

Midwest Emerging Technologies Public Health and Safety Training (METPHAST) Program

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Video List:

Module 1: Occupational Hygiene Principles



The objectives for this module are that, by the end, learners should be able to (1) classify the types of hazards workers face, (2) define "exposure" and related terms, (3) list the routes by which workers can be exposed to hazardous agents, and (4) describe the occupational hygiene framework of anticipating, recognizing, evaluating, and controlling workplace hazards.

<https://www.youtube.com/watch?v=NsVnEFVYiik>

Module 2: Risk Assessment Principles



The objectives for this module are that, by the end, learners should be able to (1) describe how severity of occupational hazards is expressed, (2) illustrate how hazard severity and exposure are combined to characterize risk, (3) identify strategies to assess worker exposures to potential hazards, (4) explain approaches to managing risk once it has been characterized, and (5) recognize uncertainties associated with risk management.

<https://www.youtube.com/watch?v=ZtmC8gia44Q>

Module 3: Occupational Health and Safety Regulations and Guidelines



The objectives for this module are that, by the end, learners should be able to (1) describe the agencies and organizations that regulate occupational health and safety, (2) locate regulations and guidelines relevant to a particular workplace hazard, and (3) apply occupational exposure limits to assess exposure risks.

https://www.youtube.com/watch?v=RAzzBCCsi6I&list=PLuqUUFD3xt8QTjsRS4buePvQF_xtLTqr3&index=3

Module 4: Introduction to Aerosols



The objectives for this module are that, by the end, learners should be able to (1) define "aerosol" and related terms, (2) interpret summary properties of particle size distributions, (3) predict the relationship between aerosol source and particle size, and (4) describe approaches to measuring airborne particles

https://www.youtube.com/watchv=Blvos4ppeNM&list=PLuqUUFD3xt8QTjsRS4buePvQF_xtLTqr3&index=4

Module 5: Importance of Particle Size



The objectives for this module are that, by the end, learners should be able to (1) describe how forces that cause a particle to move in air depend strongly on particle size, (2) predict the behavior of a particle based on size, (3) relate particle size to adverse health effects, and (4) explain why personal samplers use health-relevant size criteria. Animations were created by Derek Siebert and Steve Tomblin, Application Development, ITS, The University of Iowa.

https://www.youtube.com/watchv=t_RSx_Ykfbw&list=PLuqUUFD3xt8QTjsRS4buePvQF_xtLTqr3&index=5

Module 6: Introduction to Nanotechnology



The objectives for this module are that, by the end, learners should be able to (1) define "nanotechnology" and related terms, (2) describe several notable nanomaterials, (3) explain how several notable nanomaterials are used, and (4) illustrate the lifecycle of several nanomaterial products.

<https://www.youtube.com/watch?v=Sd3jaxue4Hc&list=PLuqUUFD3xt8SHCZcOPMBWgoRe1vo4lvc>

Module 7: Exposures to Raw Nanomaterials



The objectives for this module are that, by the end, learners should be able to (1) list types of workplaces where nanomaterial exposures can occur, (2) identify potential exposure routes and risks related to each type of workplace, (3) describe tasks and processes that lead to exposure risks across workplaces, and (4) relate exposure potential to production process.

<https://www.youtube.com/watch?v=pXQ6OL2Yd48&list=PLuqUUFD3xt8SHCZcOPMBWgoRe1vo4lvc&index=2>

Module 8: Exposures to Nanomaterials in Products



The objectives for this module are that, by the end, learners should be able to (1) classify products based on how nanomaterials have been incorporated, (2) describe how workers may be exposed to nanomaterials in products, (3) identify workers at greater exposure risk, and (4) categorize routes by which the general public may be exposed to nanomaterials in products.

<https://www.youtube.com/watch?v=UNPGSAUto88&list=PLuqUUFD3xt8SHCZcOPMBWgoRe1vo4lvc&index=3>

Module 9: Nanomaterials in the Environment



The objectives for this module are that, by the end, learners should be able to (1) identify sources for engineered nanomaterials in the natural environment, (2) describe potential ecological effects of nanomaterials, (3) predict pathways for exposure of the public to nanomaterials, and (4) assess human exposure to engineered nanomaterials in the environment.

<https://www.youtube.com/watch?v=FFSwP3-UJAs&list=PLuqUUFD3xt8SHC>

[ZcOPMBWgoRe1vo4lvc&index=4](https://www.youtube.com/watch?v=FFSwP3-UJAs&list=PLuqUUFD3xt8SHC)

Module 10: Nanoparticle Health Effects



The objectives for this module are that, by the end, learners should be able to (1) predict the role of particle properties on health effects, (2) describe the kinds of health studies that have been conducted related to nanoparticle exposures, (3) identify potential health effects from inhalation and dermal exposures to nanomaterials, and (4) recognize uncertainties in health studies as they apply to human health risks.

<https://www.youtube.com/watch?v=xrcSjTFhf8U&list=PLuqUUFD3xt8SHC>

[ZcOPMBWgoRe1vo4lvc&index=5](https://www.youtube.com/watch?v=xrcSjTFhf8U&list=PLuqUUFD3xt8SHC)

Module 11: Sampling Instrumentation for Airborne Nanomaterials



The objectives for this module are that, by the end, learners should be able to (1) categorize sampling instruments based on size resolution, time resolution, and concentration metric, (2) describe operating principles of different sampling instruments, (3) list methods used to analyze nanomaterial samples, and (4) interpret output from different instruments. Animations were created by Derek Siebert, Application Development, ITS, The University of Iowa

https://www.youtube.com/watch?v=egPKS_92MMU&list=PLuqUUFD3xt8SHC

[ZcOPMBWgoRe1vo4lvc&index=6](https://www.youtube.com/watch?v=egPKS_92MMU&list=PLuqUUFD3xt8SHC)

Module 12: Sampling Strategies for Airborne Nanomaterials



The objectives for this module are that, by the end, learners should be able to (1) summarize the steps involved in assessing exposures to nanomaterials in the workplace, (2) describe ways to anticipate and recognize hazards, (3) identify issues specific to sampling airborne nanomaterials, and (4) select the right instrument and analytical methods to meet the sampling objective.

https://www.youtube.com/watch?v=0Jz_Nc-AMIE&list=PLuqUUFD3xt8SHC

[ZcOPMBWgoRe1vo4lvc&index=7](https://www.youtube.com/watch?v=0Jz_Nc-AMIE&list=PLuqUUFD3xt8SHC)

Module 13: Assessing Dermal Exposures to Nanomaterials



The objectives for this module are that, by the end, learners should be able to (1) prioritize nanomaterial exposures based on route, (2) recognize determinants of dermal exposures to nanomaterials, (3) describe qualitative and quantitative approaches to assessing dermal exposures, and (4) identify sampling and analytical methods to assess dermal exposures to nanomaterials.

<https://www.youtube.com/watch?v=NTSi3PFh6YM&list=PLuqUUFD3xt8SHC>

[ZcOPMBWgoRe1vo4lvc&index=8](https://www.youtube.com/watch?v=NTSi3PFh6YM&list=PLuqUUFD3xt8SHC)

Module 14: Standards and Regulations Pertinent to Nanomaterials



The objectives for this module are that, by the end, learners should be able to (1) show how occupational exposure limits are established and distinguish among types of occupational exposure limits, (2) show how occupational exposure bands or provisional exposure limits can be set in the absence of reliable toxicological evidence, and (3) locate relevant occupational exposure limits for nanomaterials and select an appropriate benchmark exposure level for a nanomaterial.

<https://www.youtube.com/watch?v=Z1ZoTP7NNEk&list=PLuqUUFD3xt8SHCZcOPMBWgoRe1vo4lvc&index=9>

Module 15: Work Practice & Administrative Controls and PPE for Nanomaterials



The objectives for this module are that, by the end, learners should be able to (1) choose control options in the context of the hierarchy of control, (2) modify work practices to reduce exposures, (3) recommend administrative control measures, and (4) select appropriate personal protective equipment.

<https://www.youtube.com/watch?v=4DaKnVxKlik&list=PLuqUUFD3xt8SHCZcOPMBWgoRe1vo4lvc&index=10>

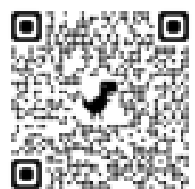
Module 16: Engineering Controls for Nanomaterials



The objectives for this module are that, by the end, learners should be able to (1) describe how engineering fits within the broader hierarchy of controls, (2) explain operating principles of different types of engineering controls, (3) relate engineering controls to specific nanotechnology processes, and (4) identify ways to evaluate engineering controls. Animations were created by Derek Siebert, Application Development, ITS, The University of Iowa.

<https://www.youtube.com/watch?v=ZAkwskhjmjw&list=PLuqUUFD3xt8SHCZcOPMBWgoRe1vo4lvc&index=11>

Module 17: Air Cleaners for Nanoparticles



The objectives for this module are that, by the end, learners should be able to (1) list the main technologies used to remove particles from moving air, (2) identify air cleaning technologies that are effective for nanoparticles, (3) describe the mechanisms by which fibrous air filters capture particles, and (4) explain why fibrous air filters can capture nanoparticles with high efficiency.

<https://www.youtube.com/watch?v=TJVxJCBesNs&list=PLuqUUFD3xt8SHCZcOPMBWgoRe1vo4lvc&index=12>

Module 18 (Special Situations and Affiliated Hazards for Nanomaterials)



The objectives for this module are that, by the end, learners should be able to (1) identify high risk fire/explosion conditions for nanomaterials, (2) select appropriate clean up procedures in nanomaterial workplaces, (3) recognize physical agent exposure risks affiliated with nanomaterial production, and (4) recognize non-particulate chemical exposure risks affiliated with nanomaterial production.

https://www.youtube.com/watch?v=m_GWT6RTxJk&list=PLuqUUFD3xt8SHC

[ZcOPMBWgoRe1vo4lvc&index=13](https://www.youtube.com/watch?v=m_GWT6RTxJk&list=PLuqUUFD3xt8SHC)

Module 19 (Disposal of Nanomaterials)



The objectives for this module are that, by the end, learners should be able to (1) describe how to dispose of waste streams of nanomaterials properly, (2) recognize how workers may be exposed to nanomaterials when they are being disposed of, and (3) give examples of pathways and sinks for nanomaterials in the environment after their disposal.

<https://www.youtube.com/watch?v=EpWEXxkGNmw&list=PLuqUUFD3xt8SHC>

[ZcOPMBWgoRe1vo4lvc&index=14](https://www.youtube.com/watch?v=EpWEXxkGNmw&list=PLuqUUFD3xt8SHC)

Introduction to Aerosol Sampling



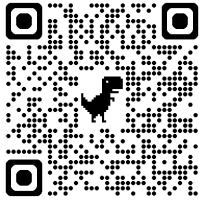
<https://www.youtube.com/watch?v=DwxvYiOxA4A&list=PLuqUUFD3xt8QQtAawYSWxRSi4FfJr5ES3>

Representative Particle Sampling



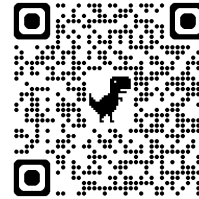
https://www.youtube.com/watch?v=SUgh_R70XbM&list=PLuqUUFD3xt8QQtAawYSWxRSi4FfJr5ES3&index=2

Calibrating Air Sampling Equipment



<https://www.youtube.com/watch?v=3XHGRNaI24&list=PLuqUUFD3xt8QQtAawYSWxRSi4FfJr5ES3&index=3>

Aerosol Instruments: Manual, Integrated by Size



<https://www.youtube.com/watch?v=IdYVUSki1w4&list=PLuqUUFD3xt8QQtAawYSWxRSi4FfJr5ES3&index=4>

Particle Collection in Filters



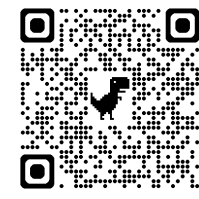
<https://www.youtube.com/watch?v=f62tNfKWb38&list=PLuqUUFD3xt8QQtAawYSWxRSi4FfJr5ES3&index=5>

Size-Selective Particle Sampling



<https://www.youtube.com/watch?v=APSZapUZWBE&list=PLuqUUFD3xt8QQtAawYSWxRSi4FfJr5ES3&index=6>

Inhalable Samplers



<https://www.youtube.com/watch?v=4hM9PckVia4&list=PLuqUUFD3xt8QQtAawYSWxRSi4FfJr5ES3&index=7>

Cyclones for Air Sampling



<https://www.youtube.com/watch?v=5aEpfa6QZzU&list=PLuqUUFD3xt8QQtAawYSWxRSi4FfJr5ES3&index=8>

Personal Sampling Demonstration



This video is a companion to the interactive activity available at <http://www.metphast.umn.edu/>. It shows the steps in calibrating personal sampling pumps, positioning a personal aerosol sampler on a worker, and preparing the sample for submission to an analytical laboratory.

<https://www.youtube.com/watch?v=XZI0NPZgOcs&list=PLuqUUFD3xt8QQtAawYSWxRSi4FfJr5ES3&index=9>

Aerosol Instruments: Manual, Size Resolved



<https://www.youtube.com/watch?v=t0SHQeFLVrU&list=PLuqUUFD3xt8QQtAawYSWxRSi4FfJr5ES3&index=10>

Electrostatic Precipitator for Air Sampling



<https://www.youtube.com/watch?v=6sfmGTcRPEc&list=PLuqUUFD3xt8QQtAawYSWxRSi4FfJr5ES3&index=11>

Size-Integrated Direct-Reading Instruments



<https://www.youtube.com/watch?v=A6A8fCvLNUE&list=PLuqUUFD3xt8QQtAawYSWxRSi4FfJr5ES3&index=12>

Using the DustTrak Aerosol Monitor



<https://www.youtube.com/watch?v=WPgaHKway5k&list=PLuqUUFD3xt8QQtAawYSWxRSi4FfJr5ES3&index=13>

Size-Resolved Direct-Reading Instruments



<https://www.youtube.com/watch?v=wBHlriDvBSM&list=PLuqUUFD3xt8QQtAawYSWxRSi4FfJr5ES3&index=14>

Aerodynamic Particle Sizer



<https://www.youtube.com/watch?v=00yAA2ulMDk&list=PLuqUUFD3xt8QQtAawYSWxRSi4FfJr5ES3&index=15>

Low-Cost Aerosol Sensors



<https://www.youtube.com/watch?v=PBkcJbgyG6I&list=PLuqUUFD3xt8QQtAawYSWxRSi4FfJr5ES3&index=16>

Hands-on Activity Demonstration: Exposure and Dose



This hands-on activity introduces students to the concepts of exposure to a contaminant in the environment, and how that exposure is related to dose.

<https://www.youtube.com/watch?v=tAuEiVE89hM&list=PLuqUUFD3xt8TriKOdd9fxlpPGmeHDluKE>

Hands-on Activity Demonstration: Dose-Response Curves



Exposure-response or dose-response curves show the relationship between the magnitude of exposure or dose and the likelihood and severity of an adverse health outcome. This activity shows learners the steps needed to create their own exposure- or dose-response curve.

<https://www.youtube.com/watch?v=xSY1Xxu7HJI&list=PLuqUUFD3xt8TriKOdd9fxlpPGmeHDluKE&index=2>

Hands-on Activity Demonstration: Choosing an Occupational Exposure Limit



An occupational exposure limit, or OEL, is the maximum concentration or quantity that is allowed or considered safe for hazardous agents. The purpose of an OEL is to protect workers from excessive exposures that could cause adverse health effects. The objective for this activity is for learners to be able to locate appropriate OELs to assess exposure risks of substances. Learners are given four scenarios for which they must select OELs and compare measured values to the OELs.

<https://www.youtube.com/watch?v=FokinqSFfM&list=PLuqUUFD3xt8TriKOdd9fxlpPGmeHDluKE&index=3>

Hands-on Activity Demonstration: Number, Surface Area, and Mass



This activity shows the relevant contributions of large and small particles to particle number, surface area, and mass measurements.

<https://www.youtube.com/watch?v=jAlvsqwQYSw&list=PLuqUUFD3xt8TriKOdd9fxlpPGmeHDluKE&index=4>

Hands-on Activity Demonstration: Gravitational Settling and Brownian Motion



This activity demonstrates the effect of particle size on gravitational settling and Brownian motion. It shows how different physical processes have greater impact on the motion of particles depending on their size.

<https://www.youtube.com/watch?v=Vmb2fECAsc&list=PLuqUUFD3xt8TriKOdd9fxlpPGmeHDluKE&index=5>

Hands-on Activity Demonstration: Orders of Magnitude



This video demonstrates the Orders of Magnitude hands-on activity developed by the METPHAST Program for learners studying nanotechnology health and safety. The video is intended primarily for instructors, to help them understand how to conduct the activity.

<https://www.youtube.com/watch?v=bXHNxpA0ec&list=PLuqUUFD3xt8TriKOdd9fxlpPGmeHDlu k E&index=6>

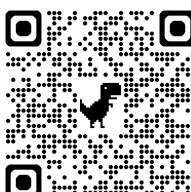
Hands-on Activity Demonstration: Dust Generation



Many nanomaterials are produced as dry powders and have the potential to release particles to the air. The dustiness of a powder correlates to an increased risk of worker exposure and dust explosion hazards in the workplace. Among the factors that influence the dustiness of a powder in an occupational setting are the quantity and size distribution of the powder and the energy input of operations or tasks that stress the powder. The objective of this activity is to measure the influence of types of powders and drop height of a powder on the spread of particles through the air.

https://www.youtube.com/watch?v=ciZOb_XokOU&list=PLuqUUFD3xt8TriKOdd9fxlpPGmeHDlu kE&index=7

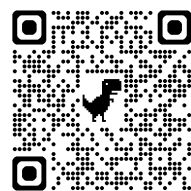
Hands-on Activity Demonstration: Routes of Exposure for Nanomaterials in Products



Releases from engineered nanomaterials (ENMs) may occur throughout the life cycle of ENM-enabled products. The critical points of exposure include production and shipping of ENMs, manufacturing of finished products, use, disposal, and recycling. Exposure may result from direct contact with ENMs particularly during manufacture or from contamination by ENMs in products. The objective of this activity is to illustrate the pathways through which the general public and workers can be exposed to nanomaterials in products.

<https://www.youtube.com/watch?v=2NBi5uUoKWU&list=PLuqUUFD3xt8TriKOdd9fxlpPGmeHDlu kE&index=8>

Hands-on Activity Demonstration: Analytical Approaches for Differentiating Objects



Measuring engineered nanomaterials in the natural environment is complicated by the presence of natural nanoscale materials dispersed within the same media, sometimes with similar elemental composition. However, nanoparticles often possess physiochemical, optical, electrical, and magnetic characteristics that can make them distinguishable from other materials during analyses of environmental samples. Particle size, structure, composition, and solubility are some of the properties that can be used to distinguish ENMs from background materials in a sample. The objective of this activity is to be able to learn more about differentiating materials using both non-destructive and destructive testing methods.

<https://www.youtube.com/watch?v=ivfDJU3ZLG1&list=PLuqUUFD3xt8TriKOdd9fxlpPGmeHDlu>

[k E&index=9](#)

Hands-on Activity Demonstration: Phagocytosis of Nano-objects



Macrophage clearance is the major means of removing nanofiber particles from the lungs through a process known as phagocytosis. When a macrophage is not able to efficiently phagocytose deposited particles, inflammatory and fibrotic immune responses are produced. This frustrated phagocytosis, which produces toxic effects on cells, has been shown to be associated with the length of deposited particles. The objective of this activity is for learners to be able to demonstrate the effects of particle size and shape on the uptake of nanoparticles by a macrophage.

<https://www.youtube.com/watch?v=LbiGUefvsMU&list=PLuqUUFD3xt8TriKOdd9fxlpPGmeHDlu kE&index=10>

Hands-on Activity Demonstration: Particle Size from Microscopy Images



Size is one of the fundamental properties of an aerosol particle. To measure nanoparticle size distributions, samples can be collected with air filters and battery-operated pumps. The filter may then be viewed in a Scanning Electron Microscope (SEM). Using a scale on the SEM image, the sizes of nanoparticles can be determined. In this activity, learners measure the sizes of particles in SEM images and create graphs of particle size distributions.

https://www.youtube.com/watch?v=Q6Qn06_pnkQ&list=PLuqUUFD3xt8TriKOdd9fxlpPGmeHDlu kE&index=11

Hands-on Activity Demonstration: Instrument Response as a Function of Particle Size



Health effects from particles may be associated with their mass, surface area, or number concentrations. Direct-reading instruments can be used to measure these concentrations. However, the response of an instrument will depend on the sensitivity of the instrument to different sizes of particles. The objective of this activity is to be able to predict the responses of various direct-reading instruments to different particle sources.

<https://www.youtube.com/watch?v=mICdjP0Ttzg&list=PLuqUUFD3xt8TriKOdd9fxlpPGmeHDlu kE&index=12>

Hands-on Activity Demonstration: Dermal Exposures from Powder Handling



Dermal exposures pose risks for those working with nanomaterials. These exposures can potentially occur during tasks such as bagging, weighing, mixing, transferring, maintenance, or cleaning. Nanomaterials also occur in a variety of physical states, i.e. cream- or gel-based, solvent-based, powders, and capsules, which can contaminate work surfaces and increase the risk of cross-contamination. The objective of this activity is to be able to recognize powder handling tasks that may lead to dermal exposures.

<https://www.youtube.com/watch?v=Jytkfd7LM30&list=PLuqUUFD3xt8TriKOdd9fxlpPGmeHDlu kE&index=13>

Hands-on Activity Demonstration: Identifying Occupational Exposure Bands



Occupational exposure bands are used to swiftly assign occupational exposure limits to emerging workplace chemicals like nanomaterials based on the toxicological profile of the materials and their constituents. Exposure banding evaluates the degree of severity of hazards stated in safety data sheets and labels in classifying, categorizing, and establishing limits for emerging chemicals. The objective of this activity is for participants to be able to choose occupational exposure bands for nanomaterials.

<https://www.youtube.com/watch?v=29PJtotEyFU&list=PLuqUUFD3xt8TriKOdd9fxlpPGmeHDlu k E&index=14>

Hands-on Activity Demonstration: Visualization of Local Exhaust Ventilation Airflows



Local exhaust ventilation (LEV) uses air movement and, in some cases, enclosures to capture pollutants before they escape into the air that workers breathe. At a minimum, LEV systems include a hood to draw contaminated air into the ventilation system, duct to convey the contaminated air, and a fan to move the air. The objective of this activity is to use a smoke generator to visualize airflow patterns to understand how different types of LEV hoods work to capture contaminants.

<https://www.youtube.com/watch?v=l3u1pXrtRMc&list=PLuqUUFD3xt8TriKOdd9fxlpPGmeHDlu k E&index=15>

Hands-on Activity Demonstration: Selection and Donning of Respirators



Respiratory protection is a type of personal protective equipment (PPE) that is fundamental to occupational hygiene practice. The objectives for this activity are for learners to be able to (a) choose a type of respirator suitable for use in an exposed environment, and (b) don and check the fit for a filtering facepiece respirator.

<https://www.youtube.com/watch?v=n45HWMj9FEQ&list=PLuqUUFD3xt8TriKOdd9fxlpPGmeHDlu k E&index=16>

Hands-on Activity Demonstration: Hazard Mapping to Identify a Source



Sources that create nanoparticle aerosols can be difficult to recognize because the airborne particles are too small to be seen. One way to identify particle sources is to use aerosol instruments to create a color-coded map of particle concentrations, commonly referred to as a hazard map. This activity uses noise measurements to demonstrate a hazard mapping technique and how to use an instrument to obtain measurements that will determine the spatial distribution of a hazard.

<https://www.youtube.com/watch?v=qdofkA9nYpo&list=PLuqUUFD3xt8TriKOdd9fxlpPGmeHDlu k E&index=17>

Introducing E-Waste: Dr. Diana Ceballos Interview (Part 1)

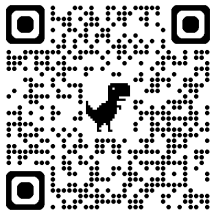


Dr. Diana Ceballos was interviewed for the METPHAST Program about electronic waste, also referred to as e-waste. At the time of the interview, Dr. Ceballos was a faculty member at the Boston University School of Public Health. She is now a faculty member at the University of Washington School of Public Health. The interview was organized and the video processed by Dr. Peter Raynor and Master of Science student Dadee Saye of the University of Minnesota School of Public Health. Questions in Part 1 of the interview include:

What is e-waste? What are some common sources of e-waste? Where does our e-waste go? What environmental health concerns arise during disposal of e-waste? How can workers be exposed to e-waste? What are some common health hazards associated with e-waste? Is the processing of e-waste an environmental justice issue?

https://www.youtube.com/watch?v=4GOh_QxTE6Q&list=PLuqUUFD3xt8R05nSG_fWK85UqZKmpQ7cS&index=1

Introducing E-Waste: Dr. Diana Ceballos Interview (Part 2)



Dr. Diana Ceballos was interviewed for the METPHAST Program about electronic waste, also referred to as e-waste. At the time of the interview, Dr. Ceballos was a faculty member at the Boston University School of Public Health. She is now a faculty member at the University of Washington School of Public Health. The interview was organized and the video processed by Dr. Peter Raynor and Master of Science student Dadee Saye of the University of Minnesota School of Public Health.

Questions in Part 2 of the interview include: How do you assess worker exposure to the components of e-waste? Are high exposures common? How can the hierarchy of controls be applied to manage e-waste exposure? How does mobile e-waste shredding work? What are the advantages, disadvantages and health effects associated with mobile e-waste shredding? Do you think we will see lower worker exposures to e-waste components in the future?

https://www.youtube.com/watch?v=HXKeOtf9w8w&list=PLuqUUFD3xt8R05nSG_fWK85UqZKm pQ7cS&index=2

Hazards in Laboratories



https://www.youtube.com/watch?v=XrOTqFcCmo0&list=PLuqUUFD3xt8R05nSG_fWK85UqZKmpQ7cS&index=3

Nanoparticle Synthesis Safety Measures Part 1



https://www.youtube.com/watch?v=ahhnCQtCip0&list=PLuqUUFD3xt8R05nSG_fWK85UqZKm_pQ7cS&index=4

Emergency Equipment in the Nano Fabrication Lab



https://www.youtube.com/watch?v=dfQWXXuQbtI&list=PLuqUUFD3xt8R05nSG_fWK85UqZKm_pQ7cS&index=5

Occupational Hygiene Framework



https://www.youtube.com/watch?v=RgLmPDIS4FU&list=PLuqUUFD3xt8R05nSG_fWK85UqZKmpQ7cS&index=6

Anticipating & Recognizing Hazards



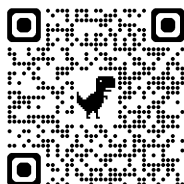
https://www.youtube.com/watch?v=x7CEskXd0JA&list=PLuqUUFD3xt8R05nSG_fWK85UqZKm_pQ7cS&index=7

Exposure Assessment Strategy



https://www.youtube.com/watch?v=UN2sAOU5dY&list=PLuqUUFD3xt8R05nSG_fWK85UqZKmpQ7cS&index=8

Composition of Air



https://www.youtube.com/watch?v=ou6ZtYdH7xM&list=PLuqUUFD3xt8R05nSG_fWK85UqZKmpQ7cS&index=9

Humidity



https://www.youtube.com/watch?v=qYaecYubyQ4&list=PLuqUUFD3xt8R05nSG_fWK85UqZKmpQ7cS&index=10

Particle Inertia



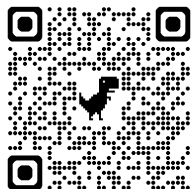
https://www.youtube.com/watch?v=Zh4pw0Lq4x0&list=PLuqUUFD3xt8R05nSG_fWK85UqZKmpQ7cS&index=11

Brownian Motion & Particle Diffusion



https://www.youtube.com/watch?v=UOifsFqy9gE&list=PLuqUUFD3xt8R05nSG_fWK85UqZKmpQ7cS&index=12

Size in Perspective



https://www.youtube.com/watch?v=dZDA1XJQ6OM&list=PLuqUUFD3xt8R05nSG_fWK85UqZKmpQ7cS&index=13

Size-Selective Particle Definitions



https://www.youtube.com/watch?v=9qtmEZOFteE&list=PLuqUUFD3xt8R05nSG_fWK85UqZKmpQ7cS&index=14

Nanotechnology Definitions



https://www.youtube.com/watch?v=vM9vQF_oz_0&list=PLuqUUFD3xt8R05nSG_fWK85UqZKmpQ7cS&index=15

Particle Deposition in Respiratory Tract



https://www.youtube.com/watch?v=6ih3F1S9MZw&list=PLuqUUFD3xt8R05nSG_fWK85UqZKmpQ7cS&index=16

Size-Dependent Particle Deposition



https://www.youtube.com/watch?v=odUjaYRVHc&list=PLuqUUFD3xt8R05nSG_fWK85UqZKmpQ7cS&index=17

Elements of Ventilation Systems



https://www.youtube.com/watch?v=Lys7XUpnbEw&list=PLuqUUFD3xt8R05nSG_fWK85UqZK

[m pQ7cS&index=18](#)

Enclosing Hoods



https://www.youtube.com/watch?v=NwsrgQuuhYQ&list=PLuqUUFD3xt8R05nSG_fWK85UqZK mpQ7cS&index=19

Capturing Hoods and Receiving Hoods



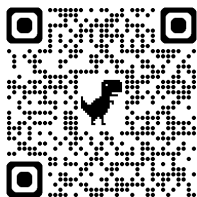
https://www.youtube.com/watch?v=4L9FdSmrD4Q&list=PLuqUUFD3xt8R05nSG_fWK85UqZK mpQ7cS&index=20

Evaluating Nanoparticle Generation during Shredding of Nanocomposites for Recycling



https://www.youtube.com/watch?v=S7tA2Kf7u2c&list=PLuqUUFD3xt8R05nSG_fWK85UqZKmp Q7cS&index=21

Viruses & SARS-CoV-2



https://www.youtube.com/watch?v=rTLtGc4O2qw&list=PLuqUUFD3xt8R05nSG_fWK85UqZK m pQ7cS&index=22

How COVID-19 Spreads



https://www.youtube.com/watch?v=Q1fxg579-kk&list=PLuqUUFD3xt8R05nSG_fWK85UqZKmpQ7cS&index=23

Animation: Dust Control for Angle Grinder



This animation illustrates the effect of local exhaust ventilation incorporated with an angle grinder. Heavy dust levels are present without ventilation; when ventilation is applied, dust concentrations decrease substantially. Created by Derek Siebert, Lead Application Developer, University of Iowa Information Technology Services.

<https://www.youtube.com/watch?v=W8P69Du2y64>

Animation: Bugs Hitting Windshield (New Version)



This animation shows the effect of inertia. Large bugs deviate from air streamlines flowing around a car and impact on the windshield; small bugs do not. The behavior of large and small aerosol particles is analogous. Created by Derek Siebert, Lead Application Developer, University of Iowa Information Technology Services.

<https://www.youtube.com/watch?v=sTHhnpI0KBo>