Alkane/Alkene/Bromine Water clean up

Posted by Anonymous on Fri, 2018-02-09 12:24

Alkane/Alkene/Bromine Water clean up: My teachers yesterday did a prac on the reactivity of alkanes and alkenes with bromine water. The waste chemical products have been collected for disposal, however do you have any tips as to how to clean up the residual chemicals from the glassware?

In testing for Alkanes and Alkenes the year 12's also use acidified Potassium Permanganate solution. How do I prepare this solution?

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Year Level:
9
10
Senior Secondary
Laboratory Technicians:
Laboratory Technicians

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Submitted by sat on 14 February 2018

Answer reviewed 28 February 2023

Appropriate waste disposal procedures and cleaning of glassware is an important part of safe laboratory work practices. Safety data sheets for each chemical used and produced should be consulted for advice on hazards, incompatibilities, disposal procedures and correct PPE.

In the experiment that you describe, bromine water or acidified potassium permanganate is used to test whether an organic compound is unsaturated[1]; it is used to distinguish between alkanes and alkenes such as cyclohexane and cyclohexene, and hexane and hexene.

Acidified potassium permanganate solution is used to differentiate between alkanes and alkenes. Alkenes will react with potassium permanganate solution in the presence of sulfuric acid while alkanes will not. During the reaction with an alkene the permanganate ions (MnO_4^-) are reduced to manganese (II) ions (Mn^{2+}), resulting in the purple solution becoming colourless, while the alkene is oxidized to a diol.

Preparation of acidified potassium permanganate

This can be pre-prepared by the lab technician or students can prepare their own acidified potassium permanganate solution by adding 2 mL of 0.01 M aqueous potassium permanganate solution to a test tube followed by 1 mL of 2 M sulfuric acid. Then use 1 mL of the acidified potassium permanganate solution to react with 1mL of the alkane or alkene.

Hazards of the chemicals used

Bromine water (5%v/v) is a highly reactive, toxic and corrosive solution. It is also toxic to aquatic flora and fauna. Exposure of the eyes, skin and respiratory tract may lead to severe irritation and burns therefore this must be used in a fume cupboard and appropriate PPE be worn when handling bromine water.[1,2,3]

Alkanes and alkenes such as cyclohexane and cyclohexene, are highly flammable in both liquid and vapour phases so care must be taken to ensure no sources of ignition are nearby. Alkanes and alkenes cause skin, eye and respiratory tract irritation, may be fatal if swallowed, and are very toxic to aquatic life[4,5,6,7] and can cause drowsiness or dizziness.

Sulfuric acid is corrosive and causes serious burns and eye damage. Potassium permanganate is harmful to aquatic life with lasting effects.

All of these chemicals should be handled in an operating fume cupboard.

Waste disposal

- No hazardous organic chemical waste solution from this demonstration should be disposed of down the sink.
- The waste chemical products from these reactions should be carefully collected into a glass bottle labelled ‘halogenated organic waste’ and the appropriate GHS label affixed to the bottle.
- As the waste quantities will be small, additional compatible wastes may be added to the waste bottle. It is important to keep track of the substances added to the waste bottle by recording them on the label. The waste bottle should be stored in a flammable liquids cabinet until ready for collection by a chemical waste contractor.
- or potassium permanganate disposal, see previously answered questions Can Potassium Permanganate waste be neutralised? and Disposal of potassium permanganate

Glassware cleaning procedure

In organic chemistry glassware cleaning is usually a multi-step process.

1. Rinse the glassware with a small amount of organic solvent such as ethanol or methylated spirits. (Simple alkanes and alkenes have low solubility in water.)
2. These rinsings can be added to the same labelled halogenated organic waste bottle in the fume cupboard.

3. Invert the clean glassware onto paper towel in the fume cupboard and leave for several hours or overnight.

Inverting onto paper towel helps to drain the glassware and helps to evaporate any residual solvent in the fume cupboard (larger surface area). You could line an ice cream container with paper towel, then invert the glassware into it. Leave the fume cupboard operating until all the residual solvent has evaporated.

After the solvent has evaporated, the paper towel is disposed of as general waste.

- that paper towel in an operating fume cupboard needs to be weighed down, otherwise it can get sucked up into the back of the fume cupboard, rendering it non-operational.
- Finally, wash glassware normally in warm, soapy water, then rinse with water and dry.

References and further reading

[1] Science ASSIST. 2017. *Science ASSIST Chemical Management Handbook*, Science ASSIST website, https://assist.asta.edu.au/resource/4193/chemical-management-handbook-au...

[2] Chem-Supply Pty Ltd Safety Data Sheet: Bromine water. Please search the product information page of the Chem Supply website for the latest version: https://www.chemsupply.com.au/

[3] Nuffield Foundation. 2016. *Handling liquid bromine and preparing bromine water.* Royal Society of Chemistry website. https://edu.rsc.org/lcredir/learn-chemistry/resource/res00000683/handlin...

[4] Chem-Supply Pty Ltd Safety Data Sheet: *Cyclohexane*. Please search the product information page of the Chem Supply website for the latest version: https://www.chemsupply.com.au/

[5] Chem-Supply Pty Ltd Safety Data Sheet: *Cyclohexene*. Please search the product information page of the Chem Supply website for the latest version: https://www.chemsupply.com.au/

[6] Chem-Supply Pty Ltd Safety Data Sheet: *Hexane*. Please search the product information page of the Chem Supply website for the latest version: https://www.chemsupply.com.au/

[7] Chem-Supply Pty Ltd Safety Data Sheet: *Hexene*. Please search the product information page of the Chem Supply website for the latest version: https://www.chemsupply.com.au/

Chem-Supply Pty Ltd Safety Data Sheet: *Potassium permanganate*. Please search the product information page of the Chem Supply website for the latest version: https://www.chemsupply.com.au/

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Submitted by on 23 March 2018

Very good question and helpful expert answer. In fact I learnt new way of managing the used glassware from organic chemical. Thanks -- Nehal

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