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Vision for WSU Energy Initiative

Make a significant impact in securing the energy future of the nation

Strategy:
- Energy conservation and sustainability
- Consideration of short-, medium-, and long-term approaches to energy generation and delivery
- Implication and impact of energy choices
- Outreach and public awareness

Strengths:
- Integration of engineering and architecture
- Agriculture
- Bioenergy initiative
- Extension
- Nanomaterials
- Socio-economic/cultural implications
- Nuclear (policy and science)

"Energy is the single most important factor that impacts the prosperity of any society"
Richard Smalley, Nobel Laureate

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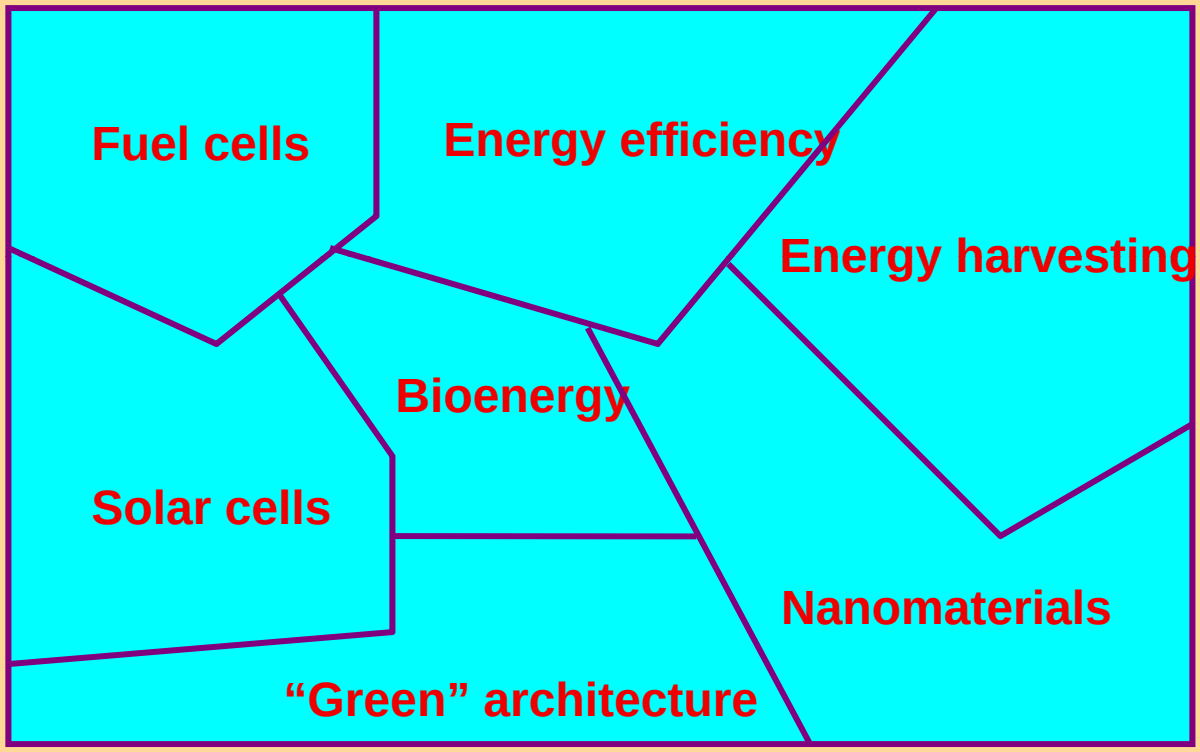
Energy Research — Connecting the Pieces



We have existing activities in each of these areas -- the goal is to find connections that allow for a coordinated approach and to pursue funding opportunities

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What are we Doing?

- Energy “task force” charged by VP Jim Petersen to catalog energy related activities on campus and identify possible strategic directions Members: Grant Norton, Mano Manoranjan, Ralph Cavalieri, Paul Whitney, Jacob Fey - Report imminent
- Initiation of Collaboration proposal funded by Office of Research (PIs: Norton, Shulin Chen, Su Ha, Dave Bahr, Andrew Jorgenson)
- Energy “survey” sent out - more than 90 faculty responded. All colleges, campuses, and extension represented
- Energy Retreat April 6, 2006 in CUB Cascade Room
- IGERT pre-proposals in energy related areas being submitted to NSF (deadline March 27, 2006)
- Bioenergy/Biproducts Center (Shulin Chen and others)
- This summit
- Energy areas well represented in FY07 Federal Initiative requests
- Web site being created that will identify funding opportunities, highlight specific research activities, etc.

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Innovations in nanotechnology are critical for enabling plentiful low-cost ene

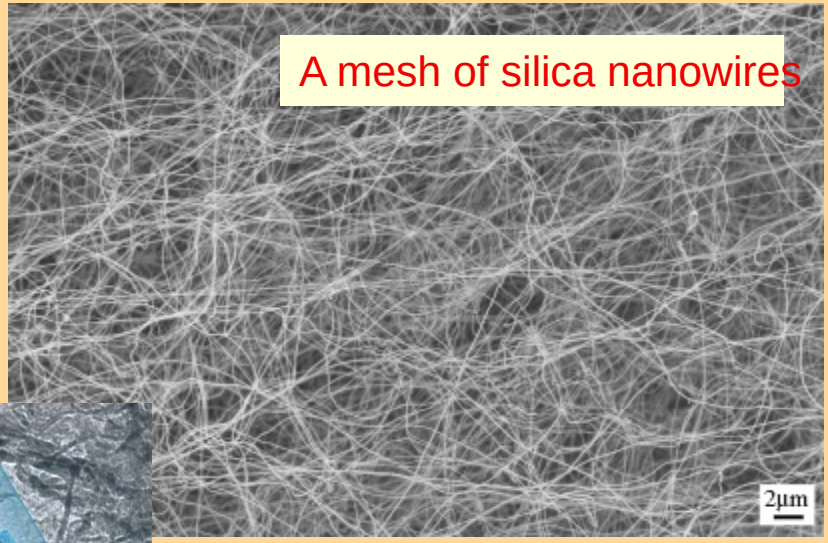
Nanomaterials will be important as catalysts and components of hydrogen storage systems

Hydrogen storage — physisorption on nanostructured materials

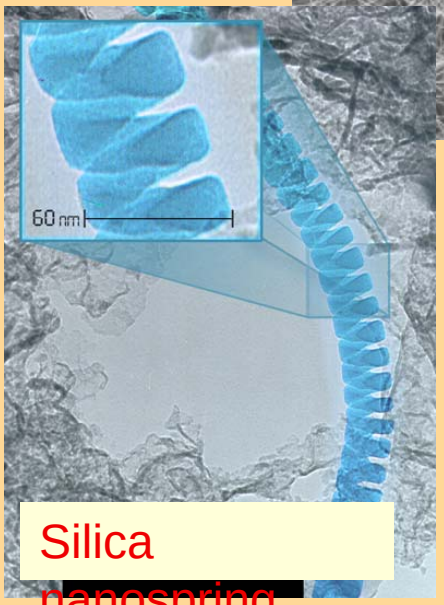
Requirements

- Large surface area
- High hydrogen binding energy
- Amorphous with ionic component ~ 50%
- Easy and inexpensive to produce

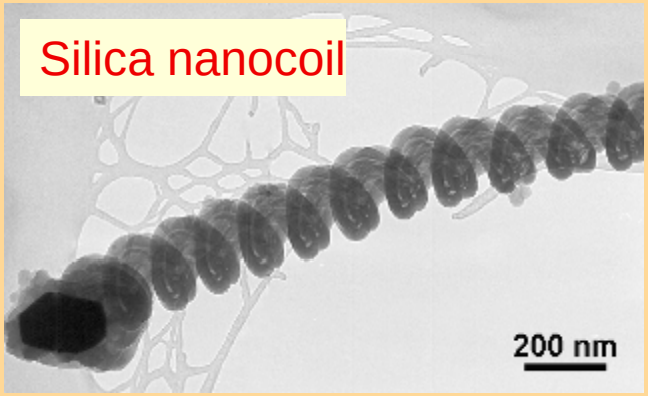
Even greater surface areas with nanocoils and nanosprings



A mesh of silica nanowires



Silica nanospring



Silica nanocoil

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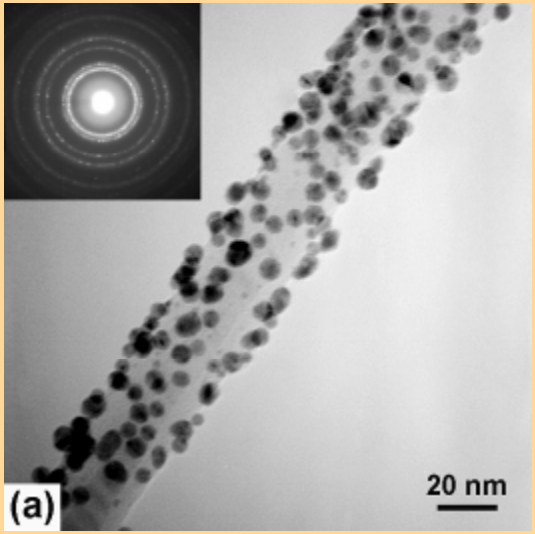
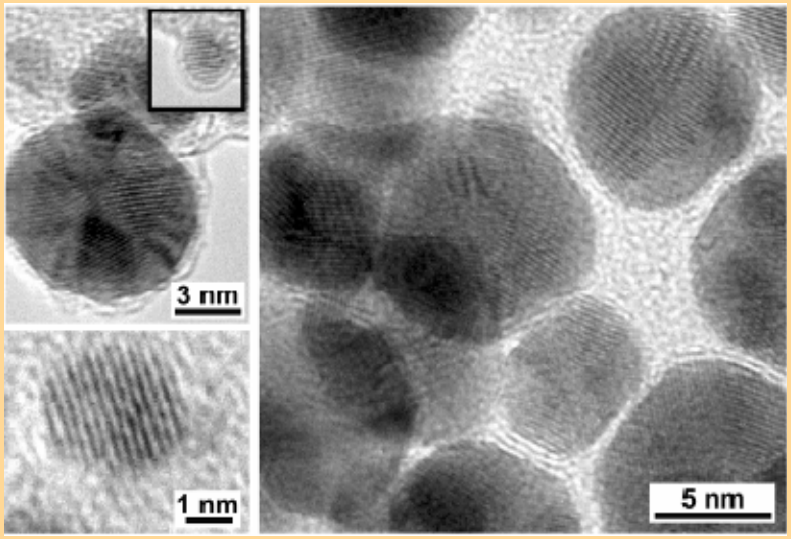
Nanoparticles for Catalysis

Applications

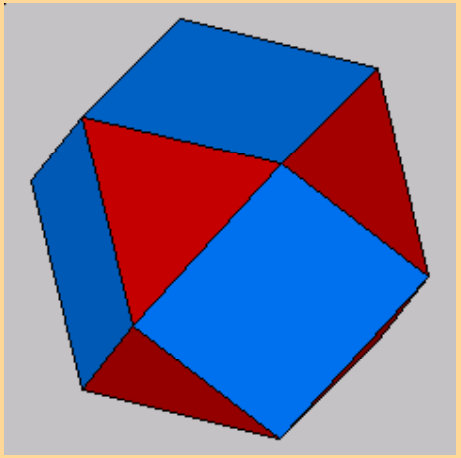
- Low-temperature proton-exchange membrane fuel cells (PEMFCs)
- Direct methanol fuel cells (DMFCs)
- Sensing
- Purification and separation



Gold nanoparticles on silica nanowire



Particle size can be varied for specific applications



Metal nanoparticles are cubeoctahedra with large number of surface sites

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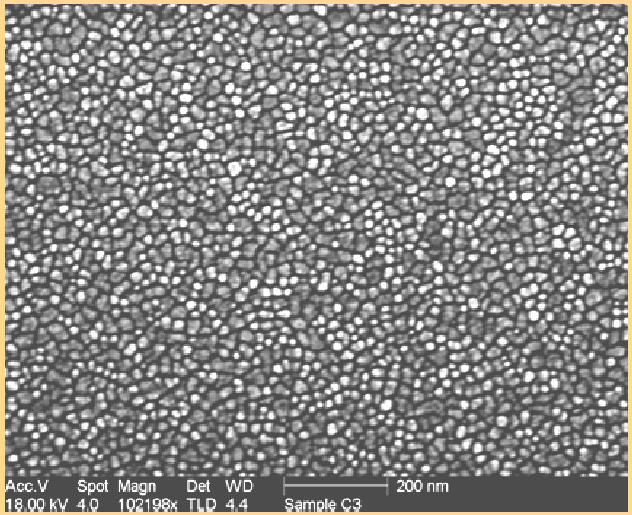
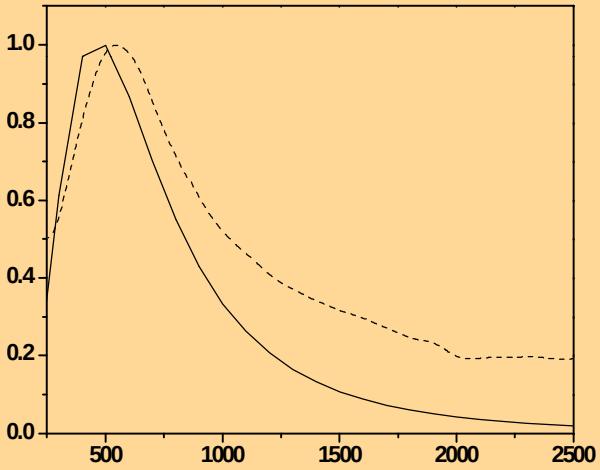
Solar Energy Systems

Nanomaterials may have vital role in improving energy efficiency of solar cells

- Efficiency of conventional solar cells limited by absorption range
- Metal nanoparticles in conductive polymers can harvest more of the sun's energy
- Ease of fabrication
- Large area deposition



Silver nanoparticles in polymer matrix



Solid curve - Planck distribution for 6000K (simulation of solar radiation)
Dashed curve - Absorption of polymer-metal nanocomposite with metal concentration 45%