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INCLUSION COMPLEX OF GLUTAMINE- CYCLIC VOLTAMETRY

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Abstract
Cyclic voltametry was used to confirm the formation of inclusion complex t was analyzed in the effect of β–cyclodextrin on the oxidation of glutamine by PMS, in the presence of Cu (II) ions in acetic acid–sodium acetate buffered medium (pH 3.6-5.2) .The oxidation peak of the analyses is shifted to internal positive potential values and the current intensity is decreased.

Keywords: copper (II), Glutamine, peroxomonosulphate (PMS), β-cyclodextrin (β-CD) catalyst, inclusion complex, Cyclic voltametry.

1. Introduction

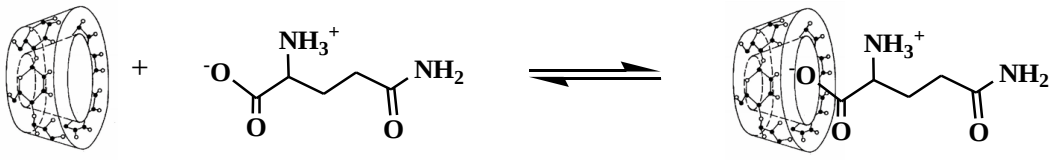
Cyclodextrins (CD), which are cyclic oligomers of α-D- glucopyranose, have a well-defined cavity(I). The effect of β-Cyclodextrin with copper (II) catalyst on the oxidation of glutamine (drug) by PMS in acetic acid -sodium acetate buffer medium at 308K by kinetics studied (2). Cyclic voltammetry has been used to monitor the inclusion phenomena of -lapachone (3). The characterization of cyclodextrin (CD) systems by electrochemical methods, mainly by cyclic voltammetry [4], electrochemical methods [5], as well as by X-ray crystallography [6]. The positive value was obtained as enthalpy, entropy and free energy of activation. These entropy and enthalpy changes were favored through inclusions. The positive enthalpy values, positive entropic values are obtained, indicating that this inclusion was hydrophobic interaction (7). The kinetics of cleavage of phenyl phenyl acetates (PPA) and several para-substituted PPAs in basic aqueous sodium carbonate–bicarbonate buffer contains β-cyclodextrin (β-CD)(8). Cyclic voltametry was also used to confirm the formation of inclusion complex.complex was discussed here.

2. Experimental method

Cyclic Voltammetric Studies

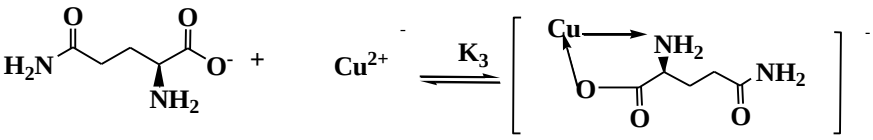
The electrochemical studies were carried out using (CHI 760C – CH Instrument Inc., USA), three electrodes single compartment cell setup were employed for the electrochemical experiments. Here, glassy carbon, platinum wire, and Ag/AgCl electrode were used as working electrode, counter electrode and reference electrode, respectively. All potentials were reported with respect to Ag/AgCl electrode.

Equation for Inclusion Complex of Glutamine



Zwitterions Of Glutamine In The Presence Of Cu (Ii) Catalyst

An amino acid zwitterions arising fron transfer of a proton from the carboxyl to the amino group of L- glutamine. It exists as a dipolar ion in aqueous solutions. The dissociation of glutamine depends on the pH of the medium. The pKa value was suggested that in acidic medium, glutamine exist both in the protonated form and as zwitterions as shown below



Inclusion Complex Of Glutamine In The Presence Of Cu (Ii) Catalyst

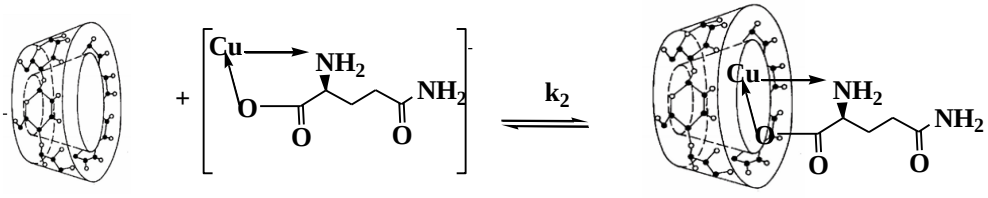


Table 2.1Potential (Volts) values of the different reaction mixtures

Description	'E' (Potential in Volts)
	Peak I
Buffer + β-CD [β-Cyclodextrin in acetate buffer medium]	4.30V
Buffer + glutamine + β-CD [β-Cyclodextrin in acetate buffer medium with glutamine]	2.202V
Buffer + glutamine + β-CD+ PMS[β-Cyclodextrin in acetate buffer medium with glutamine by PMS]	1.268V

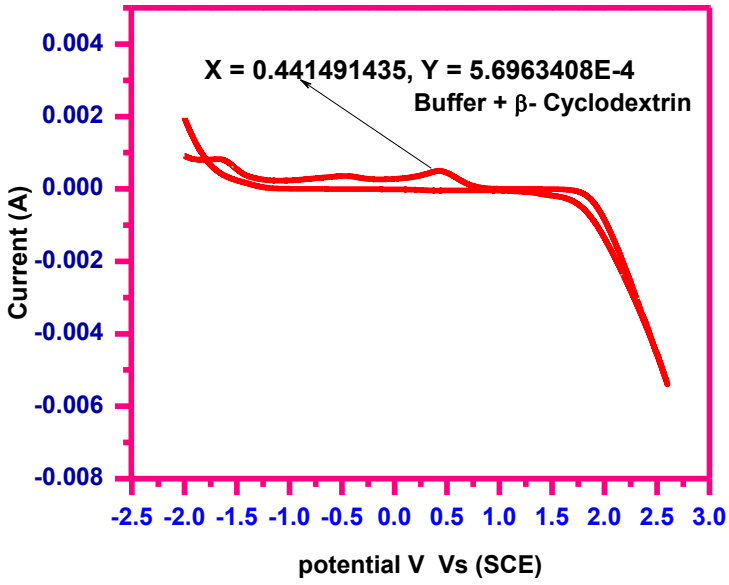


Figure 3.22 Cyclic voltammogram of the reaction mixtures of Buffer + β-CD

$[H^+]$ = 5 x 10^{-1} M; [sodium acetate] = 8.5 x 10^{-2} M ; [β-cyclodextrin] = 50mg:

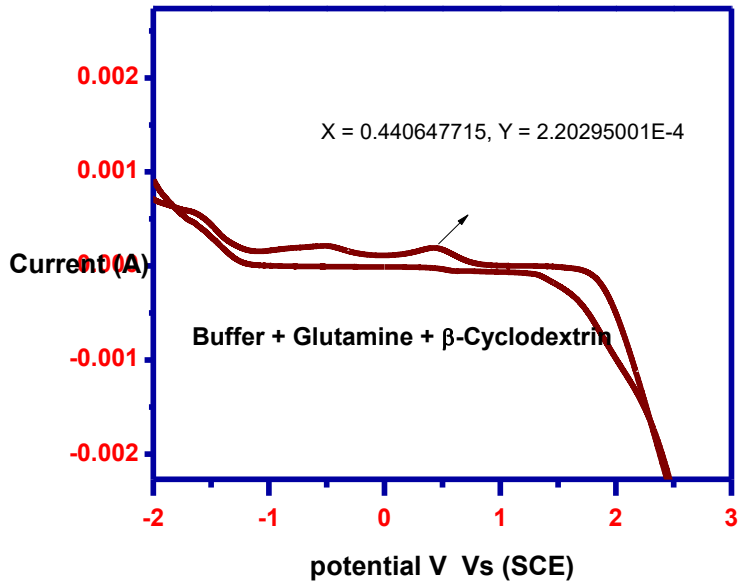


Figure 3.26 Cyclic voltammogram of the reaction mixtures of Buffer + glutamine + β-CD

$[H^+]$ = 5 x 10^{-1} M; [sodium acetate] = 8.5 x 10^{-2} M ; [β-cyclodextrin] = 50mg: [glutamine] =500mg

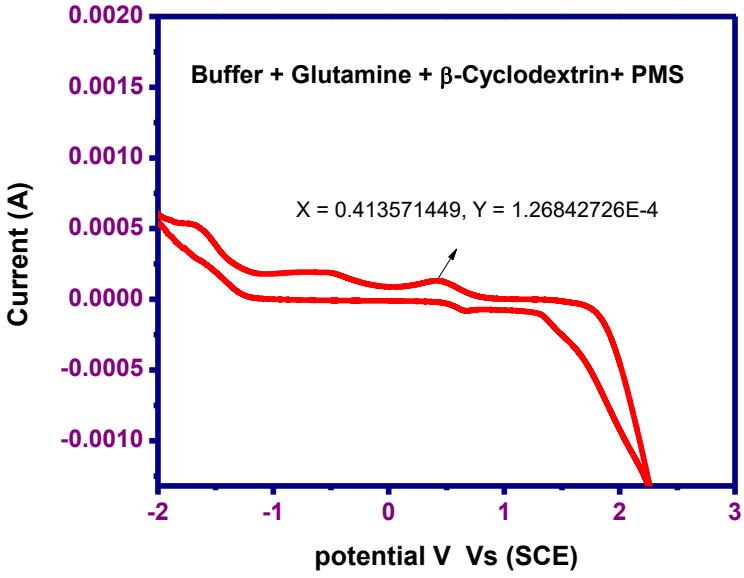


Figure 3.28 Cyclic voltammogram of the reaction mixtures of Buffer + glutamine + β-CD+ PMS

$[H^+]$ = 5 x 10^{-1} M; [sodium acetate] = 8.5 x 10^{-2} M ; [β-cyclodextrin] = 50mg: [glutamine] =500mg; [PMS] = 3.90 x 10^{-3} M

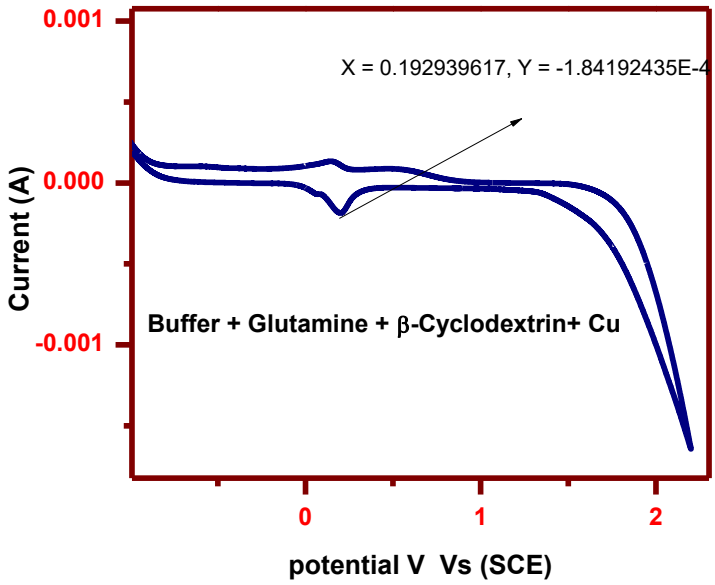


Figure 4.26 Cyclic voltammogram of the reaction mixtures of Buffer + glutamine + β-CD + Cu

$[H^+]$ = 5 x 10^{-1} M; [sodium acetate] = 8.5 x 10^{-2} M ; [β-cyclodextrin] = 50mg: [glutamine] =500mg ; . [copper(II)] = 2.5 x 10^{-3} M;

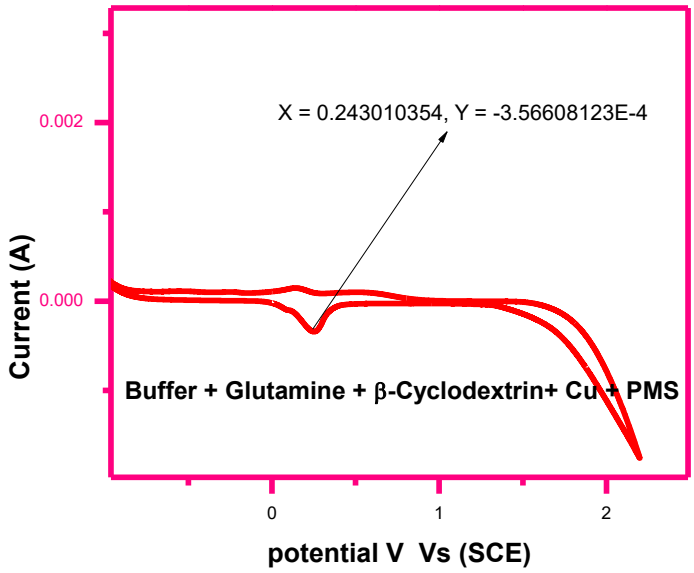


Figure 4.27 Cyclic voltammogram of the reaction mixtures of Buffer + glutamine + β-CD + Cu+ PMS

$[H^+]$ = 5 x 10^{-1} M; [sodium acetate] = 8.5 x 10^{-2} M ; [β-cyclodextrin] = 50mg: [glutamine] =500mg ; [copper(II)] = 2.5 x 10^{-3} M; [PMS] = 3.86 x 10^{-3} M

Conclusion

Cyclic voltometry was studied by the reaction mixture of glutamine, acetic acid and sodium acetate the current peak potential. The following reaction mixture with the addition of β- CD, the peak current potential so the peak current potential is decreased by the addition β- CD .The current potential was decreased which causes the formation of glutamine (guest) and β CD (host) was formed in the guest- host interaction. Further the same reaction mixture was followed by the addition of PMS the current peak potential is increased the value which causes the inclusion complex of guest-host interaction was broken. Cyclic voltametry was also used to confirm the formation of inclusion complex.complex.

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