**Bio-synthesized silver nanoparticles using *Zingiber officinale* rhizome extract as efficient catalyst for the degradation of environmental pollutants**

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**Dye degradation rate constant calculation**

A0 and At are the initial and final absorbance of each dye solution. A0 and At relate to the initial (C0) and final (C) concentrations according to the Beer–Lambert law, respectively. Where A0 and A are the initial and final absorbance of each dye solution. To calculate MB photo bleaching ratio, the Langmuir-Hinshelwood equation was used, which is expressed by the following Equation 2: [20]

Ln (A/A0) = -kt (2)

**Methylene blue**

Initial absorbance = 2.253

Final absorbance = 0.0737

t = 4 minutes (240 sec)

So, ln(0.265/2.253) = -k(240)

ln (0.032711) =-k (240)

-3.4200 = -k(240)

-0.01425=-k

K=14.25 x 10-3 sec-1

**Safranin O**

Initial absorbance = 1.927

Final absorbance = 0.265

t = 7 minutes (420 sec)

So,

ln(0.265/1.927) = -k (420)

=ln(0.1375) =k (420)

=-1.9841 =-k(420)

k=0.00472

Or = 4.72 x 10-3sec-1

**Methyl red**

Initial absorbance = 1.857

Final absorbance = 0.1017

t = 5 minutes (300sec)

So, ln (0.1017/1.857) = -k(300)

=ln (0.0547) = - k(300)

=-2.9058 =-k (300)

k=0.00968

k= 9.68 x 10-3 sec-1