

Safe Use of Base Baths

1. Introduction

Base Baths refer to concentrated alcoholic hydroxide solutions that are used to clean glassware and laboratory equipment. The solutions consist of ethanol / isopropanol and sodium / potassium hydroxide. The strong alkaline conditions help break down residues such as silicone grease, but also slowly dissolve glass and various other materials. It should be noted that base baths are not very effective in removing hydrocarbon grease.

2. Hazards and Potential for Harm

2.1 Flammable Solvents

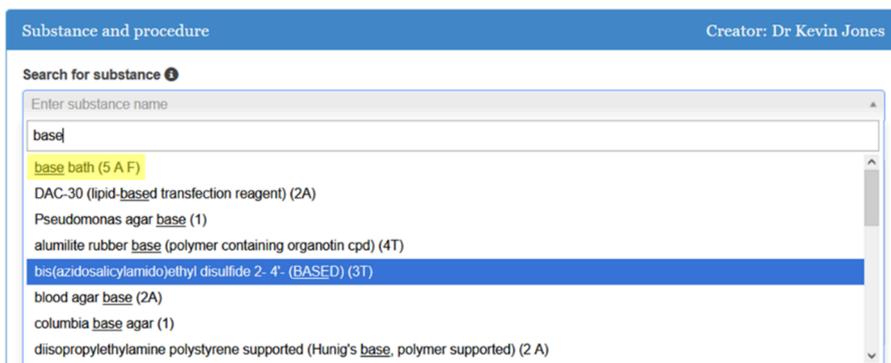
Ethanol and isopropanol are highly flammable solvents. As base baths use ~10 litres of solvent they represent a significant fire risk and should only be used when no other reasonable alternative can be identified. A fire caused by a base bath could harm lab users and, if a fire were to spread, poses a risk to all building users.

2.2 Corrosive Materials

Base bath solutions are highly corrosive. Direct contact with skin or the eye could lead to severe burns and potential loss of vision. These hazards apply primarily to those using the base bath as part of their research activities.

3. Risk Assessment

Any group wishing to use a base bath must complete a separate risk assessment using the CHARM system. Including the chemical entry "base bath" will trigger Safety Manager approval. An illustrative risk assessment can be found in the appendix.



The screenshot shows a search interface titled "Substance and procedure" with "Creator: Dr Kevin Jones" in the top right. A search bar labeled "Search for substance" contains the text "base". Below the search bar, a list of search results is displayed, with "base bath (5 A F)" highlighted in yellow. Other results include "DAC-30 (lipid-based transfection reagent) (2A)", "Pseudomonas agar base (1)", "alumilite rubber base (polymer containing organotin cpd) (4T)", "bis(azidosalicylamido)ethyl disulfide 2- 4'- (BASED) (3T)", "blood agar base (2A)", "columbia base agar (1)", and "diisopropylethylamine polystyrene supported (Hunig's base, polymer supported) (2 A)".

4. Control Measures

4.1 Engineering Controls - Mitigating Risk of Fire Propagation

To mitigate against the risk of fire, the base bath solution is contained in a specially designed fail-safe metal fire-extinguishing box.

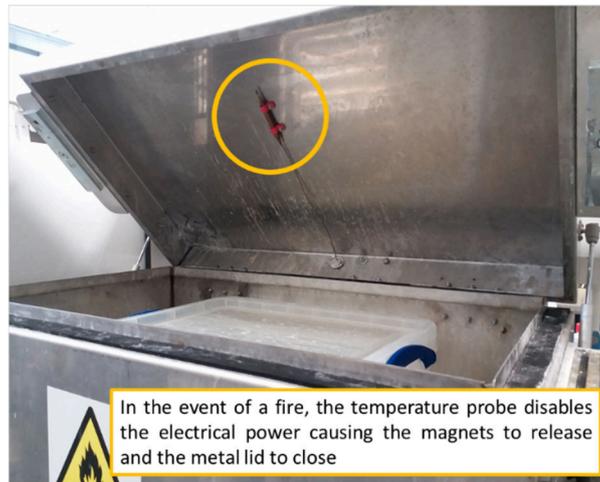


The default position of the box is closed (photo 1) and the lid should only be opened (photo 2) when adding or removing items from the base bath. As soon as you have finished working with the base bath, you must close the lid.

The fire-extinguishing box has a fail-safe closing mechanism; electrical power needs to be supplied to a magnet located at the rear of the metal container in order for the lid to remain open. When the lid is closed, the magnets are separated (photo 3). When the lid is open, the magnets make contact and serve to hold the lid open (photo 4).



The metal container is equipped with a temperature probe in the lid of the base bath. In the event of a fire, this temperature probe disables the power supply causing the lid of the fire-box to close.



Any malfunction of the magnetic mechanism of the metal fire-extinguishing base bath should be immediately reported to the School Safety Coordinator.

4.2 Equipment Maintenance

As the metal fire-extinguishing box serves as the primary engineering control to prevent the propagation of fire, it is necessary to test the equipment routinely to ensure the safety features are working correctly. An opportune time to perform these maintenance tests are when the base bath is being regenerated and the base bath containing flammable solvent has been removed.

The magnetic release mechanism can be tested by pressing the red button at the back of the box; with the power switched on and the lid open, the red button can be pressed. The red button momentarily disables power to the magnet and should cause the lid to close. **CAUTION:** the lid will close quickly and could cause an injury. When testing the mechanism, make sure your hands are removed from the area. Alternatively, you can gently support the lid so it does not drop, but still allows the mechanism to be tested. **If the lid does not close, this should be reported to the H&S Manager immediately.**



5. Preparing a Base Bath

Before starting to prepare a base bath solution, ensure you are wearing appropriate PPE (lab coat, safety glasses and heavy neoprene / rubber gloves). This process should be carried out in the fire-extinguishing container. The base bath should be prepared in a sturdy plastic box with a well-closing lid.

Several recipes are routinely used, e.g. 8 L ethanol, 4 L isopropanol, 500-1000 g of NaOH/KOH; or 10 L isopropanol, 2 L water, 500-1000 g of NaOH/KOH.

CAUTION: Be careful when adding the base to the solvent mixture (splashes, exothermic dissolution). The total volume of the bath should not significantly exceed 12 L (15 L max).

6. Safe Use

6.1 Personal Protective Equipment

When using the base bath, the following personal protective equipment should be used: Laboratory coat, safety glasses, heavy gloves (e.g. heavy rubber, PVC or neoprene), closed shoes. Before starting to work with the base bath, please ensure that the heavy gloves are in good condition and free from damage.

6.2 Pre-cleaning of Glassware

No item should be added to a base bath unless it has been thoroughly rinsed with water to destroy any water-reactive residues. **Users should be sure to break up any crust of solid that may conceal reactive material underneath.** Glassware that contained highly reactive reagents / reactive intermediates should be pre-cleaned in a basic aqueous wash-bath (VWR labwash) to destroy any residues not deactivated by rinsing with water / acid.

6.3 Avoidance of Ignition Sources

The base bath should only be used in the absence of ignition sources. It is important to check your surroundings and ensure no one else is performing an activity that may lead to ignition of the solvent.

7. Regeneration & Waste Disposal

After long periods, the cleaning ability of the base bath can be diminished by consumed base and dissolved grease and glass etc. In the first instance, NaOH/KOH and ethanol/isopropanol can be added to replenish the base bath (Note that solvent mixtures will lose content differently to their initial proportion depending on boiling point). If replenishing NaOH/KOH and ethanol/ isopropanol does not improve cleaning ability, the cleaning solution must be collected as waste.

At least two people with full PPE are required to dispose of base bath waste!

Ideally, waste base-bath solutions should be collected when the total volume is low from natural loss and evaporation. Ensure you have a suitable number of containers for the liquid waste. Carefully pour the contents of the base bath using a large funnel into the appropriate waste containers. One person needs to hold the funnel and stabilise (hold) the waste container that is rested on a flat, sturdy surface. Do not overfill containers and clean up all spillages immediately. Securely close the waste containers and label them as highly alkaline base bath waste.

8. First Aid Procedures

8.1 Eye contact

Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Alert a departmental First Aider as soon as possible.

8.2 Skin contact

In case of contact, immediately flush skin with water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately.

If a container with a hazardous solution drops / bursts, evacuate and wash areas of contact with plenty of water using a safety shower / eye-wash station.

8.3 Ingestion

If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

8.4 Accident / Incident Reporting

Report all accidents, injuries or near misses to Kevin Jones (kj34) as soon as possible.

Appendix – Illustrative Text for Risk Assessment

CAUTION! Proper PPE (thick rubber gloves, lab specs, and lab coats) must be worn at all times when handling strong bases (e.g. potassium hydroxide)

CAUTION! Isopropyl alcohol is highly flammable. Ignition sources must be avoided when the base bath is in use.

Preparation of the base bath (1.5 M KOH in isopropanol and water)

420 g KOH is slowly dissolved in 1 L of water in a large glass container which is placed in an ice-bath. After the solution has cooled to room temperature, the solution is slowly added to 4 L of isopropanol in a chemical resistant plastic bucket, closed with a lid, adequately labelled and stored in a metal fire-extinguishing box (see below).

Storage of the base bath

The base bath must only be used within one of the fail-safe metal fire-extinguishing boxes. The default position of the metal unit should be with the lid closed. Only when adding or removing items should the lid be opened. As soon as you are finished working with the bath, the lid must be closed. When the metal unit is closed and not in use, the power may be left on or off. Any malfunction of the magnetic mechanism of the metal unit will be immediately reported to the School Safety Coordinator.

Glassware cleaning procedure

No item is to be added to the base bath unless it has been thoroughly rinsed with water to destroy any water-reactive residues. Make sure to break up any crust of solid that may conceal reactive material underneath. The glassware is then cleaned with soap and a brush, rinsed with water or organic solvent as needed. The base is only to be used as a final cleaning solution, if the last steps were unsuccessful. If the base bath has been used, when the glassware is clean, the glassware is transferred from the base bath in an empty plastic bucket to the sink area and rinsed thoroughly with water to avoid any spillages. The glassware can then be rinsed as normal with acetone. Take care to close the metal lid once finished using the base bath.

Disposal of the base bath

When the base bath is exhausted, the contents should be carefully poured out into a 5 L plastic bottle and labelled as highly alkaline waste and removed by an external waste contractor.