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Cleaning glassware

Posted by Anonymous on Wed, 2015-03-25 08:59

Cleaning glassware: Dichromic acid glass cleaner waste - I use concentrated sulfuric acid and sodium dichromate in the glass cleaner I make.

I have recently learned that sulfuric acid should not be put through the chemical waste pit that protects the waste water system.

I reuse the cleaner until it is no longer active and changes pH.

The residue from the glass ware is diluted with water when being washed and put down the sink.

Should I be using a different glass cleaner or procedure?

Voting:



No votes yet

Year Level:

7

8

9

10

Senior Secondary

Laboratory Technicians:

Laboratory Technicians

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Dichromic acid glass cleaner waste

Submitted by sat on 01 April 2015

Answer reviewed 27 February 2023

Science ASSIST strongly advises against the use of chromic acid solution to clean glassware.

Chromic acid is an environmental toxin and is considered to be a human carcinogen. Any chromium solutions should not be discharged to the environment but should be stored for collection via a licenced chemical waste contractor. For more information about dichromates, see our previously answer Q&A [Potassium dichromate and sodium dichromate](#)¹

Sulfuric acid can react with lime in an acid neutralisation pit to form insoluble calcium sulfate, which coats the lime particles and reduces their reactivity. Large volumes of waste sulfuric acid should be stored for collection via a licenced chemical waste contractor. Small amounts of sulfuric acid may be diluted, neutralised and discharged to waste water. See Science ASSIST [SOP: Diluting concentrated sulphuric acid](#)² for further information about neutralisation and waste disposal.

It should not be necessary to use the chromic acid reagent for the cleaning of glassware as there is a range of alternative cleaning agents available which are safer and more than adequate for school purposes.

PPE

Safety glasses, gloves, closed shoes and a lab coat should be worn when washing glassware. Cleaning with concentrated acids, oxidising agents or a base bath should be carried out in a running fume cupboard.

Mild Cleaning Methods

Wash glassware as soon as possible after use as this will make it easier to remove contaminants. Initially, cleaning of the glassware should be attempted by washing in hot, soapy water using a laboratory cleaning detergent such as Pyroneg® or Detcon 95® and soaking it overnight if necessary. Scrub the glassware well with a brush and rinse well with tap water to remove all the soap and residues. For analytical chemistry practicals, the glassware should be rinsed a further 2–3 times with distilled water. Invert the items or place onto pegs and allow to air dry.

Note that glassware does not always need to be dried before use. For example, for titrations, students will need to familiarise their glassware with the reagents and therefore do not need to start with dry glassware.

If dry glassware is needed in a hurry, it can be rinsed with acetone, inverted on a folded paper towel and allowed to air dry.

A laboratory oven is handy for drying glassware quickly. However, items of volumetric glassware should not be dried in an oven as the expansion and contraction of the glass on heating and cooling can affect their precision. Two hazards to avoid with laboratory ovens are (i) using a mercury thermometer to monitor the temperature, which would generate extremely toxic vapours if a breakage were to occur, and (ii) using an oven to dry glassware which contains organic solvents, also potentially generating hazardous fumes.

To check if glassware is clean

Pipette distilled water over the inside surface of the glass vessel. If the water flows freely over the glass surface, wetting the surface uniformly and forming a smooth sheet, then the glass is clean. If you can see patches which are not wetted, then further cleaning is required.

To remove carbonate residues: Insoluble carbonate residues can be removed by treating the glassware with dilute acid, such as 0.5M hydrochloric acid. The mixture of carbonate and acid will fizz with the evolution of carbon dioxide gas.

To remove iron oxide (rust): Iron oxide can be removed from glassware by soaking the item in dilute (~1M) hydrochloric, citric or oxalic acid. Dissolution of the iron deposits may take a few days, depending on the extent of the contamination. For a faster result, more concentrated hydrochloric acid can be used; remember to wear appropriate PPE and work in a fume cupboard for any procedures involving concentrated acids.

To remove manganese dioxide residues: Brown manganese dioxide can be removed from glassware by soaking the item in dilute oxalic acid solution (0.5–1M). The oxalate ion sequesters the manganese by forming a chelate between two of its oxygen atoms and a manganese ion.

To remove organic residues: Before attempting chemical cleaning treatment, try to remove organic residues mechanically by scraping off the material, taking care not to abrade the glass. Solvents such as ethanol, acetone or hexane can be used to rinse organic contaminants from glassware. Ensure that you wear appropriate gloves and work in a running fume cupboard to minimise any exposure to solvent fumes. Solutions of organic residues should be stored for collection by a licenced chemical waste contractor.

To remove grease: Grease can be removed from glassware by boiling in a dilute solution of sodium carbonate. Silicone grease can be removed from ground glass joints by wiping with a paper towel soaked in hexane. When using hexane, work in a running fume cupboard to minimise exposure to fumes.

More aggressive cleaning methods

Before considering more aggressive cleaning methods, first ascertain if it is worth the cost, effort and potential risks involved. If the residues are not removed using the above methods, then the glassware can be cleaned by either using a potassium hydroxide/ethanol bath or an oxidising cleaning agent.

KOH/Ethanol Bath (or Base Bath)

- A KOH/ethanol bath removes a thin layer of silicon oxide from the surface of the glass, and thereby exposes a clean surface. This process is effective for removing organic material which cannot be removed by rinsing with solvent.
- Always work in a fume cupboard and wear thick rubber gloves, safety glasses and a lab coat when preparing and using a base bath as the solution is flammable and highly corrosive.
- A KOH/ethanol bath is prepared by dissolving 56 g of potassium hydroxide in 800 mL of ethanol or methylated spirits followed by slow, careful addition of 200 mL of distilled water. The bath can be prepared in a large (e.g., 2L) plastic (HDPE) lidded container, or one large enough to easily accommodate the items of glassware to be cleaned. Label the container as flammable and corrosive, bund the container in a spill tray capable of containing the volume of the solution and store with other alkaline solutions.

- To use the base bath, remove it from storage and place in a spill tray in the fume cupboard. Glassware should be as clean as possible before being placed in a base bath to minimise contamination of the bath. Wear thick rubber gloves and use tongs to submerge the glassware in the bath. Organic residues can be removed by soaking the glassware in the bath for 1 hour or up to several hours, depending on the level of contamination. Rinse the glassware several times with tap water and then wash as usual with warm soapy water. A base bath will slowly dissolve glass and therefore glassware should not be left in a base bath for longer than is necessary. Do not use a base bath to clean glassware contaminated with metals.
- The base bath should be disposed of as corrosive and flammable waste via a licenced waste disposal contractor when it is no longer effective or becomes dark in colour.

Oxidising cleaning agents

NOCHROMIX®: The commercially available cleaning agent NOCHROMIX® contains peroxisulphate. It is a good alternative to chromic acid, does not contain metal ions and is not carcinogenic.

Cleaning glassware in preparation for the silver mirror reaction (Tollen's test): First wash the glassware in hot soapy water, scrubbing the surface well with a test tube brush. Rinse well with tap water and allow the vessel to dry. Pipette a small amount of concentrated nitric acid over the inside surface of the vessel, making sure that the entire inside surface is wetted with the nitric acid. Use of concentrated nitric acid must be carried out in a running fume cupboard and PPE (gloves, closed shoes and a lab coat) should be worn. Before removing the glassware from the fume cupboard, rinse it several times with tap water to remove any concentrated acid and residues. Rinse 2–3 times with distilled water and allow to air dry.

Removing silver mirrors from glassware: This procedure must be carried out in a running fume cupboard. Silver mirrors can be oxidised with a small amount of concentrated nitric acid. The resulting silver nitrate solution can then be diluted and neutralised with sodium carbonate. Addition of a solution of sodium chloride to the neutral solution will precipitate the silver as white silver chloride. The precipitate can then be collected by Buchner filtration and stored for collection by a licenced chemical waste contractor and the remaining neutral solution washed down the drain.

Science ASSIST strongly advises against preparing or using the following solutions for the cleaning of glassware because they are extremely corrosive and/or carcinogenic and/or potentially explosive:

- Aqua regia
- Piranha Solution
- Hydrofluoric acid
- Chromic acid
- Fuming sulphuric acid

References

1 Science ASSIST. (2023). *Potassium dichromate and sodium dichromate*, Science ASSIST Q&A, Retrieved from the Science ASSIST website: <https://assist.asta.edu.au/question/2506/potassium-dichromate-and-sodium...>

2 Science ASSIST. (2014). *SOP: Diluting concentrated sulphuric acid*, Retrieved from the Science ASSIST website: <http://assist.asta.edu.au/resource/656/sop-diluting-concentrated-sulphur...>

Corning Inc. (1994 – 2023). *Life Sciences, Laboratory Glassware*. Retrieved from Corning Inc: <https://www.corning.com/worldwide/en/products/life-sciences/products/gla...>

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