

# GLASSWARE CLEANING

MLS 201

# Introduction

- Laboratory procedures require specific ,sensitive and precise methods for a reliable result .
- These methods should involve good glassware cleaning to ensure excellent laboratory results.
- In all instances laboratory wares should be physically clean, chemical residue free, grease free and be sterile.
- Laboratory glassware are a variety of materials made of glass used for scientific experiments and analysis in all fields of science especially the diagnostic and research field of medicine.

# Types of Laboratory Glassware

- Merck glassware
- Duran glassware
- Rankem glassware
- Borosil R glassware
- Borosilicate quality glassware
- Hydrometer
- Thermometer
- Crucibles-silica
- Zeal Thermometer
- Example of glassware items include beakers, flasks, test tubes, microscope slides, glass petri dishes, pipettes, graduated cylinders, jars etc.

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# Glassware cleaning

- Glassware cleaning is dependent on the type of glass and the agent to be cleaned off the glass.
- In lieu of this, there are different methods of glassware cleaning.

## 1. Initial Glass Cleaning

- This is the first step in glassware cleaning.
- If the glassware isn't clean after these initial steps you can go on to more aggressive cleaning protocols.
- **Method**
- Scrape away any thick solid material from the glass if possible.

# Glassware cleaning(Methods)

- Wipe away any grease from the glass joints with a solvent like acetone which can be used to help remove the grease.
- Put the glassware in a warm cleaning solution of detergent and water.
- Use a brush or cleaning pad to clean any residue or contamination.
- Rinse with tap water first, followed by deionized water and allow to dry.
- Most new glass is slightly alkaline and should be washed upon receipt and generally can be soaked in a 1% HCL or HNO<sub>3</sub> solution before wash , rinse in tap followed by DI water and allow to dry.

# Glassware cleaning(Methods)

## 2. Mild Cleaning Methods

- If the initial cleaning method fails try gentle solvents for long term soaking.
- When dealing with the gentle aqueous solutions heat soaking or, in some instances, mechanical agitation such as stirring, shaking, or sonication can enhance its productivity.
- The common gentle aqueous cleaning mixtures are described below.

# Common Gentle Aqueous Cleaning Mixtures and their Uses

- **Deionized water** For diluting out absorbed ions – passive soaking.
- **Dilute surfactants** Solubilizing lipid material – agitation, brushing, rubbing or sonication.
- **Protein or saccharide hydrolyzing enzymes** Breaking larger structures into soluble molecules – passive soaking.
- **Metal chelating compounds** Insoluble salts become more so by removing the metal ion – passive soaking.
- **Dilute strong acids** Insoluble salt's anion is soluble as its acid form – soak or agitation.
- **Concentrated weak acids** Insoluble salt's anion is soluble as its acid form – soak or brush.
- **Dilute solutions of: Phosphates, Carbonates or Ammonia** All create low levels of hydroxide ions for solubilizing weak insoluble acidic solids or hydrolyzing ester bonds – soak, agitate or brush.



# Glassware cleaning(Methods)

## 3. Using Organic Solvents

- Organic solvents are often used to remove contaminants from glass.
- Basically, if it can be readily dissolved in an organic solvent it can be removed by these means.
- The use of organic solvents is complicated due to their flammability and toxicity.
- When working with solvents proper ventilation and appropriate PPE (suitable glove compatibility with the solvent) are necessary.
- Moistening a cloth with solvent is good for easily accessed surfaces.
- Agitating solvent inside of a glass container is another method

# Glassware cleaning(Methods)

## 4. Aggressive Cleaning Methods

- If the mild ,aqueous and organic solvent methods described above are not effective then aggressive cleaning method is adopted.
- This method involve releasing the adhered material/contaminant by removing the top layer of silicon oxide of the glass.
- It can also be done by oxidizing the material itself from the glass surface.
- This can be achieved by soaking the glass in 2% hydrofluoric acid or a base bath (sodium or potassium hydroxide in either ethanol or isopropanol) before rinsing and cleaning in detergent.

# Glassware cleaning(Methods)

- The aggressive method is achievable due to the borosilicate nature of laboratory glassware as the acid will attach to the silica layer of the glass.

## 5. Oxidizing Contaminants from Glassware

- Often the residue on glass is insoluble to organic solvents, surfactant solutions, or mildly acidic solutions.
- At this point one of the common ways to clean glass is to oxidize the contaminant in order to render it soluble.
- Oxidizing agents include aqua regia(nitric acid and HCl);Chromic acid which is a sulfuric acid based agent;Piranha solution (hydrogen peroxide based agent),fuming sulfuric acid which contains pyrosulfuric acid.

# Neutralization and Disposal

- Neutralization of these aggressive baths is not a trivial matter.
- This is largely due to the volume of the baths commonly employed.
- Extreme care must be taken and appropriate PPE must be worn.
- No one should do these neutralizations without the proper training.
- The Laboratory Safety Officer/Quality Control officer will help with the process by reviewing the procedures.

## Glass cleaners

- **Detergents** are the best eg Alconox.
- They can be used for handwashing, soaking and automatic washer.
- Always use soft brushes.
- Always rinse glass well and do a final DI rinse.

# Glass cleaners

- **Chromic Acid or Chromerge**
- It is a great cleaner and also removes organic residues.
- Use gloves and well ventilate the area when using chromic acid as it is a carcinogen and very corrosive.
- Make sure metal clamps or flanges are removed.
- It is best to fill the vessel or soak the item in the solution for a short time in a plastic tub so that you can contain the wash material,.
- Then rinse immediately several times before proceeding to a detergent wash.
- Make sure the residual chromic acid is diluted after use and disposed properly according to your local or company regulations.

# Glass cleaners

- **Removal of Grease**
- Grease is best removed by boiling the glass in a weak solution of sodium carbonate.
- Acetone or any other organic solvent can be used also, followed by several water and DI water rinses.
- **Other stains**
- For permanganate stains use a mixture of equal 3% sulfuric acid and 3% hydrogen peroxide.
- For Iron stains use a solution containing one part hydrochloric acid and one part water.
- For bacteriological contamination, glassware should be soaked in a disinfectant solution and then steam autoclaved then followed by a suitable washing and rinsing.

# Glassware cleaning(Glass cleaners)

- **Ultrasonic Cleaners**
- Ultrasonics is a good method of cleaning glassware.
- Ultrasonic cleaners that are heated will be the best and generally with a mild detergent they will clean most residues off of glassware.
- **Rinsing**
- Glassware should always have a water rinse after any cleaning procedure followed by a DI rinse.
- It is best to give smaller pieces such as test tubes a soaking rinse followed by a DI soaking rinse.



# Glassware cleaning(Glass cleaners)

- **Drying**
- Oven drying at 100° C is best for all glassware. If not convenient, rack drying will work.
- **Steam Autoclaving or Sterilizing**
- Proper protocol for steam autoclaving of borosilicate glassware is 15-20 minutes at 100-120° C.

# Safety Precautions in cleaning of laboratory glassware

- When cleaning glassware, full shielding of the eyes is a minimum requirement because even soap solutions can cause eye irritation.
- Many of the chemicals used in cleaning can easily penetrate the skin, especially when combining them with organic solvents.
- Chemical Splash goggles, plastic aprons and non-disposable gloves – specifically chosen to handle extended contact with the chemical - should be worn during any of the aggressive procedures described above.

# References

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- Suggestions for cleaning laboratory glassware. Ace Glass Inc. 1430 North West Blvd. Vineland, NJ 08362. [www.aceglass.com](http://www.aceglass.com)



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