# Environmental and IH Considerations in Nanomaterial Production and Use

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# NanoMaterials – What *are* the EHS Issues??

- Nanotechnology field rapidly developing.
- Knowledge on potential adverse EHS effects lagging behind commercial development.
- Still lots of “speculation” on EHS issues – testing results beginning to come in.

# NanoMaterials – What *are* the EHS Issues??

- Questions concerning:
  - toxicity, persistence, bioaccumulation, fate and transport throughout the life-cycle.
  - *desired* commercial properties might have *undesirable* impacts on workers and environment.

# NanoMaterials – What are the Worker Exposure Issues??

- **Inhalation:**
  - Nano-dust may deposit in deep lung – may lead to pulmonary disease.
  - Certain nanoparticles may cross nasal mucosa – possible pathway to brain.
  - Greater surface area ⟶ greater health-risk.
- **Dermal:**
  - Obviously important, but no specific issues identified to date.
  - More research required.
- **Ingestion:**
  - Little work to date, but clearly needs to be studied.

# NanoMaterials – What are the Environmental Issues??

- **Environmental concerns/questions:**
  - Are nanomaterials more toxic than their non-nano counterparts?
  - What is their fate in the air?
  - What is their fate in the soil?
  - What is their fate in the water?
  - What is their biodegradation potential?
  - Are they persistent?
  - Will they bioaccumulate?
  - Will they transform in the environment into a more toxic form?

# NanoMaterials –EHS Management "Difficulties"

- Nanomaterials have same *chemical formula* as non-nano counterpart, but are different reactively.
- Current testing, regulations and controls are based on the traditional non-nano materials – applying these to nanomaterials may not be the same.
- Current guidelines may (or may not) be sufficiently protective of human health and environment when it comes to nanomaterials.

# NanoMaterials –Known EHS Management "Difficulties"

- Still many unknowns.
- Current data is limited.
- Significant research underway, but definitive results will take years.
- Public concern.

# NanoMaterials –Recommendations for an EHS Management System

- Establish a formal EHS management guideline for nanomaterials within your organization.
- Guideline needs to address:
  - Worker exposure potential, required PPE, methods for storage and handling, minimizing risk/exposure during production, waste disposal, spill and emergency response.
- Conduct an EHS review prior to beginning nanoparticle project (“management of change”) to address specific issues.

# NanoMaterials –Recommendations for an EHS Management System

- Develop written procedures/guidelines:
  - PPE, engineered controls, respirator requirements;
  - Spill cleanup and disposal;
  - Waste disposal.
- Consider all waste as hazardous or special waste.
- Minimize releases of manufactured nanomaterials into the environment.
- Consider different requirements for nano's in liquid, solid matrix, or dry particulate form.

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PPG • EHS

## Questions?

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