



Green Nanotechnology Panel

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Green Nanotechnology

Producing nanomaterials and products without harming the environment or human health

Producing nanoproducts that provide solutions to environmental challenges.

Where can Green Nanotechnology be Applied?

Past /Legacy Problems

ZVI for chlorinated hydrocarbon cleanup
bimetallic nanoparticles for remediation

Present Environmental Needs

Water purification
Energy
Waste treatment
Waste minimization

Future protection
Pollution prevention
Cleaner production
Systems approach

Green Nanotechnology

1. Production of nanomaterials and products does not harm the environment

Making NanoX “greenly”

e.g., Green chemistry, Green engineering, DfE, Smart business practices

Using NanoX to “green” production

e.g., Nanomembranes, nanoscaled catalysts

Pollution Prevention Emphasis

2. Products of nano help the environment

Direct Environmental Applications e.g., environmental remediation, sensors

Indirect Environmental Applications e.g., saved energy, reduced waste,

Addressing a full systems approach to nanomaterials and nanoproducts

The Need and Opportunity for Green Nanotechnology

650 Toxic Release Inventory Chemicals

112 Hazardous Air Pollutants

30 Waste Minimization Priority Chemicals



The Nanotechnology legacy need not be the same.

NanoTechnologies for Sustainability, more examples

Dematerialization

Energy Savings--Light Weight nanocomposites

Spun carbon nanotubes to replace copper wiring

Nano-enabled Energy

Solar Cells

Hydrogen

Fuel cells

Thermoelectric

Preventing Pollution

Principles of Green Chemistry

Sustainable synthesis

NEXT STEPS: Policies that offer incentives for developing green nanoproducts and manufacturing techniques

Some Non-technical Questions for Discussion

What can individual scientists and engineers do to promote green nanotechnology?

What choices do individual researchers have?

What legacy do you want to leave for the future—your kids, your planet?