

Script voor de reversibele fotochemische reactie tussen thionine en Fe(II)

Afkomstig van <http://elmhurst.edu/~chm/demos/thionintwofacereac.html>

(maar niet meer op die site te vinden)

Thionin - The Two - Faced Reaction

Concepts: Photochemical reaction, Oxidation/reduction, and Reversible chemical reaction

Materials:

Aluminum Foil

Ferrous sulfate, 2 g

Sulfuric Acid Solution 3 M, 10 mL

Thionin solution 0.001 M, 10 mL

Distilled water, 500 mL

1 L Beaker

Stirring Rod

Overhead projector

Preparation: Prepare 0.001 M thionin solution by adding 100 mL distilled water to 0.023g of thionin. Stir to dissolve. The thionin has a poor shelf life; use within one week.

Procedure:

1. Mix together the following in the 1 L beaker: 10 mL of freshly prepared thionin solution, 10 mL of 3 M sulfuric acid, and sufficient distilled water to bring the volume to 500 mL. Mix thoroughly.
2. Turn off the room lights and add 2.0 g of ferrous sulfate. Stir to dissolve.
3. Place the beaker on the overhead projector. Turn on the lamp. Observe that the solution changes from purple to colorless in a matter of seconds.
4. Now turn off the lamp and allow the purple color to return.
5. Place a piece of aluminum foil on the overhead projector several layers thick. Foil should not cover the entire projector.
6. When the solution is purple, place the beaker over the foil so that half of the beaker is sitting on the piece of foil. (students should be in direct line with the bisecting line to observe the vertical division).
7. Turn on the projector and observe the distinct vertical division between the purple side and the colorless side. (The division indicates that the reaction is initiated by light and not heat).
8. The reaction can be reversed by turning off the light.

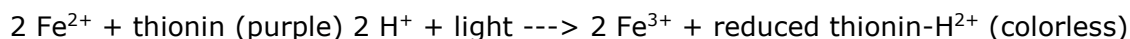
Introduction: So far we have been making chemical reactions by mixing various chemicals with each other. In this demo, no new chemicals are being added. What will be added though is a light source. Let's see what happens to this purple solution when light is added.

Next I will place the solution on the overhead with half of the solution exposed to the light and half covered up. What do you think will happen?

The result is what we like to call the two faced reaction. One half stays purple, the other half has turned colorless.

Explanation: Thionin is an organic compound that can exist in an oxidized form (purple) and a reduced form (colorless).

In this experiment, light induces the reduction of thionin by iron (II) ions.



In the presence of light, the iron ions give 2 electrons to the thionin and it also picks up 2 hydrogen ions to convert to the reduced form of thionin. This is an example of light energy being converted into chemical energy.

When the solution is taken away from the light, the purple color of the oxidized form of thionin rapidly returns and demonstrates an equilibrium reaction. If part of the solution is shaded, the boundary between the colorless and purple form is very sharp.

Safety: Sulfuric acid is severely corrosive to eyes and skin and is toxic. Use extreme caution when handling. Ferrous sulfate is slightly toxic by ingestion. Wear goggles and chemical resistant gloves.

Waste Disposal: The two-faced solution can be rinsed down the drain with excess water.

Resources:

Chen, P.S. (1974). *Entertaining and Educational Chemical Demonstrations*. p. 57-58. Chemical Elements Publishing Co, Flinn Scientific, Chem Fax, Thionin - the Two Faced Solution, Pub. No. 0815.00.