

CHEMISTRY

Lab 8: Kinetics of the Iodine Clock Reaction

Materials:

Bottle A (400ml) contains:

0.5 g of soluble starch
3 ml CH₃COOH (glacial ethanoic acid)
0.41 g CH₃COONa (sodium ethanoate)
5 g KI (potassium iodide)
0.94 g Na₂S₂O₃ (sodium thiosulfate)

Bottle B (400ml) contains:

20 ml H₂O₂ (hydrogen peroxide) 30% v/v

Observation of the reaction

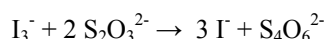
Mix 15 ml of each solution and note down what you observe.

The reaction mechanism

The first step in this reaction is the formation of triiodide ion:



In the absence of thiosulfate ion the triiodide ion would form the characteristic blue complex with starch. However, the triiodide ion is rapidly reduced back to iodide ion by thiosulfate:



In this clock reaction thiosulfate ion is the limiting reactant. The blue starch-triiodide complex forms only when all the thiosulfate ion has been consumed.

Procedure

Part A: - repeat the above experiment and measure the time taken for a colour change
- repeat 5 times with different concentrations of solution B (dilutions needed)
- plot 1/time versus concentration of B

Part B: - repeat the above experiment and measure the time taken for a colour change. Measure the room temperature.
- repeat 5 times at different temperatures in a water bath
- plot 1/time versus temperature

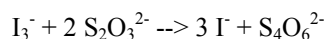
Questions

1. How does increasing hydrogen peroxide concentration affect the rate of the iodine clock reaction? Why?
2. How does increasing temperature affect the rate of the iodine clock reaction? Why?
3. The first step in the iodine clock reaction is the formation of triiodide ion from iodide ion.



Identify the limiting reagent in the above reaction for the initial measurement you did.

4. The second step in this reaction is the formation of tetrathionate ion:



Calculate the mass of tetrathionate ions produced.

5. What would have happened if no thiosulfate ion had been present?