Appendix B

Sample MATLAB codes for simulation of diffusion

Program 1

```
% creates a plot between change in r1 with distance at
% an instant of time.
% time should be in seconds, concentration in gmol/lt.
% slope comes from the graph of concentration Vs refractive index
% initial x should be negative. For example if the cell height
% is 5 cm, initial x will be -2.5 cm and final x will be +2.5 cm
% so that total cell height = 5cm.
% increment is the division by which one want to increase
% the position coordinate.
% For eg: increment of 0.01 cm will start the position at
% -2.5cm and then increment it to
% -2.49cm, -2.48cm..... -0.01cm,0.0cm,.01cm... .....,
% 2.48cm,2.49cm,2.5cm
% n0 is the refractive index of distilled water used to make
% the solutions. Is a constant
% Created on 25/05/2002

t=input('time t (sec)-> ');

c1=input('concentration c1(gmol/lt)->');

c2=input('concentration c2(gmol/lt)-> ');
m=input('slope m-> ');
xi=input('initial x (cm)-> ');
xf=input('final x (cm)-> ');
dc=input('diffusion coefficient (cm2/sec)-> ');
inc=input('increment (cm)-> ');
n0=input('n0-> ');

ele=round((xf-xi)/inc);
m1=zeros(ele,1);
m2=zeros(ele,1);
m3=zeros(ele,1);
```

```
x=x1; pr1=(c2+c1)/2; pr2=(c2-c1)/2; pr3=2.*sqrt(dc.*t);

for k=1:ele %r1 calculation
   m1(k,1)=(pr1-pr2.*erf(x/pr3));
   m2(k,1)=(m.*m1(k,1)+n0);
   m3(k,1)=x;
   x=x+inc;
end;

plot(m2,m3);
```

Program 2

```
% creates a plot between change in r1 with distance for
% two intervals of time

t1=input('time t1-> ');
t2=input('time t2-> ');

c1=input('avg concentration c1-> ');
m=input('slope m-> ');
xi=input('initial x-> ');
xf=input('final x-> ');
dc=input('diffusion coefficient-> '),
inc=input('increment-> ');

ele=round((xf-x1)/inc);
m1=zeros(ele,1);
m2=zeros(ele,1);
x1=x1;

for k=1:ele
   m1(k,1)=x1;
   x1=x1+inc,
end;

pr1=m*c1;
pr2=2*sqrt(dc.t1);
pr3=2*sqrt(dc.t2);

x2=x1; for k=1·ele
   m2(k,1)=pr1*(erf(x2/pr3)-erf(x2/pr2));
   x2=x2+inc;
end;

plot(m2,m1);

%calculation of extreme points
xa=sqrt(2.*dc.*log(t2/t1)/((1/t1)-(1/t2)))
xb=-xa

xx=2.*xa
```

Program 3

```
% Creates plots between change in refraction angle with
% distance at different times

t=input('time t-> ');
c1=input('concentration c1-> '),
c2=input('concentration c2-> ');
m=input('slope m-> ');
x1=input('initial x-> ');
xf=input('final x-> ');
dc=input('diffusion coefficient-> ');
inc=input('increment-> ');
len=input('width of diffusion cell ');
n0=input('n0-> ');

ele=round((xf-x1)/inc)+1;

while t>0
   m1=zeros(ele,1),
   ri=zeros(ele,1);
   pos=zeros(ele,1);
   angle=zeros(ele,1);
   dnbdx=zeros(ele,1);

   pr1=(c2+c1)/2;
   pr2=(c2-c1)/2;
   pr3=2*sqrt(dc*t);
   pr4=sqrt(dc*t);

   x=x1;
   for k=1:ele %ri calculation
      m1(k,1)=(pr1-pr2.*erf(x/pr3));
      ri(k,1)=(m.*m1(k,1)+n0);
      pos(k,1)=x;
      x=x+inc;
   end;

   x=x1; %bending angle calculation
   for k=1:ele
      nx=m*pr2*exp(-x^2/(4*dc*t))/(sqrt(pi)*sqrt(dc*t));
      dnbdx(k,1)=nx;
      angle(k,1)=(len/ri(k,1))*nx*180/pi;
      x=x+inc;
   end;

   color=input('plot color-> ','s');
   plot(pos,angle,color);
   axis([x1 xf 0 10]);
   hold on;
   t=input('time t-> ');
end;
```