

Glow Stick Lab Write-Up

Data Table

Sample	Observations
Glow stick at room temp.	<p>The glow stick appeared to be bright and still very luminous after 30 minutes. However, it did appear to dim as time progressed. This appeared to happen uniformly throughout the stick.</p> <p>This stick's brightness remained in between the submerged portions of the hot and ice water glow sticks.</p>
Glow stick in hot water (partially submerged)	<p>The portion of the glow stick submerged in the hot water was brighter when compared to the other two glow sticks. After 30 minutes, the submerged portion was still very bright and relatively brighter than the other two.</p> <p>The portion that was unsubmerged was relatively the same brightness as the stick at room temperature and was dimmer than the submerged portion but brighter than the submerged portion of the ice water stick.</p> <p>As the glowstick dimmed it did not do so uniformly since only part of it was under the water.</p>
Glow stick in ice water (partially submerged)	<p>Glow stick did not appear to get incredibly bright. It was dimmer than the other two sticks as well. The bottom of the glow stick's luminous interior was very shriveled. After 30 minutes the stick was still dim at the submerged portion with the unsubmerged portion remaining much brighter</p> <p>The unsubmerged portion was brighter than the portion in the water and was more spread out within the glow stick's tube.</p> <p>The submerged portion was dimmer than the room temperature stick and the hot water stick when compared side by side.</p> <p>As time progressed the stick got dimmer, however not uniformly as the submerged portion was dimmer than the unsubmerged portion.</p>

Conclusions

We noticed that the appearance of the glow sticks varied between the samples of our lab. For instance, we noticed that the bottom of the glow stick inside of the cold water bath looked "shriveled." In the hot water, the glow stick was quickly brightened, and the stick remained the brightest of the three throughout the trial period. From these observations, it appears that a larger percentage of the particles of the glow stick over the hot plate were above the energy threshold (the activation energy of the glowing chemical reaction) for a longer period of time than the other glow sticks at lower temperatures. To add

on to this, the glow stick under the hot plate appeared to illuminate faster than the other two glow sticks. This is due to the variable of temperature, where this variable causes the particles in a reaction to move around more with an increased amount of kinetic energy; therefore more particles can collide with each other to form products. As according to the collision theory, chemical reactions occur when molecules (reactants) collide with a sufficient amount of energy. When the temperature is increased, the kinetic energy of the molecules overall has increased as well, so the product can be produced at a faster rate. This statement can provide an explanation for why it took a shorter amount of time for the glow stick submerged in the hot water to glow intensely compared to the other two glow sticks under room temperature and cold temperature. As for the rationale for why the brightness may have lasted the longest for the glow stick in the hot water, this can also be explained by collision theory. The collision theory shows that particles will react under certain conditions and sufficient energy. This means that during this brightness, more particles have the potential to react unlike the particles in the cold water glow stick where there are less collisions, so it is much harder to maintain a long brightness in this scenario. The increased kinetic energy for the glow stick submerged in hot water would make collisions in general more probable to occur in a longer period of time, so this is why the illumination of this glow stick appears to be very long-lasting.

Errors and Validity

The glow sticks were not submerged to an equal depth in the water baths, meaning that the temperature changes induced by the water temperature may not have been too consistent between the samples. Furthermore, the sticks were only partially submerged so only the submerged sections could be compared and it was not the entire glow stick that was affected and was observed. We also could not quantify the light being produced and the data was therefore subjective. This could lead to differences and issues solely based on perception and human error.

Other factors also affect the reaction such as pressure and concentration of the reactants. We did not control nor measure these variables, but they may have played a role in why the differences in the brightness of the glow sticks. The water or the air could have changed the pressure of the stick, making the reaction change. Concentration was also unquantifiable in this lab, which is potentially valuable information left out. Being able to measure numerically the concentration of a reactant or a product would give us more quantitative results regarding reaction rate.