4,6,7,8]. Polyaniline electrolytes are generally complexes between metal salts and polyaniline containing solvating etheroatoms. Since ,the ionic mobility in these complexes may be interpreted on the basis of hopping mechanism between coordinating sites[2,4] local structural relaxations and segmental motions of the polyaniline chains essential to assure high conductivity to the electrolyte. . The polarographic parameter i.e. half wave potential $E_{1/2}$ plays a vital role in the polarographic techniques. Since the half wave potential is the characteristic of the electro active species which helps to analyze the electro active species qualitatively and quantitatively.

In this paper Polarographic parameters for Zn-POLYANILINE complex formation have been presented.

The Characteristic nature of $E_{1/2}$ of metal is changed when it forms a complex with some legend. It has been observed by Lingan[1] that $E_{1/2}$ of the metal ion is shifted to more electronegative value on complex formation and its diffusion current is shortened.

II. MATERIALS AND METHODS

Sulphate polymer sulphate was prepared by chemical method applying oxidant (Potassium dichromate) the polymerization of 0.4 moles of aniline in 1lit. of 1M sulphuric acid was affected using 1g equivalent of the potassium dichromate a precipitated was separated, washed, dried and weighed as polyaniline sulphate.

Polyaniline Chloride was prepared by equilibrating the polyaniline sulphate with1M HCl for about 10hrs. The mass so obtained was separated, washed and dried and weighed as polyaniline Chloride.

Preparation of polymer complex –An adequate quantity of the polyaniline host and the inorganic salts of Zn were separately dissolved in suitable solvent (e.g. acetonitrile) the two solutions were then mixed and after stirring the solvent were slowly evaporated to finally obtain powder form of polymeric complexes.

Table: 1 : Some polar graphic parameters observed for Polyaniline (PANI)

Concentration mM	Id µ	$E_{1/2}$ V vs SCE	E_{pa} v	E_{pc} v	$E_{pc} - E_{pa}$ v
0.1	1.26	-0.56	0.56	-0.60	-0.04
0.2	1.18	-0.56	0.56	-0.60	-0.04
0.3	1.16	-0.56	0.56	-0.60	-0.04

Table: 2 Some polarographic parameters observed for Zn (II)-Polyaniline (Zn-PANI) complex

Concentration mM	**Id (µA)**	**E1/2 V vs. SCE**	**Epa (V)**	**Epc (V)**	**Epc - Epa (V)**	**Ipa (µA)**	**Ipc (µA)**	**No.of electrons involved**
0.1	1.1	-0.66	0.62	-0.64	-0.02	0.24	0.30	3
0.2	1.0	-0.64	0.62	-0.64	-0.02	0.22	0.24	3
0.3	0.84	-0.65	0.62	-0.64	-0.02	0.20	0.20	3

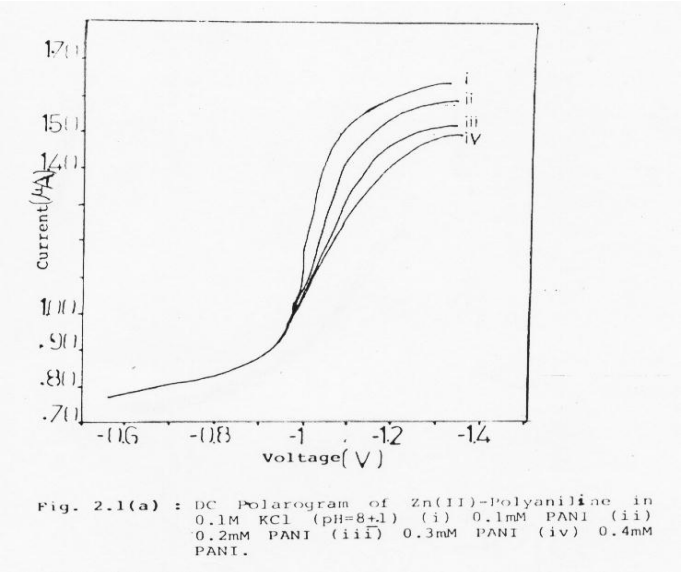

Fig. 2.1(a) : DC Polarogram of Zn(II)-Polyaniline in 0.1M KCl (pH=8+.1) (i) 0.1mM PANI (ii) 0.2mM PANI (iii) 0.3mM PANI (iv) 0.4mM PANI.

Pictures of Original Graphs recorded using pulse polarograph CL-90.

III. RESULT AND DISCUSSION

On gradual increase of the polymer concentration the half wave potential of the metal ion shifted to more negative value in each case and the diffusion current also decreased which revealed complex formation of the Zn metal ion with polyaniline.

To determine the composition and stability constants of binary complex plots of $\Delta E_{1/2}$ (shift in half wave potential ,$E_{1/2} = (E_{1/2})_c - (E_{1/2})_s$ against log C_x (logarithm of the complaxation of the legend)were drawn. The plots were linear showing the formation of single complex species in solution .Lingane treatment of the observed polarographic data revealed 1: 2 Zn : PANI complex formation in each case with formation constant log B=13.146 for Zn (II) PANI. Polarographic parameter for Zn-Polyaniline complex formation and its diffusion current is shortened Lingane has given a method for the study of dissociation /formation constant of the complex using polarographic method. The temperature dependence of the polyaniline film voltammetric response in aqueous and non aqueous by Q.Inselt[4] He observed that only a very slight shift into the direction of more negative potentials (Ca-10 mV) and a small increase in the temperature is increased by 30^0C. Study of Zn-PANI complex-All the Chemicals used were of anala R/BDH grade. 0.01 M metal (Zn^{++}) solutions were prepared by dissolving the requisite quantity of their soluble salts in double distilled water 0.1 M PANI solutions were prepared in small amount of hydrochloric acid diluted to required volume with distilled water.

Experimental sets of solutions containing overall concentration of supporting electrolyte (KCl) and Metal ion fixed at 0.1 M and 1.0 mM respectively. Whereas in other sets in addition to the above supporting electrolyte and metal ion concentration of each polymer (ligand) was varied.Polarograms were recorded on an ELICO (Hyderabad) pulse polarograph ModelCL-90 having a dropping mercury electrode (DME) a saturated calomel electrode (SCE) a working electrode as a working electrode reference electrode respectively.

The DME had a characteristics of m=2.33 mgs^{-1} t=3.03at 40cm effective height of mercury column ,$m^{2/3} t^{1/6}$=2.13$mg^{2/3}$ s-1/2

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Polarographic parameters of Zn- Poly Ethyl Aniline complex formation is confirmed by its shortened diffusion current. Lingane has given a method for the study of dissociation /formation constant of the complex using polarographic method.[6]

Q In selt[4] observed that the temperature dependence of the Poly Ethyl Aniline film voltammetric response in aqueous

and non aqueous, only a very slight shift into the direction of more negative potentials (Ca-10 mV) and a small increase in the temperature is increased by 30^0C

IV. SURVEY OF LITERATURE

W.John Albery[3], et.al have used electrode such as polyaniline, polypyrol and polythiophene. They showed that the behavior of the different polymers is similar and may be explained by a chemical model involving localized redox species with two possible conformations of the polymer.

The temperature dependence of the polyaniline film voltammetric response in aqueous and non aqueous media has been investigated by G.Inzelt[2] .He observed that only a very slight shift into the direction of more negative potentials in the peak potentials (Ca -10mv) and a small increase in the peak current as the temperature is increased by 30^0C.

Youn Chaol on Park Yong Woo studied behaviour Polyaniline and found that the electrons are moving in and out changing the polyaniline structure from one form to the another form

C. Herold 12 Yazmi, DBillaud attempted study of sodium doped polyparaphenylene film,
John Alberry, et.al

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