

QAM-I-116

Preparation of Labware

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Laboratory Manager

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1. Applicability and Purpose

- i. This procedure applies to all labware (glassware and plasticware) used for analysis in the laboratory, and sampling bottles and equipment used in field sample operations. The purpose of this procedure is to provide a method for cleaning and preparing labware for use in analytical procedures and sampling equipment used in the field. Labware must be scrupulously clean prior to analysis in order to ensure that sample aliquots do not become contaminated during measuring, transferring, storing or chemical reaction processes.

2. Definitions

- i. Class "A" volumetric: a piece of glassware, which meets federal criteria for exact volume measurement. The glassware has a capital "A" printed on it. Some labware may be calibrated or calibration checked against Class "A" glassware or weight of water at a known temperature to confirm volume.
- ii. Type II ASTM water: deionized water, which meets the criteria, set by the American Society for Testing and Materials. Type II water has a maximum specific conductivity of $<1.0 \mu\text{mho}/\text{cm}^2$.
- iii. Radioactive: for the purposes of this document, radioactive pertains to any labware that measures 2x background or more for alpha, beta or gamma emitting isotopes. Refer to QAM-S-101, "Laboratory Safety" and QAM-W-101, "Disposal of Laboratory Waste" for safe and proper handling of materials in this method.

3. Equipment, Reagents and Standards

- i. 1N hydrochloric acid made from 83 mL of concentrated hydrochloric acid added into about 800 mL hot tap water and diluted to 1 L. Larger amounts in proportion may be made. Other acids may be required for cleaning specifications in analytical SOPs (i.e. metals). Dilutions of strong acids are made under a hood or in a ventilated area with appropriate protective gear. Record in the Reagents Logbook (E-log).

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- ii. Only Liquinox™ liquid laboratory-grade soap is used, unless an alternative product has passed the inhibitory residue test in SOP-C-124 for bacteria. Dilution is made by adding about 20 mL of concentrate to about 20 liters of hot water. This dilution does not need to be recorded in the Reagents Logbook (E-log).
- iii. Alcotabs™ pipette soap or equivalent- add about 4-6 tabs per pipette washer load
- iv. Siphoning automatic pipette washer
- v. Assortment of brushes and cleaning pads of various sizes
- vi. Assortment of tubs, pans and drying racks
- vii. Ethanol
- viii. Chlorine bleach
- ix. Na₂EDTA- Ethylene diamine tetraacetic acid, disodium salt (0.25M) - 93 g dissolved into 1 liter DI water. Add Liquinox as described above. Record in the Reagents Log.

4. Procedure

- i. Laboratory personnel are responsible for ensuring that labware used in analytical procedures has been visually inspected for cleanliness. If a piece of labware appears dirty, it is immediately returned to the used labware section of the preparation area.
- ii. The used labware and clean labware sections of the preparation area are segregated to ensure that cross contamination does not occur. Labware used for radiochemistry is stored and pre-cleaned separately from all other labware and is used for no other purpose. Once radioactive labware is cleaned to < 2x background levels, it may be washed with other labware, but is always stored and used separately after cleaning.
- iii. Brushes or other devices are not used to clean the inside of class "A" volumetric glassware. Scratches and abrasions change the accurate measuring capacity of this glassware. Class "A" glassware is only soaked and vigorously shaken with cleaning solutions and rinsates.
- iv. All glassware is inspected for condition before and after cleaning. Broken or chipped glassware is inspected to

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- determine whether it can be repaired with fire polishing, filing or other repair method. Only qualified personnel attempt to repair broken glassware and make such a determination. Broken or chipped glassware that cannot be repaired is disposed of in accordance with QAM-W-101, "Disposal of Laboratory Waste".
- v. Labware is segregated and cleaned according to the analysis it is used for. The normal sequence of cleaning is:
 - a. Soak and clean in hot, soapy water.
 - b. Rinse twice in hot tap water. Rinsing twice in hot tap water, before soaking, will remove excess soap from dishes.
 - c. Soak in hot tap water for 15 minutes.
 - d. Rinse three times in hot tap water.
 - e. Rinse one time in 1N HCl reagent. Some methods require hot 1N HCl.
 - f. Rinse a minimum of three times in type II ASTM H₂O (DI).
 - g. Place on a rack or cart to dry.
 - vi. Some labware will not be acid washed with HCl, or may be acid washed with HNO₃. Examples are labware used for metals, BOD, bacteria, etc. Refer to the specific SOP for special requirements.
 - vii. Additional cleaning with bleach, solvents and oven drying may be required for biofouling, certain organic analyses or samples high in oil or humic substances. Certain SOPs require autoclaving and sterilization methods also. The Laboratory Manager will specify and direct how and when additional steps are to be done.
 - viii. Do not rinse with materials that the labware will be used to analyze for. Examples would be that labware used to test for chloride would not be rinsed with hydrochloric acid, or nitrate labware would not be rinsed with nitric acid.
 - ix. ISCO™ sample bottle washing is now performed by hand rather than with an automated washer. Pipettes are normally washed in an automated siphon device. The same sequence of washing describe above is used and with hot HCl.
 - x. After washing and drying, certain types of containers may have preservatives added to them prior to being used in the field. Containers sent out with hazardous preservatives, such as acid, are labeled with the preservative and its TIAER ID number

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- to maintain traceability. Refer to the appropriate field or lab SOP for directions.
- xi. Ethanol may be used to remove markings on the outside of containers prior to washing.
 - xii. Ice chests, ISCO™ carousels, tubs and other large containers for bottles may be washed with only tap water, or soap and water.
 - xiii. Washing pipettes
 - a. Pipettes are soaked tip up in a mixture of bleach and soapy water. Add about 250 mL of bleach and 2 Alcotabs to the small soaking tube. Fill with hot tap water. Soaking water may need to be changed periodically.
 - b. To wash pipettes, place dirty pipettes tip up in the washing basket. Fill the basket as full as possible without causing breakage.
 - c. Place 4-6 Alcotabs in the pipette washing tube. The tablets will dissolve in water.
 - d. Carefully lower the basket into the washing tube.
 - e. Connect a hose to the washing tube and to the tap water faucet. Connect the drainage hose to the washing tube.
 - f. Turn on the hot tap water and fill the washing tube. Do not overfill or the water will siphon out.
 - g. Turn off the water leaving all the hoses connected.
 - h. Let the pipettes soak in the soapy water solution for about 1 hour.
 - i. After soaking, slowly turn on the hot water. If you turn the water on too fast, the washing tube will overflow rather than siphoning. Be sure that the water begins to siphon.
 - j. Fill and drain the washing tube for about 5 minutes to rinse excess soap from the pipettes.
 - k. After rinsing, fill the washing tube with hot tap water and let soak for 15 minutes.
 - l. After soaking, fill and drain the washing tube for about 20 minutes.

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- m. Again fill the washing tube with hot tap water. While filling the tube, add 100 mL HCL at the top of the tube. Do not overfill the washing tube.
 - n. Let the pipettes soak in the acid for about 20 minutes.
 - o. Plug the sink and add about ½ cup of baking soda to the sink.
 - p. Connect the filling hose to the DI faucet and slowly fill the washing tube to begin draining. Make sure the acid solution drains out of the siphon tube into the sink with the baking soda and not the top of the washing tube.
 - q. After a few draining cycles check the pH of the solution in the sink. If it is neutral, let it drain down the sink. If it is still acidic, add more baking soda. DO NOT LET THE ACID SOLUTION DRAIN DOWN THE SINK UNTIL IT IS NEUTRAL. You may have to turn the DI on and off during this process.
 - r. After the drain water is neutral, fill the washing tube and let it siphon and drain for about 20 minutes.
 - s. When through, turn off the DI water. Let the washing tube drain completely. ♦ Disconnect all the hoses.
 - t. Remove the washing basket from the washing tube and place pipettes in drying baskets.
 - u. Put away all siphon equipment.
- xiv. Special handling of radioactive labware:
- a. All containers of radioactive labware are labeled with marking tape stating “Caution: Radioactive Material” and with the isotope(s) present or most likely present.
 - b. Radlabware is also segregated by isotope half-lives, if known, (see log Q-102-4, “Calibration Source Log”). Waste wash water from isotopes with < 90 day half-lives are also kept separate from longer ones in order to decay to levels <2x background for ease of disposal.
 - c. Radlabware, when empty of contents into proper waste storage, is placed into a water bath containing Liquinox as described above, but also containing Na₂EDTA for chelation of metals.

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- d. After soaking in soapy Na₂EDTA, radlabware is transferred to a water bath for rinsing. After rinse, it is swipe tested in accordance with SOP-RC-111 or surveyed. Record results of swipe or survey in the Equipment Preparation Log (Q-103-4) prior to transferring glassware to the main laboratory wash area.
 - e. If results of swipe testing show that the glassware is <2x background, the labware is no longer considered radioactive and is washed the same as all other labware. It is then dried and segregated back to clean Radlabware storage.
 - f. If swipe results indicate radioactivity still remains, the process is repeated with clean EDTA/soapy water and rinse until contamination is removed, before removal from the radiation area.
 - g. All wash and rinse water in the radiation area is treated as radwaste. It is segregated and stored in accordance with QAM-W-101, "Disposal of Laboratory Waste".
 - h. Waste scintillation vials are not washed and reused, but disposed of as solid waste, depending on the activity present. These vials, or any solid material or container proven to no longer be radioactive, has all labeling removed prior to disposal.
- 5. Quality Control and Safety Aspects**
- i. Method Blanks may be analyzed at the appropriate data production station in accordance with individual analytical SOPs.
 - ii. The Laboratory Manager or his/her designee is responsible for ensuring that all personnel preparing labware are trained in accordance with this procedure.
 - a. All quality control and safety aspects are maintained as established in QAM-Q-101, "Laboratory Quality Control", QAM-S-101, "Laboratory Safety" and QAM-W-101, "Disposal of Laboratory Waste".
 - iii. . Specific preservatives are listed in QAM-Q-101, if added to containers prior to field sampling.

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6. References

- i. The National Environmental Laboratory Accreditation Conference Institute (NELAP) standard, 2016.
- ii. Standard Methods for the Examination of Water and Wastewater, latest online edition, ed. by Arnold E. Greenberg, et al., APHA, AWWA, Washington, D.C.
- iii. Code of Federal Regulations, 40 CFR 160 and 10 CFR 20 Appendix C, National Archives.

7. Attachments

None

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