

**March 14, 2017**

## **Final Technical Report**

Award Number: 02-09 ER46566

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Title: Nanotechnology Standardization Activities – Support of U.S. Representation on ISO/TC 229 *Nanotechnologies*

Principle Investigator: Ms. Heather Benko

Period covered under this report –6/2/2015 – 8/14/2016

### **I. Goals for this Project:**

In carrying out its responsibilities on behalf of the United States, ANSI provides comprehensive, administrative support and expertise on international protocols and procedures to: (1) the U.S. Technical Advisory Group (TAG) to the International Organization for Standardization's (ISO) Technical Committee (TC) 229 *Nanotechnologies*, and (2) the corresponding U.S. TAG Working Groups tasked with formulating U.S. positions on topics relevant to nanotechnology standardization. Additionally, secretariat and procedural support is provided for the ISO/TC 229 WG 3 on health, safety and environment, for which the United States was assigned leadership by the participating national body members of ISO/TC 229. As the official entity that serves as the U.S. representative to ISO, ANSI provides not only expert coordination of U.S. positions and representation at ISO but also strategic direction, advice and procedural expertise to facilitate navigation of international issues to promote U.S. positions for incorporation into the ISO/TC 229 program of work necessary to support U.S. objectives.

### **II. Major Accomplishments relative to Support of U.S. Representation on ISO/TC 229 *Nanotechnologies*: 6/2/2015– 8/14/2016**

- **Face-to-face meetings:**
  - August 18-19, 2015 -Meeting of the ANSI-Accredited U.S. TAG to ISO/TC 229 *Nanotechnologies*
  - September 28 – October 2, 2015 - Meeting of the ISO/TC 229 Plenary, Working Groups and Task Groups, Edmonton, Alberta, Canada
  - April 20 -21, 2016 –Meeting of the ANSI-Accredited U.S. TAG to ISO/TC 229 *Nanotechnologies*
  - May 10-13, 2016 – Interim Meetings of ISO/TC 229 JWG 1 and JWG 2, Lowell, Mass
  - May 24-26, 2016, Interim Meetings of ISO/TC 229 WG 3 and WG 4, Kyoto, Japan
- **New Work Item Proposals Submitted to ISO/TC 229 on behalf of the United States via ANSI**
- **Face-to-face meetings of the ANSI-Accredited U.S. TAG to ISO/TC 229 *Nanotechnologies* and U.S. Representation at meetings of ISO/TC 229 *Nanotechnologies***

- **August 18-19, 2015 Meeting of the ANSI-Accredited U.S. TAG to ISO/TC 229 Nanotechnologies**

The purpose of the August 19 – 20, 2015, meeting of the ANSI-Accredited U.S. TAG and the preceding TAG Working Group meetings was to prepare for the upcoming ISO/TC 229 Plenary, Task Group and Working Group meetings to take place in Edmonton, Alberta, Canada, September 28-October 2, 2015. Positions that were formulated included:

- U.S. positions relative to ballot resolution meetings
- U.S. positions on development of specific ISO deliverables
- U.S. positions on five work items under development by CEN/TC 352, which were suggested for joint development under the Vienna Agreement.

Sample U.S. Positions are available from the Principle Investigator.

- **September 28 – October 2, 2015 - Meeting of the ISO/TC 229 Plenary, Working Groups and Task Groups, Edmonton, Alberta, Canada**

The United States was represented by 23 Delegates during the 18<sup>th</sup> meeting of ISO/TC 229.

These delegates attended the following meetings:

- ISO/TC 229 JWG 1 Terminology and nomenclature: Strategy, Project Group and ballot resolution meetings
- ISO/TC 229 JWG 2 Measurement and characterization: Strategy, Project Group and Preliminary Work Item meetings
- ISO/TC 229 WG 3 Health safety and environment: Strategy, Project Group and ballot resolution meetings
- ISO/TC 229 WG 4 Materials Specifications: Strategy and Preliminary Work Item meetings
- ISO/TC 229 Sustainability Task Group
- ISO/TC 229 Task Group on Societal and Consumer Dimensions
- ISO/TC 229 Study Group on Nanotechnology and Biological Systems
- ISO/TC 229 Chairman's Advisory Group Meeting
- ISO/TC 229 Plenary

- **April 20 -21, 2016 -- Meeting of the ANSI-Accredited U.S. TAG to ISO/TC 229 Nanotechnologies**

The purpose of the April 20 -21, 2016, meeting of the ANSI-Accredited U.S. TAG and the preceding TAG Working Group meetings was to review action items from the ISO/TC 229 Plenary week in Edmonton, Alberta, as well as to prepare for the upcoming ISO/TC 229 Interim Working Group meetings to take place in Lowell, Massachusetts and Kyoto, Japan. Positions that were formulated included:

- U.S. positions relative to ballot resolution meetings
- U.S. positions on development of specific ISO deliverables

Sample U.S. Positions are available from the Principle Investigator.

- **May 10-13, 2016, Interim Meetings of ISO/TC 229 JWG 1 and ISO/TC 229 JWG 2. Lowell, Massachusetts.**

The purpose of the May 10-13, 2016, Interim meetings of ISO/TC 229 JWG 1 and JWG 2 was to continue development of WG 1 and WG 2 projects, as well as to consider next steps regarding those documents that recently completed Systematic Review balloting. 12 U.S. experts participated in these internationally attended meetings.

The JWG 2 meeting was held in conjunction with the meeting of IEC TC 113, *Nanotechnology standardization for electrical and electronic products and systems*. ISO/TC 229 has two joint Working Groups with this IEC TC, including JWG 2. Experts also participated in a Graphene day, which focused on the development of graphene-specific standards

The following JWG 1 Project Groups held meetings in Lowell:

- JWG 1/PG 5 – Revision of *Nanotechnologies – Vocabulary – Part 4: Nanostructured materials*
- JWG 1 /PG 14 - *Plain Language Guide for Terminology*
- JWG 1 /PG 17 - *Nanotechnologies – Vocabulary – Part 11: Nanolayer, nanocoating, nanofilm and related terms*
- JWG 1 /PG 19 - *Nanotechnologies – Vocabulary – Part 13: Graphene and other 2d materials*
- JWG 1/PG 20 – *Standard terms and their definition for cellulose nanomaterials*

The following JWG 2 Project Groups held meetings in Lowell:

- JWG 2/PG 7 – Revision of *Nanotechnologies -- Characterization of carbon nanotubes using thermogravimetric analysis*
- JWG 2/PG 18 - *Matrix of characterization and measurement methods for Graphene*
- JWG 2 /PG 19 - *Separation and size fractionation for the characterization of metal-based nanoparticles in water samples* (Inaugural meeting)
- PWI 21346 *Nanotechnologies – Characterization of cellulose elementary fibril samples*
- PWI 21356 *Nanotechnologies– Structural characterization of graphene*
- PWI21363 *Nanotechnologies – Protocol for particle size distribution by transmission electron microscopy*
- PWI 19749 *Determination of size and size distribution of nano-objects by SEM*
- PWI 21362 *Nanotechnologies – Application of field flow fractionation for characterization of nanomaterial contents*
- PWI 21357 *Nanotechnologies – Measurement of average nanoparticle size and assessment of agglomeration state by static multiple light scattering (SMLS) in concentrated media*
- PWI 21361 *Identification and quantification of airborne nano-objects in a mixed dust industrial environment*

- **May 24 - 26, 2016 Interim Meetings of ISO/TC 229 WG 3 and WG 4**

The purpose of the May 24-26, 2016, Interim meetings of ISO/TC 229 WG 3 and WG 4 was to continue development of ongoing projects. 4 U.S. experts participated in these internationally attended meetings.

The following WG 3 Project Groups held meetings in Kyoto:

- *WG 3/PG 1Rev – Health and safety practices in occupational settings relevant to nanotechnologies*
- *WG 3/PG 16 - Nanotechnologies – Electron spin resonance (ESR) as a method for detecting reactive oxygen species (ROS) generated by metal oxide nanomaterials*
- *WG 3/PG 19 - Nanotechnologies – the use and application of acellular in vitro tests and methodologies to assess nanomaterial biodurability*
- *WG 3/PG 21 - Aerosol generation for NOAA air exposure studies*
- *WG 3/PG 22 – Aquatic Toxicity Assessment of Nanomaterials in salt water lakes using Artemia sp*
- *WG 3/PG 23 – Photocatalytic activity assay for nanoparticles in aqueous suspension*
- *WG 3/PG 24 - Considerations for the measurement of nano-objects, and their aggregates and agglomerates (NOAA), in the environment*

The following WG 4 Project Groups held meetings in Kyoto:

- *WG 4/PG 5 - Nanotechnology — Liquid suspension of magnetic nanoparticles — Characteristics and measurements*
- *WG 4/PG 6 - Nanotechnologies -- Materials specification -- Antibacterial silver nanoparticles*
- *WG 4/PG 7 – Nanoclays – Characteristics and measurement methods*
- *WG 4/PG 8 – Nano-enhanced air filter media using nanofibers: Characteristics, Performances and Measurement Methods*
- *WG 4/PG 9 - Nanotechnology - Specifications for Carbon Nanotube Suspension: characteristics and test methods*

- **New Work Item Proposals Submitted to ISO/TC 229 on behalf of the United States of America via ANSI.**

The following New Work Item Proposals (NWIP) were submitted to ISO/TC 229 for development under the leadership of the U.S. TAG to ISO/TC 229:

- *Technical Report: Strategies for measuring engineered or manufactured nanomaterials in the environment.* – to be developed under ISO/TC 229 WG 3
- *Technical Report: Considerations for in vitro studies of airborne engineered nanomaterials* – to be developed under ISO/TC 229 WG 3

A complete status update on the entire ISO/TC 229 Program of Work can be found in the attached **DOE-ER46566-21**.

### **III. Support of U.S. Representation on ISO/TC 229 *Nanotechnologies*: 6/2/2015 – 8/14/2016**

Relative to Activities for 6/2/1/2015 – 8/14/2016: The U.S. TAG continued to provide technical and administrative leadership for the ISO/TC 229 Working Group on Health, safety and environment.

ANSI, on behalf of the U.S. TAG, continued to perform outreach to materially affected U.S. interested parties, to ensure that the U.S. was expertly and effectively represented on this activity internationally.

### **IV. Support of the U.S. Representation on ISO/TC 229 *Nanotechnologies***

Financial support for ANSI's administration of the U.S. TAG to ISO/TC 229 as well as U.S. leadership of the ISO/TC 229 Working Group on Health, safety and environment is provided by TAG membership fees from the 50+ members of the ANSI-Accredited U.S. TAG, as well as a grant from the U.S. Department of Agriculture.

All funding received is directly applied to the program and the costs associated with operating the U.S. TAG. This funding is secured through an equitable distribution of costs shared between the public and private sector participants. The following Federal Agencies currently providing financial support via TAG fees are: U.S. FDA, NIOSH NIST, and the U.S. State Department.

**DOE-ER46566-21**

## **ISO/TC 229 PROGRAM OF WORK AND STATUS UPDATE 8/14/2016**

### **PUBLISHED DOCUMENTS DEVELOPED BY ISO/TC 229**

ISO/TS 27687:2008 – *Nanotechnologies -- Terminology and definitions for nano-objects -- Nanoparticle, nanofibre and nanoplate* (Replaced by ISO/TS 80004-2:2015)

ISO/TR 12885:2008 – *Nanotechnologies – Health and safety practices in occupational settings relevant to nanotechnologies*

ISO/TR 11360:2010 – *Nanotechnologies – Methodology for the classification and categorization of nanomaterials*

ISO/TS 80004-3:2010 – *Nanotechnologies --Terminology and definitions --Part 3: Carbon nano-objects*

ISO/29701:2010 - *Nanotechnologies --Endotoxin test on nanomaterial samples for in vitro systems -- LAL Assay*

ISO/TS 10867:2010 – *Nanotechnologies -- Characterization of single-wall carbon nanotubes using near infrared photoluminescence spectroscopy*

ISO/TS 80004-1:2010 – *Nanotechnologies – Vocabulary – Part 1: Core terms*

ISO/TR 12802:2010 – *Nanotechnologies – Model taxonomic framework for use in developing vocabularies – Core concepts*

ISO/TS 11251:2010 – *Nanotechnologies – Characterization of volatile components in single-wall carbon nanotube samples using evolved gas analysis/gas chromatograph-mass spectrometry*

ISO 10801:2010 – *Nanotechnologies --Generation of metal nanoparticles for inhalation toxicity testing using the evaporation/condensation method*

ISO 10808:2010 – *Nanotechnologies --Characterization of nanoparticles in inhalation exposure chambers for inhalation toxicity testing-*

ISO/TR 13121:2011 – *Nanotechnologies -- Nanomaterial risk evaluation*

ISO/TS 10798:2011 - *Nanotechnologies -- Characterization of single-wall carbon nanotubes using scanning electron microscopy and energy dispersive X-ray spectrometry analysis*

ISO/TS 10868:2011 - *Nanotechnologies -- Characterization of single-wall carbon nanotubes using ultraviolet-visible-near infrared (UV-Vis-NIR) absorption spectroscopy*

ISO/TS 80004-7:2011 - *Nanotechnologies -- Vocabulary -- Part 7: Diagnostics and therapeutics for healthcare*

ISO/TS 13278:2011 – *Nanotechnologies – Determination of metal impurities in samples of carbon nanotubes using inductively coupled plasma mass spectrometry*

ISO/TS 11308:2011 – *Nanotechnologies – Characterization of single-wall carbon nanotubes using thermogravimetric analysis*

ISO/TS 11888:2011 – *Nanotechnologies - Characterization of multiwall carbon nanotubes -- Mesoscopic shape factors*

ISO/TS 12805:2011 – *Nanotechnologies -- Materials specifications -- Guidance on specifying nano-objects*

ISO/TS 80004-4:2011 – *Nanotechnologies – Vocabulary – Part 4: Nanostructured materials*

ISO/TS 80004-5:2011 – *Nanotechnologies – Vocabulary – Part 5: Bionano interface*

ISO/TR 10929:2012 - *Nanotechnologies -- Characterization of multiwall carbon nanotube (MWCNT) samples*

ISO/TR 13014:2012 - *Nanotechnologies - Guidance on physicochemical characterization of engineered nanoscale materials for toxicologic assessment*

ISO/TS 10797:2012 – *Nanotechnologies -- Characterization of single-wall carbon nanotubes using transmission electron microscopy (TEM)*

ISO/TR 11811:2012 – *Nanotechnologies -- Guidance on methods for nano- and microtribology instruments*

IEC/ISO TS 62622 - *Nanotechnologies – Description, measurement and dimensional quality parameters of artificial gratings*

ISO/TS 12025:2012 - *Nanomaterials -- Quantification of nano-object release from powders by generation of aerosols*

ISO/TS 14101:2012 - *Surface characterization of gold nanoparticles for nanomaterial specific toxicity screening: FT-IR method*

ISO/TS 12901-1:2012 - *Nanotechnologies – Occupational risk management applied to engineered nanomaterials Part 1: Principles and approaches*

ISO/TR 13329:2012 - *Nanomaterials -- Preparation of material safety data sheet (MSDS)*

ISO/TS 11931:2012 - *Nanotechnologies -- Nanoscale calcium carbonate in powder form -- Characteristics and measurement*

ISO/TS 11937:2012 - *Nanotechnologies -- Nanoscale titanium dioxide in powder form -- Characteristics and measurement*

ISO/TS 16195:2013 - *Nanotechnologies -Generic requirements for reference materials for development of methods for characteristic testing, performance testing and safety testing of nano-particle and nano-fiber powders*

ISO/TS 17200:2013 - *Nanotechnology -- Nanoparticles in powder form -- Characteristics and measurements*

ISO/TS 80004-6:2013 - *Nanotechnologies -- Vocabulary -- Part 6: Nano-object characterization*

ISO/TS 13830:2013 – *Nanotechnologies – Guidance on voluntary labelling for consumer products containing manufactured nano-objects*

ISO/TS 80004-8:2013 - *Nanotechnologies -- Vocabulary -- Part 8: Nanomanufacturing*

ISO/TR 14786:2014 - *Nanotechnologies — Considerations for the development of chemical nomenclature for selected nano-objects*

ISO/TS 12901-2:2014 – *Nanotechnologies – Occupational risk management applied to engineered nanomaterials – Part 2: Use of the control banding approach*

ISO/TR 16197:2014 - *Nanotechnologies -- Compilation and description of toxicological screening methods for manufactured nanomaterials*

ISO/TS 16550:2014 - *Nanotechnologies -- Determination of silver nanoparticles potency by release of muramic acid from Staphylococcus aureus*

ISO/TS 80004-2:2015 - *Nanotechnologies -- Vocabulary -- Part 2: Nano-objects* **[Replaces ISO/TS 27687]**

ISO/TS 17466:2015 - *Use of UV-Vis absorption spectroscopy in the characterization of cadmium chalcogenide colloidal quantum dots*

ISO/TS 18110:2015 - *Nanotechnologies - Vocabularies for Science, Technology and Innovation Indicators*

ISO/TS 80004-1:2015 – *Nanotechnologies – Vocabulary – Part 1: Core terms* **[Replaces ISO/TS 80004-1:2010]**

ISO/TR 17302:2015, *Framework for identifying vocabulary development for nanotechnology applications in human healthcare*

ISO/TS 80004-12:2016 - *Nanotechnologies -- Vocabulary -- Part 12: Quantum Phenomena*

ISO/TS 19337:2016 - *Nanotechnologies -- Characteristics of working suspensions of nano-objects for in vitro assays to evaluate inherent nano-object toxicity*

ISO/TR 19716:2016 - *Nanotechnologies -- Characterization of cellulose nanocrystals*

ISO/TS 19006:2016 - *Nanotechnologies -- 5-(and 6)-Chloromethyl-2',7'-Dichloro-dihydrofluorescein diacetate (CM-H2DCF-DA) assay for evaluating nanoparticle-induced intracellular reactive oxygen species (ROS) production in RAW 264.7 macrophage cell line*

#### Current ISO/TC 229 Program of Work

Working Group	Designation	Title	Country Lead	Status
JWG 1 PG 6 Rev	ISO/TS 80004-4 Rev	Nanotechnologies – Vocabulary – Part 4: Nanostructured materials	Germany	In progress.
JWG 1/PG 14	ISO/DTR 18401	Nanotechnologies - Plain Language Guide for Terminology	UK	In progress. Document to be submitted for balloting shortly.
JWG 1/PG 17	ISO/DTS 80004-11	Nanotechnologies - Vocabulary - Part 11: Nanolayer, nanocoating,	UK/Germany	DTS Ballot <b>Approved</b> .

		nanofilm and related terms		
JWG 1/PG 19	ISO/DTS 80004-13	Nanotechnologies – Vocabulary – Part 13: Graphene and other 2d materials	UK	DTS Ballot underway and due to close: <b>10.21.2016</b>
JWG 1/PG 20	ISO/DTS 20477	Standard terms and their definition for cellulose nanomaterials	USA	DTS Ballot underway and due to close: <b>10.14.2016</b>
JWG 2/PG 2 Rev	ISO/TS 10798 Rev	Nanotechnologies -- Characterization of single-wall carbon nanotubes using scanning electron microscopy and energy dispersive X-ray spectrometry analysis	USA	This JWG 2 document to be revised. <b>US Experts Needed</b>
JWG 2/PG 3 Rev	ISO/TS 10868 Rev	Nanotechnologies -- Characterization of single-wall carbon nanotubes using ultraviolet-visible-near infrared (UV-Vis-NIR) absorption spectroscopy	Japan	DTS Ballot underway and due to close: <b>8.31.2016</b>
JWG 2/PG 7 Rev	ISO/TS 11308 Rev	Nanotechnologies – Characterization of single-wall carbon nanotubes using thermogravimetric analysis	USA	This JWG 2 document to be revised. <b>US Experts Needed</b>
JWG 2/PG 9 Rev	ISO/TS 11888 Rev	Nanotechnologies - Characterization of multiwall carbon nanotubes -- Mesoscopic shape factors	Korea	TS Ballot <b>Approved</b> . Comments to be resolved shortly
JWG 2/PG 12 Rev	ISO/TS 13278 Rev	Nanotechnologies – Determination of metal impurities in samples of carbon nanotubes using inductively coupled plasma mass spectrometry	China	TS Ballot <b>Approved</b> . Comments to be resolved shortly
JWG 2/PG 15	ISO/DTR 18196	Measurement technique matrix for nano-objects	USA	Document at <b>Proof</b> Stage
JWG 2/PG 16	ISO/DTS 19590	Nanoparticles: Detection and characterization using single-particle ICP-MS	Netherlands	Document to be submitted for publication shortly.
JWG	ISO/DTR 19733	Matrix of characterization and	Korea/USA	In Progress



2/PG 18		measurement methods for Graphene		
JWG 2/PG 19	ISO/DTR 20489	Separation and size fractionation for the characterization of metal-based nanoparticles in water samples	Singapore	In Progress
JWG 2/PG 20	ISO/DTS 19809	Guidelines for collection and sample preparation of airborne nanoparticles for microscopy techniques	France	In Progress
JWG 2	ISO/PWI	Determination of size and size distribution of nano-objects by scanning electron microscopy	USA	In progress
JWG 2	ISO/PWI	'Nanotechnologies -- Structural characterization of graphene'	UK	PWI recently added to JWG 2. <b>US Experts Needed</b>
JWG 2	ISO/PWI	Nanotechnologies -- Measurement of average nanoparticle size and assessment of agglomeration state by static multiple light scattering (SMLS) in concentrated media	UK	PWI recently added to JWG 2. <b>US Experts Needed</b>
JWG 2	ISO/PWI	Identification and quantification of airborne nano-objects in a mixed dust industrial environment	USA	PWI recently added to JWG 2. <b>US Experts Needed</b>
JWG 2	ISO/PWI	Nanotechnologies -- Application of field flow fractionation for characterization of nanomaterial contents	Japan	PWI recently added to JWG 2. <b>US Experts Needed</b>
JWG 2	ISO/PWI	Nanotechnologies -- Protocol for particle size distribution by transmission electron microscopy	USA/Japan	PWI recently added to JWG 2. <b>US Experts Needed</b>
JWG 2	ISO/PWI	Nanotechnologies – Characterization of cellulose elementary fibril samples	Japan	PWI recently added to JWG 2. <b>US Experts Needed</b>
WG 3/PG 1	ISO/TR 12885	Health and safety practices in occupational settings relevant to	USA	In progress.

Rev		nanotechnologies		
WG 3/PG 12	ISO/TR 16196	Compilation and description for sample preparation and dosing methods for engineered and manufactured nanomaterials	USA	Document at <b>Proof</b> Stage
WG 3/PG 15	ISO/TR 18637	General framework for the development of occupational exposure limits for nano-objects and their aggregates and agglomerates	USA	Document at <b>Proof</b> Stage
WG 3/PG 16	ISO/DTS 18827	ESR as a method for measuring ROS generated by metal oxide nanomaterials	Korea	DTS Ballot underway and due to close on <b>9.30.2016</b>
WG 3/PG 17	ISO/DIS 19007	<i>In vitro</i> MTS Assay for measuring the cytotoxic effect of nanoparticles	USA	<b>DIS Ballot</b> underway and due to close on <b>10.9.2016</b>
WG 3/PG 19	ISO/DTR 19057	Nanotechnologies – the use and application of acellular in Vitro Tests and Methodologies to assess Nanomaterial Biodurability	South Africa	In progress.
WG 3/PG 21	ISO/DTR 19601	Aerosol generation for NOAA air exposure studies	Korea	DTR Ballot underway and due to close on <b>10.10.2016</b>
WG 3/PG 22	ISO/DTS 20787	Nanotechnologies -- Aquatic toxicity assessment of nanomaterials using Artemia sp	Iran/Korea	In progress.
WG 3/PG 23	ISO/AWI 20814	Photocatalytic activity assay for nanoparticles in aqueous suspension'	Korea/USA	In progress.
WG 3/PG 24	ISO/DTR 21386	Considerations for the measurement of nano-objects, and their aggregates and agglomerates (NOAA), in the environment	USA	In progress.
WG 3/PG 25	ISO/DTR 21624	Considerations for <i>in vitro</i> studies of airborne engineered nanomaterials	USA	NWIP Ballot <b>approved</b> . Inaugural meeting to be held in Singapore

WG 3/PG 26	ISO/DTS 21633	Label-free impedance technology to assess the toxicity of nanomaterials <i>in vitro</i>	South Africa	NWIP Ballot <b>approved</b> . Inaugural meeting to be held in Singapore
WG 4/PG 5	ISO/DTS 19807	Specification for magnetic nanoparticle suspensions	India	In progress. <b>US Experts Needed</b>
WG 4/PG 6	ISO/DTS 20660	Nanotechnologies -- Materials specification - - Antibacterial silver nanoparticles	Korea	In progress. <b>US Experts Needed</b>
WG 4/PG 7	ISO/DTS 21236	Nanotechnologies: nanoclays: characteristics and measurements	Iran	In progress.
WG 4/PG 8	ISO/DTS 21237	Nanotechnologies- Nano-enhanced air filter media using nanofibres; Characteristics, Performances and Measurement Methods	Iran	In progress.
WG 4/PG 9	ISO/DTS 19808	Nanotechnology - Specifications for Carbon Nanotube Suspension: characteristics and test methods	China	In progress.
WG 4/PG 10	ISO/DTS 21412	Nanotechnologies -- Nanostructured layers for enhanced electrochemical bio-sensing applications -- Characteristics and measurements	Korea	In progress.

#### ISO SYSTEMATIC REVIEW BALLOTS

Working Group	Designation	Title	Systematic Review Ballot Deadline	Status
2	TS 16195:2013	Nanotechnologies -Generic requirements for reference materials for development of methods for characteristic testing, performance testing and safety testing of nano-particle and nano-fiber powders	September 15, 2016	
4	TS 17200:2013	Nanotechnology -- Nanoparticles in powder form -- Characteristics and measurements	September 15, 2016	

#### IEC TC 113 LED WORK ITEMS BEING JOINTLY DEVELOPED

<b>WG?</b>	<b>Designation</b>	<b>Title</b>	<b>Status</b>
JWG 1/PG 15	ISO/DTS 80004-9	Nanotechnologies - Vocabulary - Part 9: Nano-enabled electrotechnical products and systems	DTS Ballot approved. Comments to be resolved by IEC TC 113 Committee.
JWG 1/PG 16	ISO/DTS 80004-10	Nanotechnologies - Vocabulary - Part 10: Nano-enabled photonic components and systems	
	IEC 62565-3-1	Nanomanufacturing — Material specifications — Part 3-1: Graphene — Blank detail specification	

#### **CEN LED WORK ITEMS BEING JOINTLY DEVELOPED UNDER THE VIENNA AGREEMENT**

<b>WG?</b>	<b>Designation</b>	<b>Title</b>	<b>Status</b>

#### **Acronym Key:**

AWI – Approved Work Item

CD – Committee Draft (ballot at TC)

DIS – Draft International Standard

DTR – Draft Technical Report

DTS – Draft Technical Specification

FDIS – Final Draft International Standard

PWI – Preliminary Work Item

WD – Working Draft (being developed by WG)

TR – Technical Report

TS – Technical Specification