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RESEARCH PAPER

A polarographic approach regarding potassium propan-1,3-diol di xanthate

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ABSTRACT

In the present study the polarographic behaviour of potassium propan-1,3-diol dixanthate (PPDDX) is studied in detail at dropping mercury electrode. It also include the effect of temperature, pH, Hg-column height along with the concentration of supporting electrolyte on the wave characteristics of this xanthate. It was found that the concentration of supporting electrolyte do not affect the value of half wave potential ($E_{1/2}$). The value of diffusion current (i_d) was found directly proportional to the concentration of PPDDX. The constancy of i_d/h_{eff} indicate that the reaction was diffusion controlled. Well defined anodic waves were found at different mercury column heights. I_d values were not affected by pH-values. The linearity of $-E_{d.e.}$ vs $\log(i_d\text{-}i/i)$ with mean slope ratio of 0.015 clearly indicate the transfer of four electrons along with a reversible reaction involved during this process. The linearity of i_d with PPDDX concentration may provide an easy pathway for the estimation of xanthates.

Key Words : Potassium propan-1, 3-diol dixanthate, Reference electrode, Borax buffer, Dimerization

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Pharmaceutical,[1-3] synthetic[4] and analytical[5-10] importance of sulphur containing ligands is very well known.The polarographic studies of K-n-butyl xanthate,[11] cysteine[12] thiolactic acid[13] and thiomalic acid[14] have been done earlier which show anodic depolarisation which was accompanied by salt formation. In the present study the reaction mechanism at drop surface is analysed.

Objective of study:

This study will provide useful informations regarding the estimation of different xanthates even in the presence of impurities.

Originally xanthate family was first of synthesized by Dantzenberg and co-workers in 1972. Potassium propan-1,3-diol monoxanthate was synthesized with some modifications . Such compounds behave as sulphur donor ligands. Survey of literature clearly indicate that such compounds have their pharmaceutical[1], synthetic[4] and analytical[5] importance.

RESEARCH METHODOLOGY

Dantzenberg method[15] was used with some modification to prepare PPDDX and usual analytical methods were used to check its purity. Aqueous solution of this ligand was prepared in air free double distilled water. Fresh aqueous solutions of KCl, KNO_3, NaOH, $Na_2B_4O_7.10H_2O$, HCl, $HClO_4$, CH_3COONa and

CH_3COOH were always prepared in air free double distilled water. To avoid the effect of ageing fresh aqueous solution of 0.2 per cent gelation was used as maximum suppressor.

Apparatus:

All polarograms were recorded by using Systronic polarography model 1632 with systronic recorder model 1501 and saturated calomel electrode as reference electrode. Triply distilled mercury was used. Oxygen free N_2-gas was used to develop inert atmosphere. Duration of each polarogram is 142 seconds. Toshniwal pH-meter C.L. 49 was used after standardisation with standard phthalate buffer (pH=4) and borax buffer (pH=9.2).

The following sets of solutions were prepared for polarographic investigaions. In each set 2ml of 2M KCl or KNO_3 and 2ml of 0.2 per cent gelation were also added before making required volume.

Effect of concentration PPDDX:

1.0, 2.0, 3.0, 4.0 and 5.0 ml of ligand was mixed with stated volume of KCl or KNO_3 and gelatin before making total volume 40 ml with double distilled water. (Table 1).

Effect of pH-value:

3.0 ml volume of PPDDX was mixed with stated amounts of KCl or KNO_3 along with gelatin followed by the addition of suitable buffers of pH-ranging from 8.0 to 10.0 before making total volume 40 ml by the addition of double distilled water (Table 2).

Effect of mercury column height:

In this case 3.0 ml of PPDDX solution was mixed with stated volumes of KCl or KNO_3 and gelatin before making total volume 40 ml.

RESULTS AND REMONSTRATION

This study show that the value of diffusion current (i_d) is directly proportional to the concentration of PPDDX solution (Table 1). Logarithmic analysis clearly indicate the constancy of average values of half wave potential ($E_{1/2}$) (Table 2). Between pH range 8.15 to 9.95, well defined anodic waves with constant value of $E_{1/2}$ were found. The linear plots of $-E_{d.e}$ vs log i_d-i/I with mean dimerization reaction of PPDDX involve four electron transfer:

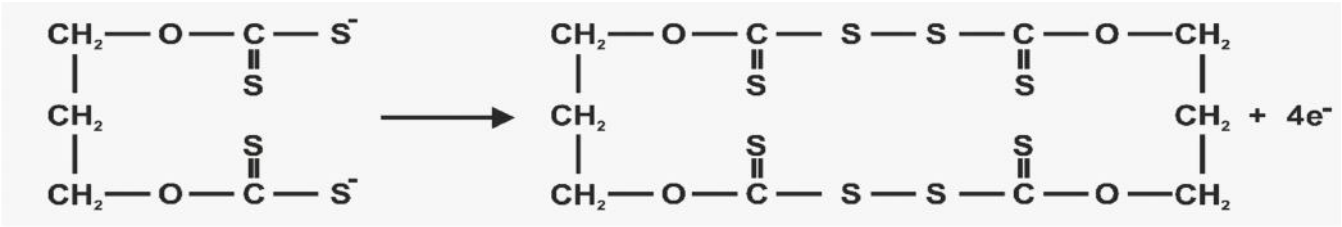

Table 1 : Effect of concentration of PPDDX on i_d and $-E_{1/2}$

Sr. No.	Concentration of PPDDX X 10^{-3} M	i_d	$-E_{1/2}$	i_d/C
1.	2.5	1.6 (1.8)	0.118 (0.121)	0.64 (0.72)
2.	5.0	3.2 (3.5)	0.113 (0.115)	0.64 (0.70)
3.	7.5	4.7 (4.9)	0.117 (0.119)	0.62 (0.65)
4.	10.0	6.2 (6.5)	0.111 (0.113)	0.62 (0.65)
5.	12.5	7.9 (8.2)	0.118 (0.119)	0.63 (0.65)

Table 2 : Logarithmic analysis of waves

Sr. No.	pH	i_d (A)	$-E_{1/2}$ (V)	Slope (V)
1.	7.5	6.1	0.118	0.018
2.	8.0	5.9	0.116	0.016
3.	8.5	5.8	0.115	0.017
4.	9.0	5.6	0.119	0.017
5.	9.5	5.4	0.116	0.016

Table 3 : Effect of pH-value on h_{eff} and i_d

Sr. No.	h_{eff} (cm)	i_d	i_d/h_{eff}
1.	50.0	6.1	0.122
2.	55.0	6.3	0.114
3.	60.0	6.7	0.111
4.	65.0	6.9	0.106

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