Supporting Information

Kinetics Model for Photocatalytic Degradation of Methylene Blue by Ag/TiO_2 Particles

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Description	t-value	DF	p-value
Unannealed TiO_2 particles vs. annealed TiO_2 particles	-0.80	48	0.429

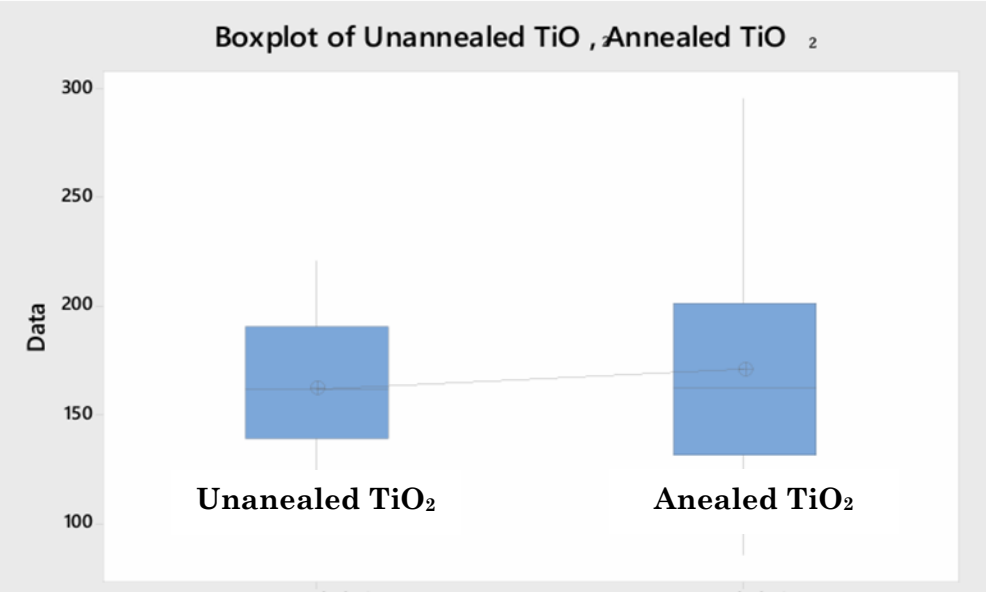

Figure S1. Box plots of unannealed TiO_2 particles vs. annealed TiO_2 particles.

Table S1. Coded Coefficients for PE.

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Model	5	580.958	116.192	7.33	0.038
Linear	2	473.707	236.854	14.94	0.014
concentration	1	38.764	38.764	2.45	0.193
pH	1	299.435	299.435	18.89	0.012
Square	2	51.207	25.604	1.62	0.306
concentration*concentration	1	1.753	1.753	0.11	0.756
pH*pH	1	50.858	50.858	3.21	0.148
2-Way Interaction	1	11.043	11.043	0.70	0.451
concentration*pH	1	11.043	11.043	0.70	0.451
Error	4	63.405	15.851		
Total	9	644.363			

Table S2. Coded Coefficients for RC.

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Model	5	0.000259	0.000052	5.01	0.072
Linear	2	0.000203	0.000101	9.80	0.029
concentration	1	0.000018	0.000018	1.75	0.256
pH	1	0.000125	0.000125	12.13	0.025
Square	2	0.000031	0.000015	1.48	0.330
concentration*concentration	1	0.000004	0.000004	0.36	0.581
pH*pH	1	0.000029	0.000029	2.78	0.171
2-Way Interaction	1	0.000002	0.000002	0.20	0.677
concentration*pH	1	0.000002	0.000002	0.20	0.677
Error	4	0.000041	0.000010		
Total	9	0.000300			

Matlab coding 1

```
function AgTiO2

%Langmuir Hinshelwood Model
%Below are the adsorption coefficient(K) and reation rate
constant(kr)
K=[0.052958594  0.297352997  0.08341867  0.10828676  0.079755251
0.148544883 0.25581479 0.106937053 0.066030876]
kr=[0.784166118     0.234600803    0.404478385    0.509491833
     0.339931402    0.24766391      0.209983453      0.252818931
     0.387632958]

%Below are the time span and initial concentration of MB
tspan = [0 60];
Co= [5.79758 4.79662 5.1674 5.87942 3.79165 4.86715 4.67435 4.7757
     4.84585];

%Numerical method
[t,c] = ode45(@(t,c) ode45function(t,c,kr,K), tspan, Co);

%Analytical method by using PIA
X1=Co(1).*exp(-kr(1)*K(1)*t).*(1+eps.*Co(1).*K(1).*(1-exp(-
kr(1).*K(1).*t)))
X2=Co(2).*exp(-kr(2)*K(2)*t).*(1+eps.*Co(2).*K(2).*(1-exp(-
kr(2).*K(2).*t)))
X3=Co(3).*exp(-kr(3)*K(3)*t).*(1+eps.*Co(3).*K(3).*(1-exp(-
kr(3).*K(3).*t)))
X4=Co(4).*exp(-kr(4)*K(4)*t).*(1+eps.*Co(4).*K(4).*(1-exp(-
kr(4).*K(4).*t)))
X5=Co(5).*exp(-kr(5)*K(5)*t).*(1+eps.*Co(5).*K(5).*(1-exp(-
kr(5).*K(5).*t)))
X6=Co(6).*exp(-kr(6)*K(6)*t).*(1+eps.*Co(6).*K(6).*(1-exp(-
kr(6).*K(6).*t)))
X7=Co(7).*exp(-kr(7)*K(7)*t).*(1+eps.*Co(7).*K(7).*(1-exp(-
kr(7).*K(7).*t)))
X8=Co(8).*exp(-kr(8)*K(8)*t).*(1+eps.*Co(8).*K(8).*(1-exp(-
kr(8).*K(8).*t)))
X9=Co(9).*exp(-kr(9)*K(9)*t).*(1+eps.*Co(9).*K(9).*(1-exp(-
kr(9).*K(9).*t)))


%Experimental data
Y1=[5.79758    2.8776    2.06906   1.48703   0.96821]
Y2=[4.79662    2.22052   1.90924   1.21959   1.02731]
```

```
Y3=[5.1674     3.06233   2.33481   1.78889   1.58284]
Y4=[5.87942    2.82119   1.89806   1.18708   1.01022]
Y5=[3.79165    2.5999    2.06375   1.54997   1.24971]
Y6=[4.86715    2.9262    2.1863    1.81078   1.55827]
Y7=[4.67435    2.84282   1.87128   1.35025   0.83571]
Y8=[4.7757     3.46812   2.7128    2.06221   1.71535]
Y9=[4.84585    3.45289   2.39267   2.02415   1.7367]
t1=[0 15 30 45 60]

%plot the curve
figure
subplot(3,1,1)
plot(t,c(:,1),'b')
hold on
plot(t,X1,'m','linewidth',2)
plot(t1,Y1,'o')
xlabel ('time(min)');
ylabel ('Concentration (ppm)');
subplot(3,1,2)
plot(t,c(:,2),'b')
hold on
plot(t,X2,'m','linewidth',2)
plot(t1,Y2,'o')
xlabel ('time(min)');
ylabel ('Concentration (ppm)');
subplot(3,1,3)
plot(t,c(:,3),'b')
hold on
plot(t,X3,'m','linewidth',2)
plot(t1,Y3,'o')
xlabel ('time(min)');
ylabel ('Concentration (ppm)');


figure
subplot(3,1,1)
plot(t,c(:,4),'b')
hold on
plot(t,X4,'m','linewidth',2)
plot(t1,Y4,'o')
xlabel ('time(min)');
ylabel ('Concentration (ppm)');
subplot(3,1,2)
plot(t,c(:,5),'b')
hold on
plot(t,X5,'m','linewidth',2)
```

```
plot(t1,Y5,'o')
xlabel ('time(min)');
ylabel ('Concentration (ppm)');
subplot(3,1,3)
plot(t,c(:,6),'b')
hold on
plot(t,X6,'m','linewidth',2)
plot(t1,Y6,'o')
xlabel ('time(min)');
ylabel ('Concentration (ppm)');


figure
subplot(3,1,1)
plot(t,c(:,7),'b')
hold on
plot(t,X7,'m','linewidth',2)
plot(t1,Y7,'o')
xlabel ('time(min)');
ylabel ('Concentration (ppm)');
subplot(3,1,2)
plot(t,c(:,8),'b')
hold on
plot(t,X8,'m','linewidth',2)
plot(t1,Y8,'o')
xlabel ('time(min)');
ylabel ('Concentration (ppm)');
subplot(3,1,3)
plot(t,c(:,9),'b')
hold on
plot(t,X9,'m','linewidth',2)
plot(t1,Y9,'o')
xlabel ('time(min)');
ylabel ('Concentration (ppm)');


end
```

Matlab coding 2

```
function dxdt = ode45function(t,c,kr,K)
dxdt = zeros(9,1);
%General equation for Langmuir Hinshelwood
%dx_dt= -(Kr.*K.*x./(1+K.*x));
%dxdt = dxdt'

i=1;
dxdt(i)= -(kr(i).*K(i).*c(i)./(1+K(i).*c(i)));
i=2;
dxdt(i)= -(kr(i).*K(i).*c(i)./(1+K(i).*c(i)));
i=3;
dxdt(i)= -(kr(i).*K(i).*c(i)./(1+K(i).*c(i)));
i=4;
dxdt(i)= -(kr(i).*K(i).*c(i)./(1+K(i).*c(i)));
i=5;
dxdt(i)= -(kr(i).*K(i).*c(i)./(1+K(i).*c(i)));
i=6;
dxdt(i)= -(kr(i).*K(i).*c(i)./(1+K(i).*c(i)));
i=7;
dxdt(i)= -(kr(i).*K(i).*c(i)./(1+K(i).*c(i)));
i=8;
dxdt(i)= -(kr(i).*K(i).*c(i)./(1+K(i).*c(i)));
i=9;
dxdt(i)= -(kr(i).*K(i).*c(i)./(1+K(i).*c(i)));

end
```

Matlab coding 3

```
function Photodegradation

%Constant in 50ppm and pH5 condition
K=[0.052958594 0.297352997 0.08341867 0.10828676 0.079755251
0.148544883 0.25581479 0.106937053 0.066030876]
kr=[0.784166118 0.234600803 0.404478385 0.509491833 0.339931402
0.24766391 0.209983453 0.252818931  0.387632958]
t = [0 60];
t=linspace(0,60,100)
Co= [5.79758 4.79662 5.1674 5.87942 3.79165 4.86715 4.67435
4.7757  4.84585];

%Calculation
Ct4=Co(4)*exp(-kr(4).*K(4).*t)
DE4=((Co(4)-Ct4)/Co(4))*100
Cexp=[5.87942   2.82119 1.89806 1.18708 1.01022];
t1=[0 15 30 45 60]'
DEe=((Co(4)-Cexp)/Co(4))*100
DEe=DEe.';
g = fittype('a-b*exp(-c*x)');
f0 = fit(t1,DEe,g,'StartPoint',[[ones(size(t1)), -exp(-t1)]\DEe;
1]);
xx = linspace(0,60,50);

%Construct graph
plot(t,DE4)
hold on
plot(xx,f0(xx),'r-')
end
```

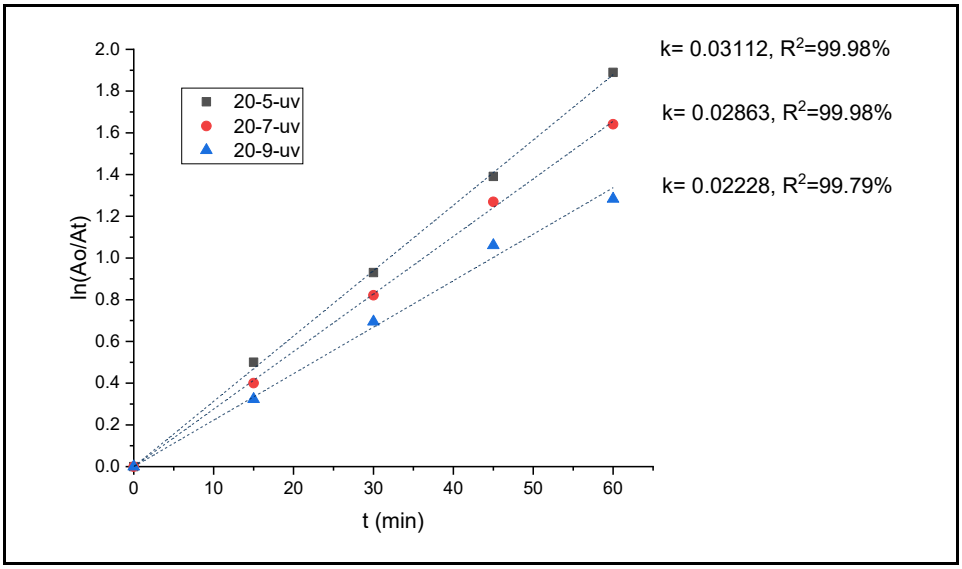

Figure S2. First-order kinetic plot for 20 ppm Ag/TiO_2 powders under pH 5, 7, and 9 under UV irradiation.

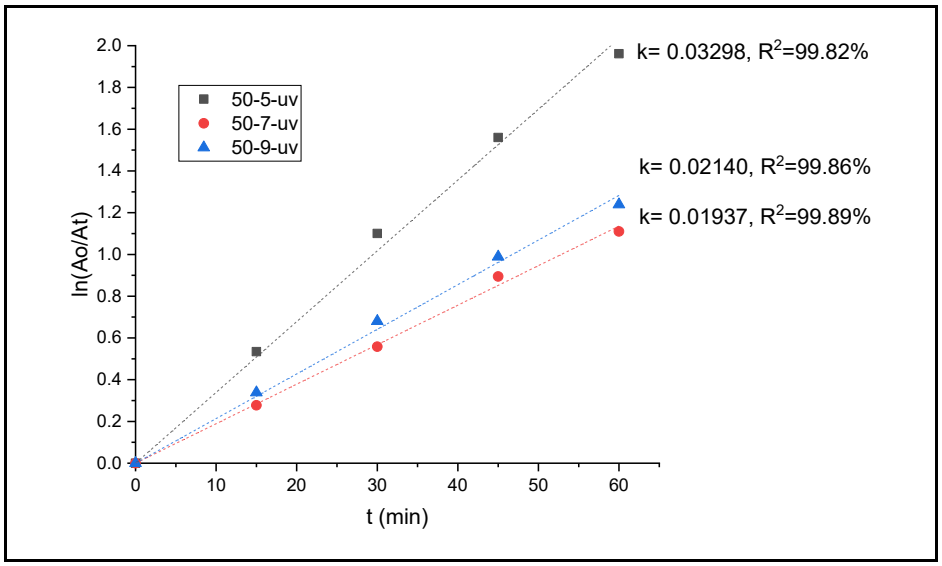

Figure S3. First order kinetic plot for 50 ppm Ag/TiO_2 powders under pH 5, 7 and 9 under UV irradiation.

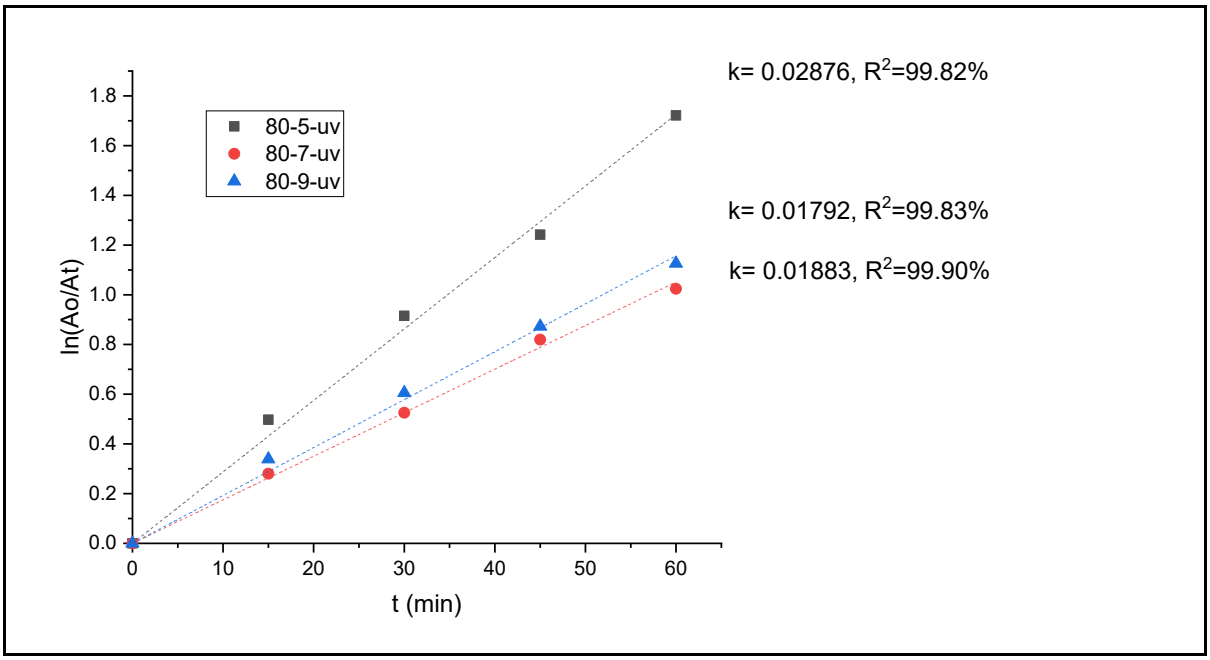

Figure S4. First-order kinetic plot for 80 ppm Ag/TiO_2 powders under pH 5, 7 and 9 under UV irradiation.

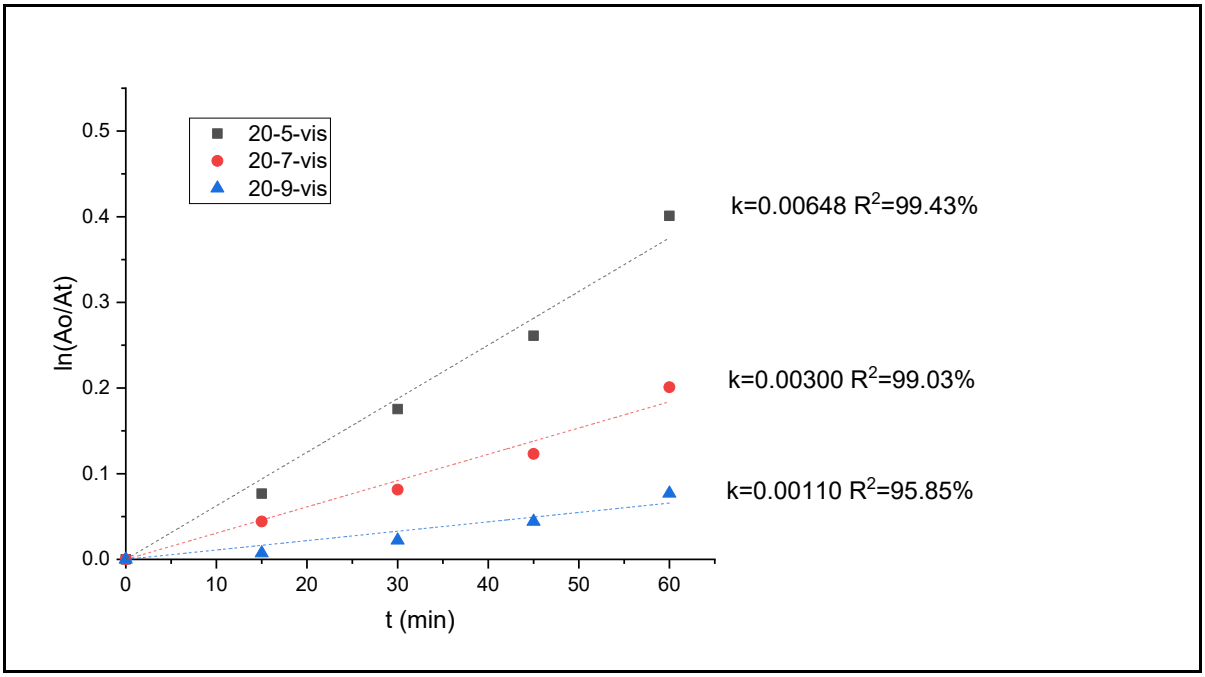

Figure S5. First order kinetic plot for 20 ppm Ag/TiO_2 powders under pH 5, 7 and 9 under visible light irradiation.

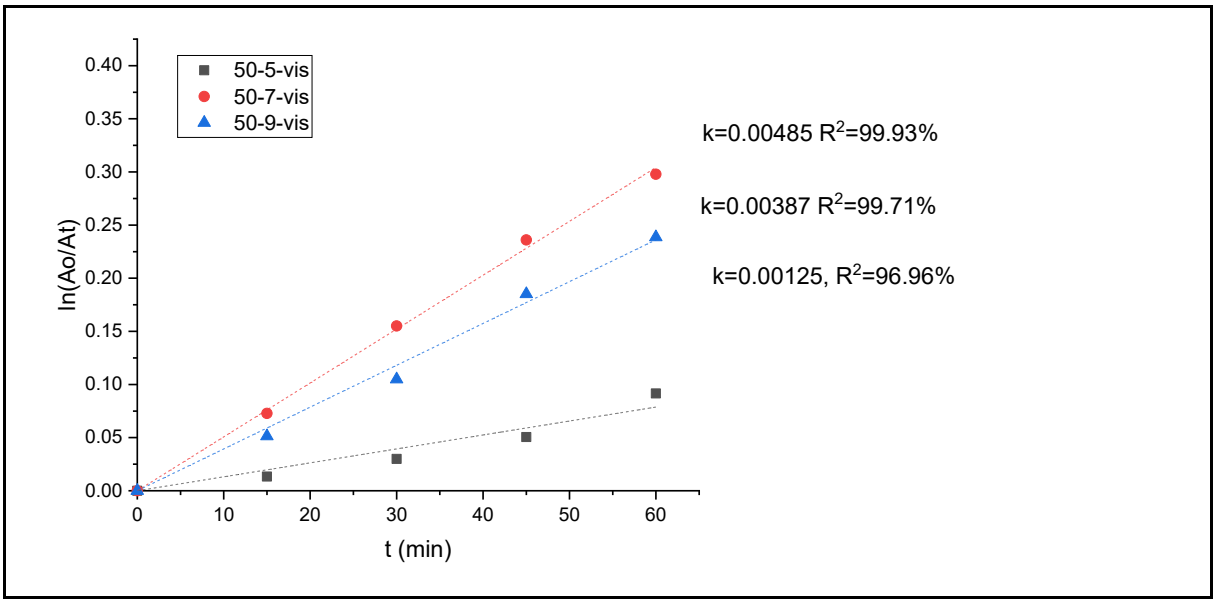

Figure S6. First order kinetic plot for 50 ppm Ag/TiO_2 powders under pH 5, 7 and 9 under visible light irradiation.

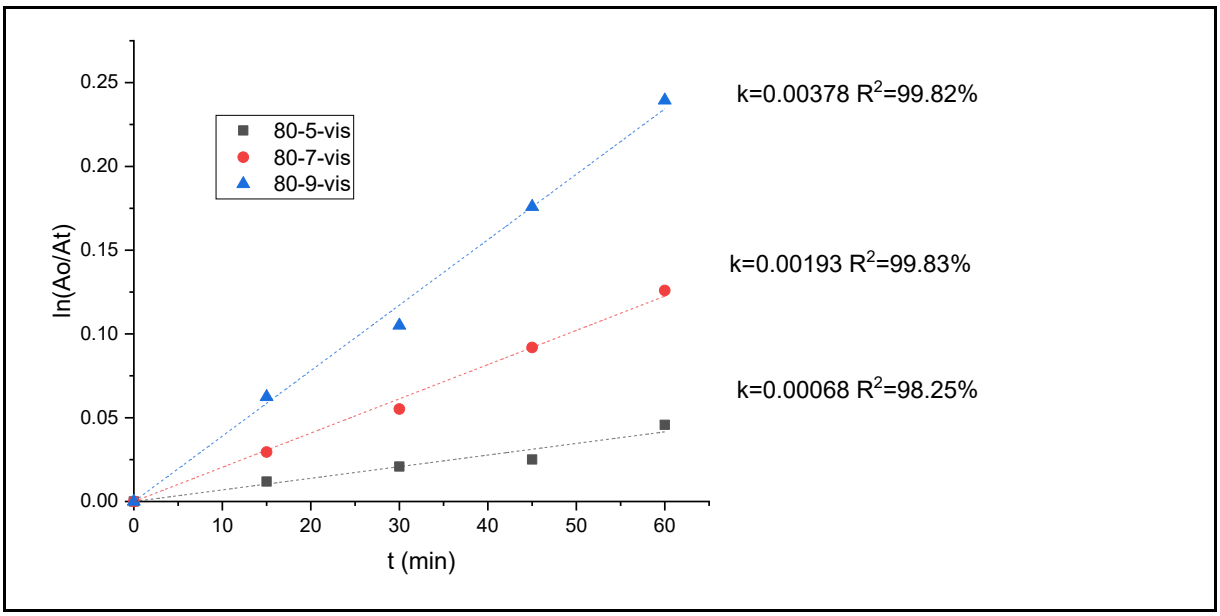

Figure S7. First order kinetic plot for 80 ppm Ag/TiO_2 powders under pH 5, 7 and 9 under visible light irradiation.