



California State University of Bakersfield, Department of Chemistry

# The Chemical Chameleon



## **Standards:**

HS-PS1-6. Define the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.

### **Introduction:**

This experiment is a bright and colorful way to demonstrate the properties of an oxidation-reduction reaction. When a tiny amount of potassium permanganate reacts with sugar and sodium hydroxide (commonly used for soap making), multiple reactions occur within a minute. The rapid chemical reactions create vibrant colors that can be observed by students. The following reactions are taking place:

$$\begin{split} MnO_4^-(aq) + e^- &\to MnO_4^{-2}(aq) \\ MnO_4^{-2}(aq) + 2H_2O(l) + 2e^- &\to MnO_2(aq) + 4OH^-(aq) \end{split}$$

#### **Materials:**

- 6 mg Potassium permanganate (KMnO<sub>4</sub>)
- 750 mL Deionized water
- 6 g Sugar
- 10 g Sodium Hydroxide (NaOH)
- 1 L Erlenmeyer flask
- Magnetic stir bar
- Hot plate with stirring feature

### **Safety:**

- Always have an adult with you to help you during your experiment.
- Always wear eye protection and gloves when doing chemistry experiments
- Potassium permanganate is highly reactive with alcohols and glycerol, so do not add it to those substances.
- Potassium permanganate is deep purple in color, and can stain clothes or skin.

### **Procedure:**

- 1. In a 1 L Erlenmeyer flask, add 750 mL deionized water, as well as a magnetic stir bar.
- 2. Place the flask on the hot plate (you do not need to heat the flask) and turn the magnetic stirring function on.
- 3. While the water is stirring, add 6.0 g sugar and 10.0 g sodium hydroxide to the flask.
- 4. Once the sugar and sodium hydroxide is dissolved, add in the potassium permanganate.

### **Data and Observations:**

Record your observations in this space

## **Questions:**

1. What is an oxidation-reduction reaction?

2. What compounds were causing the visible colors in the reaction flask?

### **References:**

1. The Chemical Chameleon. Science Brothers. http://www.sciencebrothers.org/the-chemical-chameleon/ (accessed July 31, 2013).