

Chemical Safety (II)

Nanosafety, Waste Management & Emergency Response

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Important Reminder

Safety training courses provided by HSE only cover BASIC safety principles. Your supervisor is responsible for your job-specific safety training, including operational safety procedures, departmental safety policies, etc.

Presentation Outlines

- Nanomaterials and nanosafety
- Chemical waste legal requirements
- HKUST(GZ) chemical waste procedures
- Incidents and lessons learned
- Waste minimization
- Hazardous Material Inventory
- Emergency response
- Information Source



Nanomaterials & Nanosafety

Different Nano-Related Materials

- Materials with engineered nanostructure, e.g. zeolite with designed pore features
- Silicon-based nanomaterial or nanostructure, e.g. nanoelectronics
- Nanomaterials with one dimension not in nanoscale (i.e. >100 nm), e.g. nanotube
- Nanoparticles (diameter <100 nm)

Origins of Nanoparticles

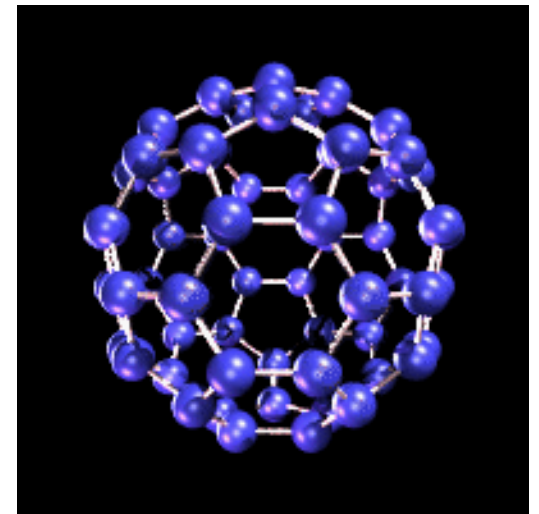
- Naturally occurring, e.g. volcanic activities, wild fires
- Anthropogenic incidental nanoparticles, e.g. engines, incinerators
 - Also known as ultrafine particles, <100 nm in AED
- Engineered nanoparticles
 - At least one dimension <100 nm
 - Relatively uniform in size, monodispersed

Unique Properties of Engineered Nanoparticles

- Novel physicochemical properties not found in parent materials
- Much higher reactivity, both chemical and biological
- Precisely designed molecules for specific purposes

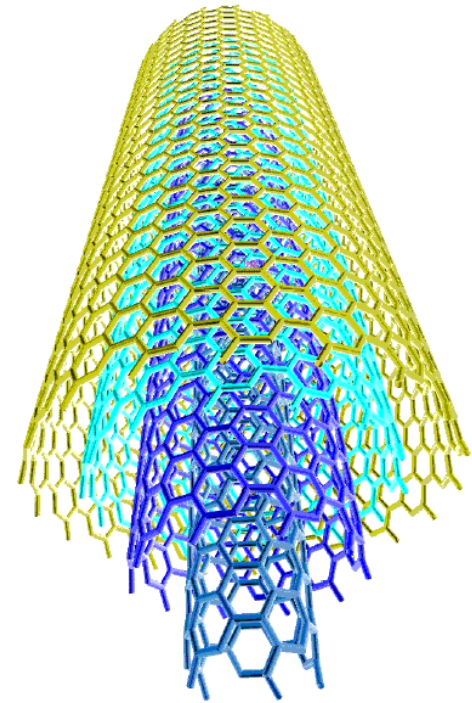
Buckyballs (C_{60})

- Extremely stable
- Can trap other atom or molecule inside
- Possible application
 - Superconducting material
 - Drug delivery system
 - Lubricant
 - Catalyst



Carbon Nanotubes

- Field emitters in flat plane display
- 100X strength, 1/6 weight of steel, mechanically stronger materials
- Ultra-miniaturized electronics, one candidate of nonsilicon microchips

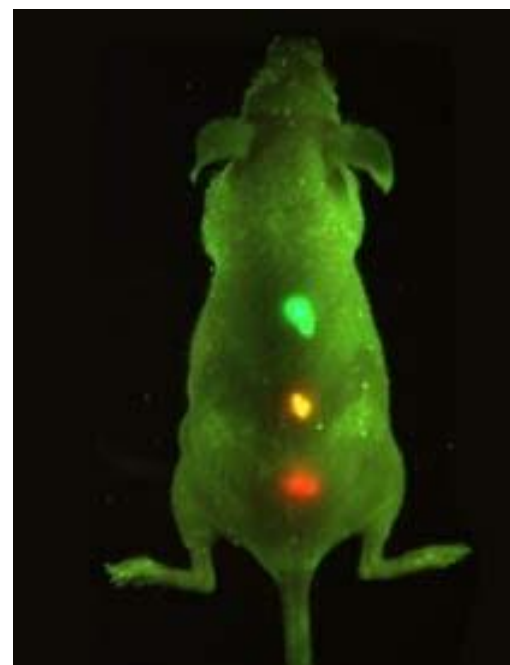
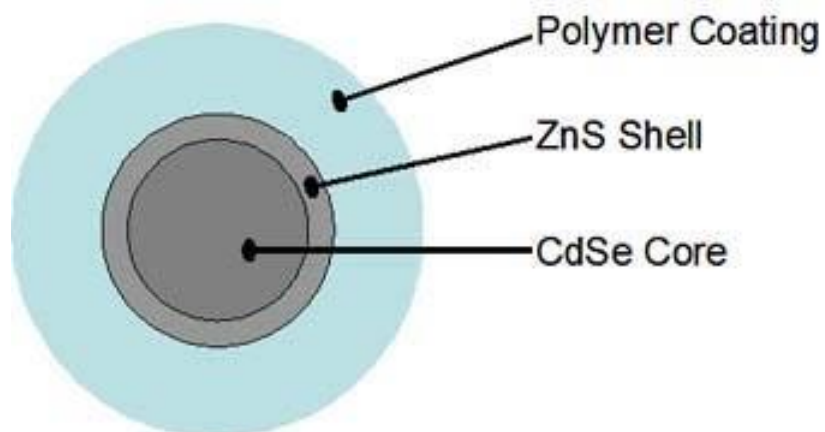
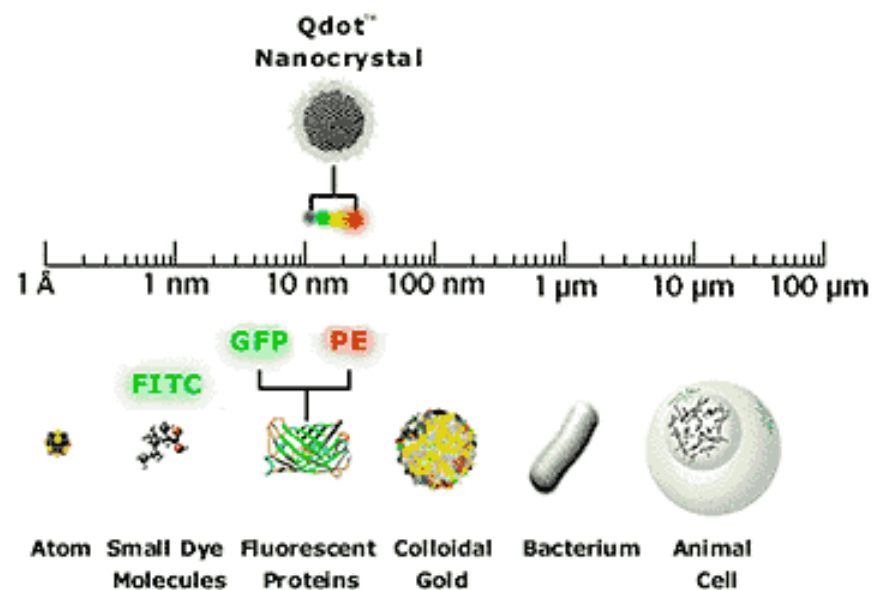
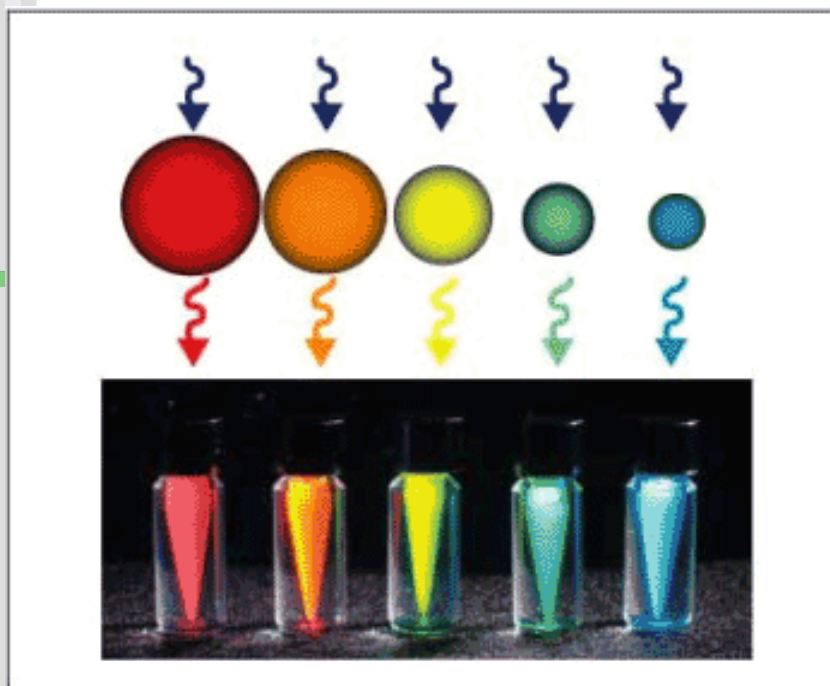


Metal and Metal Oxide Nanoparticles

- TiO_2 for photochemical oxidation, self-cleaning paints, etc
- ZnO in cosmetics, sunblock
- Fe for oxidation of contaminants in groundwater
- CuO for antimicrobial agent
- Fe_2O_3 as contrast agent for MRI

Quantum Dots (Q-Dots)

- Nanoparticles of semiconducting materials
- Size so small it interfere with quantum behavior of atoms
- Display tunable absorption and emission spectrum over visible wavelength
- Strong potential for medical imaging
- CdSe core with ZnS Shell



Biological Effects

- Ultra small size
 - Easy penetration
 - Fast distribution
 - Direct interaction with organelles
- Huge surface areas
 - Increased chemical activities (catalyst)
 - Increased biological activities

Two-Sided Sword

- Beneficial uses
 - Diagnostic (imaging, sensor)
 - Therapeutic (drug delivery)
 - Biomedical research
- Adverse health effects
 - Rapid uptake thru skin & epithelial cells
 - Translocation along neurons
 - Novel or amplified toxicity
 - Oxidative stress

Preliminary Toxicological Data

- Buckyballs caused lipid peroxidation in fish brain at 500 ppb for 48 hr
- Nanosize TiO_2 toxicity increased, proportional to surface area
- SWNT causes oxidative stress: free radical formation, depletion of antioxidants
- Metal impurity may also add toxicity
- Physical dimensions of some NT may cause pulmonary fibrosis and cancer similar to asbestos

A Series of Concerns

- Research safety
- Occupational safety
- Consumer safety
- Environmental impact

Nanoresearch at HKUST

Fullerenes Generation by Arc Discharge



Reaction Chamber



Graphite Rods and Powder

Purification of Fullerenes



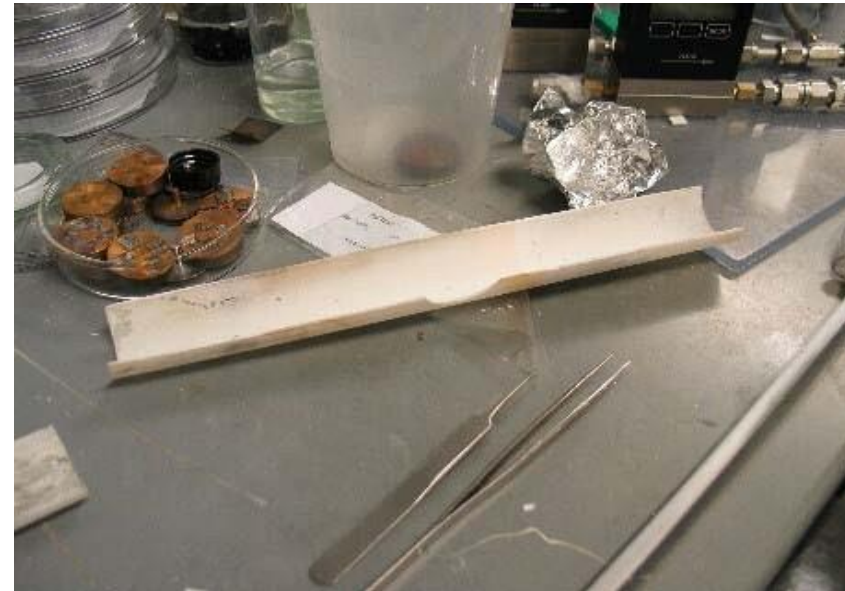
Derivatization of Nanofiber



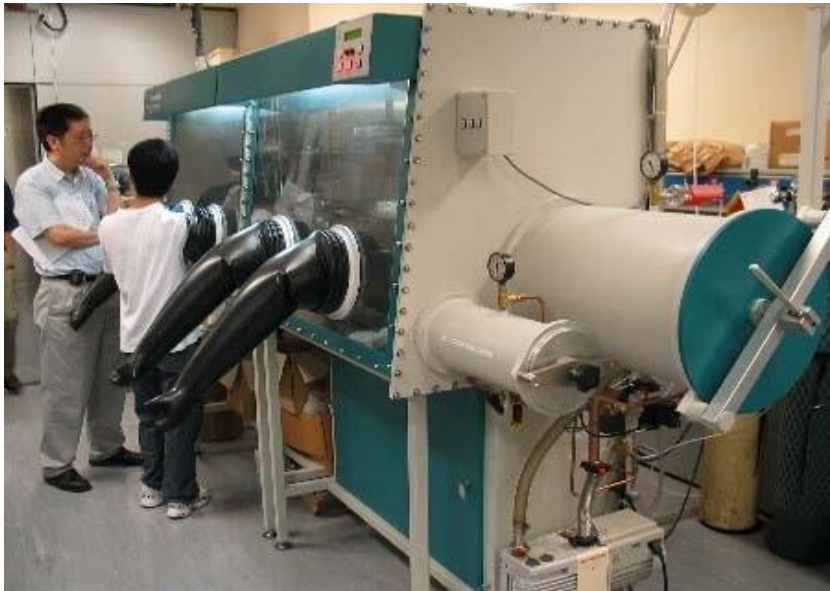
Carbon Nanotube by Chemical Vapor Deposition



Nano-sized Zinc Oxide



Iron Platinum Nanoparticles



Synthetic Zeolite

- Hydrated aluminosilicate, porous material
- Both natural and synthetic
- Porous structure allow interesting chemistry
- Synthesis can be fine-tuned to produce desired nanostructure
- Potential applications as catalyst, fuel cell etc

Synthetic Zeolite



Other Nanomaterials

- Nano-Composites

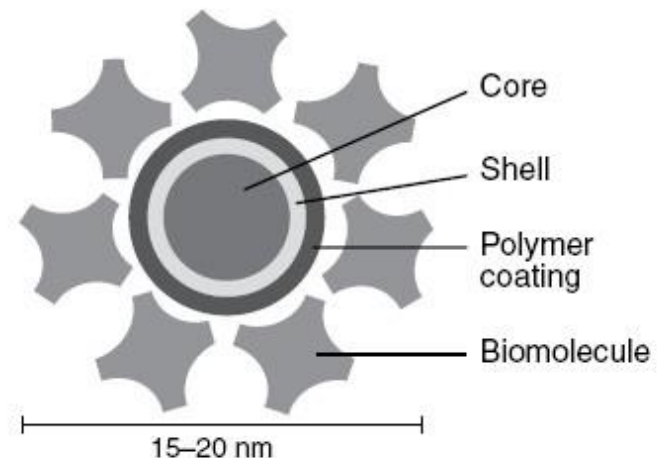
- Nanosized material e.g. CaCO_3 added to polymer as filler
- Carbon nanofiber added to polymer to increase strength

- Silicon Nanowire

- Silicon nanowire grown on substrate
- Process under vacuum

Quantum Dots

- Quantum Dots conjugate used as fluorescence label
- Xenopus muscle cells grown on circular coverslip
- Advantage: Qdot does not “bleach” over time like traditional fluorescence



<http://probes.invitrogen.com/products/qdot/overview.html>

Elements of Nanosafety Program at HKUST

Nano, or Otherwise...



Scope of Nanosafety Program

- Nanoparticles ($d < 100$ nm) & nanomaterials with one extended dimension, e.g. nanotube, nanowire, nanofiber
- Nanocomposite, e.g. CaCO_3 /PP composite
- Materials with engineered nanostructure, e.g. zeolite with designed nano-size pores
- Silicon-based nanostructure, nanoelectronics
- Nano-enabled products
- “Nano-stuff”

Preliminary Nanosafety Program at HKUST

- Safety input to Nanolab facility
- Nanosafety in research proposal review
- Nanomaterial database
- Assessment of exposure potentials
- Nanosafety training and chapter in Safety Manual
- Precautionary measures
- Monitoring of nano-EHS development

Precautionary Measures for HKUST Researchers

- Mainly for engineered nanoparticles
- Key references
 - *Approaches to Safe Nanotechnology: An Information Exchange with NIOSH*. National Institute for Occupational Safety and Health, July 2006.
http://www.cdc.gov/niosh/topics/nanotech/safenano/pdfs/approaches_to_safe_nanotechnology_28november2006_updated.pdf
 - *Nanoscience and nanotechnologies: opportunities and uncertainties*. The Royal Society & Royal Academy of Engineering, July 2004.
<http://www.nanotec.org.uk/finalReport.htm>

Precautionary Measures—Risk Assessment

- Nanomaterials possess unique physical chemical properties, should be considered as “new chemicals”
- Treat as potentially hazardous
- MSDS of raw material can only be viewed as a starting point at best
- Carbon: practically non-toxic; buckyballs: oral LD₅₀ 300 mg/kg

Precautionary Measures— Airborne Particles (1)

- Avoid aerosol generation
 - Many NPs generated in labs under contained conditions
 - NPs tend to agglomerate
 - However, many attempts to disperse NPs for various applications
- Suspended fine powder can become a fire and explosion hazard
- Do not allow escape into environment
- Intentional release into environment must show benefits clearly outweighing risks

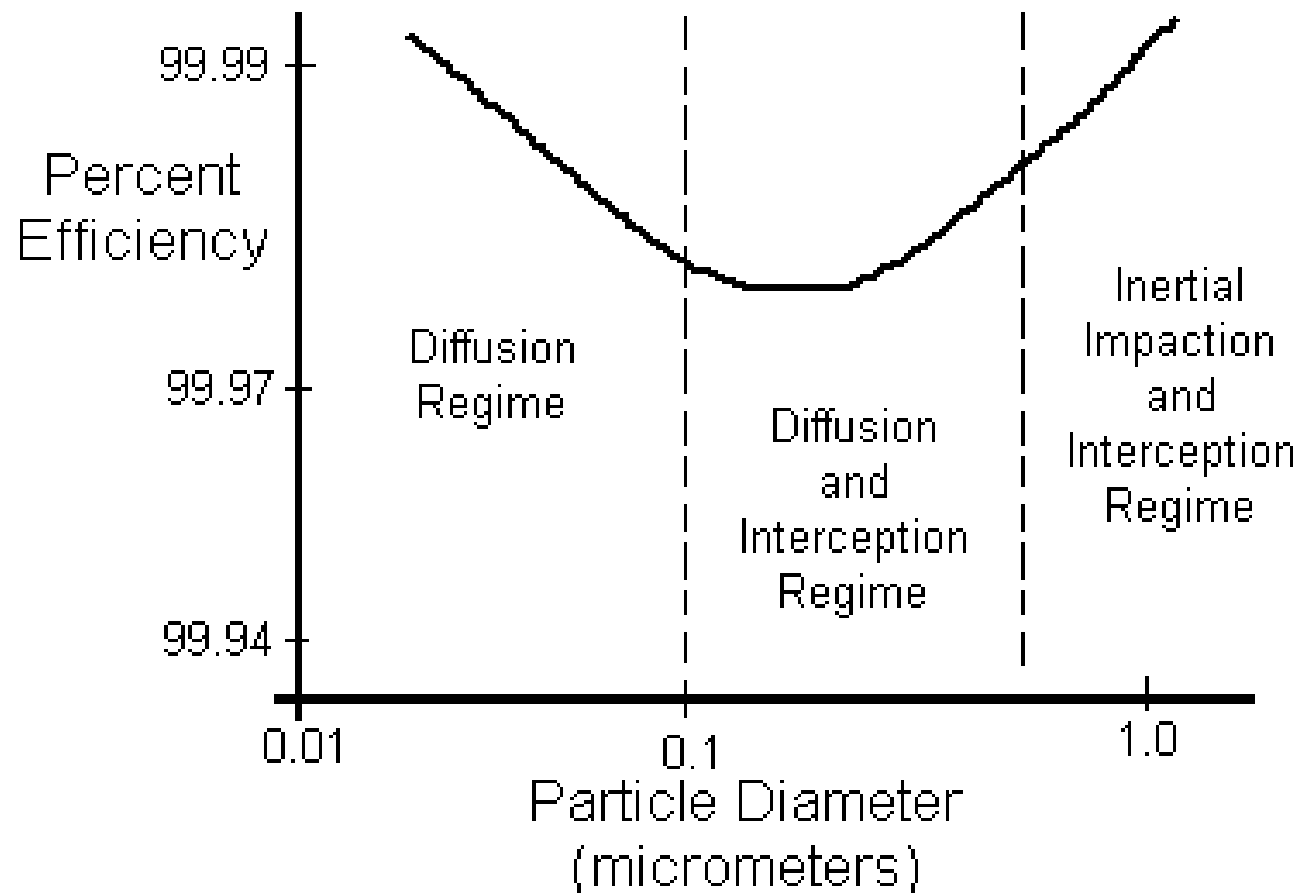
Precautionary Measures— Airborne Particles (2)

- Use local exhaust ventilation
 - Fumehood
 - Biological safety cabinets
 - Pharmaceutical hoods
- Use HEPA
 - Air treatment
 - Protection of personnel

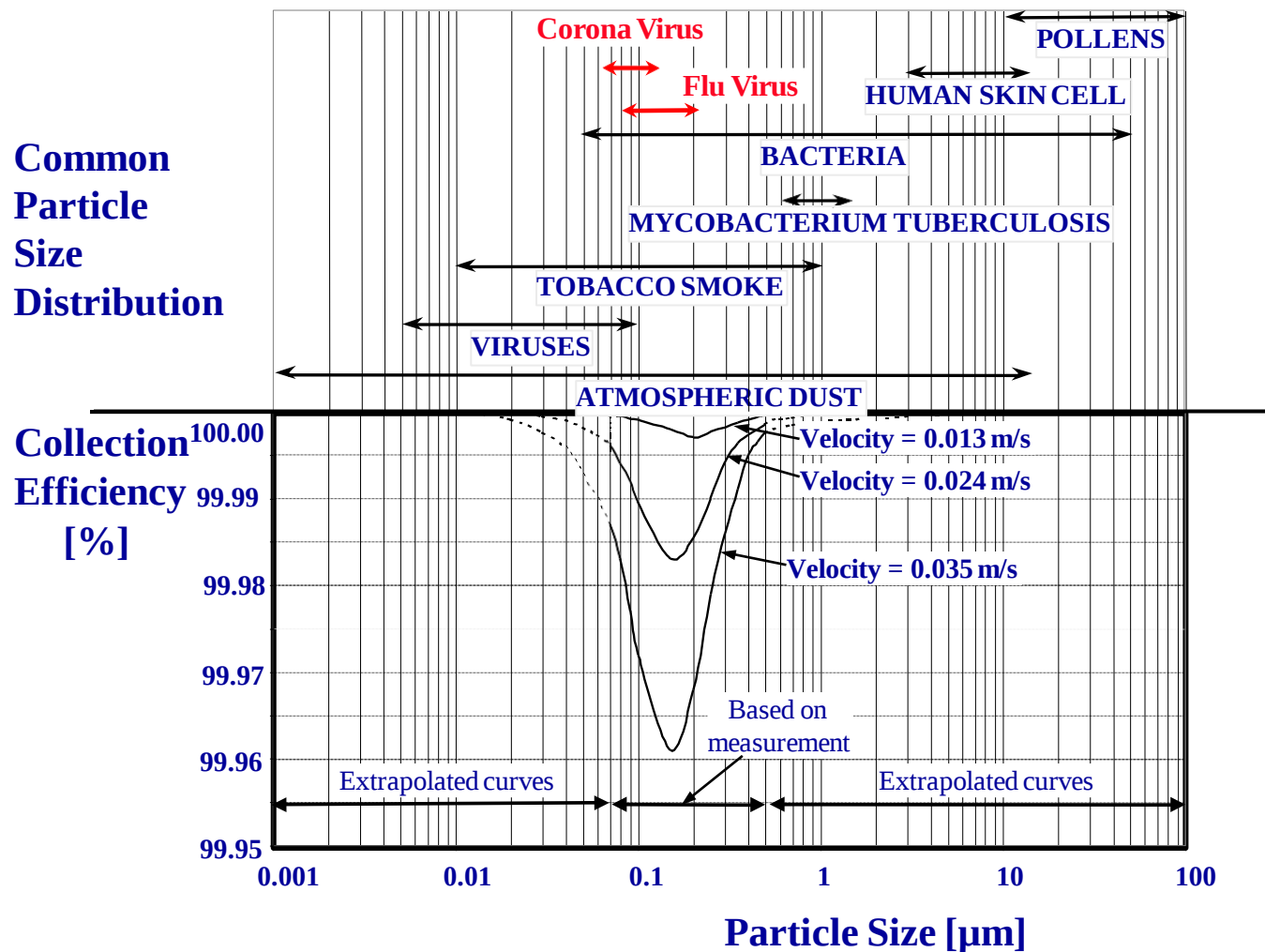
Can HEPA Filter Capture Nanoparticles?

- Theoretically efficiency increase with decreasing size below 0.1-0.3 μm
- Previously confirmed by data point down to 0.01 μm (10 nm)
- Recent study by U Minn confirmed HEPA filtration efficiency down to 2-4 nm, no thermal rebound observed
- Nanoparticles tend to agglomerate, instead of existing as single particles

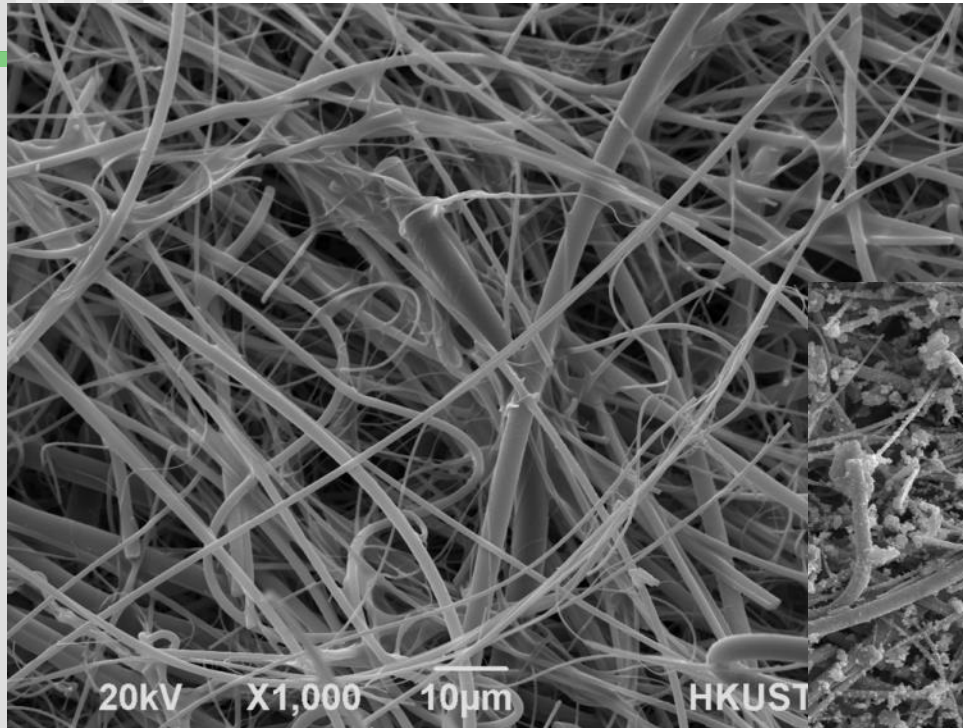
Particle Size and Filtration Efficiency



HEPA Filtration Efficiency

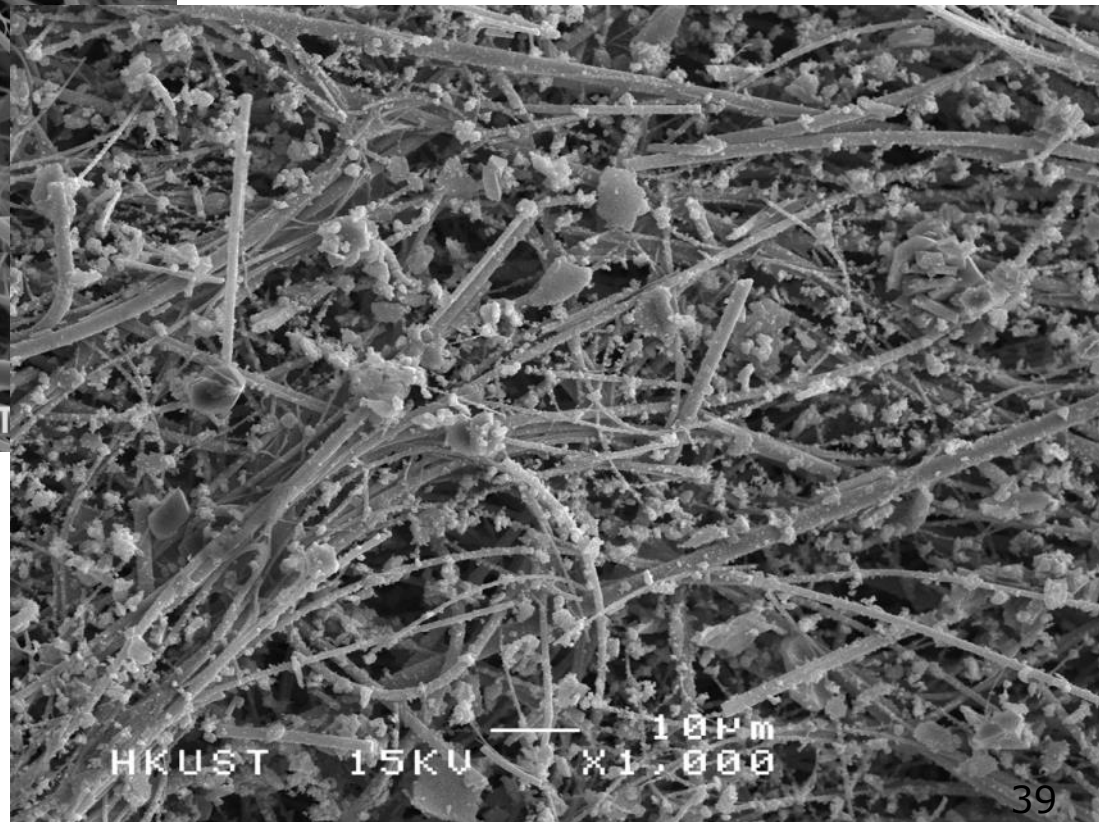


SEM of Fibrous Filter 1000 x

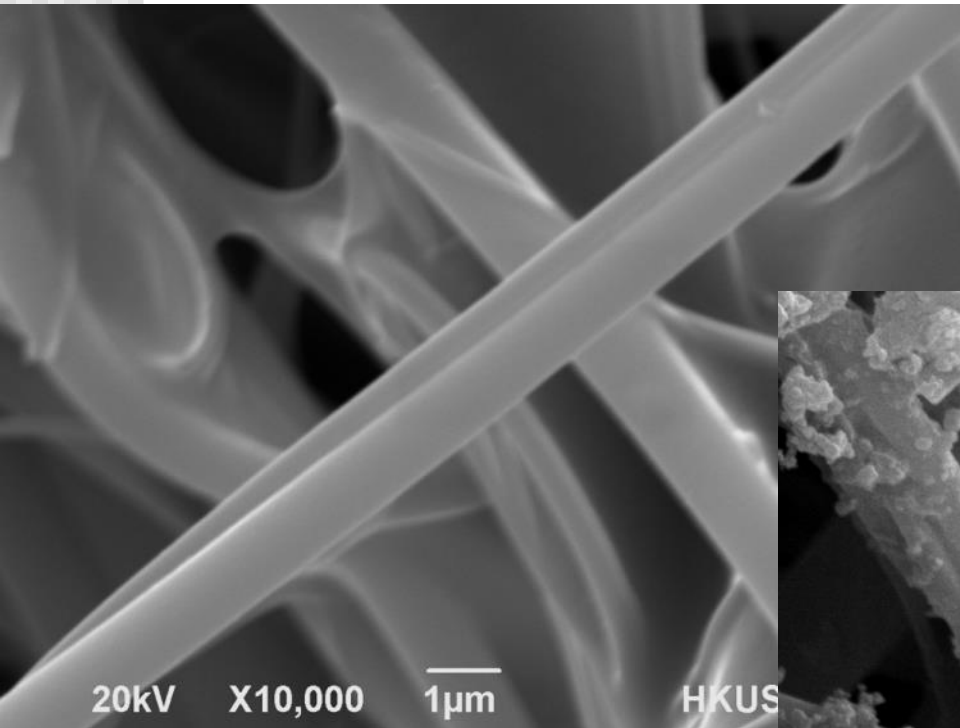


↑
New Filter

Used Filter



SEM of Fibrous Filter 10000 x



New Filter



Used Filter

Precautionary Measures— Liquid Solution/Suspension

- Avoid aerosol generation
- Avoid skin contact
- Use gloves at least protective against carrier solvent
- Do not allow escape into environment
- Intentional release into environment must show benefits clearly outweighing risks

Precautionary Measures— Waste Disposal

- Treat as chemical waste as a minimum
- Seek to remove from waste stream or destruct nanofeature as far as practicable

Quantum Dots Toxicity

- We have not investigated the toxicity of the Qdot® streptavidin conjugate. The materials are provided in a solution which is ~ 2 mM total Cd concentration; however, the CdSe core is encapsulated in a shell of ZnS and the polymer shell, which may prevent dissolution of free Cd. We have demonstrated the utility of these materials in a variety of live-cell in vitro labeling experiments, but do not have systematic data investigating the toxicity of the materials to humans, to animals, or to cells in culture.”

Quantum Dots Disposal

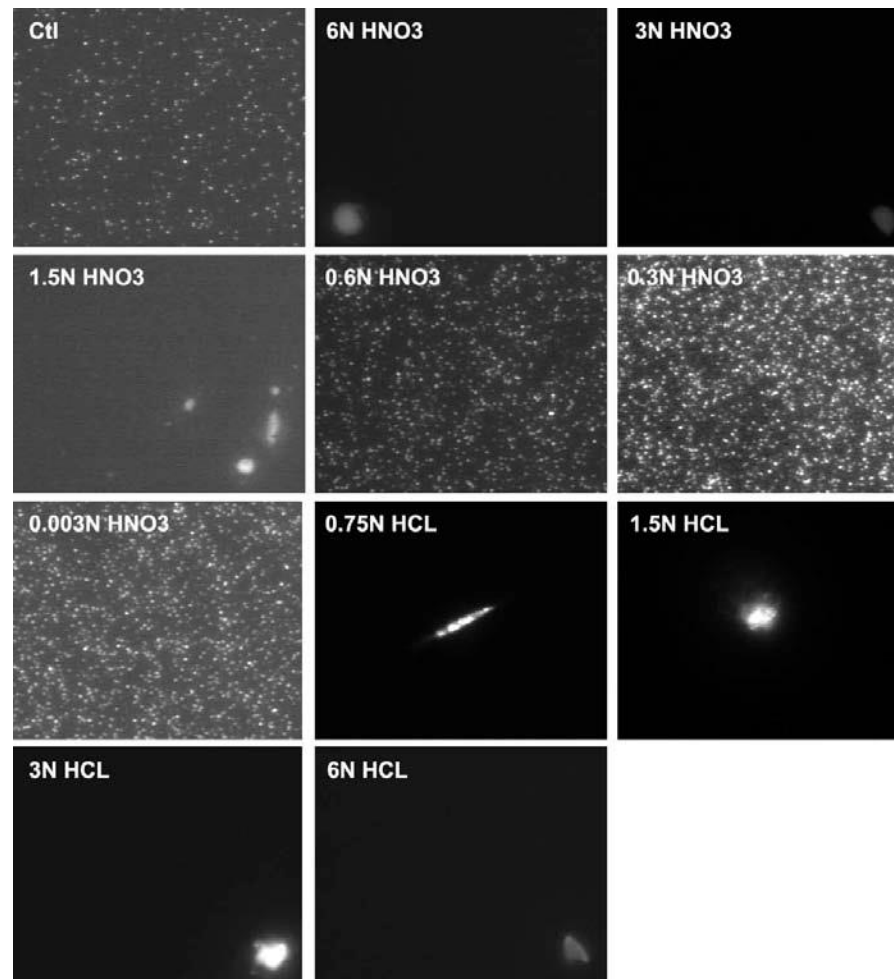
- The Qdot® conjugate contains cadmium and selenium in an inorganic crystalline form. Please dispose of the material in compliance with all applicable local, state, and federal regulations for disposal of these classes of material. For more information on the composition of these materials, consult the Material Safety Data Sheet.”

Source: Qdot Streptavidin Conjugates User Manual, Intrivogen

Qdot Destruction Experiment

- Tried different concentrations of HCl and HNO_3 to dissolve Qdots
- Use fluorescence wavelength under microscope to verify destruction
- May need to use TEM as confirmation
- Disposed as waste metal solutions may not destruct nano-feature

Acid-Treated QDot Solution



Precautionary Measures— Minor Spill Response

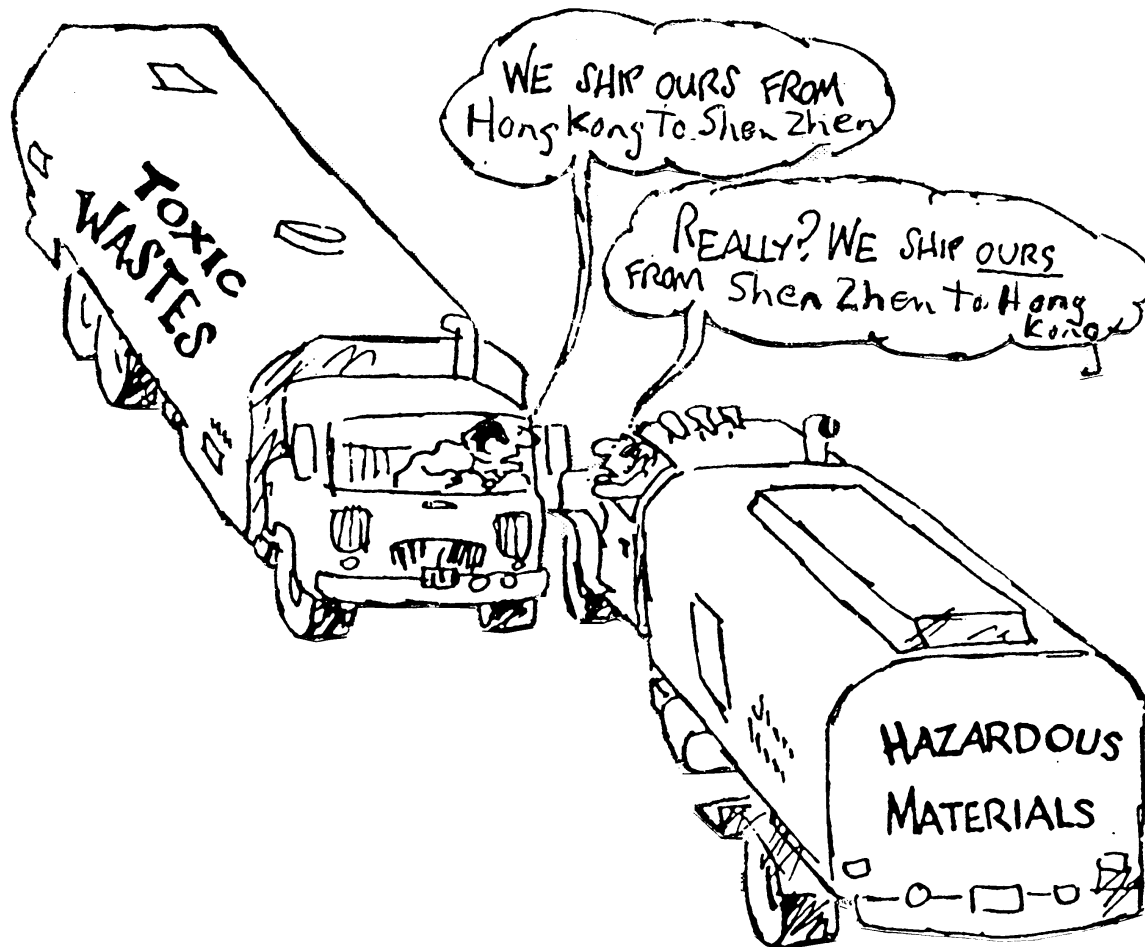
- Treat as hazardous material spill
- Evacuate area, wait 20 minutes to allow aerosols to settle
- Don respirator, gloves and coverall
- Remove spilled dry nanomaterials by HEPA vacuum cleaner
- Use normal sorbent materials for spilled liquid containing nanomaterials
- Contact HSE for major spill

Legal Framework for Chemical Wastes

What Is Hazardous Waste?

- Chemical wastes
- Biological/infectious wastes
- Medical/clinical wastes
- Radioactive wastes
- Co-contaminated wastes

A Wrong Way to Deal with Hazardous Waste



Chemical Waste Regulations in China

- 《中华人民共和国固体废物污染环境防治法》（2020年修订版）
- 《中华人民共和国动物防疫法》（2021年修订版）
- 《中华人民共和国传染病防治法》（2013年修订版）
- 《广州市生活垃圾分类管理条例》（2018年版）
- 《医疗废物管理条例》（2011修订版）
- 《广东省实验室危险废物环境管理技术指南（试行）》（2021年版）
- 《广州市危险废物规范化管理工作指引》（2019年版）
- 《国家危险废物名录》（2021年版）
- 《国家实验动物管理条例》（2017年修订版）
- 《电离辐射防护和辐射源安全基本标准》（GB 18871-2002）
- 《城市污水再生利用 城市杂用水水质》（GB/T 18920-2020）
- 广东省《污水综合排放标准》（DB 4426-2001）
- 《环境空气质量标准》（GB 3095-2012）
- 《工业企业设计卫生标准》（TJ 36-79）
- 《环境影响评价技术导则大气环境》（HJ 2.2-2018）
- 广东省《大气污染物排放限值》（DB 4427-2001）
- 广东省《家具制造行业挥发性有机化合物排放标准》（DB 44814-2010）
- 《恶臭污染物排放标准》（GB 14554-93）

Penalties for Chemical Waste Violations

- 《Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Waste》(2020) increases the penalties for enterprises that violate the law on solid waste management, raising the maximum fine to 5 million yuan, and increasing the types of daily continuous punishment, administrative detention, seizure and seizure.

Legal Definition of Chemical Waste

- According to 《National Catalogue of Hazardous Wastes》 (2021), solid wastes (including liquid wastes) under one of the following circumstances shall be included in this list:
- 1) Having one or more dangerous characteristics such as corrosiveness, toxicity, flammability, reactivity or infectivity;
- 2) Those with hazardous characteristics that may cause harmful effects on the environment or human health and need to be managed as hazardous wastes are not excluded.

HKUST(GZ) policy and program

HKUST(GZ) Safety and Environmental Policy

- ...The University will assume all reasonable directives possible to protect its appointees, students, facilities, and the environment, placing priority emphasis towards...
- ...Proper and safe procedures for the use, handling, storage, transport, and disposal of articles, hazardous materials and waste...

Chemical Waste Management at HKUST(GZ)

Waste Generators are responsible to:

- Request the correct waste container from HSE.
- Safely put their waste into the waste container.
- Fill out the Chemical Waste Log Sheet.

Chemical Waste Management at HKUST(GZ)

Waste Generators are responsible to:

- Segregate waste materials in the laboratory.
- Safely and properly store and maintain all waste within the laboratory.
- Request collection of waste by HSE.

Chemical Waste Management at HKUST(GZ)

HSE is responsible to:

- Provide waste containers and technical assistance to waste generators at HKUST(GZ).
- Transport waste from laboratories to the waste accumulation area.
- Manage the HKUST(GZ) waste accumulation area.

Chemical Waste Management at HKUST(GZ)

HSE is responsible to:

- Prepare hazardous waste for pickup and disposal by the waste contractor.
- Maintain HKUST(GZ) hazardous waste records.
- Liaise with Environmental Protection Department and Hazardous Waste Disposal Company on hazardous waste issues.

Chemical waste streams

Name filed on the platform	Site classification name	Physical state	Name of hazardous substance	Packing specification
Scientific research liquid waste	Organic waste liquid	Liquid	Organic waste liquid	20-25 L HDPE barrel
	Other inorganic waste liquid	Liquid	Containing heavy metal or other inorganic waste liquid	
	Waste acid	Liquid	Waste acid	
	Waste alkali	Liquid	Waste alkali	
Scientific research solid waste	Glass container	Solid-state	Glass containers contaminated with chemicals	Cartons
	Plastic container	Solid-state	Plastic containers contaminated with chemicals	Plastic bucket
	Other contaminated waste	Solid-state	PPE or disposable goods contaminated with chemicals; Particulate matter from sludge in laboratory sewage treatment facilities	Garbage bags/ woven bag
	Experimental solid waste	Solid-state	Ceramic Raw Waste; Ceramic Raw Waste of Ceramic Solid Containing Nickel Metal Slurry, Tin Metal, Copper Metal Slurry; Waste from other experiments	1.1-10 kg barrel bag
Waste chemical agent	Waste chemical agent	Liquid	Waste chemical agent	Plastic bucket/carton
Waste activated carbon	Waste activated carbon	Solid-state	Organic waste gas	Woven bag
Medical waste	Medical waste	Solid-state	Animal carcasses, needles, syringes, surgical blades, capillaries, glass slides, animal carcasses, organs and limbs, gloves contaminated with animal fluids, cotton, cotton swabs, gauze, etc.	Woven bag/sharps box

Chemical Waste Mixtures

- Select the container according to the MAJOR component of the mixture.
- Exceptions:
 - Always put halogenated compounds in the "Halogenated Solvents Container"
 - Always put cyanide waste into the "Cyanide" container (Always maintain alkaline, $\text{pH} > 7$, to avoid HCN formation) even if these are the minor component in the mixture.

Required Information on Waste Containers

- Waste generator name and phone number
- Waste stream name
- Standard Waste Label with Hazard Warning Symbol(s)
- A Waste Log Sheet in a plastic folder (for applicable waste streams)

危险废物标签式样四

(系挂于袋装危险废物包装物上的危险废物标签)

危 险 废 物	
主要成分:	危险类别 
化学名称:	
危险情况:	
安全措施:	
废物产生单位: _____	
地址: _____	
电话: _____ 联系人: _____	
批次: _____ 数量: _____ 出厂日期: _____	

说 明

- 1、危险废物标签尺寸颜色
尺寸: 10×10cm
底色: 醒目的橘黄色
字体: 黑体字
字体颜色: 黑色
- 2、危险类别: 按危险废物种类选择。
- 3、材料为印刷品。

Hazard Symbols on Chemical Waste Labels

危险分类	符号	危险分类	符号
Explosive 爆炸性	 黑色字 橙色底	Toxic 有毒	
Flammable 易燃	 黑色字 红色底	Harmful 有害	
Oxidizing 助燃	 黑色字 黄色底	Corrosive 腐蚀性	

废物种类	危险分类
废酸类	刺激性 / 腐蚀性 (视其强度而定)
废碱类	刺激性 / 腐蚀性 (视其强度而定)
废溶剂如乙醇、甲苯	易燃
卤化溶剂	有毒
油—水混合物	有害
氰化物溶液	有毒
酸及重金属混合物	有害 / 刺激性
重金属	有害
含六价格的溶液	刺激性
石棉	石棉

Intermediate Waste Containers

- Intermediate waste containers must be clearly labeled (waste stream, responsible person, contact)
- Containers that receive multiple sources of waste must have a log
- Same handling procedures, including logging and compatibility testing
- If empty reagent bottles are used, they must be thoroughly cleaned

Chemical waste procedures

Waste Handling Safety Precautions

- Carefully inspect each container for broken handles or leaks before use.
- Use appropriate personal protective equipment: splash-proof goggles, face shield, gloves, lab coat, respirator, etc.
- Use a fume cupboard for waste with hazardous or odorous vapors.
- Close container tightly after transfer.
- Be careful handling full containers.



Waste Handling Procedures

- Always check liquid level before adding new liquids.
- Perform compatibility test before adding new liquids.
- Leave more than 100 mm of space between the top of the container and the surface of the liquid.
- For large volume transfers, use funnel.
- Fill in the chemical waste log sheet immediately.

Compatibility Test Procedures (1)

- Performed **inside** a fume cupboard, by an experienced person.
- Fume cupboard must be functioning properly.
- Transfer 50 mL existing waste from target container to beaker.
- Place thermometer into beaker.
- Slowly mix in new chemical waste, to the estimated volumetric ratio.

Compatibility Test Procedures (2)

- If bubbling, fuming, or a temperature increase of $>10^{\circ}\text{C}$ occurs, stop mixing, the wastes are INCOMPATIBLE.
- If no observable reaction occurs within 5 minutes, the wastes are COMPATIBLE.

Chemical Waste Log Sheet

- Use a dark color permanent ink pen (not pencil, or water-based ink).
- Use chemical names of reagents and waste (full name in block letters, not abbreviations).
- Include the volume of waste being transferred.
- Estimate the percentage of mixture components.

表 2.1 危险废物产生环节记录表

记录表编号：2022 产生工序编号及名称： 废气处理设施 废物编号及名称：HW49 900-039-49 废活性炭

↩

⛶

产 生 情 况↩							转 移 情 况↩						
产生日期↩	产生时间↩	数量↩	单位↩	容器材质及容量↩	容器个数↩	废物产生部门 经办人 (签字)↩	转移日期↩	转移时间↩	数量↩	去向↩	废物产生部门 经办人 (签字)↩	废物运送部门 经办人 (签字)↩	
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Why is Chemical Waste Log Sheet Important?

- To comply with 《Technical specifications for collection, storage, transportation of hazardous waste》 (HJ 2025-2012)
- To provide information to Hazardous Waste Disposal Company on the treatment of received waste containers.
- To provide clues about the compatibility of chemical wastes in container.

Chemical Waste Storage

- Use a spill tray / secondary container for spill containment.
- Keep the waste log sheet current.
- Every storage area must have a proper chemical waste sign.
- Store flammable waste in a flammable cabinet wherever possible.



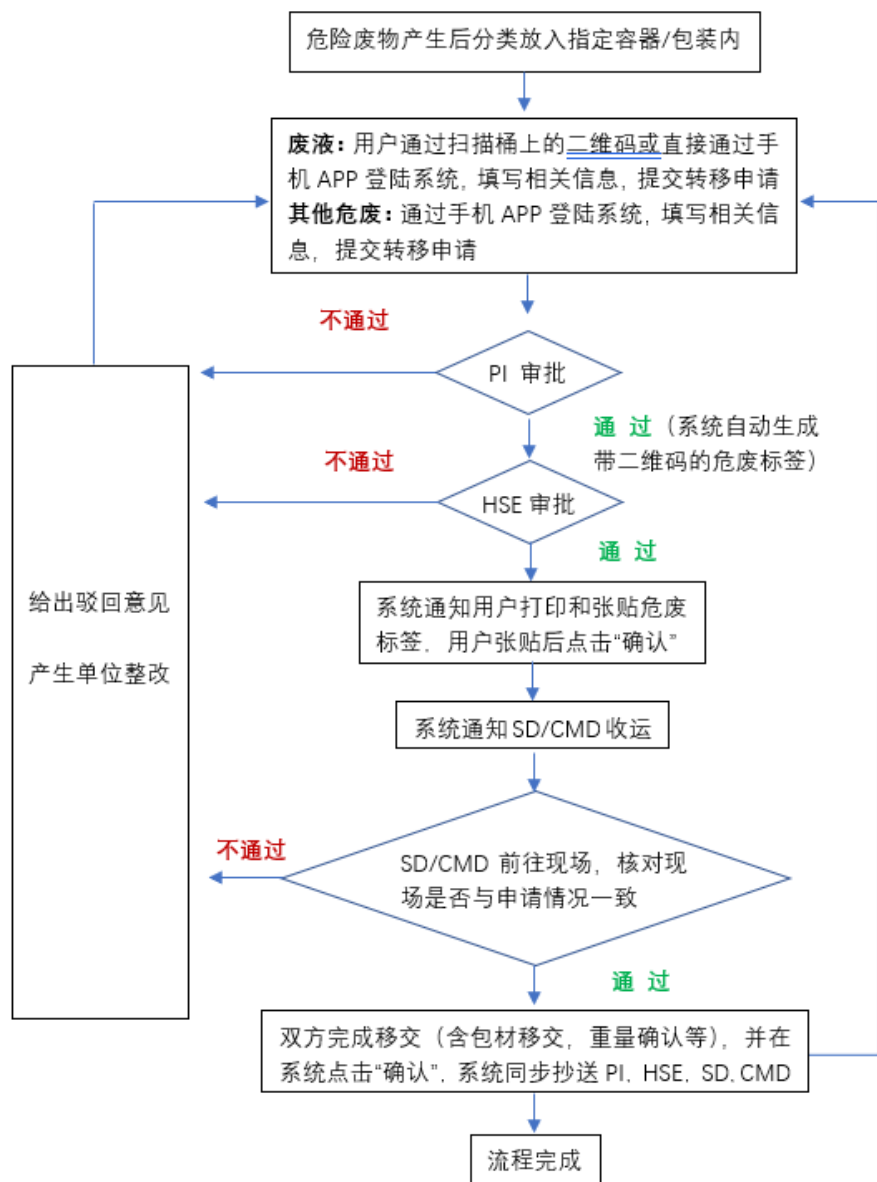


Chemical Waste Collection Procedures

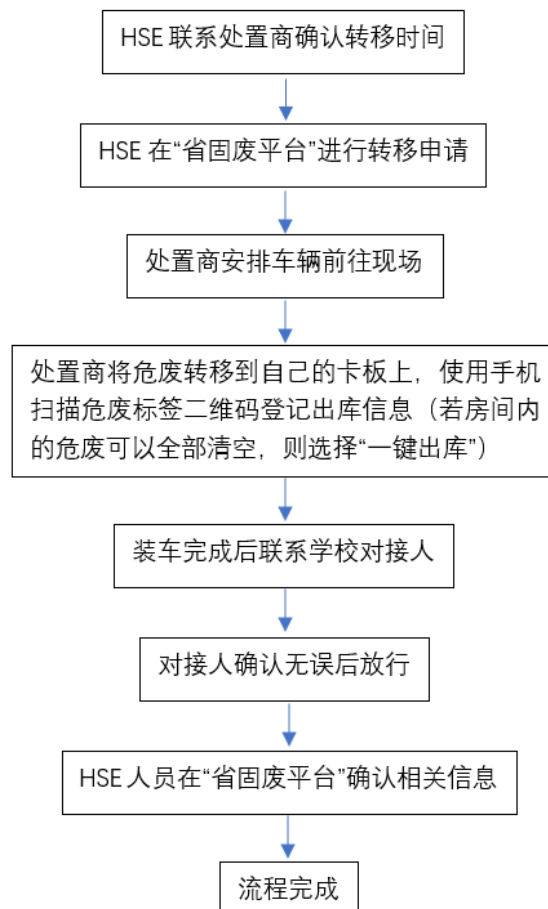
- Use the HSE web system
<https://lsms.hkust-gz.edu.cn> "Request for Chemical Waste Collection"
- HSE offer waste collection service
- Users should make a pickup appointment if a collection site is unattended.

Current Lab Pack Practice

危险废物产生和贮存流程图



危险废物转移流程图



危险废物入库申请（由产生部门人员填写）

一、基本信息

申请人*	自动生成	联系电话*	自动生成
------	------	-------	------

二、危险废物信息

学号*	楼栋*	楼层*	房间号*	危险废物名称*	环保平台备案名称	类别和代码	主要成分*
自动生成	自动生成	自动生成	自动生成	废碱	自动生成	自动生成	xxx
危险情况*	废液桶编号	安全措施	过称重量 (kg)*	容器材质及容量	容器个数*	需要补给的包材种类	需要补给的包材种类数量
易燃	当选择废液相关废物时，该选项为必选项，可通过手机或者扫码废液桶上的二维码实现	自动生成	10kg	若用户不填写，台账上此栏显示“/”	默认是1	废碱桶	1
可手工添加行							

三、上传图片

上传需要转移的危险废物的整体图片*

危险废物入库确认（由SD/CMD人员填写）

一、合规性确认

包装情况*	泄漏情况*	容器顶部与液体表面之前是否保留100mm以上空间	转移的废物情况是否和申请单一致
完好/变形/破损	有泄漏/无泄漏	是/否	一致/不一致

二、入库信息

入库楼栋*	入库楼层*	入库房间号*	经办人*	备注
W3	L2		自动生成	

三、上传图片

不合规情况 (1)	不合规情况 (2)

注：

- 1、表格设计理念参考于：a、危险废物产生/贮存台账 b、危险废物标签 c、合规性要求；
- 2、流程完结后，系统可自动生成标准模板的产生/贮存台账，产生台账的日期和时间以HSE审批时间为结点，贮存台账的日期及时间以SD人员系统确认的时间作为结点。

Information on Chemical Waste Disposal

香港科技大学（广州） 危险废物管理规定

第一章 总 则

第一条 为规范学校危险废物的管理，保护环境，根据《中华人民共和国环境保护法》、《中华人民共和国固体废物污染环境防治法》、《广东省教育厅关于高等学校实验室安全建设与管理规定（修订）》等有关规定，结合学校实际，制定本规定。

第二条 本规定所称的危险废物是指列入国家危险废物名录或者根据国家规定的危险废物鉴别标准和鉴别方法认定的具有危险特性的废物。

第三条 本规定适用于在校内开展教学、科研等各种活动产生危险废物的实验室和相关人员。

第二章 管理与职责

第四条 学校危险废物管理实行学校、各枢纽（学域、中心、所）及直属单位（以下简称二级单位）、项目组（实验室）三级管理体制。

第五条 健康、安全及环境处负责学校实验室危险废物处置的管理工作，主要职责是：

（一）评估并检查相关法律法规的遵守情况，组织制定学校相关管理规章制度和事故应急预案；开展相关宣传、教育和培训等工作。

（二）指导和监督相关单位进行实验室危险废物的分类、收

- Management and responsibilities
- Waste reduction control
- Hazardous waste collection, storage and disposal
- Emergency response and accountability

Incidents & lessons learned

Case 1: Serious Injury

- Lab user wanted to dispose of several mL of conc nitric acid
- An empty reagent bottle intended to be used as intermediate container for non-halogenated solvent was used
- An explosion occurred several minutes after transfer and closing of the cap
- Serious injury to one hand of the user requiring surgery and hospitalization





Case 2: Serious Damage

- IC is regularly etched with conc acid, then wash with excessive solvent
- Mixed waste collected in a non-halogenated solvent
- Lab user added a large quantity of used acid into same container
- Container exploded causing extensive damage to cabinet and rest of the lab







Case 3: Uncontrolled Release

- Lab user macerate silicon plastic with conc sulfuric acid
- Waste was put into spent acid container with other acids including nitric
- Fume was observed, lab user capped the container and left
- Container later ruptured shooting waste onto ceiling and surrounding areas

Lessons Learned

- Oxidizing (e.g. nitric) acid mixed with organics is the most common cause of chemical waste incidents
- Clean intermediate waste container thoroughly, if not sure, clean again
- Plan beforehand, especially for non-routine operation, may need to initiate a new waste stream

Lessons Learned

- Dilute conc acid (10 times) before transfer into waste container
- If fuming is observed after waste transfer, move the container into a running fume hood or open area
- NEVER CAP container with ongoing gas generating reaction inside
- Perform compatibility test, NEVER mix incompatible waste!

Waste minimization

Waste Minimization

Users are encouraged to:

- Estimate usage rate carefully.
- Buy in container sizes appropriate to actual use. (Money savings from bulk purchases are easily consumed by the cost of waste disposal.)
- Reduce inventory to a minimum: (rotate old containers to front of shelf, review stock before purchase, etc.).

Waste Minimization

- Waste disposal costs are increasing.
- Consider trading chemicals with other researchers before disposal.

Co-contaminated Wastes

- Chemical/Biological
 - Disinfect then treat as chemical waste
- Chemical/Radioactive
 - Treat as radioactive waste
- Biological/Radioactive
 - Chemically disinfect then treat as radioactive waste
- Do not autoclave waste with volatile organics or radioisotopes

Integrated laboratory safety management system

<https://lsms.hkust-gz.edu.cn>

实验室安全综合管理平台

夏天

★ 待办事项

★ 已办事项

★ 办结事项

待办事项

已办事项 ×

新建采购申请

办结事项

化学品管理 > 已办事项

名称或编号

查询

☐	编号	状态	创建时间	创建人	更新时间	操作
☐	采购申请P0099	待HSE初审	2022/10/20 15:10:44	夏天	2022/10/20 15:10:21	查看详情

Total 1

10/page

<1>Go to1

Purposes

- A “cradle to grave” approach to track the usage of hazardous materials on campus
- A centralized system to assist University management and users to better manage storage and use of hazardous materials
- A platform for centralized purchasing and/or delivery of hazardous materials
- A crucial compliance tool for the regulations

Features Highlights

- Allow different levels of access authority
- Radioisotopes, legally controlled substances, and chemical warfare agents are tracked. Confirmation by lab supervisor is required for transfer or disposal
- Time-sensitive chemicals such as peroxidizables, picric acid, are flagged to remind user for checking
- Allow searching of specific types of chemicals, which helps regulatory compliance

What Should Users Do?

- Make sure chemicals not purchased thru HSE system are entered into inventory and barcode affixed to container
- Check inventory (own lab and others) before buying chemicals
- Check out empty reagent bottles to keep inventory updated
- Make sure stock-taking is done at least once a year

Emergency Procedures

Information on Campus Emergency Response

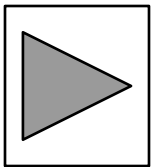
香港科技大学（广州）
紧急警报及应急程序指引

2022年9月

- Important phone numbers
- Emergency preparedness
- Response procedures for various incidents
- Bilingual text

Plan for Emergencies

- What are emergencies which could happen?
- What systems will you need to alert you to an emergency situation?
- What equipment and supplies will you need in the event of an emergency?
- What training will you need?
- Is it safe to work alone in the area?
- What is the phone number for emergency response assistance?

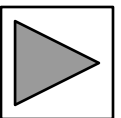
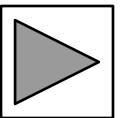


The Basic Responses for Emergencies (I)

- Notify others in the lab 
- Evacuate and isolate the area
- Activate Emergency Ventilation if necessary 
- DO NOT activate EV if there is a fire
- Call Security Control Centre at 88330110
- Provide rescue only if you are trained and have proper protective equipment
- Provide first aid assistance

The Basic Responses for Emergencies (II)

- For chemical splash in eyes or on skin:
 - Use eyewash and shower to rinse area for 15 minutes
 - Remove contaminated clothing in the shower
 - Get medical attention
- For small spills, conduct clean up if:
 - Materials is not highly toxic
 - You have supplies
 - You know what you are doing



注 CAUTION 意

HYDROFLUORIC
ACID

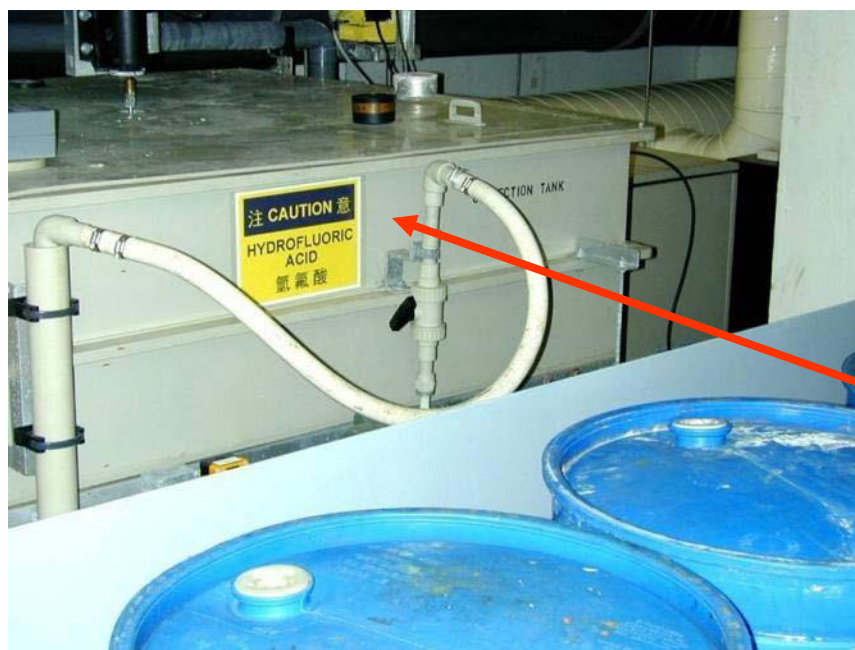
氫 氟 酸

Hydrofluoric Acid

Concentration	Health Hazard
>50%	• <i>Immediate burns</i> • <i>Rapid destruction of tissue/pain</i>
20-50%	• <i>Delayed burns (1-8 hrs)</i>
<20%	• <i>Painful reddening may be delayed up to 24 hrs</i>
As low as 2%	• <i>Delayed skin burns</i> • <i>Necrosis/slow healing</i>



HF waste
container



Hydrofluoric
acid storage
tank

Hydrofluoric Acid Injury

- For low conc exposure, onset of symptoms is often slow and unnoticed
- Damage is often prolonged: for example, contamination around the fingernails may lead to a chronic painful condition and ultimately to amputation of the finger
- Healing is usually slow

Prepare for Hydrofluoric Acid First Aid

- All potential workers and supervisor should be trained in first aid care for HF burns.
- First aid actions should be planned before beginning work with HF.
- Calcium gluconate gel should be readily accessible in areas where HF exposure potential exists.



Hydrofluoric Acid First Aid

- 1.Immediately shower with large quantities of water (within seconds after contact or suspected contact) - and completely remove all clothing while in the shower (gloves removed last).
- 2.Flush the skin thoroughly with water for 5 minutes - 5 minutes is sufficient - more time will delay treatment.

Hydrofluoric Acid First Aid

3. Apply calcium gluconate gel (2.5%) at the burn site or area of contamination by rubbing it continuously - wear impervious gloves.
4. Do NOT use calcium gluconate gel for eyes
5. The person should be examined & treated by a physician as soon as possible.

Information Sources

Chemical Information Sources

- Material Safety Data Sheet (MSDS) associated with each chemical (On-line CCINFODISC and Sigma-Aldrich MSDS Databases)
- Chemical Dictionaries and other references
- Chemical Catalogs
- Labels on reagent bottles



Labels on Reagent Bottles



Harmful



Harmful and Oxidizing

Materials Safety Data Sheet

- A Material Safety Data Sheet (MSDS) is designed to provide both workers and emergency personnel with the proper procedures for handling or working with a particular substance.

Materials Safety Data Sheet

MSDS's include the following information:

- Physical Data
- Risk Phrase, Safety Phrase
- Toxicity
- Health Effects
- First Aid
- Reactivity
- Storage
- Disposal
- Protective Equipment
- Leak / Spill Procedure

On-Line Chemical Safety Information

https://www.sigmaaldrich.cn/CN/zh?utm_campaign=SIAL%20Branded%20-%20China&utm_medium=cpc&utm_source=so&utm_content=Sigma&utm_term=sigma

Reference

- 《中华人民共和国固体废物污染环境防治法》（2020年修订版）
- 《中华人民共和国动物防疫法》（2021年修订版）
- 《中华人民共和国传染病防治法》（2013年修订版）
- 《危险废物贮存污染控制标准》（GB 18597-2001）
- 《危险废物收集贮存运输技术规范》(HJ 2025-2012)
- 《医疗废物管理条例》（2011修订版）
- 《国家危险废物名录》（2021年版）
- 《广州市生活垃圾分类管理条例》（2018年版）
- 《广东省实验室危险废物环境管理技术指南（试行）》(2021年版)
- 《广州市危险废物规范化管理工作指引》(2019年版)
- 《国家实验动物管理条例》（2017年修订版）
- 《电离辐射防护和辐射源安全基本标准》（GB 18871-2002）
- 《城市污水再生利用 城市杂用水水质》（GB/T 18920-2020）
- 广东省《污水综合排放标准》（DB 4426-2001）
- 《环境空气质量标准》（GB 3095-2012）
- 《工业企业设计卫生标准》（TJ 36-79）
- 《环境影响评价技术导则大气环境》（HJ 2.2-2018）
- 广东省《大气污染物排放限值》（DB 4427-2001）
- 广东省《家具制造行业挥发性有机化合物排放标准》（DB 44814-2010）
- 《恶臭污染物排放标准》（GB 14554-93）

~End of Series~

Thank you