

## **SOP FOR NANOMATERIALS**

Nanomaterials, ultra small materials one billionth of a meter, present new challenges in understanding, predicting, and managing potential health risks. Exposure to these materials during manufacturing and use may occur through inhalation, dermal contact, and ingestion. Studies have indicated that low-solubility ultrafine particles are more toxic than larger particles on a mass for mass basis. Because of their tiny size, they can get deep into the lungs and may be able to cross the blood-brain barrier. Other hazards to consider are catalytic effects and fire or explosion. Because of the limited information on the risks of handling these materials, workers should implement stringent controls on exposure when working with them.

The greatest hazard from nanomaterials comes during the manufacturing process. However, improper handling techniques in laboratories can result in exposures to lab personnel when these materials are used. Researches can access the UofR's Nanomaterials Safety Program at <http://www.safety.rochester.edu/restricted/NanomaterialsSafetyProgram.pdf> for details on safe handling practices.

### **Gas cylinders**

Cylinders of compressed gases must be handled as high energy sources. All cylinders are to be stored and used in an upright position. Use suitable racks, straps, chains or stands to support cylinders. The cylinder's cap must be securely in place to protect the stem when the cylinder is moved. Transport cylinders using a cylinder cart.

Air flows from gas use can disrupt nanoparticles creating a higher potential if inhalation and dermal exposures to those in the location. Personnel must use gases sparingly with nanomaterials.

### **Decontamination procedures**

- Personnel: Wash hands and arms with soap and water immediately after handling nanomaterials. Remove any jewelry to facilitate the removal of nanomaterials.
- Equipment: Surfaces where nanomaterials are used should be covered by an impervious covering to minimize clean up. Periodically, these covering are to be removed in a manner not to release particulates and the counter top wet cleaned with an appropriate cleaning agent. These cleaning activities need to be done whenever there is a release of the nanomaterials.

### **Designated area**

All locations within the laboratory where nanomaterials are handled should be posted with caution signs.

### **Emergency procedure**

Emergency procedures address response actions to fires, explosions, spills, or injury to staff. Utilize the information available in the "Emergency 13" flip chart. The following emergency phone numbers should be utilized to initiate an emergency response:

All emergencies:	x13 (Public Safety)
Chemical Exposures:	x5-4955 (UHS)
Laboratory Safety Unit	x5-2402
Occupational Safety Unit:	x5-3241

Environmental Compliance/Hazardous Waste      x5-2056  
Radiation Safety Unit:                                      x5-3781

### **Eye Protection**

Eye protection in the form of safety glasses or goggles must be worn at all times when handling nanomaterials. Ordinary (street) prescription glasses do not provide adequate protection. (Contrary to popular opinion these glasses may not pass the rigorous tests for industrial safety glasses.) Adequate safety glasses must meet the requirements of the most current version of Practice for Occupational and Educational Eye and Face Protection (ANSI Z.87.1) and must be equipped with side shields. Safety glasses with side shields do not provide adequate protection from splashes, therefore, when the potential for splash hazard exists other eye protection and/or face protection must be worn. Users can elect to wear non-vented goggles to minimize any potential eye exposures from nanomaterials.

### **Eyewash**

Where the eyes of any person may be exposed to nanomaterials, suitable facilities for quick drenching or flushing of the eyes shall be provided within 50 feet for immediate emergency use. Bottle type eyewash stations are not acceptable.

### **Fume hood**

Manipulation of dry nanomaterials in a lab should be carried out in a chemical fume hood. Solutions of nanomaterials can be handled outside of chemical fume hoods.

### **Glove (dry) box**

Certain dry nanomaterials may need to be handled in a glove box rather than a fume hood. EH&S (x5-3241) or the Principal Investigator will determine if this is required.

### **Gloves**

Gloves should be worn when handling nanomaterials. Nanomaterials may permeate gloves in a short period of time so double gloving is recommended. The selection of the proper glove material should be made according to the SDS and the recommendations of the glove manufacturer.

### **Hazard assessment**

Hazard assessment should focus on proper use and handling procedures, the education of employees concerning the health risk posed by nanomaterials, and on the demarcation of designated areas.

### **EHS Notification**

You should notify Occupational Safety Unit prior to the initial use of nanomaterials. Notification is also required following significant changes in procedures or the quantity of materials used.

### **Clothing & Protective Apparel**

To prevent dermal exposure to these chemicals: A layer of clothing will help prevent splash and droplet exposures. Personnel should wear a long sleeve shirt and pants. A lab coat can be also

recommended. Personnel should wear non-skid sole shoes. The following types of shoes are not recommended: open-toes shoes, open heeled shoes, shoes made with cotton or a material that readily absorbs liquids.

### **Safety shielding**

Safety shielding is required any time there is a risk of explosion, splash hazard or a highly exothermic reaction. All manipulations of nanomaterials which pose this risk should occur in a fume hood with the sash in the lowest feasible position.

### **Safety shower**

A safety or drench shower should be available within 100 feet where nanomaterials are used.

### **Signs and labels**

Containers: All nanomaterials must be clearly labeled with the correct chemical name and hazard warnings. Handwritten labels are acceptable; chemical formulas and structural formulas are not acceptable.

### **Special storage**

Nanomaterials must be stored in a designated area.

### **Special ventilation**

Manipulation of nanomaterials in a manufacturing location requires special local ventilation controls to minimize exposure to the material. For lab applications, fume hoods and other engineered local exhaust work stations provide the best protection against exposure to dry nanomaterials and are the preferred ventilation control device. If the use of a fume hoods or the engineered work stations proves impractical, work in a glove box. If your research does not permit the handling of nanomaterials in this manner, contact the Occupational Safety Unit for assistance. Solutions of nanomaterials can be handled on a covered lab bench.

### **Spill response**

In the event of a spill, alert personnel in the area that a spill has occurred. Do not attempt to handle a large spill of a nanomaterial. Vacate the laboratory immediately and call Public Safety (x13) for a spill response. Remain on the scene, but at a safe distance, to receive and provide information to safety personnel when they arrive.

### **Vacuum protection**

Not applicable.

### **Waste disposal**

All nanomaterials waste materials are to be handled as hazardous waste. The Environmental Compliance / Hazardous Waste Unit (x5-2056) can be contacted concerning disposal issues.