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Bromine Water

Posted by Anonymous on Thu, 2016-05-19 11:11

Bromine Water: I have been asked to make up bromine water for testing its reaction with hydrocarbons. I know that this is very toxic and requires an S7 Poisons Permit. Would the alternative "bromine water" made by adding a few drops of commercial bleach to a 0.5 M solution of potassium bromide still work for this experiment?

Voting:



Average: 5 (2 votes)

Year Level:

Senior Secondary

Laboratory Technicians:

Laboratory Technicians

Showing 1-2 of 2 Responses

Bromine Water

Submitted by on 01 June 2016

Far easier and safer is to purchase already prepared Bromine Water from your chemical supplier. Be sure to follow all the above answered safety precautions when handling and transferring into dropper bottles for students to use. Store in refrigerator in original packaging.

Bromine Water

Submitted by sat on 27 May 2016

Answer reviewed 27 February 2023

You are correct that bromine water is toxic, is classified as a S7 Poison, and requires a licence to purchase. There is variation across Australia concerning the licencing and permit requirements for the purchase, use and resale of Schedule 7 poisons.^{1, 2}

It can be prepared by the displacement of bromide ions in solution by the addition of bleach as you have described. This method will be effective for the activity you mentioned.

Bromine water³

- is classified as a Schedule 7 poison, Dangerous Goods class 8 (Corrosive) and subsidiary risk of 6.1 (Toxic)
- carries the GHS pictograms GHS05 (Corrosion) and GHS06 (Skull and crossbones);
- is a clear orange liquid with a characteristic pungent irritating odour;
- is corrosive and an oxidiser, can cause severe eye damage and skin irritation, and emits toxic fumes, which should not be inhaled.

Before undertaking the preparation of bromine water, Science ASSIST recommends the following:

- carry out a site-specific risk assessment;
- refer to Safety Data Sheets (SDSs) of bromine water and all reactants used;
- be familiar with the following safety notes and disposal information.

Safety notes

- Perform the preparation of the bromine water and the entire investigation in an operating fume cupboard wearing relevant PPE, such as gloves, safety glasses, laboratory coat and closed-in shoes.
- Avoid inhaling any of the chemicals used or produced.
- If any chemicals come into contact with your skin, immediately wash the affected area with copious amounts of water.
- prepare only the volume of bromine water that is needed.

Laboratory preparation of bromine water

Notes

- When purchasing bleach, ensure that it only contains sodium hypochlorite⁴ and does not have other additives such as thickeners or other chemicals. If possible, purchase a 5% solution, but if purchasing a home brand, which is of a lower concentration, be aware that a larger quantity may be required. Add sufficient bleach to a 0.5 M aqueous solution of potassium bromide to produce a deep orange colour.
- The formation of bromine from a mixture of bleach and a bromide salt has been shown to be an acid-catalysed reaction.⁵ Acidification of the mixture (e.g., with dilute sulfuric acid) may therefore give a higher yield of bromine under otherwise constant conditions.

Method for the laboratory preparation of bromine water^{6, 7}

(This method prepares chlorine water first and then bromine water)

40 mL of bleach

40 mL of 1 M sulfuric acid

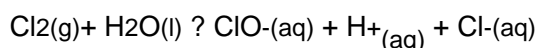
Potassium or sodium bromide crystals

Procedure

- Add the 40 mL of sulfuric acid to the bleach solution. Dilute the resulting mixture with distilled water and make up to 100 mL. This is **chlorine water**.
- Gradually, add potassium bromide (or sodium bromide) crystals to the prepared chlorine water and stir, until a deep orange coloured solution is formed. This is **bromine water**.

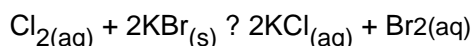
The theory behind preparing bromine water using bleach and a bromide salt is that chlorine is more reactive than bromine and will readily displace Br⁻ ions from an aqueous bromide solution to produce bromine water.

Hypochlorite ions (ClO⁻) and chlorine are in equilibrium in water, and in the presence of acid, the hypochlorite ions are readily reduced to chlorine gas, as the reverse reaction is favoured.



The resulting chlorine is reacting with the bromide which dissolves into the solution.

Chlorine water + potassium bromide → potassium chloride + bromine



Disposal of bromine water and products of your activity for the testing of hydrocarbons

- **Part A** (which uses aqueous potassium permanganate solution and hydrocarbons): The wastes produced should be collected separately into a labelled organic wastes disposal bottle.
- **Part B** (which uses bromine water and hydrocarbons): The wastes produced should be collected separately into a labelled halogenated organic wastes disposal bottle.
- Both waste disposal bottles should be tightly closed and stored in a flammable liquids cabinet. As the quantities will be small, they can have additional compatible wastes added and then should be disposed of through a waste disposal company.
- **Excess bromine water** should be reduced to bromide ions in solution by a reaction with sodium thiosulfate. Either add sodium thiosulphate solution in small portions or add sodium thiosulphate crystals, a few at a time whilst stirring, until the solution becomes colourless then dispose of in the sink with plenty of water.
- **Glassware:** Collect the used test tubes from each part separately. Rinse the test tubes with methylated spirit ensuring you collect the washings in the waste bottle and allow them to dry overnight in a fume cupboard. Once dry wash them as per normal with detergent.

References

1 'Australian State & Territory regulatory controls on Schedule 7 poisons', Department of Health TGA website: <https://www.tga.gov.au/how-we-regulate/ingredients-and-scheduling-medicines>

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3 Chem-Supply. (2021). *Bromine water*, Safety Data Sheet. Search <https://shop.chemsupply.com.au/> to source the latest Safety Data Sheet via the product information page.

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5 Kumar, K., Margerum, D.W. 1987. Kinetics and mechanism of general-acid-assisted oxidation of bromide by hypochlorite and hypochlorous acid. *Inorganic Chemistry* 26: 2706-2711.
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<http://www.labnetwest.asn.au/experiments/> (Accessed February 2023)

7 'Problems and solutions – recipes. Bromine water', WA Regional Technicians Group,
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