Appendix A:

Calculations and supportive data

*Calculations from chapter 3

Table-1: Calculation of intra state precision ***(para 3.4.10.1), chapter3***

Current (µA)	$\bar{X}$	d_i	Σd_i^2	$\Sigma\ d_i^2$	S	RSD
55.00	55.6	-0.6	0.36	0.85	0.412	0.742%
55.50		-0.1	0.01			
55.80		0.2	0.04			
55.40		-0.2	0.04			
55.70		0.1	0.01			
56.20		-0.6	0.36			

Table-2 Calculation of inter assay precision ***(para 3.4.10.1), chapter3***

Current (µA)	$\bar{X}$	*di*	di^2	$\Sigma\ di^2$	*S*	*RSD*
62.00	60.2	1.8	3.24	77.98	3.945	6.56%
58.00		-2.2	4.84			
65.10		4.9	24.01			
63.60		3.4	11.56			
57.50		-2.7	7.29			
55.00		-5.2	27.04			

*Repeatability of peak currents and peak potentials of diffusion study

Table-3: For 1 mV, at peak D, peak current value ***[Fig 3.3, Chapter 3]***

Measured Current (µA) i_1	Charging Current(µA) i_2	Actual Peak current(µA) $i_1 - i_2$	$\bar{X}$	*di*	di^2	Σdi^2	*S*	*RSD*
96.3	25.20	71.1	71.2	-0.1	0.01	0.11	0.23	0.32%
96.2	24.70	71.5		0.3	0.09			
95.1	24.00	71.1		-0.1	0.01			

Table-4 At peak D, peak potential value ***[Fig 3.3, Chapter 3]***

Peak potential (Volt)	$\overline{X}$	*di*	*di*^{2}	*Σ di*^{2}	*S*	*RSD*
0.201		0.000	0.000000			
0.202	0.201	0.001	0.000001	0.000001	0.0007	0.35%
0.201		0.000	0.000000			

Table-5 At peak F, peak current value ***[Fig 3.3, Chapter 3]***

Measured Current (μA) i_1	Charging Current(μA) i_2	Actual Peak current(μA) $i_1 - i_2$	$\overline{X}$	*di*	*di*^{2}	*Σdi*^{2}	*S*	*RSD*
147.9	24.9	123		-1.1	1.21			
149.0	24.0	125	124.1	0.9	0.81	2.03	1.00	0.80%
150.2	26.0	124.2		0.1	0.01			

Table-6 At peak F, peak potential value ***[Fig 3.3, Chapter 3]***

Peak potential (Volt)	$\overline{X}$	*di*	*di*^{2}	*Σ di*^{2}	*S*	*RSD*
-0.600		- 0.001	0.000001			
-0.602	Mod	- 0.001	0.000001	0.000003	0.0012	0.20%
-0.600	0.601	0.001	0.000001			

Table-7 peak current value at peak E ***[Fig 3.3, Chapter 3]***

Peak potential (Volt)	$\overline{X}$	*di*	*di*^{2}	*Σ di*^{2}	*S*	*RSD*
0.66		0.01	0.0001			
0.65	0.65	0.00	0.0000	0.0005	0.010	1.5%
0.63		-0.02	0.0004			

Table-8: Calculation for 5 mV, *Peak current value* ***[Fig 3.3, Chapter 3]***

Measured Current (μA) i_1	Charging Current(μA) i_2	Actual Peak current(μA) $i_{1}-i_2$	$\overline{X}$	*di*	*di^2*	*Σdi^2*	*S*	*RSD*
257.0	78.0	179.0		-0.8	0.64			
257.8	78.0	179.8	179.8	0.0	0.00	1.45	0.85	0.47%
258.1	77.4	180.7		0.9	0.81			

Table-9: Peak potential value ***[Fig 3.3, Chapter 3]***

Peak potential(Volt)	$\overline{X}$	*di*	*di^2*	*Σdi^2*	*S*	*RSD*
0.505		- 0.001	0.000001			
0.507	0.506	0.001	0.000001	0.000003	0.0012	0.24%
0.505		- 0.001	0.000001			

Table-10: Calculation for 8 mV peak current value ***[Fig 3.3, Chapter 3]***

Measured Current (μA) i_1	Charging Current(μA) i_2	Actual Peak current(μA) $i_{1}-i_2$	$\overline{X}$	*di*	*di^2*	*Σdi^2*	*S*	*RSD*
391.4	157.5	233.9		-1	1.0			
394.1	158.1	236.0	234.9	1.1	1.21	2.25	1.1	0.47%
391.7	157.0	234.7		-0.2	0.04			

Table-11: peak potential value ***[Fig 3.3, Chapter 3]***

Peak potential(Volt)	$\overline{X}$	*di*	*di^2*	*Σdi^2*	*S*	*RSD*
0.603		0	0.000000			
0.604	0.603	0.001	0.000001	0.000002	0.001	0.17%
0.602		-0.001	0.000001			

Table-*12:* For 10 mV *peak current value* ***[Fig 3.3, Chapter 3]***

Measured Current (μA) i_1	Charging Current(μA) i_2	Actual Peak current(μA) $i_{1}-i_2$	$\overline{X}$	*di*	*di^2*	*Σdi^2*	*S*	*RSD*
433.0	163	270		-0.5	0.25			
432.9	164	268.9	270.5	-1.6	2.56	7.22	1.9	0.70%
433.6	161	272.6		2.1	4.41			

Table-13: peak potential value ***[Fig 3.3, Chapter 3]***

Peak potential(Volt)	$\overline{X}$	*di*	di^2	Σdi^2	*S*	*RSD*
0.610		0.001	0.000001			
0.607	0.609	-0.002	0.000004	0.000005	0.0015	0.25%
0.609		0.000	0.000000			

Table-14: For 20 mV (anodic) *peak current value* ***[Fig 3.3, Chapter 3]***

Measured Current (µA) i_1	Charging Current(µA) i_2	Actual Peak current(µA) $i_1 - i_2$	$\overline{X}$	*di*	di^2	Σdi^2	*S*	*RSD*
666.9	238.9	428.0		-1.6	2.56			
671.2	240.0	431.2	429.6	1.6	2.56	5.12	1.6	0.37%
670.1	240.5	429.6		0.0	0.00			

Table-15: peak potential value ***[Fig 3.3, Chapter 3]***

Peak tential (Volt)	$\overline{X}$	*di*	di^2	Σdi^2	*S*	*RSD*
0.801		0.001	0.000001			
0.798	0.800	-0.002	0.000004	0.000009	0.0021	0.26%
0.802		0.002	0.000004			

Table-16: 20 mV (cathodic), peak current value ***[Fig 3.3, Chapter 3]***

Measured Current (µA) i_1	Charging Current(µA) i_2	Actual Peak current(µA) $i_1 - i_2$	$\overline{X}$	*di*	di^2	Σdi^2	*S*	*RSD*
757.0	349.0	408.0		-1.7	2.89			
761.1	349.0	412.1	409.7	2.4	5.76	9.29	2.1	0.51%
761.2	352.3	408.9		-0.8	0.64			

Table-17: 20 mV (cathodic), peak current value ***[Fig 3.3, Chapter 3]***

Peak potential (Volt)	$\overline{X}$	*di*	di^2	Σdi^2	*S*	*RSD*
-0.800		-0.001	0.000001			
-0.803	0.801	0.002	0.000004	0.000006	0.0017	0.21%
-0.800		0.001	0.000001			

Table-18: Square root of scan rate versus Peak Current value ***[Fig 3.3, Chapter 3]***

Scan rate (mV/s	Square root of scan rate	Actual Peak current(μA)
1	1	71.2
5	2.24	179.8
8	2.83	234.9
10	3.16	270.5
20	4.47	429.6

Table-19 Repeatability of peak currents and peak potentials of pH study

At pH 7.8 ***[Fig. 3.9, chapter 3]***

Measured Current (μA) i_1	Charging Current(μA) i_2	Actual Peak current(μA) $i_1 - i_2$	$\overline{X}$	*di*	*di*^{2}	Σdi^2	*S*	*RSD*
173.2	51.00	122.2	121.8	0.4	0.10	1.9	0.90	0.73%
173.0	52.40	120.6		-1.2	1.40			
175.3	52.80	122.5		0.7	0.49			

Table-20: peak potential value ***[Fig 3.9, Chapter 3]***

Peak potential (Volt)	$\overline{X}$	*di*	*di*^{2}	Σdi^2	*S*	*RSD*
0.800	0.802	-0.002	0.000004	0.000013	0.0025	0.31%
0.802		0.000	0.000000			
0.805		0.003	0.000009			

Table-21 pH 7.4 ***[Fig 3.9, Chapter 3]***

Measured Current (μA) i_1	Charging Current(μA) i_2	Actual Peak current(μA) $i_1 - i_2$	$\overline{X}$	*di*	*di*^{2}	Σdi^2	*S*	*RSD*
329.0	133.0	196.0	195.4	0.6	0.36	2.41	1.1	0.56%
327.1	133.0	194.1		-1.3	1.69			
331.4	135.4	196.0		0.6	0.36			

Table-22 pH 7.4, potential ***[Fig 3.9, Chapter 3]***

Peak potential (Volt)	$\bar{X}$	*di*	di^2	Σdi^2	*S*	*RSD*
0.850		-0.001	0.000001			
0.853	0.851	0.002	0.000004	0.000006	0.0017	0.20%
0.850		-0.001	0.000001			

Table-23 pH 7.2, current ***[Fig 3.9, Chapter 3]***

Measured Current (μA) i_1	Charging Current(μA) i_2	Actual Peak current(μA) $i_{1-}\ i_2$	$\bar{X}$	*di*	di^2	Σdi^2	*S*	*RSD*
666.0	240.0	426.0		-1.6	2.56			
667.2	238.0	429.2	427.6	1.6	2.56	5.12	1.6	0.37%
665.7	238.1	427.6		0.0	0.00			

Table-24 pH 7.2, potential ***[Fig 3.9, Chapter 3]***

Peak potential (Volt)	$\bar{X}$	*di*	di^2	Σdi^2	*S*	*RSD*
0.802		0.001	0.000001			
0.799	0.801	-0.002	0.000004	0.000007	0.0019	0.24%
0.803		0.002	0.000002			

Table-25, at pH 7.0, Peak current value ***[Fig 3.9, Chapter 3]***

Measured Current (μA) i_1	Charging Current(μA) i_2	Actual Peak current(μA) $i_{1-}i_2$	$\overline{X}$	*di*	*di^2*	*Σdi^2*	*S*	*RSD*
508.7	179.2	329.5		-0.4	0.16			
509.2	180.5	328.7	329.9	-1.2	1.44	4.16	1.44	0.44%
511.5	180.0	331.5		1.6	2.56			

Table-26 at pH 7.0, potential, Peak potential value ***[Fig 3.9, Chapter 3]***

Peak potential (Volt)	$\overline{X}$	*di*	*di^2*	*Σdi^2*	*S*	*RSD*
0.801		0.001	0.000001			
0.798	0.800	-0.002	0.000004	0.000006	0.0017	0.21%
0.801		0.001	0.000001			

Table-27 at pH 6.8, potential, Peak current value ***[Fig 3.9, Chapter 3]***

Measured Current (μA) i_1	Charging Current(μA) i_2	Actual Peak current(μA) $i_{1-}i_2$	$\overline{X}$	*di*	*di^2*	*Σdi^2*	*S*	*RSD*
246.6	94.00	152.6		0.5	0.25			
243.0	92.40	150.6	152.1	-1.5	2.25	3.5	1.0	0.66%
245.5	92.40	153.1		1	1.00			

Table-28 at pH 6.8, potential value ***[Fig 3.9, Chapter 3]***

Peak potential (Volt)	$\overline{X}$	*di*	*di^2*	*Σdi^2*	*S*	*RSD*
0.840		0.000	0.000000			
0.841	0.840	0.001	0.000001	0.000002	0.001	0.12%
0.841		0.001	0.000001			

Table-29 at pH 6.4, peak current value ***[Fig 3.9, Chapter 3]***

Measured Current (μA) i_1	Charging Current(μA) i_2	Actual Peak current(μA) $i_1 - i_2$	$\overline{X}$	*di*	di^2	Σdi^2	*S*	*RSD*
217.7	76.90	140.8	140.8	0.0	0.00	1.13	0.75	0.53%
219.8	78.20	141.6		0.8	0.64			
218.9	78.80	140.1		-0.7	0.49			

Table-30 at pH 6.4, peak potential value ***[Fig 3.9, Chapter 3]***

Peak potential (Volt)	$\overline{X}$	*di*	di^2	$\Sigma\, di^2$	*S*	*RSD*
0.830	0.830	0.000	0.000000	0.000004	0.0014	0.17%
0.832		0.002	0.000004			
0.830		0.000	0.000000			

Table-31 Calculation of K_m^{app} (immobilized enzyme) ***[Fig 3.6, Chapter 3]***

Concentration, $molL^{-1} \times 10^{-4}$	1/Concentration , $mol^{-1}L \times 10^3$	Current, A $\times 10^{-6}$	RSD	1/Current, $A^{-1} \times 10^4$	RSD
4	2.5	53 .0	0.73%	1.88	0.53%
		53.2		1.87	
		53.8		1.85	
2	5.0	20	0.35%	5.0	0.34%
		20.1		4.97	
		20.0		5.0	
1	10	8	0.72%	12.5	0.48%
		7.9		12.6	
		8.0		12.5	
0.5	20	4.07	0.42%	25.6	0.25%
		4.1		24.4	
		4.1		24.4	

Table-32-39: Peak current values and RSD calculation of table 31 **[*Fig 3.6, Chapter 3]***

Current, Ax 10 $^{-6}$	$\overline{X}$	*di*	*di*^{2}	*Σdi*^{2}	*S*	*RSD*
53.0		-0.3	0.09			
53.2	53.30	-0.1	0.01	0.30	0.39	0.73%
53.8		0.5	0.25			

Current, Ax 10 $^{-6}$	$\overline{X}$	*di*	*di*^{2}	*Σdi*^{2}	*S*	*RSD*
20.0		0.0	0.00			
20.1	20.0	0.1	0.01	0.01	0.07	0.35%
20.0		0.0	0.00			

Current, Ax 10 $^{-6}$	$\overline{X}$	*di*	*di*^{2}	*Σdi*^{2}	*S*	*RSD*
8.0		0.03	0.0009			
7.9	7.97	0.07	0.0049	0.0067	0.057	0.72%
8.0		0.03	0.0009			

Current, Ax 10 $^{-6}$	$\overline{X}$	*di*	*di*^{2}	*Σdi*^{2}	*S*	*RSD*
4.07		0.02	0.0004			
4.1	4.09	0.01	0.0001	0.0006	0.017	0.42%
4.1		0.01	0.0001			

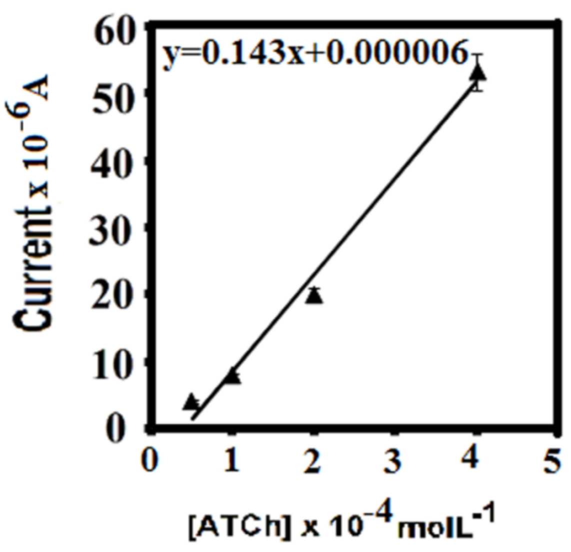

Fig.3.6

R^2= 0.987. Sensitivity = Slope = 0.143 A/ M = 143 mA / M

Thiocholine LOD $= 3 \times \frac{s}{m}$ [Standard deviation value for PBS reading s= 0.10×10^{-6} M]

$=3\times0.10\times 10^{-6}$ A/ 0.143 A/M

$= 2.1\times 10^{-6}$ M (Fig. 3.6)

1/Current, $A^{-1}\times 10^4$	$\overline{X}$	*di*	di^2	Σdi^2	*S*	*RSD*
1.88	1.87	0.01	0.0001	0.0005	0.010	0.53%
1.87		0.00	0.0000			
1.85		-0.02	0.0004			

1/Current, $A^{-1}\times 10^4$	$\overline{X}$	*di*	di^2	Σdi^2	*S*	*RSD*
5.0	4.99	0.01	0.0001	0.0006	0.017	0.34%
4.97		0.02	0.0004			
5.0		0.01	0.0001			

1/Current, $A^{-1}\times 10^4$	$\overline{X}$	*di*	di^2	Σdi^2	*S*	*RSD*
12.5	12.53	-0.03	0.0009	0.0067	0.06	0.48%
12.6		0.07	0.0049			
12.5		-0.03	0.0009			

1/Current, $A^{-1}\times 10^4$	$\overline{X}$	*di*	di^2	Σdi^2	*S*	*RSD*
24.5	24.43	0.07	0.0049	0.0067	0.06	0.25%
24.4		-0.03	0.0009			
24.4		-0.03	0.0009			

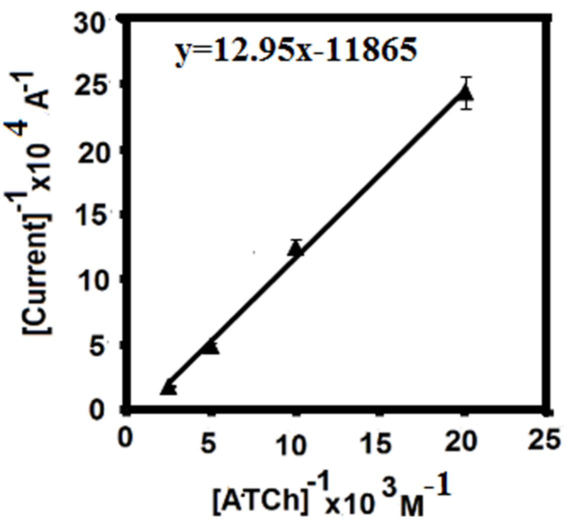

Fig.3.6, inset

R^2= 0.997; Slope/intercept = 12.95/11865 = 1.09 $mmolL^{-1}$

Table-40 Calculation of K_m^{app} (free enzyme) Fig.3.7, chapter3

Concentration, $molL^{-1}$ x 10^{-3}	1/Concentration, $mol^{-1}L$ x 10^3	Current, A x 10^{-6}	RSD	1/Current, A^{-1} x 10^4	RSD
0.8	1.25	5.92	0.51%	16.89	0.47%
		5.90		16.94	
		5.87		17.04	
0.5	2.00	5.02	0.74%	19.92	0.70%
		5.08		19.69	
		5.10		19.61	
0.4	2.50	4.50	0.66%	22.20	0.59%
		4.57		21.89	
		4.57		21.89	
0.2	5.00	3.45	0.49%	28.98	0.48%
		3.48		28.73	
		3.45		28.98	
0.1	10.00	2.73	0.73%	36.63	0.73%
		2.75		36.36	
		2.71		36.90	

Table-41-50: Peak current values and RSD calculations from table 41 (Fig.3.7)

Current, Ax 10^{-6}	$\overline{X}$	*di*	di^2	Σdi^2	*S*	*RSD*
5.92	5.90	0.02	0.0004	0.0013	0.03	0.51%
5.90		0.00	0.0000			
5.87		-0.03	0.0009			

Current, Ax 10^{-6}	$\overline{X}$	*di*	di^2	Σdi^2	*S*	*RSD*
5.02	5.07	-0.05	0.0025	0.0030	0.038	0.74%
5.08		0.01	0.0001			
5.10		0.03	0.0009			

Current, Ax 10^{-6}	$\overline{X}$	*di*	*di*^{2}	*Σdi*^{2}	*S*	*RSD*
4.50	4.55	-0.05	0.0025	0.003	0.03	0.66%
4.57		0.02	0.0004			
4.57		0.02	0.0004			

Current, Ax 10^{-6}	$\overline{X}$	*di*	*di*^{2}	*Σdi*^{2}	*S*	*RSD*
3.45	3.46	-0.01	0.0001	0.0006	0.017	0.49%
3.48		0.02	0.0004			
3.45		-0.01	0.0001			

Current, Ax 10^{-6}	$\overline{X}$	*di*	*di*^{2}	*Σdi*^{2}	*S*	*RSD*
2.73	2.73	0.00	0.0000	0.0008	0.02	0.73%
2.75		0.02	0.0004			
2.71		-0.02	0.0004			

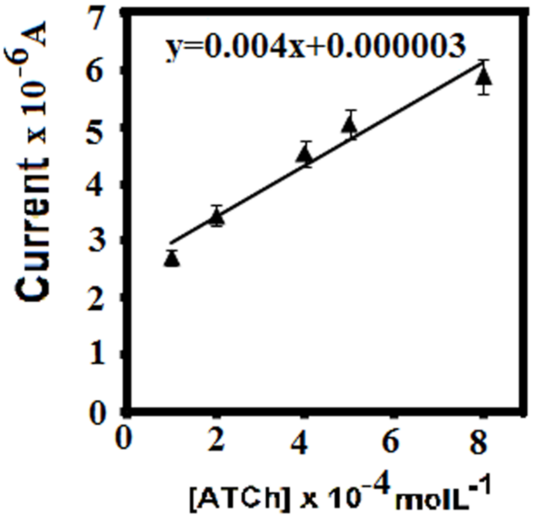

Fig.3.7

R^2= 0.961; Sensitivity = 0.004 A/M = 4 mA /M

1/Current, A^{-1} x 10^4	$\overline{X}$	di	di^2	Σdi^2	S	RSD
16.89	16.96	- 0.07	0.0049	0.0117	0.08	0.47%
16.94		0.02	0.0004			
17.04		0.08	0.0064			

1/Current, A^{-1} x 10^4	$\overline{X}$	di	di^2	Σdi^2	S	RSD
19.92	19.74	0.18	0.0324	0.05	0.15	0.70%
19.69		-0.05	0.0025			
19.61		-0.13	0.0169			

1/Current, A^{-1} x 10^4	$\overline{X}$	di	di^2	Σdi^2	S	RSD
22.20	21.99	0.21	0.0441	0.0641	0.13	0.59%
21.89		-0.10	0.0100			
21.89		-0.10	0.0100			

1/Current, A^{-1} x 10^4	$\overline{X}$	di	di^2	Σdi^2	S	RSD
28.98	28.90	0.08	0.0064	0.0417	0.14	0.48%
28.73		-0.17	0.0289			
28.98		-0.09	0.0064			

1/Current, A^{-1} x 10^4	$\overline{X}$	di	d_i^2	Σd_i^2	S	RSD
36.63	36.63	0.00	0.0000	0.1458	0.27	0.73%
36.36		-0.27	0.0729			
36.90		0.27	0.0729			

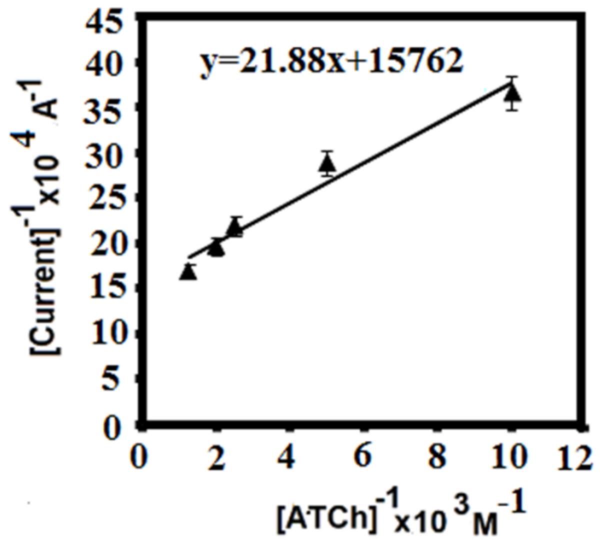

Fig.3.7, inset

R^2=0.964; K_m=21.88/15762= 0.001388 M
= 1.39 mmolL^{-1}

** Calculations from chapter 4 [Fig. 4.6 B, C and D in chapter 4]*

Michaelies-Menten plots, the apparent Michealis-Menten Constant (K_m^{app}) and the sensitivity calculation

*Method parameters for Figures D, E and F t_0 = 180 sec, t_1 = 10 sec, E_0= -- 0.8 V, E_1= X (0.2, 0.4 and 0.7 V respectively).

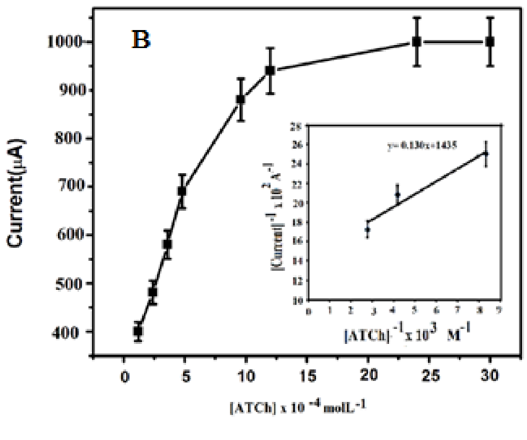

Fig. 4.6 B

Table-51 Calculation of K_m^{app} ***[Fig. 4.6 B in chapter 4]***

Concentration, $molL^{-1}$	1/Concentration , $mol^{-1}L$	Current, A	1/Current, A^{-1}	K_m
3.6×10^{-4}	2.78×10^{3}	580×10^{-6}	1724.14	
2.4×10^{-4}	4.17×10^{3}	481×10^{-6}	2079.00	$0.09 mmolL^{-1}$
1.2×10^{-4}	8.33×10^{3}	400×10^{-6}	2500.00	

Slope = $0.130\ A^{-1}molL^{-1}$

Intercept = $1435A^{-1}$

K_m = Slope/ Intercept

= 0.130/ 1435

= 0.0000905 mol

= $0.09\ mmolL^{-1}$

The apparent Michaelis- Menteen constant was found to be $0.09mmolL^{-1}$ which was calculated from the linear part of the calibration plot, using the Lineweaver –Burk equation. (Inset, Fig. B)

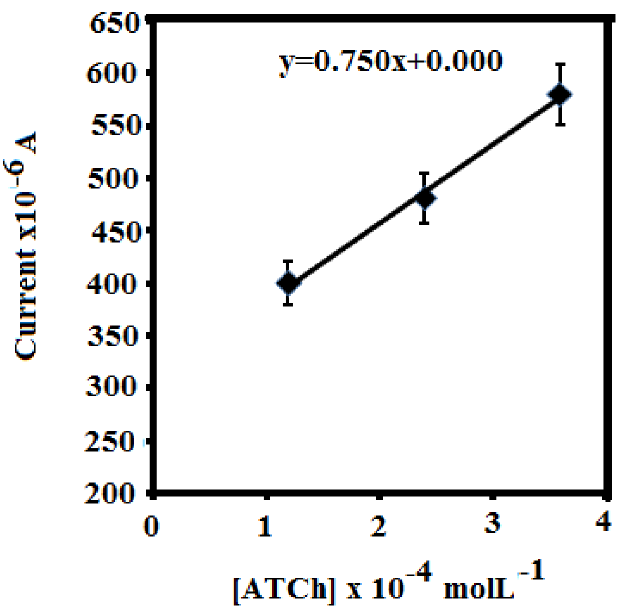

Fig. 4.6 B

R^2= 0.996, Sensitivity = Slope = 0.750 A/ M = 750mA /M

Thiocholine LOD = $3 \times \frac{s}{m}$ [Standard deviation value for PBS reading s= 0.16×10^{-6} M]

$=3 \times 0.16 \times 10^{-6}$ A/ 0.750 A/M

= 6.4×10^{-7} M

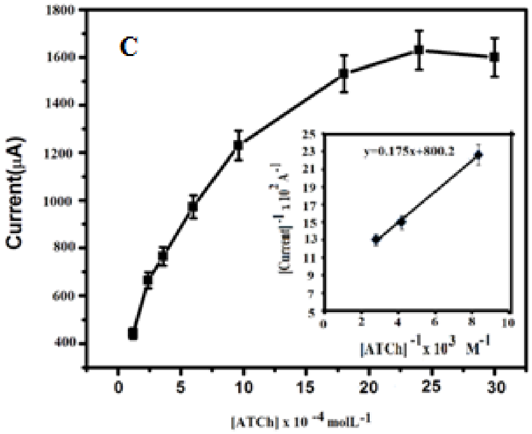

Fig. 4.6 C

Table-52 Calculation of K_m^{app} ***[Fig. 4.6 C in chapter 4]***

Concentration, $molL^{-1}$	1/Concentration , $mol^{-1}L$	Current, A	1/Current, A^{-1}	Km
3.6×10^{-4}	2.78×10^{3}	765×10^{-6}	1307.19	$0.22 mmolL^{-1}$
2.4×10^{-4}	4.17×10^{3}	665×10^{-6}	1503.76	
1.2×10^{-4}	8.33×10^{3}	441×10^{-6}	2267.57	

Slope = $0.175\ A^{-1}molL^{-1}$

Intercept = $800.2\ A^{-1}$

K_m = Slope/ Intercept

= 0.175/ 800.2

= $0.000218\ mol\ L^{-1}$

= $0.22\ mmolL^{-1}$

The apparent Michaelis Menteen constant was found to be $0.22 mmolL^{-1}$ which was calculated from the linear part of the calibration plot, using the Lineweaver –Burk equation. [Inset, Fig. C]

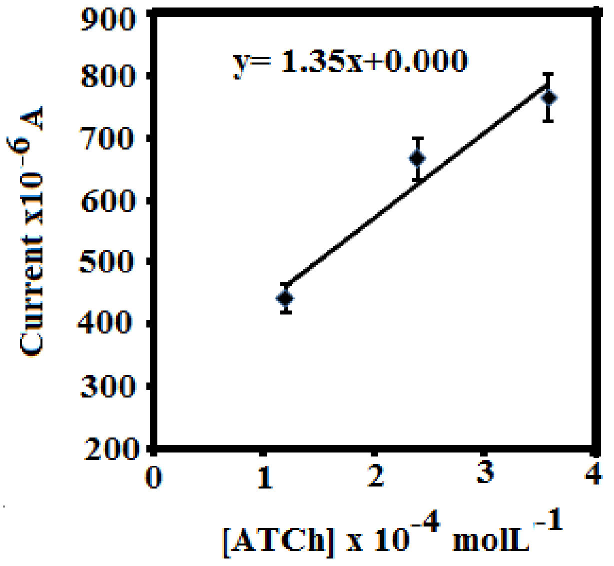

Fig. 4.6 C

R^2= 0.953, Sensitivity = Slope = 1.35 A/ M = 1350 mA / M

Thiocholine LOD $= 3 \times \frac{s}{m}$

=3×0.16x 10-^{6} A/ 1.35 A/M

= 3.5× 10 $^{-7}$ M

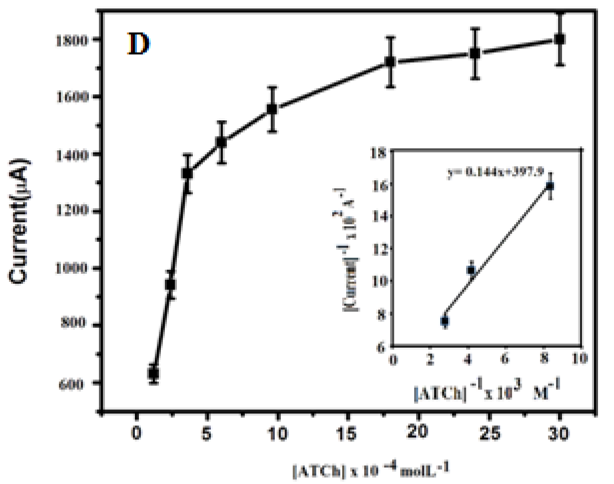

Fig. 4.6 D

Table-53 Calculation of K_m^{app} ***[Fig. 4.6 D in chapter 4]***

Concentration, molL^{-1}	1/Concentration , mol^{-1}L	Current, A	1/Current, A $^{-1}$	Km
3.6 x 10 $^{-4}$	2.78 x 10 ^{3}	1331 x 10 $^{-6}$	751.31	0.36 mmolL^{-1}
2.4 x 10 $^{-4}$	4.17 x 10 ^{3}	941x 10 $^{-6}$	1062.69	
1.2 x 10 $^{-4}$	8.33 x 10 ^{3}	631 x 10 $^{-6}$	1584.79	

Slope = 0.144 $A^{-1}molL^{-1}$

Intercept = 397.9A^{-1}

K_m = Slope/ Intercept

= 0.144/ 397.9

= 0.000362 mol L^{-1}

= 0.36 mmolL^{-1}

The apparent Michaelis Menteen constant was found to be 0.36mmolL^{-1} which was calculated from the linear part of the calibration plot, using the Lineweaver –Burk equation. [Inset, Fig. 4.6D]

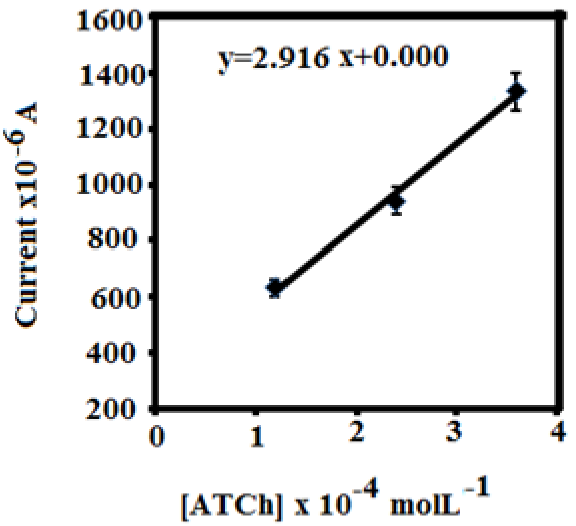

Fig. 4.6 D

R^2= 0.995, Sensitivity = Slope = 2.916A/ M = 2916mA / M,

Thiocholine LOD $= 3 \times \frac{s}{m}$,

= 3×0.16x 10-^{6} A/ 2.916 A/M

= 1.6× 10^{-7} M

Table-54 Calculation of intra state precision at 0.7 V ***[Para 4.4.5, chapter 4]***

Current (µA)	$\bar{X}$	*di*	di^2	Σdi^2	*S*	*RSD*
825.0		-18.8	353.44			
803.0		3.2	10.24			
800.0	806.2	6.2	38.44	450.8	10.62	1.32%
803.0		3.2	10.24			
800.0		6.2	38.44			

Table-55 Calculation of intra state for precision at 0.4 V ***[Para 4.4.5, chapter 4]***

Current (µA)	$\bar{X}$	*di*	di^2	Σdi^2	*S*	*RSD*
88.20		0.32	0.102			
88.60	88.52	-0.08	0.006	4.14	1.02	1.15%
89.10		-0.58	0.336			
89.70		-1.18	1.39			
87.00		1.52	2.31			

Table-56 Intra state for precision at 0.2 V ***[Para 4.4.5, chapter 4]***

Current (µA)	$\bar{X}$	*di*	di^2	Σdi^2	*S*	*RSD*
36.20		-0.24	0.06			
34.80		1.16	1.35			
34.80	35.96	1.16	1.35	4.92	1.11	3.1%
37.00		-1.04	1.08			
37.00		-1.04	1.08			

Appendix B:

List of publications and conference attended/presented

List of Publication in International Journals:

1. Dutta, R.R & Puzari, P. **(2014)**, Amperometric biosensing of organophosphate and organocarbamate pesticides utilizing polypyrrole entrapped acetylcholinesterase electrode. *Biosens. Bioelectron.* 52,166–172.
2. Dutta, R.R., Borah, H., Gogoi, S., Phukan, M., Puzari, P. **(2016)**, Low potential thiocholine oxidation on polypyrrole surface and application to organophosphate detection. (comm.)
3. Dutta, R.R., Borah, H., Gogoi S., Puzari, P. Application of lipase catalyzed transformation of ethyl acetate for analysis of organophosphate and organocarbamate pesticide residue in organic extract using acetylcholinesterase biosensor. Patent application number: 201631008813. Ref: E-2/481/2016-KOL.
4. Gogoi,S., Borah, H., Dutta, R., Puzari. P. **(2015)**, Evaluation of Diffusion Coefficient of Thiocholine in Enzyme loaded Polypyrrole Composite Film through Different Methods and Electrode Polarization, *J. Phy. Chem B* 119, 4749-4757.

5. Borah, H., Dutta, R, R., Gogoi, S., Puzari, P.**(2016)**, Influence of methanol, ethanol and cypermethrin on the Glutathione S-tranferase catalyzed reaction of Glutathione with 1-chloro-2,4-dinitrobenzene: A method for detection and quantification of cypermethrin. *Electrochim. Acta.205,* 198-206.

6. Dutta, R.R., Borah, H., Gogoi S., Puzari, P., Medhi, T., Saikia, A. Application of lipase catalyzed transformation of ethyl acetate for analysis of organophosphate and organocarbamate pesticide residue in organic extract using acetylcholinesterase biosensor.(To be comminucated)

List of Conferences attended/presented:

1. Dutta, R.R and Puzari, P. Contemporary developments in chemical sciences. **November 23-24, 2015**. Department of Chemistry, Tezpur University.
2. Dutta, R.R and Puzari, P. International symposium on Polymer Science and Technology. **January 23-26**, **2015**. Indian Association for the Cultivation of Science, Kolkata, India.

3. Dutta, R.R and Puzari, P. National Conference on Chemistry, Chemical Technology and Society. **November**, **12**, **2011**. Department of Chemical Sciences, Tezpur University.
4. Science academies lecture workshop on modern trends in chemistry, **November 20-22, 2013,** Department of chemical Sciences, Tezpur University
5. National workshop on A dvances in Applied Microbiology and Bioprocess Engineering with special reference to Petroleum Biotechnology, **August 23-24, 2012,** Organised by ONGC-Centre for Petroleum Biotechnology, Tezpur University.