No Small Thing

Getting nanodevelopment right the first time

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ANSI annual meeting
October 11, 2006

ENVIRONMENTAL DEFENSE

finding the ways that work

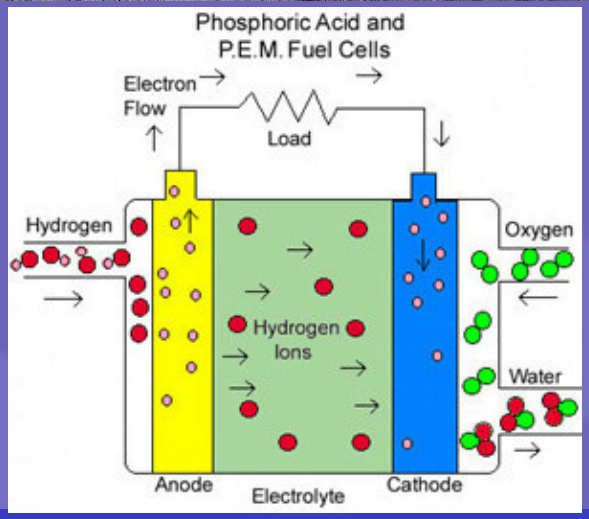
Introduction to Environmental Defense

- Founded in 1967
- 250 scientists, economists, attorneys and other professionals in 9 offices
  - *Most PhDs of any environmental advocacy organization*
- Funded by foundations, benefactors and 400,000 members

We focus on four strategic priorities

Using the strength of partnerships

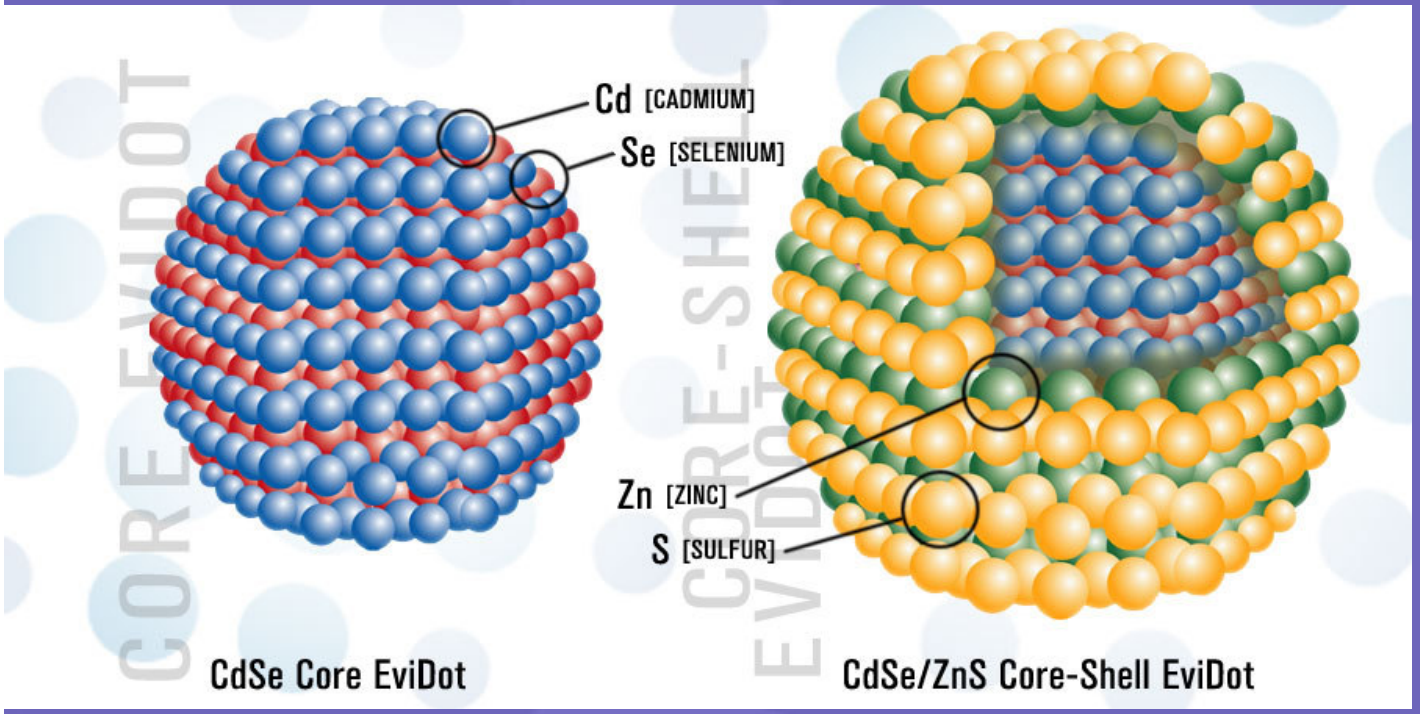
Novel Properties Will Bring Breakthroughs



Nanomaterial safety concerns

- Analogy with insoluble ultrafine particles
- Very few toxicity studies have been performed
- Small size introduces potential risks
- Durability → bioaccumulation?

Why are nanoparticles different?

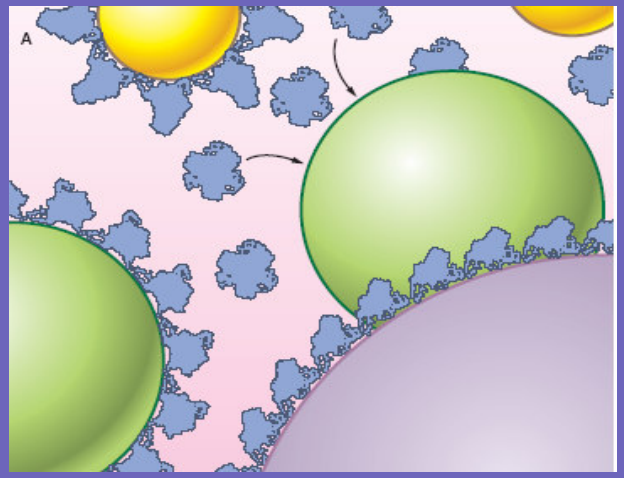


- Size= unique interactions

Unique potential toxicity…

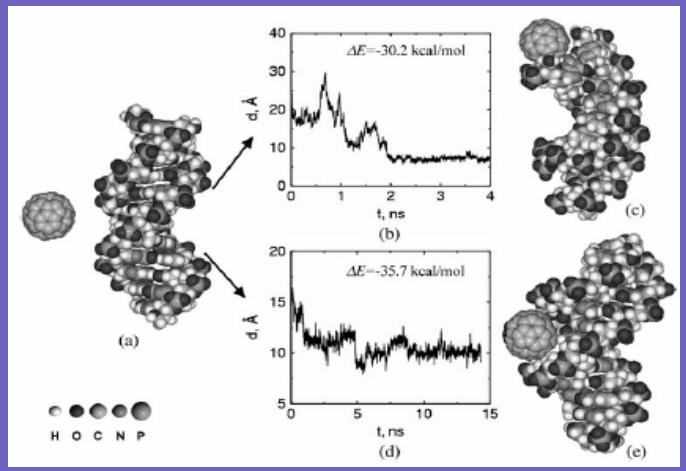
- Surface binding may bend proteins

  Lynch et al (2006) Science STKE March 21



- Buckyballs reconfiguring DNA?

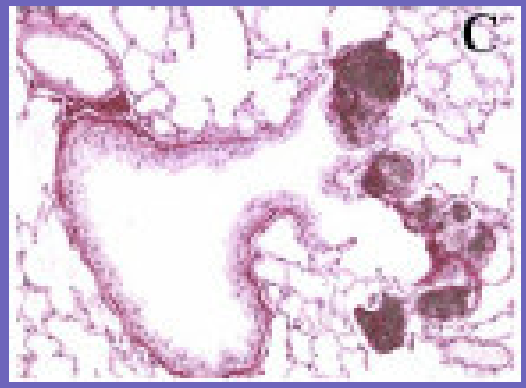
  Zhao et al (2005) Biophys J



...and some early surprises

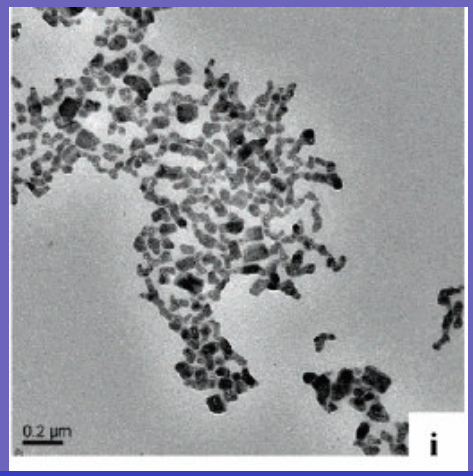
- Nanotubes cause lung scarring with minimal inflammation

Shvedova et al, Am J Physiol Lung Cell Mol Physiol. 2005



- Buckyballs form water-soluble crystals and kill bacteria

Fortner et al., Env Sci and Tech, 2005



Four Keys to Getting Nano Right

I. Significant increase in government risk-research investment

II. Effective regulations

III. Voluntary interim standards

IV. Meaningful stakeholder engagement

Issues in Science & Technology, Summer 2005

Priorities for international standards development

- Nomenclature and terminology
- Methods of characterization
- Elements of characterization for toxicology
- Risk management principles