



**Welcome to the
17th Annual Meeting of the**

***SRC Engineering Research Center for
Environmentally Benign
Semiconductor Manufacturing***

March 19-21, 2013



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Welcome to Sunny Tucson



Tucson now has a snowier 2013 than Seattle!

Feb 20, 2013, KOMO news



A Short Overview and Update on the ERC Program

March 19-21, 2013

ERC: A Pioneer in University-Industry Collaborative Research on the ESH Aspects of SC Manufacturing

Founding Universities (1996)

- U Arizona
- U California – Berkeley
- MIT
- Stanford

*17 years of
Experience*

Other University members

- Arizona State U (1998 -)
- Columbia (2006 - 2009)
- Cornell (1998 - 2012)
- Georgia Inst. of Tech. (2009 - 2012)
- U Maryland (1999-2003)
- U Massachusetts (2006 - 2009)
- U North Carolina (2009 -)
- Purdue (2003 - 2008)
- U Texas - Dallas (2009 -)
- Tufts (2005 - 2008)
- U Washington (2008-)
- U Wisconsin (2009- 2012)
- UCLA (2011 -)
- North Carolina A&T (2012 -)
- Johns Hopkins (2012 -)
- Colorado School of Mines (2012 -)

Sources of Funding

- **SRC (core)**
- **Industrial membership**
- **Customized projects (including Intel/ERC new HVnM initiative)**
- **Cost sharing by participating universities**
- **Grants from Federal and State agencies (NSF, SFAz, WSP, etc.)**
- **Donations**
- **Endowments (currently 3)**

Success in creating research leverage for S/C industry

ERC Thrust Areas

Environmentally Sustainable IC Manufacturing

Thrust A
Novel
Solutions
to Existing
ESH Problems

Thrust B
ESH-Friendly
Novel
Materials and
Processes

Thrust C
ESH Aspects
of Future
Nano-Scale
Manufacturing

Enabling ESH Fundamentals

Types of ERC Research Projects

Core projects

- Primarily funded by the core SRC contract; some cost sharing by other ERC funds.
- Selected through RFP process: pre-proposals, proposals, and review/selection by a panel appointed by SRC.
- 11 core projects from 2009-2012 (2 projects in Thrust A, 5 projects in Thrust B, and 4 projects in Thrust C).
- Currently 9 three-year projects that started in 2012.

Customized projects

- Added throughout the year; review and selection procedures are primarily by the sponsoring member company.
- Currently 4 projects, including those in the Intel HVnM initiative; 2 more are expected.

New Projects (2012 - 2015)

A) ESH Challenges of Existing Processes

- **ESH-Friendly Cleaning and Rinsing of Multi-Material Surfaces and Structures:** *Srini Raghavan, Manish Keswani, and Farhang Shadman (U Arizona)*

B) ESH-Friendly Novel Materials and Process

- **Non-PFC Plasma Chemistries for Patterning Complex Materials and Structures:** *Jane Chang (UCLA)*
- **Pad-in-a-Bottle: Planarization with Slurries Containing Suspended Polyurethane Beads:** *Ara Philipossian (UA) and Duane Boning (MIT)*

New Projects (2012 - 2015)

C) ESH Aspects of Nano-Materials

- **Cell-based Toxicity Assay-on-Chip for the Next-Generation CMOS Technology:** *Shyam Aravamudhan and Shanthi Iyer (North Carolina State A&T); Adam Hall and Ethan Taylor (U North Carolina/Greensboro)*
- **Interactions of Chemical Mechanical Planarization Nanoparticles with Model Cell Membranes: Implications for Nanoparticle Toxicity:** *Kai Loon Chen (Johns Hopkins)*
- **Dispersion, Bioaccumulation, and Mechanisms of Nanoparticle (NP) Toxicity:** *Steven Nielsen, Rockford Draper, Paul Pantano, Inga Musselman, and Gregg Dieckmann (U Texas/Dallas)*
- **Computer-Aided Design of Nanomaterials with the Desired Bioactivity and Safety Profiles:** *Alex Tropsha, and Denis Fourches (U North Carolina/Chapel Hill)*
- **QNAR Models to Prioritize Nanoparticles for Biological and Safety Studies**
Alex Tropsha, and Denis Fourches (U North Carolina/Chapel Hill)
- **Detection of Engineered Nanomaterials at Semi-Conductor Facilities and Consumer Products:** *Paul Westerhoff and Pierre Herckes (Arizona State U); Jonathan Posner (U. Washington); James Ranville, and Chris Higgins (Colorado School of Mines)*

AGENDA
Wednesday, March 20


- 8:00 – 8:30 AM** **TAB/PAG Caucus**
- 8:30 – 8:45 AM** **Introduction and Overview**
- 8:45 – 9:10 AM** **Core Projects**
Cell-Based Toxicity Assay-on-Chip for the Next-Generation CMOS Technology
(North Carolina A&T, U North Carolina/Greensboro)
- 9:10 – 9:40 AM** **Non-PFC Plasma Chemistries for Patterning Complex Materials and Structures (UCLA)**
- 9:40 – 10:15 AM** **Pad-in-a-Bottle: Planarization with Slurries Containing Suspended Polyurethane Beads (U Arizona, MIT)**
- 10:15 – 10:30 AM** **Break**
- 10:30 – 11:00 AM** **Detection of Engineered Nanomaterials: Semi-Conductor Facilities and Consumer Devices (Arizona State U, Colorado School of Mines, U Washington)**
- 11:00 – 11:25 AM** **Interactions of Chemical Mechanical Planarization Nanoparticles with Model Cell Membranes: Implications for Nanoparticle Toxicity (Johns Hopkins U)**
- 11:25 – 12:00 PM** **Dispersion, Bioaccumulation, and Mechanisms of Nanoparticle Toxicity (U Texas/Dallas)**
- 12:00 – 1:15 PM** **Lunch**

Wednesday, March 20

- 1:15 – 1:40 PM ESH-Friendly Cleaning and Rinsing of Multi-Material Surfaces and Structures (*U Arizona*)
- 1:40 – 1:55 PM Computer-Aided Design of Nanomaterials with the Desired Bioactivity and Safety Profiles (*U North Carolina/Chapel Hill*)
- 1:55 – 2:10 PM QNAR Models to Prioritize Nanoparticles for Biological and Safety Studies (*U North Carolina/Chapel Hill*)
- 2:10 – 2:20 PM Summary of Interactions on Nano-Materials Projects
- Customized Projects**
- 2:20 – 2:25 PM Introduction
- 2:25 – 2:40 PM Novel Methods for Reducing UHP Gas Usage in Fabs (*U Arizona, Intel*)
- 2:40 – 2:55 PM Reclamation of Water and Sulfuric Acid from Spent Piranha Solutions and Piranha Generated Wastewater (*U Arizona, Intel*)
- 2:55 – 3:10 PM Measurement of Hydroxyl Radicals in Wafer Cleaning Solutions Irradiated with Megasonic Field (*U Arizona, TEL*)
- 3:10 – 3:20 PM General Discussion

Wednesday, March 20

3:20 – 3:35 PM	Simon Karecki Award Presentation
3:35 – Open	Poster session/Networking Event
4:30 – Open	Hors d'oeuvres, Cash bar
5:15 – Open	TAB/PAG Caucus w/ working dinner
6:00 – Open	Dinner
7:00 – Open	PIs group planning meetings



Thursday, March 21

7:00 – 7:50 AM	Continental Breakfast
7:50 – 8:00 AM	Message by UA Dean of Engineering , Jeff Goldberg
	<u>Invited Overview Presentations</u>
8:00 – 8:30 AM	Nanotechnology Environmental Health and Safety Research Program at NIEHS Srikanth Nadadur (<i>NIH/NIEHS</i>)
8:30 – 9:00 AM	Synthesis and Patterning of Multifunctional and Complex Materials Jane Chang (<i>UCLA</i>)
9:00 – 9:10 AM	Break
9:10 – 9:40 AM	CMP: Overview of Current Practices and Future Trends S.V. Babu (<i>Clarkson University</i>)
9:40 - 11:00 AM	<u>Workshop and Planning Session on Nano-Materials ESH</u> Chair: David Speed (<i>IBM</i>)
9:40 - 11:00 AM	IAB meeting Chair: Reed Content (<i>GlobalFoundries</i>)
11:00 - 11:45 AM	Feedback to PIs
11:45 – 1:30 PM	Lunch
12:00 – 2:00 PM	Executive Advisory Meeting w/ working lunch
2:00 PM	Program End