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The ANSI-NSP Newsletter provides information on nanotechnology standards and related topics of interest. Stakeholders are encouraged to submit information to the [ANSI-NSP](#) that they feel would be of interest to the larger ANSI-NSP Community.

While ANSI will be providing some of the content to be included in this newsletter, this is a community-driven project, with developers and organizations providing updates on any documents published or upcoming meetings that may be of interest to the ANSI-NSP. If you do have any information you would like to share, please feel free to forward it to [hbenko@ansi.org](mailto:hbenko@ansi.org).

For further information and updates on the Panel, please visit the [ANSI-NSP Website](#).



## **WELCOME**

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Since its discovery in 2004, graphene has been touted as a miracle material, anticipated to revolutionize a number of industrial sectors, from electronics to automotive industry to medicine. But as graphene-enabled products become more common in the marketplace, graphene producers and users face familiar obstacles in fostering commercialization, such as: What type of graphene is it: Is it fluffy graphene? Epitaxial graphene? Tri-layer graphene? And, how can consumers be certain that the material they purchased really is the graphene promised and, what are its characteristics?

The development of terminology and measurement standards for graphene will help to ensure effective communication between buyers and sellers, and create trust between these important business relationships. In this emerging technology sector, it is important for standards organizations to reach out to the graphene community to hear what their needs are, and solicit their input and expertise as relevant

standards are developed. It will also be important for the graphene community to become more familiar with standards, and how they can benefit the development and distribution of their products.

Our guest columnist, Dr. Zina Jaharri Cinker, is on the forefront of these issues. Previously, as an entrepreneur and now as Executive Director of the National Graphene Association, Dr. Cinker is working to enable greater communication between these two communities, and understanding the important role that standardization can play in such efforts.

## **Guest Columnist – Dr. Zina Jaharri Cinker**

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### **Graphene: A New Chapter in the Tale of Carbon Standardization**

Coming from academia, the necessity of standards development was completely lost on me. It was not until I started my own business and was positioned as a commercial graphene consumer that I realized the tangible void and chaos that is created by the lack of agreed-upon terminology and well-validated characterization and testing protocols.

When a novel material such as graphene is first introduced, the initial wave of scientific research at the forefront is so fast-paced and targeted that it leaves little room for the unification of nomenclature. The terminology developed within a discipline is shared and understood among peers through the collective knowledge of the recent scientific literature. However, once the base of knowledge broadens and the commercialization efforts begin, a common lexicon is essential.

The lack of an agreed-upon answer to the simple question, “What can be called graphene?” was, and still is, a cause for concern as it hinders buyers and sellers from being able to communicate effectively with one another. Based on ISO’s technical specification being developed on vocabulary of graphene and other 2D materials (ISO/ TS 80004-13, to be published), in today’s market, the majority of materials marketed and sold as “graphene” are not graphene. To make matters more complicated, the absence of standardized characterization and testing protocols means that the buyer cannot easily verify and compare physical parameters such as electrical or thermal conductivity.

Is graphene simply too nascent for the development of standards? The answer is: “No.”

As the executive director of the National Graphene Association (NGA), I recurrently witness the struggles that the absence of standards can cause for our members. This lack of consensus within the supply chain creates an atmosphere of confusion and mistrust which is hindering the global commercialization of graphene. That is why NGA is getting involved with the development of standards for graphene, including those being considered within the ANSI-Accredited U.S. TAG to ISO/TC 229. In addition, the NGA has organized a track devoted to the issue of graphene standardization at its first commercially focused graphene conference “Graphene Innovation Summit” to be held Oct 29-31 in Nashville, TN. We believe that the development of robust and well-validated standards and practices will bring clarity and stability to the chaotic, but absolutely promising graphene market.

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Dr. Zina Jarrahi Cinker, serves as the Executive Director of the National Graphene Association (NGA). NGA is responsible for promoting and facilitating the commercialization of graphene and graphene based materials in the United States. Zina Jarrahi Cinker received her PhD in the field of Graphene optoelectronics and ultrafast spectroscopy from Vanderbilt University with a focus on electron-phonon interactions. She served as the CTO and founder of G.Element, a consulting and application development company in the graphene composite sector.

<https://www.nationalgrapheneassociation.com/>

## NEWS & INFORMATION

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### Asia Nano Forum (ANF)

Asia Nano Forum (ANF) is a network organization, founded in May 2004 and now a registered society in Singapore, known as Asia Nano Forum Society, since Oct 2007.

The mission of the standardization committee to coordinate the cross-sector activities of ANF members for the purpose of facilitating the development of standards in the area of nanotechnology. Through this working group, ANF is an official liaison member of ISO/TC229 and IEC/TC113 Standards for Nanotechnologies.

Below are items currently published under the collaboration with IEC Technical Committee 113:

Recent publication:

#### **IEC/TS 62844: Guidelines for quality and risk assessment for nano-enabled electrotechnical products**

This TS provides a recommended methodology for identifying relevant parameters of nanomaterials as well as providing generic guidelines on implementation of quality assessment and environment/health/safety assessment for nano-enabled/nano-enhanced electrotechnical products.

#### **IEC TS 62607-4-4:2016: Nanomanufacturing - Key control characteristics - Part 4-4: Nano-enabled electrical energy storage - Thermal characterization of nanomaterials, nail penetration method**

This TS provides a measurement method for thermal runaway quality level test for nano-enabled energy storage devices (e.g. Li battery). This method can decide whether or not the nanomaterial additives used in energy storage devices are resilient against the thermal runaway caused by a faulty or accidental low resistance connection between two or several internal points.

Other activities:

New proposed standards harmonization between nano-enabled product certification program are under discussion between different ANF Nano Mark systems:

- (1) Taiwan nano-enabled product certification program (NanoMark) and Malaysia NanoVerify are collaborating a new scheme for possible mutual recognition.

- (2) Iran, Malaysia and Malaysia Nano Mark system are discussing collaboration for mutual nano-enabled products application process.

The next meeting of Asia Nano Forum Summit will be held on 22-23 August 2017 at Johor Baharu, Malaysia. For more information, contact [contact@asia-anf.org](mailto:contact@asia-anf.org).

## **ASTM E56 Committee on Nanotechnology**

### **New Subcommittee on Nano-Enabled Medical Products**

Drug products and medical devices containing nanomaterials are examples of medical applications of nanotechnology. A major challenge for the development and regulation of medical products is standardized measurements of nanomaterial properties, particularly in complex biological media. To this end, ASTM International Committee E56 has established a new Subcommittee E56.08, Nano-Enabled Medical Products, the scope of which is to develop science-based standard test methods and standard practices, guides, specifications and performance standards for medical applications of nanotechnology.

E56.08 topics include characterization of nanomaterials widely used in medical applications; identification, *in vitro* evaluation, and stability assessment of nanomaterials in medical products; and the performance of medical devices that utilize nanomaterials. This subcommittee shall coordinate its activities with those of other relevant ASTM Committees and U.S. Pharmacopeia.

Four work items for E56.08, led by FDA, are in the balloting or draft stages: (1) New Cryo-TEM standard for evaluation of size and morphology of liposomal drug products; (2) New standard for detection of Nitric Oxide Production *in vitro*; (3) New standard for quantitative measurement of the chemoattractant property of nanomaterials *in vitro*; and (4) New standard for evaluation of nanomaterial internalization by phagocytic cells *in vitro*. For more information on these standards development efforts or to get involved, contact Kate Chalfin at [kchalfin@astm.org](mailto:kchalfin@astm.org).

### **Other News**

E56 has completed two recruiting documents that will be made available on the website <https://www.astm.org/COMMITTEE/E56.htm>. The first is a "Welcome to E56" document, the purpose of which is to provide new or potential members with background information about ASTM Committee E56, including membership, meetings, officers, work items, and voting on standards. The second is an updated brochure with an emphasis on the new subcommittee E56.08, geared to attract new members from the medical products community, including pharmaceutical and medical device companies.

## **ISO/TC 229 Recent Publications and approved work items**

ISO has recently published the following deliverables developed under ISO/TC 229 *Nanotechnologies*:

- **ISO/TS 10868:2017 - *Nanotechnologies -- Characterization of single-wall carbon nanotubes using ultraviolet-visible-near infrared (UV-Vis-NIR) absorption spectroscopy (Revision of 2011 edition)***, provides guidelines for the characterization of compounds containing single-wall carbon nanotubes (SWCNTs) by using optical absorption spectroscopy.

- **ISO/TS 18827:2017 - Nanotechnologies -- Electron spin resonance (ESR) as a method for measuring reactive oxygen species (ROS) generated by metal oxide nanomaterials**, provides a procedure for the detection of ROS (OH, O<sub>2</sub><sup>-</sup>, <sup>1</sup>O<sub>2</sub>) generated by metal oxide nanomaterials in aqueous solution with a reactive oxygen species-specific spin trapping agent using ESR, but excludes ESR procedures that do not use a spin trapping agent.
- **ISO/TR 18401:2017 - Nanotechnologies -- Plain language explanation of selected terms from the ISO/IEC 80004 series**, is intended to assist stakeholders who are making decisions about the direction, management and application of nanotechnologies to better understand selected key terms and definitions in the ISO/IEC 80004 vocabulary series for nanotechnologies.
- **ISO/TS 19590:2017 - Nanotechnologies -- Size distribution and concentration of inorganic nanoparticles in aqueous media via single particle inductively coupled plasma mass spectrometry**, specifies a method for the detection of nanoparticles in aqueous suspensions and characterization of the particle number and particle mass concentration and the number-based size distribution using ICP-MS in a time-resolved mode to determine the mass of individual nanoparticles and ionic concentrations.
- **ISO/TR 19601:2017 -- Nanotechnologies -- Aerosol generation for air exposure studies of nano-objects and their aggregates and agglomerates** describes methods for producing aerosols of nano-objects and their aggregates and agglomerates (NOAA) for *in vivo* and *in vitro* air exposure studies.
- **ISO/TS 80004-9:2017 - Nanotechnologies -- Vocabulary -- Part 9: Nano-enabled electrotechnical products and systems** – this document, led in development by IEC/TC 113, specifies terms and definitions for electrotechnical products and systems reliant on nanomaterials for their essential functionalities. It is intended to facilitate communications between organizations and individuals in industry and those who interact with them
- **ISO/TS 80004-11:2017 – Nanotechnologies – Vocabulary – Part 11: Nanolayer, nanocoating, nanofilm and related terms**, lists terms and definitions, and specifies an extensible taxonomic terminology framework for nanolayers, nanocoatings, nanofilms, and related terms in the field of nanotechnologies.

More information regarding the documents above, or any published ISO Standards or other deliverables, can be reviewed after publication using the ISO Online Browsing Platform (<https://www.iso.org/obp/ui/>). All ISO published documents are available for purchase via ANSI's [Webstore](#).

**ISO/TC 229 has recently added the following projects to their work programme:**

- **ISO/AWI 21361 – Nanotechnologies – Quantification of airborne nanoscale carbon black and amorphous silica in a manufacturing environment** (under development by WG 2, Measurement and characterisation)
- **ISO/AWI TR 22019 – Nanotechnologies – Evaluation of methods for assessing the release of nanomaterials from commercial, nanomaterial-containing polymer composites** (under development by WG 3, Health, safety and environment)
- **ISO/AWI TS 22082 – Nanotechnologies – High throughput screening method for nanoparticle toxicity using 3d cells** (under development by WG 3, Health, safety and environment)

More information regarding the work items above, or any other work items included in ISO/TC 229's work programme is available via your country's [ISO Member Body](#). In the U.S., please contact ANSI: [hbenko@ansi.org](mailto:hbenko@ansi.org)

The American National Standards Institute's Nanotechnology Standards Panel ([ANSI-NSP](#)) serves as the cross-sector coordinating body for the purposes of facilitating the development of standards in the area of nanotechnology, including, but not limited to: nomenclature/terminology; health, safety and environmental aspects; materials properties; and testing, measurement, and characterization procedures.

For more information about the NSP, please contact [hbenko@ansi.org](mailto:hbenko@ansi.org)