

Nano Research Facility Lab Safety Manual

Nano Research Facility:

Weining Wang

Office: Brauer 3027/3035

Tel: 314-935-6018

Email: wangwn@wustl.edu

Nathan Reed

Office: EPS L27

Tel: 314-935-7264

Email: nreed@wustl.edu

A. GENERAL INFORMATION

1. Basic rules and procedures.

(a) Training and access

- All users must first complete the annual safety training offered through the EH&S department. A copy must be placed in the lab Blue Book.
- All users must complete laboratory specific training prior to gaining independent access to the lab and sign the training record in the lab Blue Book.

(b) Specific policies

- Any “NEW” chemicals stored in the lab, must first be approved by Staff. Confirm there is a MSDS for the chemical(s) you wish to bring in. You are responsible for providing an MSDS if there is not a copy in the MSDS notebook.
- Manipulation (transferring containers, pipetting, etc...) of nanomaterials, even those suspended in liquid, should take place in a fume hood whenever possible.
 - ALL manipulation of dry, loose, nanomaterials MUST take place in a properly operated fume hood.

B. CHEMICAL SAFETY POLICIES

1. Basic rules and procedures

(a) Accidents and spills for chemicals Not containing Nano-Materials

- Spills of non-hazardous materials may be cleaned with paper towels or a spill kit.
- Small spills of hazardous, non-volatile materials may be cleaned with paper towels and/or a spill kit.
- Do not attempt to clean up a spill of volatile hazardous waste or a large hazardous waste spill yourself; you could be exposing yourself to great danger!
- **Spills:** Call University Police at 935-5555 and give them your location (building name and room number), your name, the number of the nearest safe phone to call back on and the nature of the spill---chemical, biological, or radiological. Notify the lab manager, Dr. Yujie Xiong at 5-4530.
- **Eye Contact:** Promptly flush eyes with water for a minimum period (15 minutes) and seek medical attention.
- **Ingestion:** Encourage the victim to drink large amounts of water and seek medical attention.
- **Skin Contact:** Promptly flush the affected area with water (15 minutes) and remove any contaminated clothing. Seek medical attention.
- All injuries or illnesses shall be reported to the Insurance Department (935-5547) for medical treatment authorization, and Environmental Health and Safety (362-6816) for analysis and recommendations for future prevention of the incident. Complete the Report of Injury or Illness form available at the Insurance Department website at <http://www.insurance.wustl.edu> or in the Blue Book.

(b) Accidents and spills for chemicals Containing Nano-Materials

- In a fume hood small spills of nano-materials in a liquid may be cleaned with paper towels and/or a spill kit. All materials contaminated with nano-materials should be collected and sealed in a plastic bag while still in the fume hood. Notify lab personnel for proper disposal, noting the type of nano-material, type of liquid and any equipment that may have been contaminated.
- In a fume hood small spills of dry nano-materials may be cleaned with WET paper towels or wet-wipes. All materials contaminated with nano-materials should be collected and sealed in a plastic bag while still in the fume hood. Notify lab personnel for proper disposal, noting the type of nano-material and any equipment that may have been contaminated.
- If a spill occurs outside a fume hood all lab users should contact lab personnel and leave the lab. Do not attempt to clean up a spill of nano-materials outside of a fume hood yourself; you could be exposing yourself to great danger!
- In the event that your lab coat or clothing is contaminated with nanomaterials remove the contaminated clothing and place in a large plastic bag.
- **Eye Contact:** Promptly flush eyes with water for a minimum period (15 minutes) and seek medical attention.
- **Ingestion:** Encourage the victim to drink large amounts of water and seek medical attention.
- **Skin Contact:** Promptly flush the affected area with water (15 minutes) and remove any contaminated clothing. Seek medical attention.
- All injuries or illnesses shall be reported to the Insurance Department (935-5547) for medical treatment authorization, and Environmental Health and Safety (362-6816) for analysis and recommendations for future prevention of the incident. Complete the Report of Injury or Illness form available at the Insurance Department website at <http://www.insurance.wustl.edu> or in the Blue Book.

- (c) **Avoidance of "routine" exposure:** Develop and practice safe habits that avoid unnecessary exposure to chemicals by any route:
- Do not smell or taste chemicals.
 - Vent apparatus that may discharge toxic chemicals (vacuum pumps, distillation columns, etc.) into local exhaust devices.
 - Use a fume hood whenever possible.
- (d) **Choice of chemicals:** Use only those chemicals for which the quality of the available ventilation system is appropriate.
- Know about the chemicals you work with by reading MSDS for detailed information. A **MSDS (Material Safety Data Sheet)** is to be supplied by the user. The MSDS binder is located in the cabinet with the Blue Book.
 - All chemicals and samples brought into the lab must be clearly labeled with user name, group (supervisor) name, contact information (email or phone number), chemical name, and the date. Full information is not required on each sample; you may label your sample rack with full information and samples with abbreviated information (minimum of chemical formula and initials).
 - No open containers of liquids are permitted in the storage cabinets or fume hoods.
 - Collect all hazardous waste in the appropriate waste containers located in the ICP-MS prep fume hood and below the nanomaterial synthesis fume hood. Do not mix different waste types
 - Dispose of pipette tips in the proper labeled containers. Do NOT put directly in the trash.
 - Dispose of broken and cracked glass ware and disposable glass pipettes in the proper glass container. Glassware should be cleaned by triple rinsing prior to disposal! If the glassware contained or was used to handle hazardous materials collect the rinse water and dispose of in the proper hazardous waste container, do NOT pour down the sink!

- **Select chemical carcinogens** shall only be used in the designated area. In this laboratory, the designated area is the Soft Lithography Fume Hood.
- (e) **Eating, drinking, smoking, etc:**
- Eating, drinking, smoking, handling contact lenses and applying cosmetics is strictly prohibited in areas where hazardous laboratory chemical or biological materials are used or are intended for use.
 - Storage of food and beverage in containers or in areas that are intended or are used for storage of hazardous laboratory materials is prohibited.
- (f) **Equipment and glassware:** Handle and store laboratory glassware with care to avoid damage.
- Inspect glassware before each use and do not use damaged glassware.
 - Use extra care with Dewar flasks and other evacuated glass apparatus. Shield or wrap them to contain chemicals and fragments should implosion occur.
 - Use equipment only for its designed purpose (See Equipment Policies below).
- (g) **Exiting:** Remove gloves and/or wash areas of exposed skin well before exiting the laboratory. Do NOT touch the door handle if you are wearing gloves!
- (h) **Horseplay:** Avoid practical jokes or other behavior that might confuse, startle or distract another worker.
- (i) **Mouth pipeting:** Do not use mouth for pipeting or starting a siphon.
- (j) **Personal apparel:** Confine long hair and loose clothing. See Dress Code.
- (k) **Personal housekeeping:** Keep the work area clean and uncluttered, with chemicals and equipment properly labeled and stored. Clean up

the work area on completion of an operation or at the end of each day.

- (m) **Personal protection:** Assure that all persons, including visitors, wear appropriate eye protection where chemicals and biological agents are stored or handled.
- Wear appropriate gloves when the potential for contact with toxic materials exists. Inspect the gloves before each use and replace them periodically or when damaged. If handling nanomaterials in the hood dispose of gloves in trash receptacle **INSIDE** the fume hood.
 - Nitrile gloves (large, medium & small) are available in the lab.
 - Use appropriate respiratory equipment when air contaminant concentrations are not sufficiently restricted by engineering controls. The Environmental Health and Safety Office will determine if respiratory protection is required.
 - Use any other protective and emergency apparel and equipment as appropriate.
 - Remove laboratory coats immediately upon significant contamination.
- (n) **Planning:** Seek information and advice about hazards before starting an experiment. Plan appropriate protective procedures, and positioning of equipment before beginning any new operation.
- (o) **Unattended operations:** Leave lights on, place an appropriate sign on the door, and provide for containment of toxic substances in the event of failure of a utility service (such as cooling water) to an unattended operation.
- (p) **Use of fume hood:** Use the fume hood for operations that might result in release of toxic chemical vapors or dust or when handling nano-materials.
- As a rule of thumb, use a fume hood or other local ventilation device when working with any appreciably volatile substance with a TLV (Threshold Limit Value) of less than 50 ppm.
 - Confirm adequate fume hood performance before use. Keep the

fume hood sash closed at all times except when adjustments within the fume hood are being made.

- When using a horizontal sash fume hood a glass panel should be between your face and the interior of the fume hood with just enough clearance for your arms between panels during operations. When using a vertical sash fume hood the sash should be lifted only high enough to allow your arms to enter the hood (~6" to 12").
 - Keep materials stored in fume hood to a minimum and do not allow them to block vents or airflow. Hazardous materials should be at least 6 inches behind the sash of the fume hood.
 - Leave the fume hood "on" when it is not in active use if toxic substances are stored in it or if it is uncertain whether adequate general laboratory ventilation will be maintained when it is "off."
 - NEVER leave any liquid-filled container in a hood without a label. The label must provide the following information: the container's contents, user name, supervisor name, expected time of disposal, and a phone number where you can be reached if there are questions. Maximum time for unattended chemicals is 12 hours.
 - No chemicals, glassware, etc., should be left in fume hoods, or benches.
- (q) **Vigilance:** Be alert to unsafe conditions and report them to lab personnel.
- (r) **Waste disposal:**
- Deposit liquid hazardous chemical waste in appropriately labeled (EHS yellow hazardous waste labels) receptacles.
 - Do not discharge to the sewer concentrated acids or bases; highly toxic, malodorous, or lachrymatory substances; or any substances which might interfere with the biological activity of waste water treatment plants, create fire or explosion hazards, cause structural damage or obstruct flow. For all drain disposal questions, contact lab personnel or the EHS office at (314) 362-6816.
 - The only chemicals that may be safely washed down the drain are pure water and any solutions made with chemicals in the

Non-hazardous chemical cabinet.

- Gloves, paper towels and other clean-up materials contaminated with nano-materials should be disposed of in a plastic bag INSIDE the fume hood. Do NOT place in regular trash or expose to lab air.
- (s) **Working alone:** Avoid working alone in a building. Do not work alone in a laboratory if the procedures being conducted are hazardous.

C. DRESS CODE

1. Basic rules and procedures.

- (a) Acceptable dress for lab users includes full length skirts and pants and closed toe shoes. Shorts and Capri pants are not allowed. Lab coats should be worn when handling any chemicals. In the summer months, hospital type scrubs may be worn over shorts.
- (b) Users must wear closed toe shoes that fully cover the toes, heels, and top of the foot.
- (c) Safety glasses should be worn when working with chemicals.
- (d) Contact lenses are allowed in the lab.

G. EQUIPMENT POLICIES

1. Basic guideline:

- (a) The equipment in the NRF facilities is under the responsibility of the full time staff members. These staff members are responsible for the maintenance, training, and process development. Each tool has a training document or instructions for its use. Users should make sure that they are thoroughly trained on equipment before they operate it. Staff members are available for training sessions on equipment via an online training request form.
- (b) No alterations of any kind should be done to the tools or the engineering control devices in place to ensure safe operation. If a

user has trouble or notices a mechanical failure of a tool, this should be brought to the immediate attention of NRF staff.

H. EMERGENCY RESPONSE GUIDELINES

2. Fire:

- (a) In the event of a fire all persons in the laboratory should immediately exit the lab using the closest exit and leave the building by the closest available staircase. All persons should gather in the designated building meeting area. Designated meeting areas and nearest stairwells are marked on the map near the lab door.

- (b) In the event of a tornado or earthquake all persons in the laboratory should not leave the building, but should find shelter under a sturdy table or desk far away from any chemicals or glass.