

Temperature Effects on Glowsticks

Chemiluminescence is defined as the direct production of light as the result of a chemical reaction with little or no heat produced. If the temperature of the glow stick is reduced, the average velocity (which is related to the kinetic energy) of the reactant molecules is reduced and the chance for a successful reaction is less. If the temperature of the glow stick is increased, the average speed (and hence the kinetic energy) of the reactant molecules is increased and the chance for a successful reaction is increased.

Kinetic molecular theory states that the average kinetic energy of a particle depends only on the temperature of the particle. Thus, the average kinetic energy of the particles increases as the gas becomes warmer.

Purpose

Observe what happens to activated glow sticks when they are submerged in water at three different temperatures: cold, room temperature, and hot.

Materials

- safety goggles and apron
- three beakers (large enough to contain the glow sticks)
- ice water
- room-temperature water
- hot water (no hotter than 45 °C)
- three glow sticks

Procedure

- 1) Predict what will happen when the glow sticks are added to the water. Record your predictions below.
- 2) Fill three beakers with water: one with ice water; one with room-temperature water; and one with hot water. There is no need to use water with a temperature greater than 45 °C. Do not use boiling water.
- 3) Activate and shake three glow sticks. Submerge the glow sticks in the three prepared beakers of water.
- 4) Dim the lights and observe the three glow sticks for a few minutes.
- 5) Leave the glowsticks for the remainder of the period and observe what happens.
- 6) Properly dispose of glowsticks and clean work station.

Observations

Glowstick in cold water	
Glowstick in room temperature water	
Glowstick in warm water	

Discussion

Use your knowledge of kinetic molecular theory and chemiluminescence to develop an explanation for your observations.