

## Talking the Talk: Standardizing the Language of Nanotechnology

*This third article in a series on standards for the nanotechnology community explains how agreements for terminology and nomenclature are creating the common baseline that is needed for global collaboration and understanding.*

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As an ever increasing array of industry sectors embraces the rapid development of materials at the nano scale, stakeholders around the planet have attempted to weave a new “nano” vocabulary into their communications.

Consistent and globally-accepted nomenclature and terminology – the fundamental building blocks for any burgeoning industry – tops the list of stakeholder needs. Until there is consensus, even terms that are frequently cited in relevant scientific literature, e.g., nanotechnology, nanoparticle, nanostructure, nanoscale and nanomaterial are at risk of being interpreted differently between nations and industries.



In a June 2004 letter to the American National Standards Institute (ANSI), Dr. John H. Marburger, III, director of the Office of Science and Technology Policy to the Executive Office of the President, wrote:

“As new materials, structures, devices, and systems are developed that derive their properties and function due to their nanoscale dimensions, it will become increasingly important to the researchers, manufacturers, regulators, and other stakeholders to have an agreed upon nomenclature with which to communicate.”

Dr. Marburger asked ANSI to step forward to facilitate the development of standards in the area of nanotechnology, starting with nomenclature and terminology.

The Institute responded by forming in August 2004 a cross-sector coordinating body known as the ANSI-Nanotechnology Standards Panel ([www.ansi.org/nsp](http://www.ansi.org/nsp)). The Panel does not itself develop standards; rather, it works with other national, regional, and international standards bodies, as well as industry, academic, and government stakeholders, to establish work plans, harmonize efforts, and mitigate duplication or overlap.

As the Panel became more and more engaged in coordination activities within the United States, the International Organization for Standardization (ISO) and, then later, the International Electrotechnical Commission (IEC) each formed Technical Committees

(TCs) to create and promote the implementation of nanotechnology standards. The Panel quickly took on a new global perspective.

Experts understood that the road to consensus would be bumpy. Many of the participating nations had already made clear their perspectives about the characterization of nano-objects and what constituted “work at the nanoscale.” There were distinct differences of opinion about whether the definitions for nanotechnology terminology should consider the size of the object, the unique properties that materials exhibit at the nanoscale, or both. [Ultimately, consensus was reached that it should be both.]

**Terminology** is the body of specialized terms used in a subject of study – in other words, the vocabulary for a particular topic. It is technology-driven, promoting transparency and facilitating communication and understanding.

**Nomenclature** is defined as the selection of names for things in a particular field, or as the system used for developing unambiguous names. It includes a description of the system concept and a structure through which new names can be developed. By providing this basic structure, it facilitates growth and commercialization in the field.

### **Work in Progress for Terminology and Nomenclature**

Upon its formation in 2005, the founding members of ISO Technical Committee (TC) 229, *Nanotechnologies*, including the United States, agreed that a standardized naming system and standardized terms were needed to facilitate communication among the many sectors that deal with nanotechnologies.

U.S. participation in ISO/TC 229 and its Working Groups begins in the U.S. Technical Advisory Group (TAG) to ISO/TC 229, chaired by Clayton Teague, director of the National Nanotechnology Coordination Office. The TAG, which is administered by ANSI, is organized into Working Groups that mirror their efforts on the scope of each TC 229 WG.

Under the leadership of convenor Dr. Clive Willis (Canada), a working group on *Terminology and nomenclature* (ISO/TC 229/WG 1) was created and charged with defining and developing unambiguous and uniform terminology and nomenclature that can be used by any stakeholder, from manufacturing and research to government agencies and regulatory bodies.

The mirror U.S. activity for nanotechnology terminology and nomenclature is chaired by Martha Marrapese of Keller and Heckman. Experts from academia, government, standards developing organizations, and the legal arena comprise the group’s membership

One of the WG’s first actions was to agree that industries should resist the temptation to simply add the prefix “nano” to already existing, well-defined terms. WG 1 members also

agreed to try to avoid redefining technical terms that are already in common usage and not nano-specific.

The WG's first published work, *Nanotechnologies – Terminology and definitions for nano-objects – nanoparticle, nanofibre, and nanoplate* (ISO/TS 27687), defines the basic terms frequently used in nanotechnology literature. Included in this technical specification are definitions for terms such as “nanoscale” (the size range from approximately 1nm to 100nm) and “nano-object” (a material with one, two, or three external dimensions at the nanoscale). The document also establishes a hierarchy of terms that describe some of the more specific forms of nano-objects based on their dimensions.

Three additional WG 1 work items are still under development:

- ISO/NP TS 12144, *Nanotechnologies – Core terms – Terminology and definitions* and ISO/NP TR 12802, *Nanotechnologies – Terminology and nomenclature – Framework* provide a prioritized and systematic approach for developing further definitions as needed.
- ISO/NP TS 12921, *Nanotechnologies – Terminology and definitions for nanostructured materials* will help foster a common understanding among worldwide industrial, academic, and public sectors related to nanomaterials.

The audiences for WG 1's work are expansive. In addition to its collaborative work with IEC's nanotechnology committee (IEC TC 113), requests have also been received for additional definitions that will apply to terms commonly used in nanomanufacturing sectors, including: IT and telecommunications; aerospace and automotive industries; energy and utilities; materials and chemical industries; forest and paper products industries; food industries; pharmaceuticals, biomedical, and biotechnology; environment and national security; and clothing and personal care.

“Terminology and nomenclature are important underpinnings of nanotechnologies standards activities,” said Ms. Marrapese. “They inform the other areas of standards development, including measurement and characterization, health, safety and environment issues, and product quality specifications. They also serve as the basis for how vocabulary is used and specific materials are identified for the purposes of international research, commercial activities, intellectual property protection, and government oversight and support.”

### **Getting Involved in ISO/TC 229 WG 1**

Participation in the U.S. TAG ISO/TC 229 Working Group is open to all nationally interested stakeholders. The TAG actively seeks participants who have expert knowledge in all aspects of nanotechnology terminology and nomenclature. To join the ANSI-accredited U.S. TAG for ISO/TC 229 or any of its WGs, contact Heather Benko ([hbenko@ansi.org](mailto:hbenko@ansi.org); 212.642.4912).

For more information on the U.S. TAG for ISO/TC 229, visit <http://www.ansi.org/isotc229tag>.

**Stay Tuned:** The next article in this series will introduce ISO/TC 229/WG 2, *Measurement and characterization*.