

Safe Handling Guide

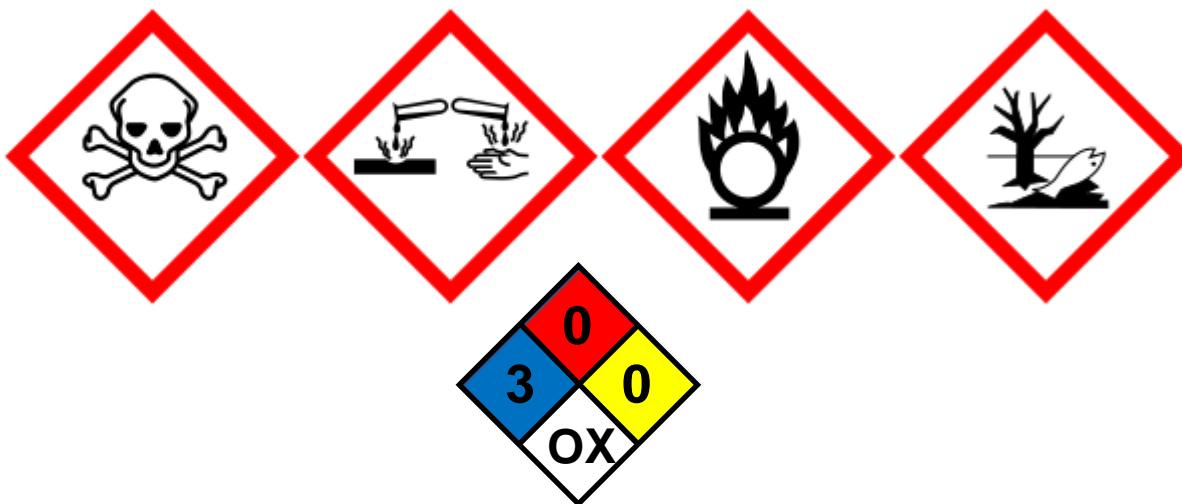
Aqua Regia [Nitrohydrochloric acid]

[8007-56-5]

Aqua Regia is a corrosive, fuming yellow-orange-red liquid comprised of one volume of concentrated nitric acid and three volumes of concentrated hydrochloric acid. It can dissolve metals such as gold, platinum, and silver. Its fumes and color are caused by reaction of nitric acid (HNO₃) with hydrochloric acid (HCl) to form volatile nitrosyl chloride (NOCl) and chlorine gas (Cl₂). Aqua regia is commonly used as a cleaning agent to remove trace amounts of organic compounds. Due to its highly corrosive nature and oxidizing potential, solutions must be handled with extreme caution.

SIGNAL WORD: DANGER

HAZARD SIGNS



- Extremely corrosive.
 - Causes destruction of living tissue at site of contact. Corrosive effects can occur not only on the skin and eyes, but also in respiratory tract, causing respiratory tract irritation. Toxic if inhaled, causes severe burns and eye damage.
 - Very strong oxidizer. May ignite flammable/combustible materials. DO NOT mix with ORGANIC materials, especially solvents (e.g. ethanol). May result in explosion.
 - Very toxic to aquatic life.
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PRECAUTIONS

Before starting work:

- Review manufacturer's [Safety Data Sheet](#) and additional chemical information.
- Ensure that a written experimental protocol including safety information is available.
- Be familiar with the [Western Emergency Response Guide](#) and the [Exposure Response and Spill Response Posters](#).
- Create the most dilute solutions available that will meet experimental/cleaning needs. Create only as much as you need.
- Identify the location of the nearest eyewash and shower and verify that they are accessible.
- Locate and verify that appropriate spill cleanup materials are available.
- **Perform all work in a secondary container** that is clean and free of organic matter.
 - NEVER add more than **trace** organic materials to Aqua Regia solution; it could react violently. This includes any chemical containing a C-H bond, e.g., acetone, isopropanol, ethanol, photoresist, or detergents.
 - When preparing Aqua Regia, always add nitric acid to hydrochloric acid, never vice versa.
- DO NOT STORE AQUA REGIA. Apart from its hazardous byproducts and reactions, Aqua Regia quickly loses its effectiveness due to oxidation of its components. Mix fresh solutions for each use.
- Do not perform hazardous work alone when at all possible. If you must work alone, notify your supervisor beforehand and ensure that you have a plan for handling an emergency.

During work:

- All handling of Aqua Regia **MUST** be done with glassware inside a fume hood. Never remove a container with Aqua Regia from the fume hood. Keep the sash as low as possible. Never raise it above the indicated position (18 inches).
 - If you must leave something to soak overnight, close the fume hood sash, and clearly label the container as "Aqua Regia: Corrosive, Toxic"
 - Wear appropriate PPE including:
 - Lab coat
 - Safety goggles
 - Appropriate gloves (thick neoprene or butyl rubber are suitable)
 - If handling volumes >500mL or if splashing is likely, wear an acid-resistant apron and face shield.
 - Wash hands thoroughly each time gloves are removed.
 - Use materials and containers appropriate for Aqua Regia use and remain aware of potential incompatibilities.
 - Always use glass (preferably Pyrex) containers as metals and some plastics are incompatible. Aqua Regia can become quite hot from oxidation reactions - more than 100°C, so be sure the glass used is heat resistant.
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PRECAUTIONS

- Never put Aqua Regia in a closed vessel; evolved gases will cause pressure to build up. Allow the aqua regia cool completely before transferring to a container with a vented cap. In the absence of a vented cap, screw a regular cap on very lightly and be sure that labels clearly indicate that caps are not tightly sealed and should not be tightly sealed.

After completing the work:

- Dispose of Aqua Regia waste following Western's [Hazardous Waste Pickup Procedures](#):
 - Hazardous Waste Classification: Corrosive/Toxic
 - Use a glass bottle with a vented cap. In the absence of a vented cap, screw a regular cap on very lightly and be sure that labels clearly indicate that caps are not tightly sealed and should not be tightly sealed.
 - Ensure that the waste container you are using is clean, dry, and does not have residual solvent or other organic materials in it. Aqua Regia should be the sole waste constituent in the waste bottle. Aqua Regia is a strong oxidizing agent and will react with organic chemicals.
 - Wash hands before leaving lab.



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EMERGENCY PROCEDURES

FIRST AID

SKIN CONTACT

- Flush skin with copious amounts of water for 15 minutes using the closest available sink, portable drench hose, or safety shower. Remove contaminated clothing.
- Call 360-650-3911 or 911 for emergency assistance.

EYE CONTACT

- Using eyewash, flush eyes while hold eyelid open and away from exposed eye.
- Call 360-650-3911 or 911 for emergency assistance.
- Continue flushing with water until emergency medical personnel arrive.

INHALATION

- If mist or vapors are inhaled, immediately move to fresh air.
- If someone else has been exposed and is unconscious, remove the individual only if safe for you to do so.
- Call 360-650-3911 or 911 for emergency assistance.

INGESTION

- Do not induce vomiting. Never give anything by mouth to an unconscious person. If conscious, wash out mouth with water.
- Call 360-650-3911 or 911 for emergency assistance.

SPILL RESPONSE

OUTSIDE FUME HOOD or INSIDE FUME HOOD (>500mL)

- Alert others and evacuate to a safe distance and prevent entry.
- Contact EHS at 360-650-3064 during business hours or 360-650-3911 or 911 outside of business hours.
- Remain in a safe location until EH&S or other response personnel arrive.

INSIDE FUME HOOD (< 500 ml)

- Alert others of the spill.
- If you are working alone, are not trained in spill response, or not comfortable cleaning the spill, contact EHS at 360-650-3064 during business hours or 360-650-3911 or 911 outside of business hours.
- If trained and confident in spill response, don the appropriate PPE. Neutralize spill with soda ash or lime.
- Absorb neutralized spill with vermiculite or other inert absorbent material, then place in a suitable container for disposal. Clean surfaces thoroughly with water to remove residual contamination. Dispose of all waste and cleanup materials as hazardous waste.