Calcium Carbide

Posted by Anonymous on Mon, 2017-08-14 10:20

Calcium Carbide: My teachers are wondering whether there are any restrictions on us storing and using Calcium carbide for pracs here at school? They apparently used to do some wonderful pracs with it in the past, which they have not done for many years, however I am concerned about the safety of these pracs.

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Year Level:
7
8
9
10
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Laboratory Technicians

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Calcium Carbide

Submitted by sat on 24 September 2017

Answer reviewed 27 January 2023

Storage and properties

Calcium carbide can be safely stored with Dangerous Goods Class 4.3, segregated from incompatible chemicals, and MUST be kept dry.

When calcium carbide reacts with water it forms acetylene gas (ethyne) and calcium hydroxide, and generates heat.

$CaC_{2\,(s)} + 2H_2O_{\,(l)}? C_2H_{2\,(g)} + Ca(OH)_{2\,(s)}$

Calcium carbide may contain impurities of phosphorus, nitrogen and sulfur compounds. While pure acetylene gas is odourless and non-toxic, these impurities in the calcium carbide, when reacted with water, produce trace amounts of phosphine, ammonia and hydrogen sulfide, which are toxic and can impart an unpleasant odour to the gas. Acetylene can form explosive mixtures with air.

Safe Handling

Calcium carbide is not banned from use; however, the following safe practices should be observed:

- Be familiar with the storage and handling information in the Safety Data Sheet
- Conduct a risk assessment of the proposed activity
- Only use under controlled conditions
    - Wear suitable PPE Safety glasses, nitrile gloves, enclosed shoes, laboratory coat
    - Use in an operating fume cupboard, or a well-ventilated area
    - Control the scale of the activity by using only a very small lump (2-3g)
    - A small lump of calcium carbide reacts more slowly and is more controllable than fine powder, which reacts faster due to the larger surface area.
- Trial the proposed activity prior to classroom demonstrations
- Have dry sand available in the event of a fire

DO NOT:

- handle calcium carbide with bare hands
- inhale the gas produced
- use large quantities of calcium carbide fine powder
- take the stock container of calcium carbide into the classroom
- perform any reactions in a closed vessel
- react acetylene gas produced in the reaction with aqueous silver or copper(I) salts; explosive acetylides are formed
- assume that reactions shown on YouTube are suitable for use in the classroom

Recommended activity:

- place about 50mL of water in a 250mL beaker
- place a small lump (2-3g) calcium carbide into the water
- bubbles of acetylene will form and these can be ignited using a long taper

A safe alternative is to view the following videos:

1. ‘Calcium Carbide & Acetylene - Periodic Table of Videos’, YouTube (6:20 min), https://youtu.be/KQSLpuVZK9Y (7 May 2012)
2. ‘Combustion of Acetylene’, YouTube (11:14 min), https://youtu.be/i-shpoG6jeM (17 December 2012)
3. ‘Carbide lamp.wmv’, YouTube (3:37 min) https://youtu.be/UqXnBXmPQ3U (21 February 2010)
4. ‘Acetylene Production from Calcium Carbide’, YouTube (2:44 min) https://youtu.be/5hExAXfqI4w (5 August 2012)

References:

‘Calcium Carbide & Acetylene - Periodic Table of Videos’, YouTube (6:20 min), https://youtu.be/KQSLpuVZK9Y (7 May 2012)

Chem Supply website, (2022) ‘*Safety Data Sheet*’. Please search the product information page on the website for the latest version for calcium carbide https://shop.chemsupply.com.au/

Queensland Department of Education, Training and Employment. 2014. *Unpredictable science experiments*. Health & Safety Alert, DET website, https://education.qld.gov.au/initiatives-and-strategies/health-and-wellb... (Search for *Unpredictable science experiments*)
