UNIVERSITY OF TOLEDO

PURPOSE OF PROCEDURE

To ensure proper lab specific hazard controls are established for all UT staff, students and faculty that are involved in the handling, use, storage, sh; the handling, use, storage, shipment, and disposal of engineered nanomaterials.

II. DEFINITIONS

"Engineered Nanomaterials" are intentionally created (in contrast with natural or incidentally formed) nanomaterials with dimensions ≤100 nanometers. This definition excludes biomolecules (proteins, nucleic acids, and carbohydrates) and materials for which the occupational exposure limit (OEL) documentation of national consensus or regulatory standards has specifically addressed nanoscale particles for that material.

"Nanoparticles" means dispersible particles having two or three dimensions greater than 0.001 micrometer (1 nanometer) and smaller than about 0.1 micrometer (100 nanometers) and which may or may not exhibit a size related intensive property.

"Laboratory scale" describes activities involving chemical containers, reaction vessels, material transfers, and other handling of substances which are designed to be easily and safely manipulated by one person. "Laboratory scale" excludes those activities whose function is to produce commercial quantities of materials.

III. ROLES and RESPONSIBILITIES

The University of Toledo Environmental Health and Radiation Safety Department is responsible for developing and implementing university guidelines for nanotechnology. All activities involving nanotechnology fall under the provision of this plan. The Principal Investigator (PI) is responsible for ensuring compliance.

IV. PROCEDURES

A. Hazard Control Assessment

The goal of the hazard control assessment is to determine that appropriate controls are in place to contain nanomaterials, resulting in reduced exposure for users. The Environmental Health and Radiation Safety Department will conduct a lab specific hazard control assessment for all laboratory scale.cn[(r)13.tal c iu(f)0.8 (e)0.5 (f)0.8 http://www.enrollmentservices.utoledo.edu/events/register.asp?event_id=1204. The survey will provide the initial information necessary for development of a lab specific hazard control sampling strategy.

Environmental Health and Radiation Safety will contact the PI to set up an initial meeting to get a welltechniques. Both background and source samples, during operation, will be measured during the evaluation for comparison.

B. Hazard Control Preferences

1. The hierarchy of controls (Engineering Controls, Administrative Controls, and Personal Protective Equipment) will be followed when determining control recommendations. A graded approach will also be used based on the dispersion capabilities of the nanomaterials being used. Operations involving easily dispersed dry nanoparticles deserve more attention and more stringent controls than those where the nanomaterials are imbedded in solid or suspended in liquid matrixes.

2. From the perspective of managing laboratory worker health, the order of preference (most preferred to least preferred) for handling nanomaterials is:
   a. Solid materials with imbedded nanostructures
   b. Solid nanomaterials with nanostructures fixed to the materials surface
   c. Nanoparticles suspended in liquids
   d. Dry, dispersible (engineered) nanoparticles, nanoparticle agglomerates, or nanoparticle aggregates

3. Avoid handling nanomaterials in the open air in a free particle state. Whenever possible, handle and store dispersible nanomaterials, whether suspended in liquids or in a dry particle form, in closed (tightly sealed) containers.

4. Consider the hazardous properties of the precursor materials as well as those of the resulting nanomolecular product (i.e. heavy metals). Remember, nanomaterial hazards might not be known or reliably anticipated. Environmental Health and Radiation Safety can assist with this evaluation.

5. Consider all routes of possible exposure to nanomaterials including inhalation, ingestion, injection, and dermal contact (including eye and mucus membranes).

C. Engineering Controls

1. Work Area Design
   Consider the potential need to implement additional engineered or procedural controls to ensure workers are protected in areas where engineered nanoparticles will be handled. Consider additional controls that will better ensure that engineered nanoparticles are not brought out of the work area on clothing or other surfaces, e.g

3. Work Practices
   a. Transfer engineered nanomaterials samples between workstations (such as exhaust hoods, glove boxes, furnaces) in closed, labeled containers, e.g., marked Zip-Lock bags.
   b. An exothermic reaction involving nanomaterials and wipes at a DOE facility reportedly resulted in discovery of an incipient fire in a domestic trash container. Take reasonable precautions to minimize the likelihood of skin contact with engineered nanoparticles or nanoparticle-containing materials likely to release nanoparticles (nanostructures).
   c. If engineered nanoparticle powders must be handled without the use of exhaust ventilation (i.e., laboratory exhaust hood, local exhaust) or enclosures (i.e., glove-box), evaluate hazards and implement alternative work practice controls to control potential contamination and exposure hazards.
   d. Handle nanomaterial-bearing waste according to the University of Toledo's hazardous chemical waste procedures (HM-08-001).
   e. Vacuum dry engineered nanoparticulates only with an approved HEPA vacuum cleaner.

4. Marking, Labeling and Signage
   a. Post signs indicating hazards, personal protective equipment req

e.

b. Labeling
The inner package should be labeled (not to be confused with DOT hazard labeling). Caution:

b. Use packaging consistent with the recommendations for off-site shipment or packaging that affords