

# CheMagic Demonstration Notes<sup>©</sup>

## Acetylene Combustion & Acetylene Explosion

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### *Materials*

300-mL beaker; ~270-mL plastic bottle (cylinder approx. 15X5 cm with a small hole 4 cm from the bottom); small Styrofoam coffee cup; Plexiglas shield; butane grill lighter; electrical tape

### *Chemicals*

granular calcium carbide (AKA - Bangsite sold by The Conestoga Company, <http://www.bigbangcannons.com/products.aspx?c=10>); water

### *Abstract*

In the first part of the demonstration, approximately 1 g of granular calcium carbide is added to 100 mL of water in a 300-mL beaker. The mixture is stirred to form foam. This foam is then carefully ignited with the butane grill lighter.

In the second part of the demonstration, 0.3 - 0.4 g of granular calcium carbide is added to 10 mL of water in the bottom of the plastic bottle. The bottle is loosely covered with the Styrofoam coffee cup, and after 20 seconds, the mixture of gases is ignited at the hole in the bottle. There will be an explosion, so it is a good idea to use a long grill lighter. The explosion will turn the Styrofoam cup into Styrofoam confetti. The explosion limits for acetylene in air are quite wide; hence this explosion requires only an approximate measuring of calcium carbide.

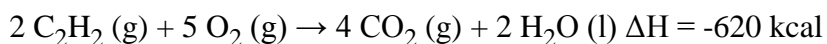
### *Obligatory but Very Important Note*

Please check the demonstration video for details on the above abstract. Are there possible hazards and risks in these demonstrations? Yes, absolutely. The demonstrations involve fire that could get out of hand. Butane lighters have been known to explode. The plastic bottle could fragment, and the use of a taped bottle and explosion shield is recommended (see below). The demonstrator needs to wear industrial grade ear plugs and safety glasses. We have not experienced specific problems in our use of the demonstrations, but potential problems are there. This video demonstration manual is distributed to chemists and chemistry teachers, and the assumption is made that professionals using the manual are knowledgeable about materials, chemicals, demonstration procedure, and demonstration risks. If there is any doubt about risk, then please show your students the video rather than doing the demonstration.

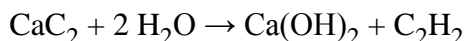
### *Demonstration Note*

We have used the same shampoo bottle for over 100 explosions without apparent physical damage. To play it safe, however, tape the bottle with plastic electrical tape to prevent flying fragments. For added protection, we have also constructed a small Plexiglas shield which we place in front of the explosion bottle. Since people vary in their ability to tolerate loud noises, it is important to warn the audience prior to the explosion. The demonstrator needs to wear industrial grade ear plugs and safety glasses.

This reaction, of course, involves the combustion of acetylene under explosive conditions:



The acetylene is formed by the reaction of calcium carbide with water:



The wide explosion limit for acetylene [Arenson, S.B., *J.Chem.Educ.*, **17**, 469(1940)] in air is probably related to the thermodynamic instability of acetylene:



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The chemical demonstrations described above are suggested for use by chemical educators and other chemical professionals interested in the instructional use of chemical magic. It is assumed that qualified chemical professionals using this manual are familiar with the properties of the chemicals and with the characteristics of the materials involved in all of the demonstrations. Any attempts to repeat the demonstrations in this manual **MUST** be carried out under the supervision of a qualified chemical professional.

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