

Aqua Regia Handling and Disposal Procedures

Aqua regia is commonly used to remove minor organic contaminants from glass or noble metal substrates, as in microfabrications and microelectronics labs. Aqua regia solutions are extremely corrosive and may result in explosion or skin burns if not handled with extreme caution. Do NOT use aqua regia unless it is necessary. Please consult with PI or senior lab investigators before you use aqua regia for the first time.

Always use glass (preferably Pyrex) containers. Aqua regia will melt some plastics and corrode/dissolve most metals.

Never store aqua regia solutions. Mix up only what you need, then treat as hazardous waste after each use (see disposal on the next page).

Never prepare or manipulate aqua regia while alone. If you leave something to soak overnight, the container must be clearly labeled as "Aqua Regia, Extremely Corrosive!"

The traditional solution is comprised of a 3:1 mixture of hydrochloric acid and nitric acid, respectively. Always add the nitric acid to the hydrochloric acid slowly.

Mix the solution in an uncluttered hood with the sash or a face shield between you and the solution. Wear chemical splash goggles (eye protection), lab coat and appropriate acid-resistant gloves.

Dissolving metals or reacting organics in aqua regia releases toxic gases, so always work with aqua regia in a fume hood.

Aqua regia solution is very energetic and potentially explosive if reacting with some organics. It is very likely to become hot during a reaction, more than 100°C. Handle with care always in an uncluttered hood.

Do not add other acids or (especially!) bases to aqua regia. Do not spray it with water, which will give a very exothermic heat of mixing.

Leave hot aqua regia solution in an open container in the hood until it is cool (it should not be bubbling if ready for disposal).

Never store or leave aqua regia in a closed container without a pressure venting cap. It will oxidize over time to form toxic nitrosyl chloride, nitrogen dioxide and chlorine gases. This will pressurize the container if a standard cap is used, and can lead to an explosion.

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Mixing aqua regia with organic compounds may cause an explosion. Never, ever put any solution that might have even a small amount of aqua regia into a typical organic waste container, or put an organic solvent or liquid into a container that has aqua regia in it (even a small residue).

Again, do not store aqua regia. Aqua regia quickly loses its effectiveness due to oxidation of its reactive components. Mix a fresh solution for each use.

Used aqua regia should be allowed to cool and cease gas generation, and then should be handled as hazardous waste. The spent solution can be stored until pickup in a glass bottle as appropriately labeled hazardous waste with a pressure venting cap. Pressure venting caps are available from EH&S (413-545-2682). The waste bottle should be dedicated to aqua regia disposal; never put aqua regia into a waste container with other materials. The spent solution should still be considered an oxidizer, and therefore the waste should not be stored in the same secondary containment as incompatible (e.g., solvent or other organic, or basic) waste. Contact EH&S for pickup of waste containers when full or when operations with aqua regia have ceased.

Modified from procedures found at Princeton University after consultation with EHS and faculty at the University of Massachusetts at Amherst