

**Albany NanoTech
School of NanoSciences
and NanoEngineering
University at Albany
State University of New York**



Facilities, Staff & Resources - World Class Infrastructure

- 70,000 ft² Lab, Manufacturing & Cleanroom Facilities
- 120 Researchers, Post-Doctoral Fellows, Graduate Students
- Only University 200mm Wafer Process Line
- World's First 200mm Wafer Nano/Micro Systems Process Line
- \$200 Million in Process & Characterization Equipment
- \$20M operating budget
- University Business Support
 - CESTM Incubator
 - East Campus Incubator
- Partnerships
 - ◆ 115 Companies Provide Funds
 - ◆ 44 New York State Companies
 - ◆ 19 Capital Region Companies



NanoFab 300

**Future Home of the Only
University Based 300mm
Wafer Prototyping and
Workforce Training Facility**



Only non-proprietary 300mm wafer prototyping/integration center in the world. To be completed in 9/03 (\$90M brick/mortar, \$250M tools/equipment).



Highlights of recent successes - Over \$1B in investments

- International Focus Research Center
 - Partnership between UAlbany, RPI, Stanford, MIT, Georgia Tech
 - Funded by SIA, MARCO, DARPA - \$35 Million
- Center of Excellence
 - Partnership with IBM
 - Funded at \$150 Million
- International Sematech North
 - Co-location of Sematech at UAlbany
 - Funded at \$400 Million
- Tokyo Electron Limited
 - Co-location at UAlbany
 - funded at \$300 Million



New York State, IBM Announce \$150 Million For Albany Nanotech Center Of Excellence In Nanoelectronics

Source: INTERNET WIRE
Publication date: 2001-04-24

ALBANY
NanoTech

Announcing International SEMATECH North
A Partnership with International SEMATECH

International SEMATECH North
Albany, NY

International SEMATECH
Dallas, TX

ST. Michael's
Columbus, OH

Princeton
New Jersey

IBM
Yorktown Heights, NY

Toshiba
Sunnyvale, CA

Advanced
Micro Devices
Sunnyvale, CA

Wolfspeed
Columbus, OH

Bydco
Troy, NY

Toshiba
Microelectronics
Sunnyvale, CA

New York Center of Excellence in Nanoelectronics

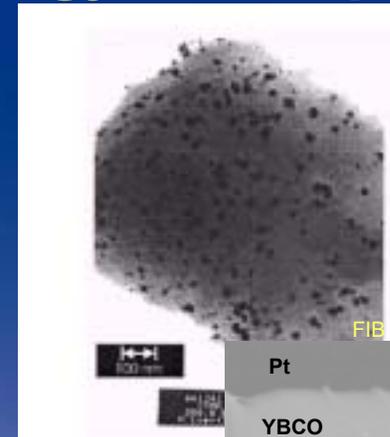
www.nytimes.com
The New York Times
ON THE WEB

July 18, 2002

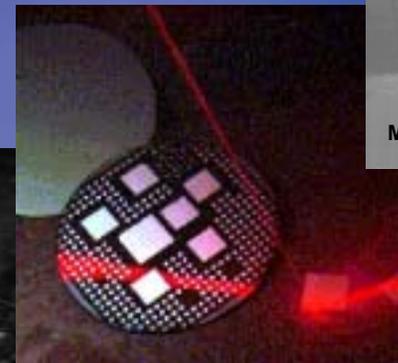
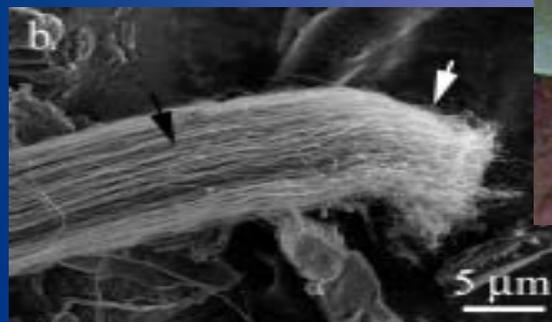
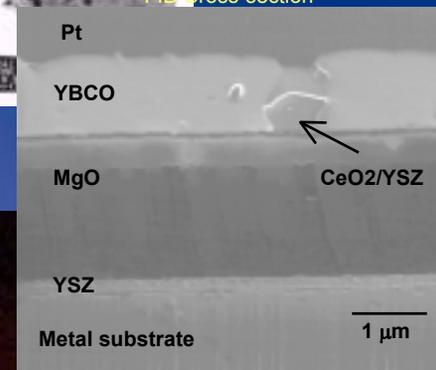
**Albany Chosen as Research Hub for Next-
Generation Chips**

Energy & Environmental Technology Development

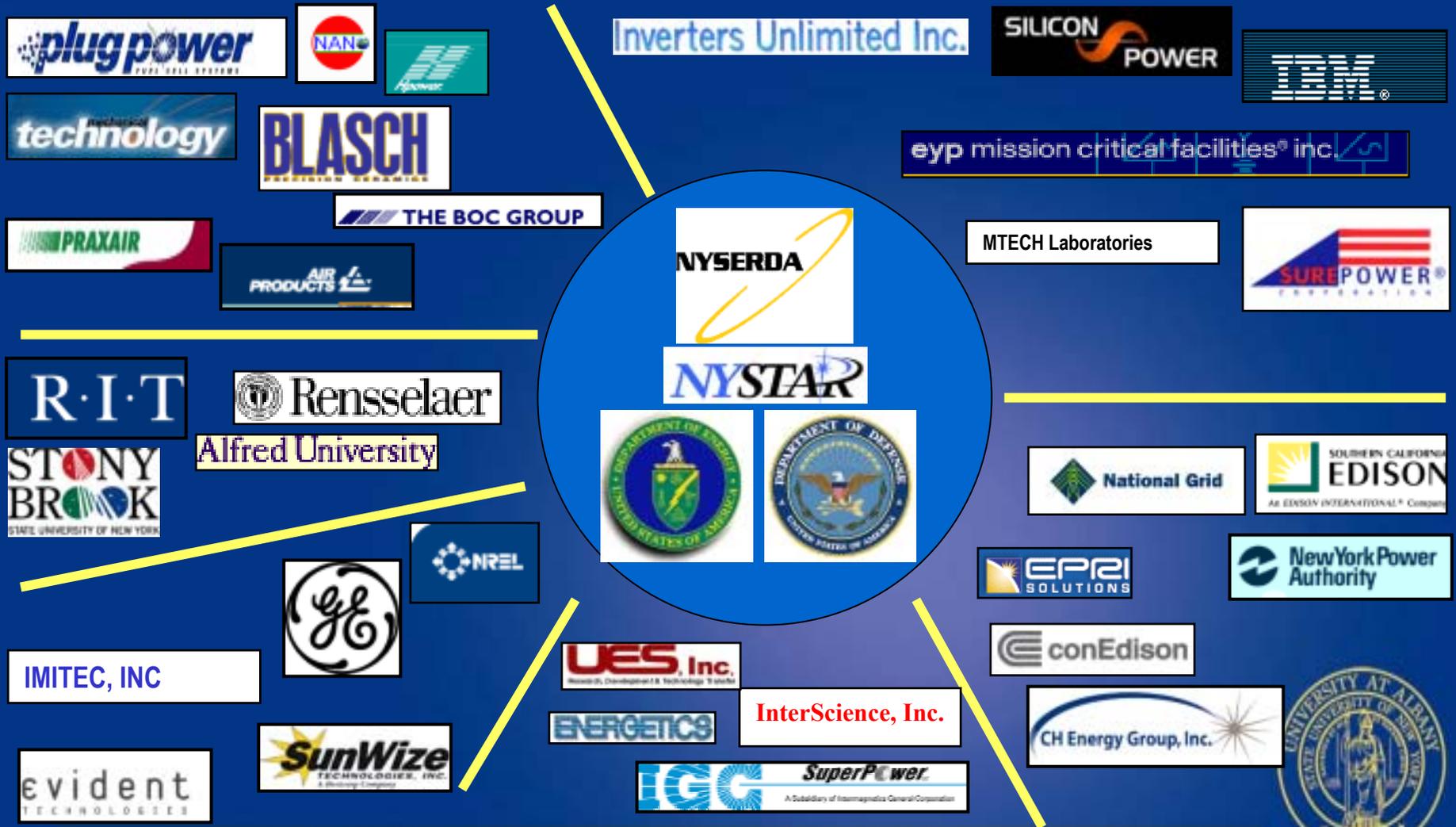
- Advanced Photovoltaic Technology Development
 - CIGS (CuInGaSe)
 - Dye Sensitized solar cells
 - Polymer based solar cells
- Fuel Cell Technology Development
 - PEM
 - SOFC
 - Micro-Fuel Cells
- Superconductors
- Power Electronics
- Hydrogen Storage
- Sensors



FIB Cross-section



Partnerships



Outline of useful capabilities at ANT (UAlbany, SUNY) for HTS

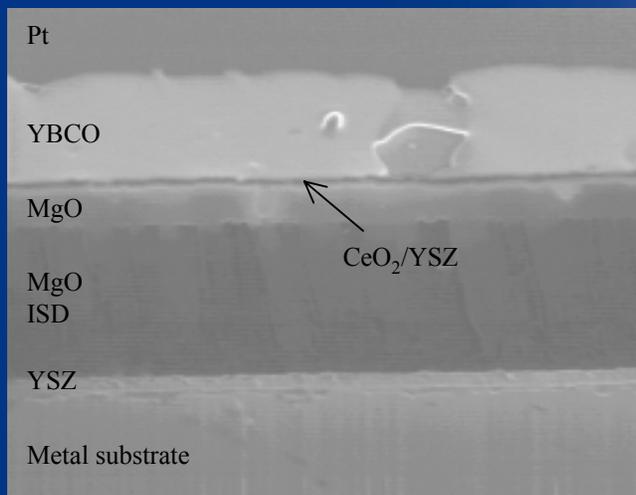
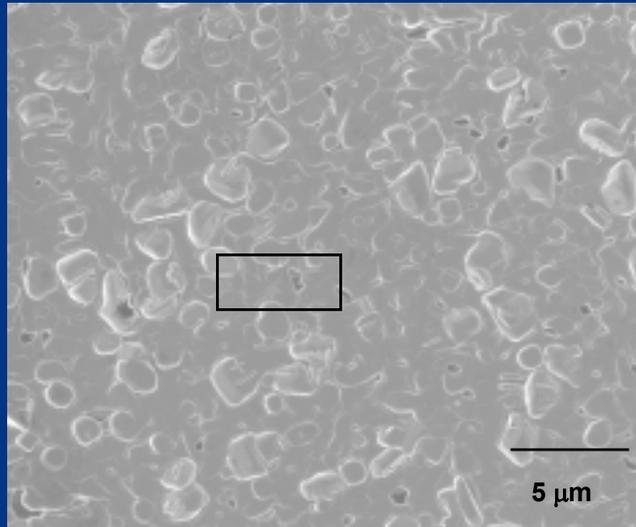
Examples of capabilities

- Characterization
 - Single Beam FIB
 - Dual Beam FIB
 - Other (RBS, NRA)
- Modeling
- Processing
 - AA-CVD



Characterization - Focused Ion Beam Imaging

Early Images of FIB sections from UAlbany



- Non-uniform buffer layers result in non-continuous YBCO films, which consequently have very poor current carrying capabilities
- Ability to study other effects of underlying layer on the growth and superconducting behavior of YBCO.



Dual Beam FIB

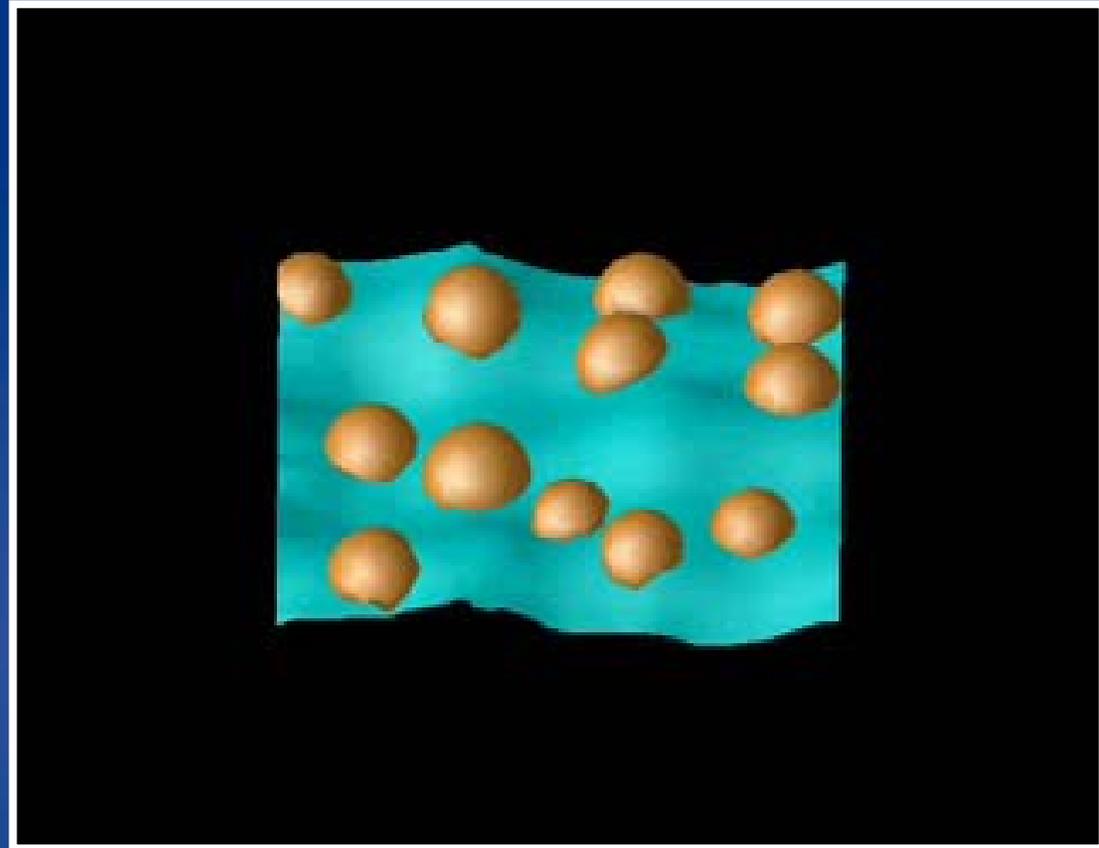
LEO



Modeling: Microstructure formation and evolution

Use of FEBLE Software

- Able to test models of island growth, grain formation, grain boundary evolution, ripening, grain rotation
- Can track continuum islands as they grow, collide, and coalesce into a blanket film.
- Initial process simulation done for electroless deposition (ELD) of copper using a kinetic model



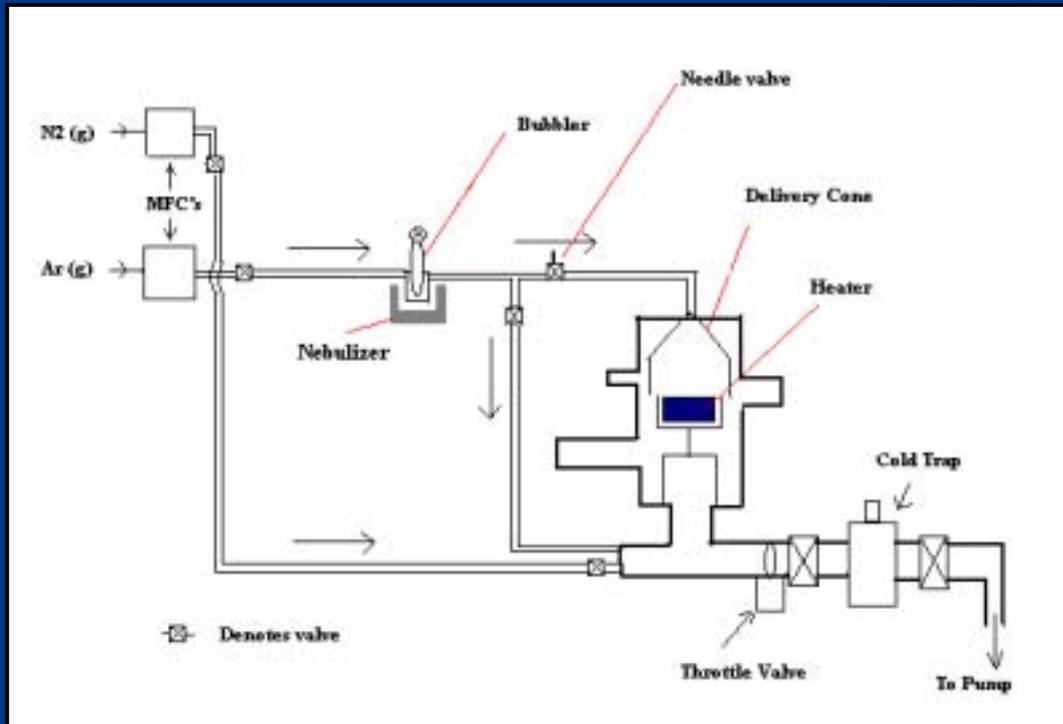
*Max Bloomfield, Tim Cale et.al.
International Focus Center project*



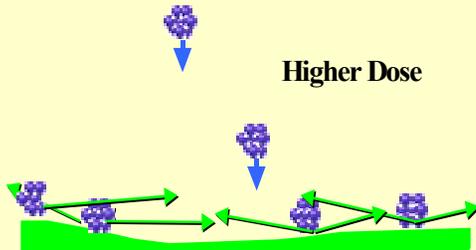
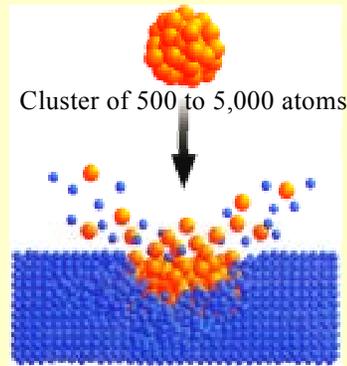
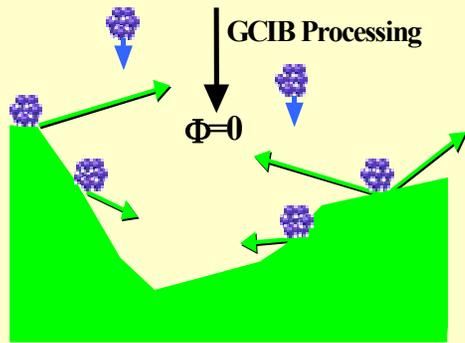
Aerosol Assisted Chemical Vapor Deposition

Advantages

- Low cost precursor
 - Nitrates or acetates
- High Rate deposition
 - use of electrostatic charge
- Deposition done at relatively high or atm pressure
- Useful for other oxide ceramics
 - LaSrMnO perovskites (solid oxide fuel cell electrodes)

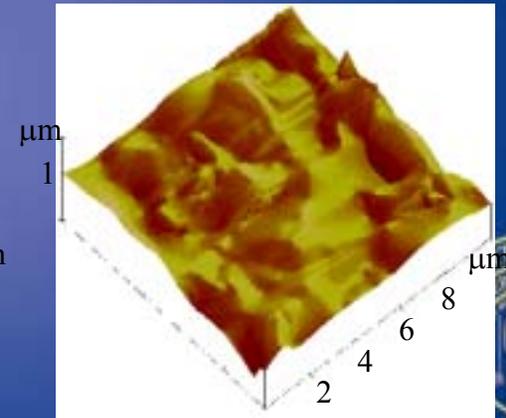
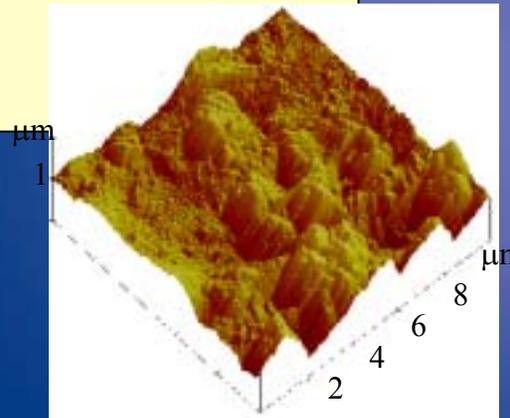


Gas Cluster Ion Beam (GCIB) Processing



Advantages

- Ability to smooth rough films (similar to planarization)
- Allow thicker YBCO films to be deposited while maintaining high currents
- Surface roughness improved by over 50%



Summary of Capabilities at UAlbany, SUNY

- Characterization and smoothing techniques can be applied to all approaches - PLD, sol-gel, TFA, MOCVD etc
- Unique infrastructure and semiconductor processing know-how can be applied to superconductors
- Fundamental understanding of mechanisms through modeling, smoothing and metrology valuable when applied to real world problems
- Proprietary information with partners is protected through proper agreements
- Public presentations and publications are encouraged

