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| **TEACHING LABORATORY**  **SCHOOL OF CHEMISTRY, UNIVERSITY OF BRISTOL**  **RISK ASSESSMENT**  **This form must be completed for any procedure/system of work carried out in the undergraduate teaching lab before an attempt is made at that procedure/system of work.** | |
| **Name: Catherine Monk** | **Date: 11/11/2024** |
| **Activity being assessed:**  Acid Cleaning of Diamonds | |
| **Describe the reaction or new procedure you intend to carry out, including a reaction scheme if appropriate:**  Use of nitric acid (either made in situ from H2SO4 with KNO3), or from a pre-made mixture.  The diamonds will be refluxed in the nitric acid solution in a round bottom flask (RBF), fitted with a condenser. This will be on a heating mantle (with light stirring), to ~85 oC.  Once refluxed for 3 hours, the RBF will be taken off the heat to cool to room temperature. The mixture is carefully poured back into its labelled Duran bottle. The remaining residual acid with the diamonds in the RBF will be neutralised with a carbonate and plenty of water, which can be poured down the sink.  The diamonds will then be transferred to a small beaker and sonicated in acetone and then IPA. | |
| **Known or expected hazards associated with the activity (Equipment, Procedures, Chemicals etc.):**  **Equipment/procedures:**  Use of glassware: risk of cuts from broken glassware; cuts from forcing plastic tubing teats or rubber bungs  onto glass tubing, pipettes or condensers that break; burns from heated glass; poisoning following cuts by  contaminated glassware  Use of a fume hood: risk of contamination due to insufficient airflow; risk of injury due to the sash cord  breaking and the glass front falling down.  Use of heating equipment: personal injury and burns from hot surfaces, liquids, vapours or flames. Sources of ignition both from hot surfaces, liquids or flames from electrical components.  **Chemicals (including intermediates & products)**   |  |  |  | | --- | --- | --- | | **Chemical** | **Is a COSHH required? Yes/No** | **If no separate COSHH is required, please list hazards here.** | | **KNO3** | **No** | H272: may intensify fires; oxidiser.  H315: skin irritation  H319: serious eye irritation  H335: may cause respiratory irritation, keep away from heat sources. | | **H2SO4** | **Yes** | H290: corrosive to metals  H314: causes severe burns and eye damage. | | **HNO3** | **Yes** | H272: may intensify fire; oxidiser.  H314: causes severe skin burns and eye damage.  H330: fatal if inhaled. | | **K2SO4** | **No** | H318: Causes serious eye damage. | | **KHSO4** | **No** | H314: Causes severe skin burns and eye damage.  H335: May cause respiratory irritation. | | |
| **Measures to be taken to reduce the level of risk:**  Glassware: All glassware should be checked to ensure that it is free from cracks, flaws or scratches. When  fitting tubing to glassware, excessive force must not be used. Damaged glassware should be returned to the  Prep room for repair or disposed of in the "Broken Glass" bin. Dispose of glass (including Pasteur pipettes) in yellow glass bins, rinsing them with acetone prior to disposal. Take care of hot glass, placing it where no one can accidentally come in contact with it before it is cooled. Disassemble ground glass connections immediately after use. Do not stopper hot flasks or containers. Glassware subjected to either pressure or vacuum should be inspected carefully for flaws before use.  Fume hoods: The front sash must be kept closed as far as is comfortable while working and fully closed when not actively working. If airflow fails for any reason the fume hood alarm will sound and work must stop and the sashes be closed. Heads must stay OUT of the fume-hood.  Heating equipment: If any heating device becomes so worm or damaged that the heating element is exposed, the device should not be used but reported to the technician in charge of the laboratory. All heating devices should be kept away from flammable material  Wear gloves/lab coat/safety glasses.  Use chemicals only in a fume hood.  Dispose of residues in the appropriate waste containers.  Flammable chemicals should be kept away from hot surfaces.  Wear suitable protective equipment.  Label any glassware with what chemicals is contained.  Chlorinated and non-chlorinated solvents must be disposed oof separately, into the containers provided in the fume hoods.  Aqueous solutions, including acids and bases, should not be added to these solvent waste containers. | |
| **Waste disposal:**  The bulk solution will be returned to its labelled storage Duran bottle.  Residues of nitric acid will be neutralised with carbonate before being poured down the sink with plenty of running water.  Acetone and IPA be disposed of in NON-CHLORINATED waste container. | |
| **Action to be taken in an emergency:**  **Spillage**   |  |  | | --- | --- | | Spillage material | Who to contact and when | | * Ventilate the affected area and eliminate any sources of ignition. * Volatile liquids may be absorbed onto absorption granules available at the Fire Points or in the laboratory (have them replenished after use) and, as appropriate, transferred to a fume-hood to evaporate or to a suitable sealed container for waste disposal. In a well-ventilated area such as a laboratory, the best procedure may be simply to turn off sources of ignition, ventilate, evacuate and seal and secure the room. * For corrosive material neutralise first then dilute with water before mopping up. * Solids should be swept up and disposed of via Chemical Waste. | Academic in charge |   **Fire/failure of services (e.g. electricity, water):**   |  |  | | --- | --- | | Action | Who to contact | | Use a dry powder or carbon dioxide extinguisher Unless in immediate danger, take a few moments to turn off any heaters and pull fume hood sashes down before leaving lab by normal fire exit routes or as directed by lab staff. | Academic in charge | | In case of fume hood airflow failure, close fume hood, evacuate and do not return until told it is safe to do so. |  |   **Contact with skin or eyes:**   |  |  | | --- | --- | | Action | Who to contact | | **If chemicals inhaled**, move person into fresh air. If not breathing, give artificial respiration. Consult a physician. In case of skin contact: Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water.  **In case of eye contact:** Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.  **If swallowed**: Do NOT induce vomiting. Rinse mouth with water. Consult a physician. Never give anything by mouth to an unconscious person.  **In case of injury**: Do not attempt to remove broken glass from wounds. Wash with plenty of water if there is a possibility of chemical contamination.  **In case of burns:** Douse the burn with copious amounts of water e.g. under a running tap. Do not attempt to remove anything sticking to the burn. | Contact a first aider  Contact academic in charge |   **Emergency contacts**  Laboratory staff (demonstrators, technicians, academics)  Security: # 112233 | |
| **References:**  [Nitric Acid 695041 (sigmaaldrich.com)](https://www.sigmaaldrich.com/GB/en/sds/sial/695041?userType=undefined)  [Sulfuric acid 339741 (sigmaaldrich.com)](https://www.sigmaaldrich.com/GB/en/sds/ALDRICH/339741?userType=undefined)  [Potassium nitrate Fisher](https://www.fishersci.co.uk/chemicalProductData_uk/wercs?itemCode=BPE368-500)  [Potassium sulfate (fisher.com)](https://www.fishersci.com/store/msds?partNumber=AC424220010&productDescription=POTASSIUM+SULFATE%2C+ANHYD+1KG&vendorId=VN00032119&countryCode=US&language=en)  [Potassium bisulfate (fisher.com)](https://www.fishersci.com/store/msds?partNumber=P193500&productDescription=POTASSIUM+BISULFATE+CERT+500G&vendorId=VN00033897&countryCode=US&language=en) | |
| **This assessment MUST BE APPROVED AND SIGNED before you begin work.**  **Keep the risk assessment with you whilst working in the lab.**  **Student Signature:**  **Approved by (sign, initial & date):** | |