NSLS Nano-science Safety Requirements LS-PRM-1.3.5a Section 7, Rev 3, Effective Date 9/8/2008

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RISK →	LOW	MEDIUM	HIGH
Material Form → / Requirements ↓	**Fixed Nanostructures**	**Solutions**	**Free Nanoparticles**
PPE Requirements for Handling	Standard PPE required for the work area. No additional PPE is needed for this nanomaterial work.	Standard PPE required for the work area plus: • Gauntlet-type nitrile gloves "or" wrist length disposable nitrile gloves with extended sleeves • Eye protection: Safety glasses with side shields for handling powders only. Chemical splash goggle for handling either powders or liquids.	
Handling Requirements	• For work outside of a HEPA filtered exhaust hood: o No Mechanical abrasion. o No thermal stresses o Cover samples when practical to protect the sample, e.g., (slide cover) • Store in sealed container when not in use.	• Volumes must be limited to the milliliter range (<200 ml). • If there is a potential for particle aerosol formation manipulate within a HEPA filtered laboratory exhaust hood over adsorbent paper to capture any spills. • Solutions brought to the beamline must be: o Transported in sealed containers. o Manipulated over an absorbent paper to capture any spills. o Kept wet (do not allow solutions to dry out and form particulates) • Work surfaces must be wiped with a dampened adsorbent paper towels at the completion of the experiment (aqueous soap solution).	• Total particle masses must be limited to the milligram range (<200 mg) and be manipulated within a HEPA filtered laboratory exhaust hood over water soaked absorbent paper to capture any spilled materials. • Exhaust hood work surfaces must be wiped with a dampened adsorbent paper towels at the completion of the experiment (aqueous soap solution). • When ejecting samples from a capillary, that sample must be directed to water for capture. Compressed nitrogen (< 5 psi) or other inert gas must be used to eject the sample from the capillary tube. A covered beaker is best to contain any splash. This must be completed within a laboratory HEPA exhaust hood. • Nano-scale materials brought to the beam line must be: o Sealed within a sample holder, a capillary tube, or with at least two layers of Kapton, Mylar or cellophane tape. Only sealed containers are allowed at the beam lines for storage during an experiment. o Experiments that involve gas flow over particles must include a water scrub of the gas exhaust to provide a final barrier to particle loss.

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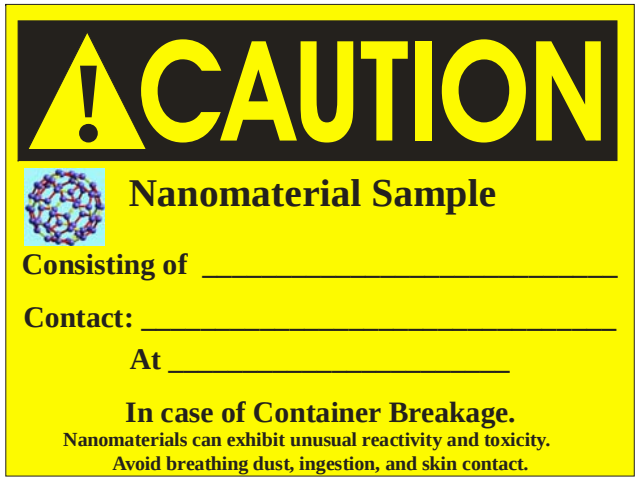
Labeling of Containers	Follow the labeling requirements list below in the "Transportation & Labeling Requirements" section. Labels are available in the NSLS Stockroom.		
Transportation & Labeling Requirements	***ALL NANOMATERIALS MUST BE SHIPPED WITH SECONDARY CONTAINMENT*** (i.e. a container within another container). Any nanomaterial that meets the definition of hazardous materials according to 49 CFR 171.8 (http://a257.g.akamaitech.net/7/257/2422/12feb20041500/edocket.access.gpo.gov/cfr_2004/octqtr/pdf/49cfr171.8.pdf) or has known hazardous properties (toxic, flammable, reactive) must be shipped according to the NSLS Shipping Requirements (http://www.nsls.bnl.gov/esh/safety/shipping.htm) for Hazardous Materials. ➢ **Other nanomaterials may be carried in private vehicles when labeled and packaged in secondary containment as follows:** **Labeling:** 1. The inner package must be labeled as follows (Labels are available in the NSLS Stockroom):  **Packaging:** 1. Inner containers must be a tightly sealed, rigid, and leak proof. Use tape on the cap to prevent the container from being unintentionally opened. 2. Place the inner container in a >=6 mil plastic bag. 3. The outer package (sealed cardboard box "or" sealed plastic container) must be filled with absorbent material to protect the inner container and absorb liquids during an inner container failure.		

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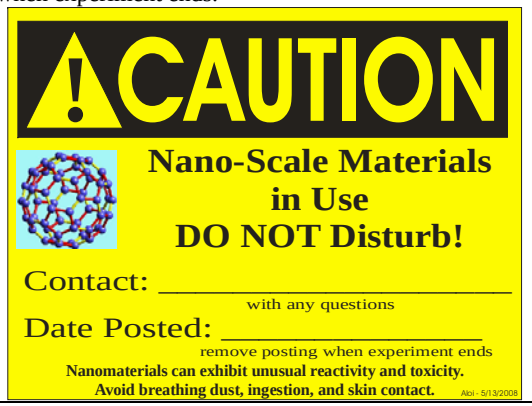
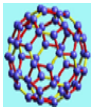
Area Posting Requirements	N/A	The required nanomaterials caution sign can be found here (http://www.nsls.bnl.gov/esh/SAF/nano_sign.pdf) , please post a sign at each designated nanomaterials workstation (i.e. beam line hutch and laboratory exhaust hood) for the duration of your experiment. Remove posting when experiment ends. 	
Waste Management Requirements	All waste in contact with nanomaterials must be disposed as hazardous waste e.g.,(swabs, Kim wipes, blotter paper, beakers, flasks, tape, sample holders). Chemicals containing nanomaterials must NOT be released to the sink or disposed in the regular trash. 1. Waste containers: a. Liquids: Must be stored in a rigid leak proof container. b. Particulates: Must be stored in a rigid leak proof containers “OR” >=6 mil plastic bags. 2. Satellite Accumulation Areas: a. Liquids: Must be stored in a secondary tray on the bench top or in a HEPA exhaust Hood. b. Particulates: Must be stored in a secondary container inside the designated nanomaterials HEPA filtered exhaust hood. Waste must be placed into a clean secondary bag, within the HEPA exhaust Hood, before transferring to the 90-day area. 3. Waste container labeling (Red Hazardous Waste Label): a. NO formulas, spell out the chemical name. b. The contents line on the label must contain the chemical composition and the word “NANOMATERIALS”. c. A second label, in addition to the Red Hazardous Waste Label, is required on the outside of the bag stating “CONTAINS NANOMATERIALS”. (Labels are available in the NSLS Stockroom)  Contains Nanomaterials		
Spill Response	N/A	Powder spills within an exhaust hood can be cleaned by using paper towels and an aqueous soap solution. Liquid spills within a hood can be cleaned with paper towels and then wiped with an aqueous soap solution. For spills outside of an exhaust hood, control access to the area and immediately notify the Operations Staff by calling the Control Room at x2550.	