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Experiment Safety Review Form
Review Number: NC-08-2011

PRINCIPAL INVESTIGATOR: Aaron Stein
GROUP: NC
EXT: 3527 **E-MAIL: stein@bnl.gov** **LIFE NUMBER: 22947**

Project Title: Thin Film Processing
Location(s): 0735
Area(s): 0735-FIRST-1-1L42, 0735-FIRST-1-1L43
Proposed Start Date and Duration: 1/3/2012 - 1 years

SIGNATURES:

Principal Investigator: Aaron Stein	**Date: 1/5/2012**
Experiment Review Coordinator: Robert Sabatini	**Date: 1/5/2012**
Reviewer: Lorraine Davis	**Date: 1/5/2012**
Approval: Emilio Mendez	**Date: 1/10/2012**
Review/Approval (ERC) Comments: 01/05/2012 1:44 PM 01/05/2012 11:44 AM Only minor changes. Updated emergency plan. Deleted old Denton system.	
Walkthrough Signature: Robert Sabatini	**Date: 1/19/2012**
Expiration Date (max 1 yr.): 1/10/2013	
FUA Change Required? No	
Fire Rescue Run Card Changes Required? No	
Has a NEPA Review been Performed for this Project? Yes	
Required Approvals (i.e., IACUC, IBC, etc.):	
Project Termination Acceptance Signature: **Comments:**	**Date:**

I. Define the Scope of the Work

A. Description

This covers half of the activities in the CFN Clean Room, specifically all the work done in the deposition and etching of thin films. Films are deposited via physical deposition (sputtering, evaporation) or chemical vapor deposition. Films are etched via reactive ion etching. Since these tools reside in the clean room, full clean room garb as described in the attached SOP , including nitrile gloves, will be worn at all times. Entry into the clean room requires clean room orientation/training as per SOP# NC-2007-ELM-Ops-3 as well as COSA given by authorized CFN staff. Most chemical work in the clean room is covered under ESR NC-2007-07-MS.

All gases (incl. liquid nitrogen) are kept in the service galley and are piped through penetrations in the wall to the systems they supply.

In general, reactive ion etching (RIE) requires a plasma of ions generated by applying an RF voltage to a gas in a vacuum chamber. The ions react with the substrate and selectively etch different materials based on the type of gas. The **Oxford Plasmalab Deep RIE tool (DRIE)** uses an inductively coupled plasma (ICP) to increase ionization without increasing the voltage across the plasma. The DRIE can operate in several modes: regular RIE, ICP RIE, cryo ICP or the Bosch process. When cryo ICP etching is used, the substrate is cooled by liquid nitrogen down to temperatures of -120C. Liquid nitrogen procedures are described below. The unit uses the following process gases: SF_6, C_4F_8, CHF_3, Ar, O_2. Gases are fed to the system by a gas pod which controls the flow of each gas. All functions of the DRIE machine are controlled by the system software. In addition, nitrogen and helium are used during operation of the DRIE tool. The system operates under vacuum with a loadlock for exchanging wafers. A single pump, located in the service galley, supplies backing for the turbo for the chamber as well as pumping the loadlock. House chilled water is used to cool the system.

Please note there is a second Oxford Plasmalab RIE tool using corrosive and toxic gases that is covered by a separate ESR NC-30.

A second RIE tool is the **Trion Phantom III**. This machine only does regular RIE and uses the following process gases in an RF plasma environment: SF_6, CHF_3, CF_4, Ar and O_2. The Trion RIE has a single mechanical pump, a turbo pump and its own water chillers for system cooling; the pump and one chiller are located in the service galley, a turbo pump is attached to the chamber. N_2 gas is used to run the system and for venting. The system is run completely by the software. There is also a **Technics PE-IIA plasma asher** which uses O_2 plasma (0-200W) in a vacuum chamber to “ash” organics and hydrocarbons off samples. The pump for the asher is located in the chase and is turned on and off via a contact switch inside the clean room: the pump is only turned on when the system is in use. An attached SOP describes the use of the PE-IIA system.

The **Trion Orion III plasma enhanced chemical vapor depositon** tool (PECVD) uses an RF plasma of different gases to grow thin films of silicon dioxide or silicon nitride on a substrate. The gases used in this system include silane (5% mixture in argon), which is pyrophoric, and ammonia, which is toxic. Each gas is stored in a separate, sprinklered gas cabinet in the service galley. See attached SOP for all procedures and precautions when dealing with these gases. *Only authorized CFN staff should change cylinders of these gases.* In addition, the system uses CF_4, nitrous oxide (N_2O) in processing. Samples are loaded into the system via loadlock and two pumps (one for loadlock, one for chamber) in addition to a water chiller are located in the service galley. There is a manual load/unload only for authorized users (restricted by software password). When manually loading and unloading caution is taken because the platen is heated (100-300C) under certain processes and can remain hot for some time after use – anyone manually opening the chamber should take care to note the temperature of the stage before doing so. In addition, the door to the chamber is a bit heavy and can present a hazard if it fell on someone, so special care should be taken when loading and unloading the chamber manually. During normal operation, all loading/unloading should take place via the loadlock. The exhaust from the pump is routed through a gas scrubber which includes a burn box running at 600C and then is fed into the building exhaust system. The system controls all functions completely through software, including the flow of gases in the gas cabinet as well as the scrubber. A detailed cylinder exchange procedure is included in the attached SOP.

Note: all plasma systems have small windows to view the plasma process inside the vacuum chamber. These windows are all UV-shielded.

There are three tools that deposit thin films of materials via physical deposition: the **Kurt Lesker PVD-75 Sputterer** and the **Kurt Lesker PVD-75 Electron Beam Evaporator**. The sputterer uses an argon plasma to sputter different materials, mostly metals, from a target source. The e-beam evaporator uses an electron beam to heat up a target material in a crucible while the thermal evaporator uses resistive heating to melt a material. The e-beam evaporator can be used to deposit any material desired. The thermal evaporator is limited to gold, copper, aluminum and chrome. Both systems have oil-free mechanical pumps located inside the clean room which will be exhausted into the building exhaust system; both systems have a turbo pump to get pressures down to 10^{-7} to 10^{-8} T in the vacuum chambers. The sputterer requires argon gas. Nitrogen is used to vent all systems. During operating, the interior of the deposition systems will be covered with aluminum foil or similar. After a couple of uses, the foil will be removed and kept as solid waste and replaced with a fresh piece of foil. In addition, anything containing any hazardous materials – including foil, glass slides, or metal flakes – such as chrome or silverwill be bagged, labeled and stored as hazardous waste.

Liquid nitrogen is required to cool down the Oxford DRIE tool, to fill a cold trap for the Denton as well as to fill a dewar on an x-ray detector which is covered in ESR NC-2007-07-MS. The liquid nitrogen is supplied by a single 180 L dewar located in the service chase. Under normal operation, the manual valve at the dewar is left open such that liquid flows into the transfer line that goes through a penetration and into room 1L-43. Inside the room, the transfer line is T'd off with one end going to each Oxfrod DRIE system. There is a shut off valve that, when open, allows nitrogen flow to the system. The Oxford controls when liquid nitrogen is required in the system and the flow of liquid as dictated by the process recipe entered in the software. The other end of the T goes to a vacuum-insulated transfer line which can be used to fill a smaller dewar. (This line has an electronic solenoid on/off control) This dewar can then be used to fill a 4L dewar which is used to supply all other LN_2 needs inside the clean room (*i.e.* EDX detector and Denton cold trap).

Several nitrogen generators are located in the service galley, taking house compressed gas and generating pure nitrogen. This nitrogen is used to provide venting gas to most of the tools described in this document.

In addition, there is a general-purpose fume hood (no HEPA) located in 1L-42 for general purpose work which could include solvent cleaning, wafer cleaving, etc. All hydrofluoric acid (HF) work is done in this hood. HF is seldom used and only handled by authorized users who must undergo additional training. Hydrofluoric acid is used in oxide etch processing and occasionally in other applications. The typical concentration is ~10% HF, 70% water and 20% Ammonium fluoride buffer, but in general use this is diluted further 3:1 in water. HF spill kit is located directly next to the hood. There is also a HF first aid kit located next to the hood. HF training will include proper first aid response to accidental contact.

The Oxford tools are maintained under service contract. The Lesker and Trion tools will be serviced by the manufacturer as well. Between each use of the Trion and Oxford plasma tools it is suggested that an oxygen plasma is used to clean the chamber of any hydrocarbons that may have deposited during processing. In addition, it is suggested that after 10 RF hours, the Trion tools are manually cleaned. The Technics asher requires no regular service.

Equipment manuals or procedures that are controlled documents:

- Manuals for the Lesker PVD systems, the two Trion systems and the Oxford DRIE are stored in a cabinet on which the Technics asher sits in 1L43
- At the present time, SOP's have been written for:
  - Liquid nitrogen filling
  - Acid usage
  - Silane and ammonia gas cylinder changing
  - Technics PE-IIA usage
  - Lesker sputterer and e-beam evap. usage

SOP-NC-2007-EM-OPS-1 (Clean Room Gowning Procedure); SOP-NC-2007-ELM-Cryo-3 Oxford x-ray detector fill procedure);SOP-NC-2007-ELM-PECVD-1 (Clean room silane and ammonia gas handling procedure).; SOP-NC-2007-OPS-CHEM-1 (HF) (hydrofluoric acid procedure); Ref ODH Analysis Case # 3a,5c and 7.

B. Human Performance Factors

1. Acid use is of particular concern in the clean room. We restrict use of acids to only approved Users. To become

authorized requires additional training, both from CFN staff and from the industrial hygienist. In addition, an SOP has been written specifically to deal with the hazards involved with acids.

2. The electron beam evaporator seems to present the most potential for things to go wrong via human error. If a user is not familiar with the system, does not take the proper precautions or is using new materials, there is a chance that they could use the electron beam to disrupt service or potentially damage the instrument. We have worked very hard to minimize this through extensive training with potential users and a detailed operating procedure which was arrived at through many iterations and usage. By emphasizing careful usage with vigilant observation and communication with the staff, we have eliminated issues with the tool.
3. The Oxford DRIE has a loadlock and is presently configured for use with 3" or 4" wafers only. Because many users are using chip-sized pieces, they are required to attach them to a wafer for etching. This is often down with a little bit of Fomblin oil or indium (to ensure thermal contact) and a waste "carrier wafer." After several uses, the carrier wafer is unusable and must be discarded. If this practice is not followed, it is possible for the wafer to break inside the chamber or to slip. In both instances, the chamber must be vented, causing interruptions in service which can be detrimental to user projects. We try to avoid this situation by training all users in the importance of using "fresh" carrier wafers.

C. Waste Minimization/Pollution Prevention

We will use lint-free cloths as work surfaces during sample preparations with each cloth serving multiple uses prior to disposal.

Tyvek suits are recycled.

D. Materials Used /Waste Generated

Materials Used	Disposal Method	Amount per Use	Amount per Year	Comments
see attachment		0.00	0.00	
		0.00	0.00	

II. Identify and Analyze Hazards Associated with the Work

The following hazards were identified:

Physical Hazards:

- Oxygen deficient atmosphere
- Sharps (non medical)
- Cryogens (any substance or device capable of producing temperatures <= 170K)
- Compressed gases (lecture bottles, cylinders, gas lines)
- Vacuum chambers or systems with >100,000 J stored energy (>35 cu ft. total volume)
- Compressed gas-Flammable
- Compressed gas pyrophoric
- Compressed gas-toxic
- Flammable liquids

Chemical Hazards:

- Chemicals, Hazardous (General)
- Highly acute toxins
- Corrosives
- Flammable liquids
- Peroxidizables
- Pyrophoric materials
- Hydrofluoric acid, any use
- Nano-material bound in a solid matrix or fixed substrate
- Toxic metals (e.g., As, Ba, Be, Cd, Cr, Hg, Pb, Se, Ag)

Ionizing and Non-ionizing Radiation Hazards:

- Radio frequency (RF) or Microwave sources exceeding 10 mW radiated output
- Ultraviolet sources >1 W

Biological Hazards:

- None

Offsite Work:

- None

Other Issues (Security, Notifications, Community, etc.):

- None

Significant Environmental Aspects

- Any amount of hazardous waste generation
- Any atmospheric discharges that require engineering controls
- spill potential (Other)

III. Develop and Implement Hazard Controls and Assess Risk

A. Physical Hazards, Tasks and Controls

Hazard, Default Controls, Task Specific Info	Risk Level
Hazard: **Oxygen deficient atmosphere** **Default Controls:** Contact ESH Coordinator for ODH determination and associated controls. Comply with Subject Area "Oxygen Deficiency Hazards (ODH), System Classification and Controls"	**Negligible (0-20)**
Hazard: **Sharps (non medical)** **Default Controls:** Sharps including needles, razor blades and syringes (plastic and glass) must be disposed of in sturdy, rigid, sharps containers. Sharps containers cannot be more than 2/3 full.	**Negligible (0-20)**
Hazard: **Cryogens (any substance or device capable of producing temperatures <= 170K)** **Default Controls:** General Requirements: • Evaluate location oxygen deficiency • Store/transport only in approved containers (i.e. DOT/ASME or BNL LESHC) • Never pour from above chest level • PPE: Long Sleeve Shirt (or Lab Coat), long pants (or skirt covering ankles) and closed shoes Pressurized transfer to open (vented) container; Or-Pouring > 5 liter volumes of LN2 between open containers: • Face shield along with either Safety Glasses (w/side shields) or Goggles • Gloves (Cryo or Heavy Leather) Pouring small (5 liters or less) volumes of LN2 between open containers: • Safety Goggles (face shield recommended if possible) • Gloves (Cryo or Heavy Leather) Work with samples immersed in LN2 in small (~1 liter) dewars: • Use Tongs (tools) to manipulate/handle cryogenic samples (do not touch with gloves)• Use	**Negligible (0-20)**

insulated non-absorbent gloves with dexterity (cotton/nylon gloves under disposable nitrile gloves) • Safety Goggles	

Hazard: Compressed gases (lecture bottles, cylinders, gas lines) **Default Controls:** • Any systems >15psi must be SME Approved • Transport cylinders using a cylinder cart • Secure cylinders to a fixed object/wall • Use regulator, hoses, and components compatible with gas • Use hoses and clamps rated for maximum regulator output or use pressure relief device • Wear safety glasses with side shields when installing/removing/or adjusting regulator • Label piping/tubing	**Negligible (0-20)**

Hazard: Vacuum chambers or systems with >100,000 J stored energy (>35 cu ft. total volume) **Default Controls:** Contact SME	**Negligible (0-20)**

Hazard: Compressed gas-Flammable **Default Controls:** In addition to compressed gas requirements: • Flash arrestor/backflow device • Separate 20 ft from oxidizers or barrier • Electrically ground lines/equipment • Non-Sparking tools	**Negligible (0-20)**

Hazard: Compressed gas pyrophoric **Default Controls:** Controls specific to task required.	**Negligible (0-20)**

Hazard: Compressed gas-toxic **Default Controls:** Controls specific to the task are required.	**Negligible (0-20)**

Hazard: Flammable liquids **Default Controls:** As for chemicals, plus Store large quantities in Flam. cabinets as required	**Negligible (0-20)**

B. Chemical Hazards, Tasks and Controls

Hazard, Default Controls, Task Specific Info	Risk Level
Hazard: Chemicals, Hazardous (General) **Default Controls:** • All operations with large (>250ml, health hazard 3) quantities of hazardous chemicals (pouring, mixing, evaporation, etc) in hood, or use snorkel when hood is impractical • Register Commercial Chemicals in CMS • Work alone after hours only if permitted by supervisor or ESR • Identify containers so contents are identifiable unless being actively used (ex. 1 shift) • Food, beverage, smoking, and cosmetics are prohibited • Handle glassware properly: no mouth suction, no drinking from labware.	**Negligible (0-20)**

Hazard: **Highly acute toxins** **Default Controls:** Use hazardous chemicals controls plus: Establish and post a "designated area" where used Note location on fire run card and hazard info. placard. Exposure monitoring to assure that action levels not exceeded Establish procedures for work area cleanup and decontamination	**Negligible (0-20)**
Hazard: **Corrosives** **Default Controls:** Use hazardous chemicals controls plus: - Unobstructed access to Emergency Eyewash and Shower	**Negligible (0-20)**
Hazard: **Flammable liquids** **Default Controls:** Use hazardous chemicals controls. Review large quantity storage with Fire Protection Engineer Note location on fire run card and hazard info. placard for storage of solids, greater than 40 pounds; liquids, greater than 5 gallons; gases, greater than 10 pounds	**Negligible (0-20)**
Hazard: **Peroxidizables** **Default Controls:** Use hazardous chemicals controls plus: Identify class and label based on CHP List A substances test every 3 months Lists B, C test every six months Before designating as waste, assure testing current (if testing is not possible contact ECR)	**Negligible (0-20)**
Hazard: **Pyrophoric materials** **Default Controls:** Use hazardous chemicals controls plus: Contact Fire Protection Engineer to choose a specialized Class D extinguisher, as appropriate	**Negligible (0-20)**
Hazard: **Hydrofluoric acid, any use** **Default Controls:** Use hazardous chemicals controls plus: • HF burn kit (training on use by SHSD rep) • Location of HF to be entered on Fire Run Card and Hazard Information placard • Designated area for HF use and storage must be Posted. • Two people must be in speaking/hearing range at all times that HF is in use. • Off-hours use generally prohibited. Must be approved by OMC Mgr. and Chem Hygiene officer • HF storage in its own secondary containment • PPE: as for corrosives plus: • PPE: Face shield for >2% solutions (1 molar). or if high splash potential. • HF resistant apron (typ. thick butyl rubber or neoprene) • Spill cleanup: <10ml in fume hood can be neutralized with Calcium carbonate or hydroxide • Spill cleanup: >10 ml or any amount outside hood: evacuate and call 2222. • Any worker exposure report to OMC.	**Negligible (0-20)**
Hazard: **Nano-material bound in a solid matrix or fixed substrate**	**Negligible (0-20)**

Default Controls:
PPE Requirements for Handling: Standard PPE required for the work area. No additional requirements.
Handling Requirements
• No Mechanical abrasion.
• No thermal stresses.
• No etching
Laboratory Posting Requirements - No Posting Requirements
Waste Handling:
• Solids containing nanomaterials which have a potential to be released must NOT be disposed in the regular trash. See SBMS Hazardous Waste Management for more information.
• Collect solid UNP waste in a bag (6 mil thick minimum zip-lock type or J-sealed) or other sealing container (i.e. jar with threaded lid).

• Spell out the chemical name (do not use formulas or trade names) on the RED Hazardous Waste Label.
• The contents line on the label must contain the chemical composition and the word “NANO”
• A second label, in addition to the Red Hazardous Waste Label, is required on the outside other container/bag stating “CONTAINS NANOMATERIALS” see ES&H Coor. or 90-Day area manager for labels.

Hazard, Default Controls, Task Specific Info	Risk Level
Hazard: **Toxic metals (e.g., As, Ba, Be, Cd, Cr, Hg, Pb, Se, Ag)** **Default Controls:** As for chemicals, plus need for SHSD and OMC monitoring and surveillance must be evaluated BURF for Beryllium operation **Task Specific Info:** Cr, Ag	**Negligible (0-20)**

C. Environmental Hazards, Tasks and Controls (include on/off site transportation and products/services)

Hazard, Default Controls, Task Specific Info	Risk Level
Hazard: **Any amount of hazardous waste generation** **Default Controls:** Engineering Controls • Waste will be accumulated in chemically compatible containers that appropriately contain/protect the waste. • Waste containers will be closed in a tray (secondary containment) in the Satellite Accumulation Area (SAA). Administrative Controls • All hazardous waste containers will have a (red) “Hazardous Waste Label” that has the generator’s name and the chemical contents (trade name/formula not acceptable). • All waste will be accumulated in closed containers and kept in an established and posted SAA until ready for transfer to the 90-Day Haz Waste Area for pick-up by Waste Management. • For pick-up by Waste management, complete the Nonradioactive Haz Waste Control Form and consult the 90-Day Area Manager to gain access/transfer the waste to the 90Day Area. Training: Hazardous Waste Gen. (HP-RCRIGEN3). PPE: When handling waste materials follow PPE requirements specified for the specific materials.	**Negligible (0-20)**

Comply with the SBMS Subject Area: “Hazardous Waste Management”.	

Hazard: **Any atmospheric discharges that require engineering controls** **Default Controls:** • Maintain controls and emissions according to permit requirements, if applicable. • Maintain control equipment (such as filters) as per manufacturer’s recommendations if not a permitted emissions point. Comply with the SBMS Subject Area: “Nonradioactive air emissions”.	**Negligible (0-20)**

Hazard: **spill potential (Other)** **Default Controls:**	**Negligible (0-20)**

D. Radiation Hazards, Tasks and Controls

Hazard, Default Controls, Task Specific Info	Risk Level
Hazard: **Radio frequency (RF) or Microwave sources exceeding 10 mW radiated output** **Default Controls:** Administrative Controls • Request RF survey/evaluation through SHSD • Complete JAF or Non-Employee Static Magnetic Field Questionnaire for exposed employees/workers • Training: TQ-RF/MW-SAFE for people routinely working in area • Evaluate medical device wearers • Appropriate posting (see Subject Area) Comply with Subject Area “RF and Microwave Safety”	**Negligible (0-20)**
Hazard: **Ultraviolet sources >1 W** **Default Controls:** Task and source specific. Evaluate below.	**Negligible (0-20)**

E. Biological Hazards, Tasks and Controls

None

F. Offsite Work Hazards, Tasks and Controls

None

G. Other Issues (Security, Notifications to Other Organizations, Community Involvement, etc.)

None

H. Recommended Exposure Monitoring

- None

Description or comments:

I. EPHA Determination

Chemical Name	Quantity (lbs, gal)	Location (Bldg/Room#)

IV. Perform Work Within Controls

A. Recommended Training and Medical Surveillance Summary

- Laboratory Standard (HP-IND-220)
- Cryogen Safety (HP-OSH-025)
- Hazardous Waste Generator (HP-RCRIGEN3)
- Nanoparticles Protocol (OM-MEDSURV-NANO)
- Compressed Gas Safety (TQ-COMPGAS1)
- Nanotechnology for Nano-workers (TQ-NC-HS2)
- Oxygen Deficiency Hazard (TQ-ODH)

B. Personnel Training, Qualification, and Authorization List

Employee/Guest Name	Life/Guest#	Dept	Required Training Course(s)	Signed
Aaron Stein	22947	NC	Oxygen Deficiency Hazard (TQ-ODH) [EXPIRES: 1/5/2014] Cryogen Safety (HP-OSH-025) [EXPIRES: NEVER] Compressed Gas Safety (TQ-COMPGAS1) [EXPIRES: 3/2/2013] Laboratory Standard (HP-IND-220) [EXPIRES: 2/28/2013] Nanotechnology for Nano-workers (TQ-NC-HS2) [EXPIRES: 6/4/2012] Hazardous Waste Generator (HP-RCRIGEN3) [EXPIRES: 4/11/2012] Nanoparticles Protocol (OM-MEDSURV-NANO) [UNASSIGNED: EXPIRES: NEVER]	
Don Elliott	14624	IO	Oxygen Deficiency Hazard (TQ-ODH) [EXPIRES: 12/28/2013] Cryogen Safety (HP-OSH-025) [EXPIRES: NEVER] Compressed Gas Safety (TQ-COMPGAS1) [EXPIRES: 3/6/2013] Laboratory Standard (HP-IND-220) [EXPIRES: 7/20/2012] Nanotechnology for Nano-workers (TQ-NC-HS2) [UNASSIGNED: EXPIRES: 5/8/2012] Hazardous Waste Generator (HP-RCRIGEN3) [EXPIRES: 3/18/2012] Nanoparticles Protocol (OM-MEDSURV-NANO) [UNASSIGNED: EXPIRES: NEVER]	
Fernando Camino	23799	NC	Oxygen Deficiency Hazard (TQ-ODH) [EXPIRES: 8/24/2013] Cryogen Safety (HP-OSH-025) [EXPIRES: NEVER] Compressed Gas Safety (TQ-COMPGAS1) [EXPIRES: 3/4/2013] Laboratory Standard (HP-IND-220) [EXPIRES: 8/24/2013] Nanotechnology for Nano-workers (TQ-NC-HS2) [EXPIRES: 4/29/2012] Hazardous Waste Generator (HP-RCRIGEN3) [EXPIRES: 8/17/2012] Nanoparticles Protocol (OM-MEDSURV-NANO) [UNASSIGNED: EXPIRES: NEVER]	
Ming Lu	24188	NC	Oxygen Deficiency Hazard (TQ-ODH) [EXPIRES: 4/6/2013] Cryogen Safety (HP-OSH-025) [EXPIRES: NEVER] Compressed Gas Safety (TQ-COMPGAS1) [EXPIRES: 4/8/2012] Laboratory Standard (HP-IND-220) [EXPIRES:	

			4/11/2013] Nanotechnology for Nano-workers (TQ-NC-HS2) [EXPIRES: 4/30/2012] Hazardous Waste Generator (HP-RCRIGEN3) [EXPIRES: 4/7/2012] Nanoparticles Protocol (OM-MEDSURV-NANO) [UNASSIGNED: EXPIRES: NEVER]	
Jon Allen	24101	NC	Oxygen Deficiency Hazard (TQ-ODH) [EXPIRES: 12/7/2012] Cryogen Safety (HP-OSH-025) [EXPIRES: NEVER] Compressed Gas Safety (TQ-COMPGAS1) [EXPIRES: 2/9/2013] Laboratory Standard (HP-IND-220) [EXPIRES: 12/7/2012] Nanotechnology for Nano-workers (TQ-NC-HS2) [UNASSIGNED: EXPIRES: 4/27/2012] Hazardous Waste Generator (HP-RCRIGEN3) [EXPIRED: 12/7/2011] Nanoparticles Protocol (OM-MEDSURV-NANO) [UNASSIGNED: EXPIRES: NEVER]	
Danvers Johnston	24305	NC	Oxygen Deficiency Hazard (TQ-ODH) [EXPIRES: 8/3/2013] Cryogen Safety (HP-OSH-025) [EXPIRES: NEVER] Compressed Gas Safety (TQ-COMPGAS1) [EXPIRES: 8/5/2012] Laboratory Standard (HP-IND-220) [EXPIRES: 8/2/2013] Nanotechnology for Nano-workers (TQ-NC-HS2) [EXPIRES: 8/7/2012] Hazardous Waste Generator (HP-RCRIGEN3) [EXPIRES: 8/3/2012] Nanoparticles Protocol (OM-MEDSURV-NANO) [UNASSIGNED: EXPIRES: NEVER]	
Chang-Yong Nam	23659	NC	Oxygen Deficiency Hazard (TQ-ODH) [EXPIRES: 5/24/2013] Cryogen Safety (HP-OSH-025) [EXPIRES: NEVER] Compressed Gas Safety (TQ-COMPGAS1) [EXPIRES: 3/4/2013] Laboratory Standard (HP-IND-220) [EXPIRES: 5/27/2013] Nanotechnology for Nano-workers (TQ-NC-HS2) [EXPIRES: 4/27/2012] Hazardous Waste Generator (HP-RCRIGEN3) [EXPIRES: 3/8/2012] Nanoparticles Protocol (OM-MEDSURV-NANO) [UNASSIGNED: EXPIRES: NEVER]	

C. Emergency Procedures

DO NOT DISROBE FIRST. Following the Bldg. 735 Local Emergency Plan. Spill kits located in NE Service Galley and in 90-day area. Eyewash and shower in Lab and galley. HF emergency kit located next to hood in 1L-43, refer to special provisions detailed in standard operating procedure for HF. There is a status light tree, green, yellow, and red in the clean room and galley. The green light indicates all systems are normal. Yellow indicates a fault which needs attention by the system owner. Red indicates a Level 1 Alarm, which indicates either a gas detection or problem with exhaust system. This will stop the process until the problem is resolved. If **Level 2 Alarm** is tripped, there will be a **special temporal 3 alarm** and a message **to evacuate the building due to a Toxic Gas release**. The message will tell everyone to exit out the north doors (front) only. **In the event of a TOXIC GAS release. There will be a temporal 3 alarm followed by a message to exit out the north(front) doors only. After evacuation go to the outdoor assembly area on the west side of the building.**

D. Transportation

Laboratory users bringing samples into the laboratory for processing should be aware of the SBMS requirements for transporting hazardous materials and transporting nanomaterials. Sample preparation other than that described in this document must be done in an environment appropriate for chemical handling. Samples must be shipped through the BNL Shipping Office.

E. Logistical Interactions

ES&H Coor. x3509 EMS x2222 or 911 from cell 631-344-2222

F. Termination/Decommissioning

Closeout is not anticipated in the near future. At the time of closeout, guidance from ESH Coordinator, Facility Safety Representative, and Environmental Compliance Rep. will be sought.

V. Provide Feedback

Updated emergency plans to reflect new hazards associated with the new Oxford RIE.

VI. Attachments

Attached Files:

Materials Used NC-08.doc