

**EEM-EHS**

**Environmental Health and Safety**

**Handling Nanomaterials**

**Standard Operating Procedure**

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| **SOP Number: LS006** | **Revision Number: 0** | **Date of Last Revision:** |

Name:

Date:

Revision Number:

Date of Revision:

**\*Attach description of process that involves the use of nanomaterials.\***

1. **Hazards Associated with Nanomaterials:**

Potential health effects for nanomaterials continues to be developed with ongoing research. Although there is still much to learn and discover about the hazards of nanomaterials, it is important to know that the nanomaterial may be more toxic, flammable, reactive, explosive, etc. then its parent material. The Occupational Safety and Health Administrations’s Fact Sheet “Working Safety with Nanomaterials” - <https://www.osha.gov/Publications/OSHA_FS-3634.pdf> - has more information regarding exposure to nanomaterials on page 2 of this document.

Nanoparticles may be deposited in the respiratory tract and may cause inflammation and damage to lung cells and tissues. [Carbon nanotubes and carbon nanofibers may cause pulmonary inflammation and fibrosis. See the following National Institute of Occupational Safety and Health (NIOSH) document for more information: <http://www.cdc.gov/niosh/docs/2013-145/>. Nanoscale titanium dioxide particles, according to NIOSH, should be considered a potential occupational carcinogen. See the following NIOSH document for more information: <http://www.cdc.gov/niosh/docs/2011-160>.]

Nanoparticles may cause eye, skin, and respiratory tract irritation.

**2.0 Controls:**

**2.1 Engineering Control:**

Utilize a fume hood, biological safety cabinet, or glove box for the following procedures:

* Handling nanopowders,
* Performing maintenance on equipment used to produce nanomaterials,
* Cleaning of dust collection systems used to capture nanoparticles,
* Working with nanomaterials in liquid media during pouring, mixing, sonicating, heating, centrifuging, etc. (Once the nanopowders are dissolved in a solution, there is no longer an inhalation hazard from the nanopowders unless the solution is agitated.)
* Generating nanoparticles in the gas phase,

**2.2 Administrative Controls:**

* Do not work alone in the lab. Implement the buddy system.
* Attend baseline laboratory safety training (required annually). The training schedule is located at the following link - <http://www.uml.edu/ehs/Training_Schedule.html>.
* Attend laboratory-specific training on handling methylene chloride.
	+ Document this training in section 8 of the Chemical Hygiene Plan Notebook.
* Know the location of the emergency shower and eyewash station.
* Review this SOP and applicable safety data sheets as part of your laboratory-specific training on handling nanomaterials.
* Keep a hard copy of the safety data sheet (SDS) for specific nanomaterials used in the lab in section 6 of the CHP Notebook.
* Place the nanomaterials SOP in section 7 of the CHP Notebook.
* Purchase only enough material needed to complete an experiment.
* Label containers of nanomaterials with chemical name and particle size.
* Label work area where nanomaterials are handled.
* Wet wipe work areas where nanoparticles are handled with soap and water after each use or at the end of each day. Contaminated wet wipes must be disposed of as hazardous waste. The other option is to clean work areas by vacuuming with a HEPA vacuum. Do not vacuum reactive or incompatible materials. (The filter of the HEPA vacuum much be changed out inside of a fume hood or biological safety cabinet. The contaminated filter must also be placed in a bag and disposed of as hazardous waste. Contact extension 42746 for more information regarding maintenance of the HEPA vacuum and disposal of contaminated HEPA filters.)
* Change gloves frequently.
* Launder lab coats on a periodic basis. (Lab coats that are dropped off for cleaning in the lab coat room are picked up on Monday mornings by the lab coat room and the clean lab coat is delivered to the lab coat room the following Monday. Go to <http://www.uml.edu/EEM/Programs/Lab-Safety.aspx> and click on lab coat program for more information.)
* Wash hands thoroughly with soap and water after removing gloves.
* If gloves become contaminated with nanomaterials, remove gloves immediately and wash hands with soap and water for 15 minutes. Check hands for any signs of contamination.
* Transport dry nanomaterials in closed contaners.

**2.3 Personal Protective Equipment:**

* Safety goggles are required if there is a splash hazard. Safety glasses are required at a minimum.
* Face shield is required if there is a splash hazard to the face.
* Laboratory coat
* Respirators may be required for activities that cannot be controlled using local exhaust ventilation. Also, respirators may voluntarily be worn when handling nanomaterials inside of a fume hood. Please email kathi\_lyon@uml.edu for more information about UMass Lowell’s Respiratory Protection Program.
* Double glove with disposable nitrile gloves and change the top layer of gloves whenever there is visible contamination. (Refer to a glove compatibility chart and/or contact Kathi Lyon at extension 42746.)
	+ NOTE: Gloves must be selected on the basis of their chemical resistance to the material(s) being handled, their suitability for the procedures being conducted as well as temperature extremes. Improper selection may result in permeation of the chemical through the glove and possible personal exposure to the chemical.
* Closed toe shoes and pants

**3.0 Storage:**

* Store in a well-ventilated location.

**4.0 Disposal:**

Place the UMass Lowell Hazardous Waste Label on the container and fill out the label. Full and/or dated containers of hazardous waste are picked up by EEM-EHS during the weekly inspection checks for satellite accumulation areas or upon request by calling 42543. Remember, the container must be picked up within 3 days after the container is full or dated. Since weekly inspection checks occur every Wednesday, please call extension 42543 for a pick-up if your full and/or dated container of hazardous waste is generated on a Thursday, Friday, or Saturday.

Empty containers that once contained nanopowders and/or nanomaterial solutions must be disposed of as hazardous waste. Please properly label the empty container with a hazardous waste label.

**NOTE: Gloves that are not contaminated with nanopowders and/or nanomaterial solutions may be disposed of in the trash. Gloves, KimWipes, and other solid waste contaminated with nanopowders and/or nanomaterial solutions must be disposed of as hazardous waste. Please place contaminated solid waste in an impervious, properly labeled container. Contact the chemical receiving stockroom at extension 42543 if in need of a waste container.**

**5.0 Emergency Procedures:**

**5.1 Chemical Spills (nanomaterials dissolved in solvents)**

* Evacuate the lab, post a restriction on the lab door and call UMass Lowell Police at extension 44911.
* Stay close by to answer questions when EEM-EHS and emergency response personnel arrive.

 **Dry Nanomaterial Spills**

* Vacuum with a HEPA vacuum if the nanomaterials are not reactive or wet wipe the area. Dispose of nanomaterials, including contaminated wet wipes, in a hazardous waste container that is properly labeled.

**5.2 First Aid**

For eyes

* Irrigate the eyes for 15 minutes, holding eyelids apart.
* Call extension 44911 or 978-934-4911 from a cell phone to seek medical assistance and then can keep track of the length of time eyes are being irrigated.

 For skin

* For full body exposure, remove contaminated clothing and go under the emergency shower for 15 minutes. If bare hands and/or arms are contaminated, rinse area with soap and water for 15 minutes.
* Call extension 44911 or 978-934-4911 from your cell phone immediately to seek medical assistance.

For inhalation

* Remove to fresh air. Seek medical attention immediately. Call extension 44911 or 978-934-4911 from a cell phone.

**5.3 Fire:**

* Evacuate the lab, pull the nearest fire alarm pull station and then go to a safe area and call extension 44911 or 978-934-4911 from a cell phone. Follow the fire safety evacuation plan.

**NOTE:** All work-related injuries must be reported immediately to Human Resources (HR) by calling extension 43560. (HR has some forms that will need to be filled out within 48 hours after the incident.) An Incident/Injury Report Form must be filled out and faxed to EEM-EHS at 978-934-4018. [The Incident/Injury Report Form is available on-line at <http://www.uml.edu/ehs>. Please double click on the link, under quick links, for permits and forms.]

*\*The buddy, supervisor, or Principal Investigator may fill out the Incident/Injury Report Form while the injured employee follows first aid procedures and seeks medical attention.*