Cleaning procedures for glass substrates

INRF Application note
Process names: SOAPCLEAN + SOLVENTCLEAN + HCLCLEAN + HN03CLEAN + AQUAREGIA

Overview
Glass slides wafers are often cleaned by a solvent clean followed by a dionized water (DI) rinse, followed by a mild acid clean, DI rinse and blow dry. This is a level-1 process and required basic INRF safety certification. The use of dangerous chemicals requires that the user may not perform the process alone.

Time needed

The total process takes approximately 50 minutes.

Materials needed

Soap solution
Acetone
Methanol
Dilute hydrochloric acid (30%)
Dilute nitric acid (30%)
Pyrex bath containers

Soap clean (SOAPCLEAN)

Most slides and glass surfaces can be effectively cleaned with soapy water. Prepare a bath of soapy water. Use a lint-free wipe and cotton swab to gently rub the surface clean of dirt and residues. Rinse thoroughly in DI water and blow dry with nitrogen.

Solvents can clean oils and organic residues, which appear on glass surfaces. Unfortunately, solvents themselves (especially acetone) leave their own residues. This is why a two-solvent method is used.

Pour acetone into a glass container. Pour methanol in a separate container. Place acetone on hot plate to warm up (do not exceed 55 deg C). Place silicon wafer in warn acetone bath for 10 minutes. Remove and place in methanol for 2-5 minutes. Remove and rinse in DI water, blow dry with nitrogen. If the solvents are clean and you intend to use them again, store in an appropriately labeled INRF container. If not, pour used acetone and methanol in the solvent waste container. DO NOT pour solvents down the drain.

Hydrochloric acid clean (HCLCLEAN)

Setup time for this process is about 5 minutes. This process takes about 35 minutes to complete. Wear protective gear (eye protection, nitrile gloves).

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Hydrochloric acid can be used to clean glass. It does this by mildly etching the surface of the glass. Prepare the HCI bath in a polypropylene container by the following recipe:

200 ml DI water
100 ml HCI (add to water)

Pour the water into the container then add the acid. Be sure to label the container with the title "30% HCI solution" then add your name and the date.

Put the glass substrates into the bath to soak for 30 minutes. For extra clean surfaces, soak for 24 hours. Rinse in DI water then blow dry. If the acid solution is clean and you intend to use it again, store it in an appropriately labeled INRF container. If not, pour the acidic solution into the acid waste container.

Nitric acid clean (HNO3CLEAN)

Setup time for this process is about 5 minutes. This process takes about 35 minutes to complete. Wear protective gear (eye protection and nitrile gloves).

Nitric acid can be used to clean glass. It does this by leeching the ions from within the surface of glass. Prepare a nitric acid bath in a polypropylene container by the following recipe.

200 ml DI water
100 ml nitric acid (add to water)

Pour the DI water into the container then add the acid. Be sure to label the container with the title "30% nitric acid solution" then add your name and the date.

Put the glass substrates into the bath to soak for 30 minutes. For extra clean surfaces, soak for 24 hours. Rinse in DI water then blow dry. If the acid solution is clean and you intend to use it again, store it in an appropriately labeled INRF container. If not, pour the acidic solution into the acid waste container.

Aqua Regia (AQUAREGIA)

Setup time for this process is about 5 minutes. This process takes about 35 minutes to complete. Wear protective gear (eye protection and nitrile gloves).

Aqua Regia ("royal etch**")** is a HCI-HNO3 (3:1) etchant used to etch many metals including gold. Prepare an Aqua Regia mixture in a polypropylene container by the following recipe.

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400 ml DI water
150 ml hydrochloric acid (HCI)
50 ml nitric acid HNO3 (carefully add to HCI)

Pour the DI water into the container then add the acid. Be sure to label the container with the title "Aqua Regia, 3-1 hydrochloric acid/nitric acid solution" then add your name and the date.

Put the glass substrates into the bath to soak for 30 minutes. For extra clean surfaces, soak for several hours. Rinse in DI water then blow dry. If the acid solution is clean and you intend to use it again, store it in appropriately INRF labeled container. If not, pour the acid solution into the appropriate acid waste container.

Safety and emergency

All INRF safety and procedural regulation must be followed. Use of acid requires at least one other person in the clean room (buddy system). Acids should be handled in a laminar flow bench, using nitrile gloves and eye protection. Any small spills should be wiped up immediately with wipes. Dispose of the wipes in the corrosive waste container. DO NOT LEAVE the acids unattended unless properly contained, labeled, and stored for overnight cleaning. Review INRF Standard Operating Procedures (SOP) for fire, chemical spill, and acid exposure.

Acetone and methanol are flammable liquids. Handle with care. DO NOT let solvent exceed 55 deg C. DO NOT store the solvent near the hotplate or any other source of heat.

In case of exposure to skin or eyes flush immediately with water for 15 minutes. Remove all clothing that are exposed and flush with water. Report to INRF staff or EH&S. Seek medical attention immediately.

References

G. Shugar and J. Ballinger, *Chemical Technicians' Ready Reference Handbook*, McGraw-Hill; New York, 1996