Chemical Information Call-in Candidate: Nano Titanium Dioxide

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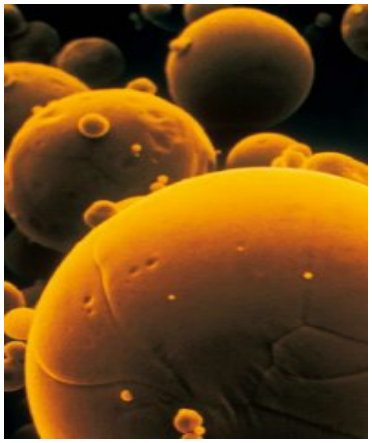
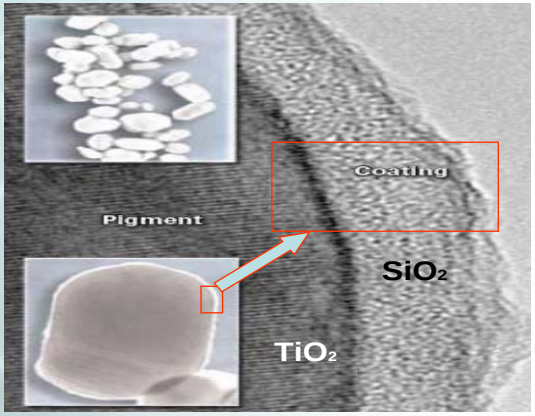
OVERVIEW: Nano Titanium Dioxide

- **Why?**
  - **Expanding Production and Applications**
  - **Health and Environmental Concerns**
- **What Information Gaps?**
  - **Properties, Stability**
  - **Toxicity, Fate in Environment**
  - **Analytical Methods**
- **Who?**
  - **Producers**
  - **Importers**
  - **Researchers**



Nano Titanium dioxide (image: Swiss Re)



Nano Titanium dioxide with surface coating (image:DuPont)

Source: European Commission Nanotechnology. Innovation for tomorrow's world

TiO_2 Applications

- **Paint:** architectural, automotive coatings, appliance coatings, aerospace coatings
- **Cosmetics:** sunscreens, personal care products
- **Hygiene:** Water treatment and purification, anti-bacterial coating, air purification
- **Electronics and energy:** batteries, solar cells
- **Paper:** Coating for opacity
- **Self-cleaning products:** windows, road signs, mirrors
- **Other:** sensors

TiO_2 Production

- **Annual Capacity:**
  - **World-wide: 5,000 tons per year**
  - **California: ?**
- **Final forms:**
  - **Powders**
  - **Solutions**
  - **Thin films**
- **Major Producers:**
  - DuPont, BASF, Evonik, Ishihara, Altair nano, Huntsman, Kronos, Kemira, Kon Corp., Tronox, Nanocompsix, Nano-oxide, Green millennium, MK nano, Advanced Nano, NanoCo, Pilkington, etc.

Properties and Potential Concerns
(experimental results)

- **High refractive index (n>2.5), high reflection**

- **Photocatalytic property**
  - Absorb UV
  - Generate Reactive Oxygen Species (ROS)
    - √ Destroy environmental pollutants
    - √ Sterilize the waste water
    - √ Make self cleaning
    - √ Used in cancer therapy

- **Oxidative stress by ROS can**
  - Similar reactions on the skin or the outmost skin layer
  - DNA damage in cultured human cells *in vitro*
  - Genotoxicity
  - Phototoxicity to skin fibroblasts

TiO_2 Information Gaps

Information gaps:

- Structure: anatase versus rutile form
- Modification: combined with other materials
- Production capacity
- Toxicity and size dependence
- Stability, fate, and transport
- Analytical and other test methods

State-Federal Partnership:

- USEPA
- CA Department of Public Health

Questions for Producers, Importers, Researchers, and Others

- **Analyzing the materials**

  1. What machines and methods do you use to analyze your materials?

  2. What are the properties of your materials? After modification?

- **Monitoring program**

  1. What types of monitoring program are you using in your work place? In air? In water?

- **Use and End of Life**

  1. What is the toxicity when your material is directly contacted with human skin?

  2. What is the weathering, liberation rate of your material into the Environment? Impacts?

- **Production**

  1. What is your actual production amount per year?

Please participate!

Browse our website, offer comments, prepare and submit your responses, meet with us, and call and write!

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