Chemical Sunset

Description: Light scattering is observed as colloidal sulfur is precipitated from $Na_2S_2O_3$.

Materials:

0.1 M $Na_2S_2O_3$	Petri dish
6 M HCl	Glass rod

Procedure:

Perform this demonstration on an overhead projector with the classroom lights dimmed or off for best viewing.

1. Cut a hole the size of the Petri dish in a manila folder and cover the overhead projector. Place the Petri dish in the hole of the folder and add enough 0.1 M $Na_2S_2O_3$ to cover the bottom of the dish.

2. Carefully add 5 mL of concentrated HCl and stir the resulting solution. As sulfur precipitates out of solution, the white light transmitted through the solution will be scattered and a "sunset" observed.

Discussion: In this demonstration, colloidal sulfur is generated by the reaction of HCl with $Na_2S_2O_3$ in a two step process involving first the formation of thiosulfuric acid followed by its decomposition to sulfurous acid and colloidal sulfur.

$$2\ H^{1+}\ (aq)\ +\ S_2O_3^{2-}\ (aq)\ \rightarrow\ H_2S_2O_3\ (aq)$$
$$H_2S_2O_3\ (aq)\ \rightarrow\ H_2SO_3\ (aq)\ +\ \text{colloidal sulfur}$$

As the reaction produces colloidal sulfur, the white light passing through the solution is scattered, producing the colors observed due to the Tyndall effect. The colors observed during a natural sunset are a result of the same principle.

Safety: Wear proper protective equipment including gloves and safety glasses when preparing and performing this demonstration. Concentrated solutions of acids and bases (>2 M) can irritate the skin and cause burns. When diluting concentrated acids, add the acid to the water to avoid spattering.

Disposal: Materials should be neutralized slowly and placed in an aqueous waste container.

References:

Shakhashiri, B. Z. In *Chemical Demonstrations: A Handbook for Teachers of Chemistry*; The University of Wisconsin Press: 1989; Vol. 3, p 353-357.

Ackerson, P. *J. Chem. Educ.* **1959**, *36*, A309.

For a non-chemical version, see: May, J.C. *J. Chem. Educ.* **1982**, *59*, 57.

Video: http://www.youtube.com/watch?v=tKrM9FT7vhw