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Synthesis, Conducting Properties and Applications of Poly Ethyl Aniline

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Abstract— During the period of 1920-1960 quite a good number of polymers were prepared. Polymer scientists were trying to take advantage of polymers. They used polymers in various fields, such as; to bond objects, seal joints, fill cavities bear loads, etc..Polymers were used as conducting materials too. Polymer synthesis is not difficult today, because of the abundant availability of literature on the subject .thus to synthesis a few tons of polymers, all we need is the appropriate quantity of the monomer and catalyst and a suitable polymer reactor. Poly Ethyl Aniline complexes generally have a multiple nature ,consisting of salt rich crystalline phase and amorphous phase with dissolved salts .Therefore one of the most important characteristic of Poly Ethyl Aniline electrolyte is that their conductivity is a property of the amorphous elastomeric phase. Poly Ethyl Aniline may be converted into electro active materials using various doping methods.

Keywords-*Ethyl aniline,Ethero atom, electrochemically induced*

Introduction

Ion conducting polymers were first studied by write and coworkers but their potentials as practical electrolyte materials in electrochemical devices were recognized by Armend and coworkers .These materials are generally complexes between metal salts and high molecular weight polymers containing solvating etheroatoms.The most common examples are complexes formed by Zn (II) and Al (III) complexes with Poly Ethyl Aniline. The chemical and electrochemically induced doping process greatly modifies the conducting properties of the Poly Ethyl Aniline. On gradual increase of the PEG concentration the half wave potential of the metal ion like Zn (II)or Al(III) shifted to more negative value in each case and the diffusion current also decreased ,thereby indicating complex formation of the metal ions with PEG.Lingane Treatment of the observed polarographic data showed 1:1 metal :PEG complex formation in each case with formation constants for Zn(II)-PEG equal to log B=0.2787and log B=4.50,respectively. To find out the number of electrons involved in the electrode process cyclic voltammetric studies have been performed. Various sets of solutions containing varying concentrations of each of the polymers in 0.1 M potassium chloride(over all concentration) were prepared and the pH was adjusted to 8.0 ± 0.1and scan rate was 40mVs-1, similar sets were prepared containg various concentration of the polymer complexes under study.Cyclic voltammograms of these sets were recorded on pulse polarograph CL-90. [2].

Preparation of Poly Ethyl Aniline

Poly Ethyl Aniline sulphate was prepared by chemical method applying oxidant (Potassium dichromate) the polymerization of 0.4 moles of methyl aniline in 1lit. of 1M sulphuric acid was affected using 1g equivalent of the potassium dichromate a precipitate was separated, washed, dried and weighed as poly Ethyl Aniline sulphate

Poly Ethyl Aniline Chloride was prepared by equilibrating the Poly Ethyl Aniline sulphate with1M HCl for about 10 hrs. The mass so obtained was separated, washed and dried and weighed as Poly Ethyl Aniline Chloride. An adequate quantity of the Poly Ethyl Aniline 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 evaporated slowly to finally obtain powder form of Poly Ethyl Aniline - Zn complexes.

Table: 1: Polarographic parameters for Poly Ethyl Aniline

Concentration (mM)	Id (µA)	E1/2 (V vs. SCE)	Epa (V)	Epc (V)	Epc-Epa (V)
0.1	0.76	-0.62	-0.58	-0.62	-0.04
0.2	0.58	-0.64	-0.60	-0.64	-0.04
0.3	0.52	-0.64	-0.60	-0.64	-0.04

Table: 2 Polarographic parameters for complex of Poly Ethyl Aniline with Zinc metal

Concentration (mM)	Id (µA)	E1/2 (V vs. SCE)	Epa (V)	Epc (V)	Epc-Epa (V)
0.1	1.10	-1.08	-1.04	-1.07	-0.03
0.2	0.94	-1.10	-1.05	-1.08	-0.03
0.3	0.84	-1.10	-1.05	-1.08	-0.03

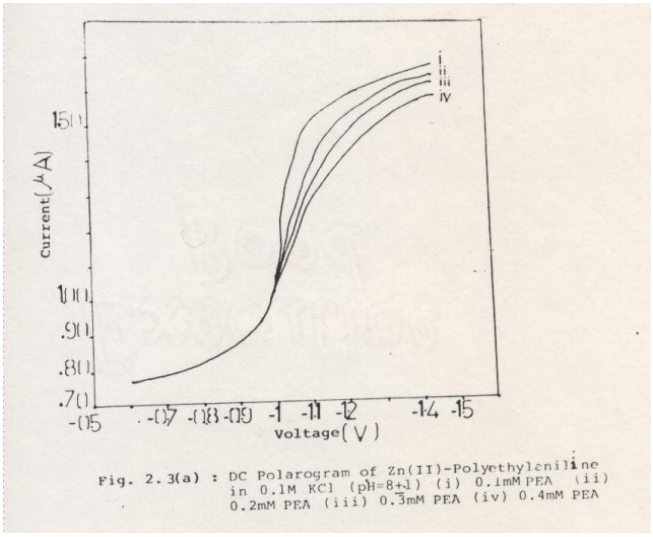

Fig. 2.3(a) : DC Polarogram of Zn(II)-Polyethylaniline in 0.1M KCl (pH=8±1) (i) 0.1mM PEA (ii) 0.2mM PEA (iii) 0.3mM PEA (iv) 0.4mM PEA

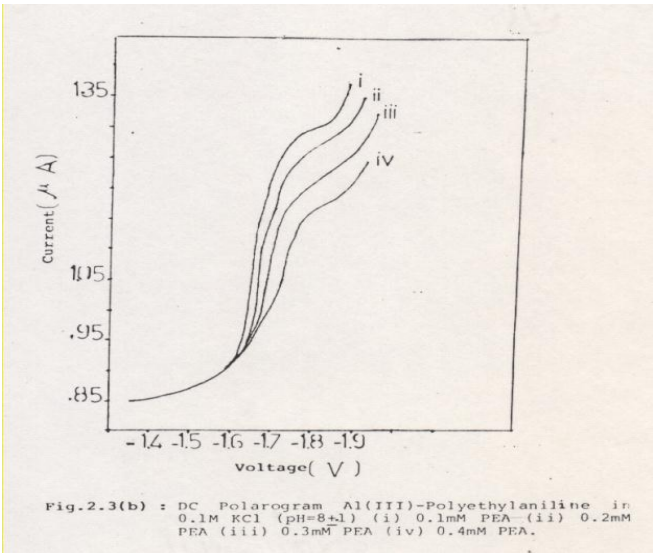

Fig.2.3(b) : DC Polarogram Al(III)-Polyethylaniline in 0.1M KCl (pH=8±1) (i) 0.1mM PEA (ii) 0.2mM PEA (iii) 0.3mM PEA (iv) 0.4mM PEA.

Figure:1 Pictures of Original Graphs recorded using pulse polarograph CL-90

Result & Discussion

From tables and graphs it can be conclude that in case of Poly Ethyl Aniline - Zn complexes (Zn–PEA),the Epc-Epa i.e.cathodic and anodic peak potential values, indicating the involvement of 3, 2 and 3 electrons in the reversible electrode reduction process of the said species respectively[5].the Ipc and Ipa values are also tabulated in tables-1.1and table 1.2 which also supports this argument. 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. 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 Poly Ethyl Aniline. 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 : PMA complex formation in each case with formation constant log B=13.146 for Zn (II) PANI

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.

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

Survey of literature

W.John Albery[3], et.al have used electrode such as Poly Ethyl Aniline, poly pyrrol. Poly Ethyl Aniline and poly thiophene. 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 Poly Ethyl Aniline 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 behavior Poly Ethyl Aniline and found that the electrons are moving in and out changing the Poly Ethyl Aniline structure from one form to the another form C. Herold 12 Yazmi, DBillaud attempted study of sodium doped poly paraphenylene film,

John Alberry, et.al

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