

Kinetics of Light Sticks

Recommended for Chapter(s): 15

Demo #036

Materials NOT in box

1. Hot water.
2. Ice water (An ice machine is located on the ground floor where the chemistry and PSBN buildings meet).

Procedure

1. (Prep) Heat up some water. The hot plate in the general cabinet can be used for this. Make sure that the hot water is not above 70°C otherwise the light stick will melt
2. (Prep) Fill one of the dewars with hot water.
 - a. Once the light stick is in the hot water it will only last for ~5 min, therefore, do not put the light stick in the water until you are close to ready to do the demo.
3. (Prep) Fill the other dewar with ice water.
4. Crack the three light sticks put one light stick in the hot water, one in the cold water and leave one out.
5. Let them sit there for 2 minutes.
6. Have students predict which reaction will occur the fastest. Ask them how they will know which reaction is happening the fastest.
7. Show the students all three light sticks; the one in the hot water will be the brightest the one in the cold water will be the dimmest.
8. Ask students which light stick will give off light the longest.

Clean Up

1. Return the materials to the cart in the demonstration library room.

Stockroom Notes

2. Throw away used light sticks.
3. Return items to demonstration tub.
4. Return tub to the demonstration library.

Discussion

This demonstration can be used to introduce Arrhenius equation

$\left(\ln(k) = -\frac{E_a}{R} \left(\frac{1}{T} \right) + \ln(A) \right)$. Since all of the light sticks have the same initial

concentrations and rate laws are all $\text{rate} = k[A]^x[B]^y$... the change in the rate of the reaction must be due to variations in k . This shows that k is temperature dependent. The faster the reaction occurs the brighter the light stick will shine. The light stick in the hot water will be the brightest because the reaction is happening the fastest. The light stick in the cold water will be the dimmest because the reaction is occurring the slowest. Because the reaction in the cold water is happening the slowest it will produce light the longest. Light sticks can be put in the freezer and taken out the next day and used because while in the freezer the reaction is occurring at a very slow rate.

Materials for demo 036

1. Light Sticks
2. Two Small Dewars