

## Autocatalysis

### Purpose

To demonstrate the phenomenon of autocatalysis.

### Materials

4 g potassium chlorate	12.5 g sodium sulfite
5 mg bromophenol blue indicator	water
3 M sulfuric acid	100 mL graduated cylinder
dropper	two 250 mL beakers

### Procedure

1. Place 50 mL of water in a beaker.
2. Add three solids to the water and dissolve. Do not mix solids before addition to water.
3. In the second beaker, add 4 mL of 3 M sulfuric acid to 50 mL of water.
4. Add the solution from the second beaker to the first beaker, stirring constantly. The solution should be blue-violet.
5. Fill a 100 mL graduated cylinder with the solution.
6. Add two droppers full of the 3 M sulfuric acid to the top of the liquid in the graduated cylinder. A yellow color should appear, and over the course of several minutes should move down the graduated cylinder.

### Additional Information

1. The reaction is:  
$$\text{ClO}_3^-(\text{aq}) + 3 \text{HSO}_3^-(\text{aq}) \rightarrow \text{Cl}^-(\text{aq}) + 3 \text{SO}_4^{2-}(\text{aq}) + 3 \text{H}^+(\text{aq})$$
2. The  $\text{H}^+$  is produced by and acts as a catalyst for this reaction. The indicator is yellow in highly acidic solutions. The solution is initially blue due to the bisulfite-sulfite buffering system (pH about 6.5 to 7.0).
3. 3 M  $\text{H}_2\text{SO}_4$  is made by adding 5 mL concentrated sulfuric acid to 18 mL distilled water.
4. Point out that the acid simply starts the reaction. If it were the catalyst, the entire solution would turn yellow immediately.

### Questions for the Students

1. In this reaction, what is oxidized? What is reduced?
2. What happens at the interface of the blue and yellow solutions?

### Disposal

Solutions can be poured down the drain with excess water.

### Reference

Summerlin, L. & Ealy J. Chemical Demonstrations: A Sourcebook for Teachers, Volume 1, Second Edition, 1988.