



**ANSI-Nanotechnology Standards Panel
Break-out Group Report**

- 1. Name of Break-out Group:** Top-down assembled structures and devices
 - 2. Date of Report:** September 29, 2004
 - 3. Scope of Break-Out Group:**
 - 4. Facilitator:** Dr. William Tong
 - 5. Recorder:** Dr. Kristen Kulinowski
 - 6. Break-out Group Participants:** Append a list of participants in the discussions.
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These issues and questions are posed specific to the scope of this break-out group.

I. Brainstorming session related to nomenclature standardization

Break-out group members should develop and prioritize on a scale of 1-10, 10 being most urgent, the top three to five issues with respect to the following question:

What are the most critical nomenclature issues that require discussion and resolution?

1. The relative importance of size vs. properties in the definition of “nano” as a prefix is not clear.
 - a. The word “nano” has been usurped for funding and marketing purposes, *e.g.* NanoCare fabrics, nano device companies
2. There is a need for a simple way of naming nanomaterials/nanostructures (of relevance to the device community)
 - a. Need a numbering system with reference tables *E.g.*, X₁, X₂, X₃... Can CAS system be adapted for devices?
 - b. Need clarity in the role of shape and topography in setting terminology
3. The terms “top-down” and “bottom-up” are not well-defined

- a. No agreement on which is which. Is it determined by length scale or process of fabrication or structure.
4. There is a need to clarify what is meant by the term “manipulation”.
 - a. Is it moving, pushing, etching, gripping/releasing, etc?
 - b. What specifically is “nano-manipulation”?
5. There is a need to define the terms macro, meso, micro, nano.
 - a. Meso = “in between” in Greek but in between what?
 - b. Different disciplines define these in different ways, e.g., 1 μm > mesoporous > 100 nm but mesoscale devices are between micro and macro

II. Discussion of implementation questions

1. What standards work is underway; who is involved and is any group or individual considered the “leader”?
 - i. Domestic: SIA (?), ANSI, IEEE
 - ii. International: SEMI, International Electrotechnical Commission, ISO
 - iii. Regional
2. Are any stakeholders missing from this group? PTO, public advocacy group, customers, trade organizations (e.g., SEMATECH, SELETE, IMEC), labor (technicians), microfluidics and biodevice developers, biotech companies
3. Are there any cross-cutting issues with other break-out groups? If so, please identify.
Definition of nano, simple nanomaterial nomenclature framework
4. What are the possible impediments to the generation and acceptance of a universal nomenclature?
Trade protectionism, research funding, international collaboration
5. Provide recommendations on appropriate venues in which to address the needs identified and any individuals or organizations who should be contacted to serve as project leaders.

Venues for addressing needs: standards workshops

Outreach targets: National meetings, personal contacts, trade magazines, press release, journal editors, professional societies, ANSI, standards developing organizations.

III. Brainstorming broader issues of nanotechnology standardization needs

Break-out group members should develop and prioritize on a scale of 1-10, 10 being most urgent, the top three to five issues with respect to the following questions:

1. Are there other areas in nanotechnology that would benefit from standardization? If yes, please identify the top 5.

Nanomanufacturing, modeling and simulation, standard methods of synthesis, environmental health and safety

2. Are there stakeholders in these areas that should be involved in future discussions? Please identify.

IV. General Comments

1. Comments/observations/suggestions
2. Thoughts on next steps
3. Is there a need for a future meeting of this break-out group? YES. The group in general agreed that standards for nano devices were a near-term priority but there was no complete agreement.