OHS Registration #: _____

Expiration Date: _____

STANDARD OPERATING PROCEDURE/APPROVAL FORM
FOR CARCINOGENS AND HIGHLY TOXIC MATERIALS

Instructions: Please complete this form to request approval to use and possess highly toxic or carcinogenic material from the University Chemical Hygiene Committee as required by Chapter 12 of the University Chemical Hygiene Plan and University Policy 7-37.

Submit a separate form for each chemical. Copies of the current guidelines and Chemical Hygiene Plan are available at the DOHS web site: http://www.udel.edu/OHS/. For questions, please contact the University Chemical Hygiene Officer at 831-2103.

Section I – Information

1. Principal Investigator(s): _____
2. E-Mail Address: _____
3. Department: _____
4. Address: _____
5. Phone Number: _____ 6. Fax Number: _____
7. Lab(s) to be Used: _____
8. Chemical: Inorganic Cadmium and Cadmium Compounds

Section II – Use and Storage

A. Purchasing

All purchases of this material must have approval from the Principal Investigator (PI) or authorized personnel before ordering. The user is responsible to ensure that a current Material Safety Data Sheet (MSDS) is obtained unless a current one is already available within the laboratory. Quantities of this material will be limited to _____, and/or the smallest amount necessary to complete the experiment.

B. Authorized personnel

Please select the general categories of personnel who could obtain approval to use this material:

1. ☐ Principal Investigator 2. ☐ Graduate Students 3. ☐ Undergraduates
4. ☐ Technical Staff 5. ☐ Post Doctoral Employees
6. ☐ Other (Describe): _____

Please list the specific personnel and their approval level (Attach an addendum to this form for additional personnel):

NOTE: The Principal Investigator must be aware of all purchases of this material. The Principal Investigator must assure the there is not an exceedance of the quantity limits.

1. _____	☐ Purchase	☐ Use the Material
2. _____	☐ Purchase	☐ Use the Material
3. _____	☐ Purchase	☐ Use the Material
4. _____	☐ Purchase	☐ Use the Material
5. _____	☐ Purchase	☐ Use the Material

The Principal Investigator will update this section when any personnel changes occur. If changes occur, document the changes (include the record of training of additional personnel) in the laboratories files and submit an addendum to the University Chemical Hygiene Officer with all training documentation.

C. Storage

Materials will be stored according to compatibility and label recommendations in a designated area.

1. Please list compounds that this chemical is incompatible with: Segregate from strong oxidizers, sulfur, selenium, tellurium, hydrazoic acid

2. Please list special storage requirements (I.E.: Refrigerated, Inert Atmosphere, Desiccated, etc.): _____

3. Please list specific storage area (This Area Must be Marked and Labeled): _____

Storage areas will be inspected by laboratory personnel on a regular basis. Personnel will check for safety concerns such as improper storage, leaking/damaged container(s), damaged labels, quantities in excess of approved limits, theft/disappearance of material, etc. The inspector will also determine if an inventory reduction is possible. The Principal Investigator will designate one individual to complete this inspection.

4. Please select an inspection frequency:

☐ Weekly ☐ Biweekly

☐ Bimonthly ☐ Monthly

D. Use location:

Materials shall be used only in the following designated areas.

Check all that apply:

1. ☐ Demarcated Area in Lab (Describe): _____
2. ☐ Fume Hood
3. ☐ Glove Box
4. ☐ Other (Describe): _____

Section III – Personnel Safety and Protection

A. Training requirements:

All users must demonstrate competency and familiarity regarding the safe handling and use of this material prior to purchase. The Principal Investigator is responsible for maintaining the training records for each user of this material. Training should include the following:

1. Review of current MSDS
2. Review of the OSHA Lab Standard
3. Review of the Chemical Hygiene Plan
4. Special training provided by the department/supervisor (Right to Know)
5. Review of the departmental safety manual if applicable
6. Safety meetings and seminars
7. One-on-One hands-on training with the Principal Investigator or other knowledgeable laboratory personnel.

B. Personal Protective Equipment:

All personnel are required to wear the following personal protective equipment whenever handling this material:

1. Proper Laboratory Attire (Pants or dresses/shorts below the knees, sleeved shirt, close-toe shoes)
2. Safety Glasses
3. Lab Coat

Personnel may be required to wear other Personal Protective Equipment when working with this material. The Principal Investigator should contact the University Chemical Hygiene Officer to discuss the selection of chemical protective clothing (aprons, suits and gloves) and respirators. Please check all that apply:

1. ☐ Chemical Safety Splash Goggles	2. ☐ Face Shield
3. ☒ Chemical Protective Gloves (Describe): Neoprene or Nitrile	
4. ☐ Chemical Protective Clothing (Describe): _____	
5. ☐ Chemical Protective Splash Apron (Describe): _____	
6. ☐ Respirator (Type): _____	
7. ☐ Other (Describe): _____	

C. Safe Work Practices

The following safe work practices should be employed when using this material:

1. Wear all required personal protective equipment
2. Cover open wounds
3. Wash hands thoroughly when work with the material is completed
4. No mouth pipetting

5. Use of sharps, such as glass Pasteur pipettes, needles, razor blades, etc. should be avoided or minimized

6. Must not work alone in the laboratory

7. Please list any other safe work practices: Do not generate dust. Use HEPA vacuum and wet methods for clean up. Do not work with the material without proper respirator protection or laboratory ventilation such as a fume hood or exhaust trunk when exposure to cadmium dust could occur. Fine divided powers can be a flammable solid. Extinguish all ignition sources.

D. Personnel Decontamination

For most exposures, decontamination should occur as follows:

1. Small Skin Exposures –

    a. Wash contaminated skin in sink with tepid water for 15 minutes
    b. Have buddy locate the MSDS
    c. Wash with soap and water
    d. Contact Occupational Health and Safety at 831-8475 for further direction

2. Eye Exposure –

    a. Locate the emergency eye wash
    b. Turn eye wash on and open eyelids with fingers
    c. Rinse eyes for 15 minutes
    d. Have buddy contact 911 for the Newark Campus, 911 for all others and locate the MSDS
    e. Notify OHS

3. Large Body Area Exposure –

    a. Locate the emergency safety shower
    b. Stand under shower and turn it on
    c. Rinse whole body while removing all contaminated clothing
    d. Have buddy contact 911 for the Newark Campus, 911 for all others and locate the MSDS
    e. Rinse body for 15 minutes
    f. Notify OHS

Please list any special decontamination procedures: _____

E. Exposure Symptoms and Treatment

Please list the emergency procedures to be followed in the event of an exposure. These will be found in the MSDS for the compounds:

1. Skin/eye contact:

    a. Symptoms: Discomfort

    b. First Aid: Rinse with water in a emergency eye wash or safety shower while removing contaminated clothing for 15 minutes. Seek emergency medical care by dialing 911.

2. Ingestion:

    a. Symptoms: Less than 40 grams may be fatal

b. First Aid: Seek emergency medical care by dialing 911.

3. Inhalation

   a. Symptoms: Irritation to the throat and lungs. May be fatal

   b. First Aid: Move to fresh air. Seek emergency medical care by dialing 911. Provide CPR if necessary.

4. Injection

   a. Symptoms: May be fatal

   b. First Aid: Seek emergency medical care by dialing 911.

The ChemWatch MSDS, which is available at http://www.udel.edu/OHS/ oftentimes, has treatment information for Emergency Room Personnel and Doctors to follow. Please list any information that can be provided to assist with the treatment:

Long term exposure to high dust concentrations may cause changes in lung function i.e. pneumoconiosis; caused by particles less than 0.5 micron penetrating and remaining in the lung. Prime symptom is breathlessness; lung shadows show on X-ray. High acute exposure, to cadmium, produces delayed pulmonary edema progressing to interstitial fibrosis. For acute inhalations, initial presentation simulates metal fume fever (fever, headache, dyspnea, pleuritic chest pain, conjunctivitis, rhinitis, sore throat, cough) developing 4-12 hours post-exposure. Respiratory failure may ensue in 3-10 days. For acute oral exposures, gastroenteritis results with sudden onset of vomiting, diarrhea and abdominal pain. If vomiting is not prominent, use Ipecac/lavage/catharsis in usual manner. CaNa2EDTA is the chelator of choice for acute cadmium exposure. British Anti-Lewisite increase nephrotoxicity and therefore is not indicated [Ellenhorn and Barceloux: Medical Toxicology]

COMMENTS on HUMAN TOXICITY:
- Between 10 and 50% of inhaled cadmium is adsorbed, the adsorption being greater for smaller particles and fumes; absorption through skin is negligible.
- The half-life of cadmium in the human body is thought to be about around 30 years and it has no known biological function. Blood and urine cadmium concentrations may be determined.

Normal concentrations	Hazardous concentrations
Blood <27 nml/l (<3ug/l), non-smokers <54 nmol/l (<6 ug/l), smokers	>180 nmol/l (>20 ug/l)
Urine <18 nmol/l (<2 ug/l), non-smokers 0.4-1.3 nmol/mmol creatinine <45 nmol/l (<5 ug/l), smokers 10-35 nmol/mmol creatinine	>180 nmol/l (>20 ug/l) >4-13 nmol/mmol creatinine

BIOLOGICAL EXPOSURE INDEX (BEI)
These represent the determinants observed in specimens collected from a healthy worker exposed at the Exposure Standard (ES or TLV):

Determinant	Sampling time	Index	Comments
Cadmium in urine	Not critical	5 ug/g creatinine	B
Cadmium in blood	Not critical	5 ug/L	B

B: Background levels occur in specimens collected from subjects NOT exposed.

* In addition to preplacement and periodic medical examinations, recommended medical surveillance procedures include urinary cadmium and protein determinations and pulmonary function testing.

CRITICAL SITES OF TOXICITY INCLUDE: liver, respiratory system, blood, kidneys

GENERAL TOXICOLOGY KINETICS
Absorbtion by: inhalation, ingestion

Metabolism: Binds to metallothionein which causes cadmium to be retained in the body for long periods of time
Distribution to: kidneys, liver
Elimination route(s): Excreted through kidneys (urine), Excreted in faeces
Half-Life: Half-life in blood = 1-3 months, Half-life in the whole body = 10-30 years

CLINICAL MANIFESTATIONS / CLINICAL EFFECTS
Overt clinical symptoms: skin irritation, nausea, vomiting, diarrhea, gastroenteritis, abdominal pain
Effects - Head, Ear, Eye, Nose, Throat: irritation:eye, edema, salivation
Cardiovascular: no literature on cardiovascular effects
Neurological: headache, tremors, vertigo
Respiratory: coughing, dyspnea, chest tightness, bronchitis, pneumonitis, pulmonary edema, emphysema
Renal: proteinuria or albuminuria
Reproductive: decreased birth weight
Haematological: hypochromic anemia

LABORATORY TESTS / BIOLOGICAL MONITORING TESTS

	Whole Blood	Serum or Plasma	Urine
Normal	non-smokers: 0.4-1.0 ug/L, smokers: < 4.5 ug/L	0.5-2.0 ug/L	0.02 - 4.5 ug/L
Exposed	5 ug/L	not established	5 ug/g creatinine
Toxic	> 10 ug/L	not established	10 ug/L

Other Tissue
Cadmium exposure can be accomplished by measurement of metallothionein in urine
Organ and system assessment requires: Neutron activation analysis, X-Ray fluorescence

F. Spills

The laboratory should be prepared to clean up minor spills (25 ml/25 g or less) of highly toxic/carcinogenic materials should they occur in a properly operating fume hood. Chemical spill clean up guidance can be found at http://www.udel.edu/OHS/chemspillkit/chemspillkit.html. Laboratory personnel cleaning up a spill will wear all personal protective equipment listed above and manage all cleanup debris according the waste disposal section. Notify OHS of any spills, even if the lab staff handled the clean-up.

Please list the following:

1. Location of Spill Cleanup Materials for a small spill: _____

2. Any special measures/cleanup material required to cleanup a spill: Use HEPA vacuum and wet methods to clean up a spill. Do not generate a dust.

If a spill is large or occurs outside of a fume hood, the laboratory occupants should immediately vacate the laboratory, close all doors and contact Occupational Health & Safety at 831-8475 during working hours or 911 after hours. If the laboratory personnel determine that the spill is not contained to the lab or could cause harm to people outside the laboratory, they should pull the building fire alarm and go to the Emergency Gathering Point to await the University Police and Emergency Responders. The responsible/knowledgeable person should provide the University Police and the Emergency Responders with the following:

1. Common Name of the Material Involved

2. A copy of a MSDS, if possible

3. Any pertinent information related to the emergency, such as location in the lab, other hazards in the lab, etc.

G. Emergency Phone Numbers:

Below are a list of emergency numbers to contact in the event of an emergency:

1. Police, Fire or Medical Emergency, call – 911 on the Newark Campus, 9-911 for all others

2. Occupational Health & Safety – X8475

Please provide a list of other emergency phone numbers, such as after hour contacts for laboratory personnel or any other important phone number, to be used in the event of an emergency: _____

H. Other Special precautions

Please list any other special precautions or procedures not listed in the above sections. Please be as specific as possible:

Extremely toxic, carcinogenic material.

Section VI – Waste Disposal

The authorized person using this material is responsible for the safe collection, preparation and proper disposal of waste unless otherwise stated below. Waste shall be disposed of as soon as possible and in accordance with all laboratory and University procedures. All personal must obtain chemical waste disposal training via DOHS.

Specific instructions:

Use wet methods and HEPA vacuum to clean up all spills. Collect clean up material in a 7mil polyethylene bag and label with an orange chemical waste label. Use proper laboratory ventilation or respirator when exposure to cadmium dust could occur. Contact DOHS for removal. Do not put in the normal trash or pour any solutions down the drain.

Section V – Signature and Verification

Your signature below indicates that you have completed this form accurately to the best of your knowledge, you acknowledge all requirements and restrictions of this form and that you accept responsibility for the safe use of the material.

1. Prepared By: _____ Date: _____

   Signature: _____

2. Principal Investigator: _____ Date: _____

   Signature: _____

Section VI – Approval Process

A. University Chemical Hygiene Officer Approval

The Principal Investigator should have this form completed as accurately as possible. Please e-mail or fax this form to the University Chemical Hygiene Officer at eich@udel.edu or 831-1528. The Chemical Hygiene Officer will review and verify the form and make any necessary changes or updates.

1. University CHO: _____ Date: _____

Signature: _____

B. Conditional Approval to Purchase and Use

This form will then be e-mailed or faxed to a member of the University Chemical Hygiene Committee (CHC), usually from the same department as the requesting PI. The Committee Member will meet with the Principal Investigator or designee and discuss the form and the use of the material. If the Committee Member finds the procedure acceptable, they can offer a conditional approval for purchase and use of this material.

2. CHC Member: _____ Date: _____

Signature: _____

C. Full Approval

A signed copy of the form will be sent, via campus mail, to the University Chemical Hygiene Officer, who will bring it up at the next Chemical Hygiene Committee Meeting for full approval. All approvals will be good for two years. The complete, signed approval form will kept on file with Occupational Health & Safety and a copy will be sent to the Principal Investigator to keep on file.

3. Acceptance: _____ Date: _____

CHC Chair: _____

Signature: _____

D. Approval Expiration

The approval for use and purchase of this material will expire should any of the approved information change, with the exception of Section II, B and C, Authorized Personnel and Storage Location, or two years after CHC approval. If, at the end of two years, the procedure is substantially the same, the Principal Investigator can complete a renewal form and send it to the University CHO, who can approve the renewal for an additional two years.

CHECKLIST FOR POSSESSION AND USE OF CARCINOGENS AND HIGHLY TOXIC MATERIALS

The checklist is provided to assist a researcher with the approval process for possession and use of carcinogens and highly toxic materials. This form may be kept on file in the laboratory with the SOP to serve as documentation. The complete procedure can be found in the University Chemical Hygiene Plan in Chapter 12.

Date and Initial	
_____	1. Complete a Standard Operating Procedure/Approval Form For Carcinogens and Highly Toxic Materials and submit this form to OHS for review
_____	2. Review and make OHS's changes and recommendations
_____	3. Meet with a member of the University Chemical Hygiene Committee to review the approval form and the use of the material.
_____	4. Submit (via campus mail) the completed and signed form back to the University Chemical Hygiene Officer for conditional approval to purchase and use the material. The University Chemical Hygiene Committee will review this form at the next scheduled meeting for full approval.
_____	5. Complete a Job Hazard Analysis (JHA) for each experiment in which this compound is used. These JHAs must be kept on file in the laboratory and updated every 5 years or when a process changes.
_____	6. Provide and document training for every worker who will use the material. Training shall include hands-on instruction as well as review of the JHA, SOP and the University Chemical Hygiene Plan; specifically Chapter 12.
_____	7. Conduct a trial run with OHS present.
_____	8. Have OHS present the first time a process using this material occurs.