

Gun Cotton

Purpose

To demonstrate ignition and burning of nitrocellulose.

Materials

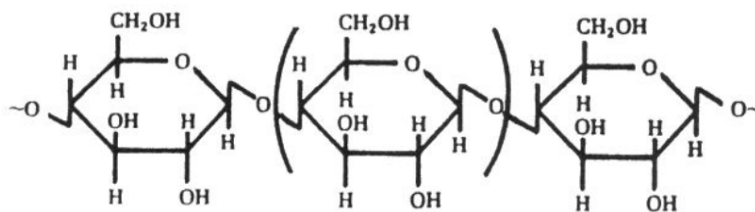
commercial cotton balls	concentrated nitric acid
glass rod	concentrated sulfuric acid
bunsen burner	400 mL beaker
asbestos pad	

Procedure

1. Prepare the nitrocellulose in the hood.
 - a. Place about 10 cotton balls in a 400 mL beaker.
 - b. Carefully combine 50 mL of concentrated nitric acid with 100 mL of concentrated sulfuric acid and pour into the beaker.
 - c. Place the beaker in an ice bath in a hood and allow it to sit overnight.
 - d. Rinse the material well with tap water several times and allow the material to dry.
 - e. Store the gun cotton in a closed plastic bag, store each batch separately.
2. Place a ball of cotton on the asbestos pad.
3. Heat a glass stirring rod in a burner flame for about 30 seconds.
4. Carefully touch the hot end of the stirring rod to the nitrocellulose from a safe distance.
5. The nitrocellulose will immediately ignite and burn with a flash. Little or no ash will be present.

Additional Information

1. If brown/red smoke (NO_2) begins to spew from the mixture when the cotton is added, this means the cotton was contaminated, and a new batch will need to be made.
2. Be sure to test a sample from each batch before using for the demonstration to make sure it works.
3. Cellulose is a polysaccharide found in plants. It is commonly called plant starch.



Cellulose

Concentrated sulfuric acid acts as a dehydrating agent to remove OH^- groups on the cellulose molecule. Nitric acid nitrates the cellulose and forms a highly reactive nitrate group. Because three nitrate groups are on each unit in the cellulose molecule, it is more properly called trinitrocellulose.

4. Combustion of trinitrocellulose can occur with a small amount of heat and the reaction produces nitrogen gas as one of its products.

Disposal

The unused gun cotton can be stored in a container in the hood for later use. If any ash remnants are present after the demo, these can be cleaned up with a paper towel. The acid solution can be diluted and poured down the drain with excess water.

Reference

Summerlin, L., Borgford, C., Ealy, J. Chemical Demonstrations, Volume II, 1987.