

November 12, 2012

## **The Description of Nanomaterials A CODATA-VAMAS Working Group**

*The description of materials at the nanoscale must include and emphasize information common to diverse materials and the many scientific disciplines and different user communities interested in them. As the same time, such a description system must avoid stifling innovation and discovery through overly prescriptive or restrictive requirements. CODATA and VAMAS have established a Joint Working Group (CVJWG) to develop an updated set of requirements for the information necessary to support standardization of a uniform description system.*

*This brief document presents the background, a summary of the proposed work plan, and the community from which participants are being drawn.*

The CODATA-VAMAS Joint Working Group on the Description of Nanomaterials was recommended by an expert workshop held in Paris on 23-24 February 2012, sponsored by the International Council for Science (ICSU) and its Committee on Data for Science and Technology (CODATA). Attendees were nanomaterials [for purposes of this report the term “nanomaterials” is used as a synonym for the phrase “materials at the nanoscale”] researchers, standards developers, and information scientists from around the world, including representatives of ten international scientific unions. The Workshop concluded that an international pre-standardization project is needed with the objective to develop a uniform description system that provides the multi-disciplinary, multi-use requirements of the data necessary to describe materials at the nanoscale. The description system will have two capabilities: (1) to identify nanomaterials uniquely and (2) to determine if two nanomaterials are equivalent according to a set of descriptors agreed to by all parties involved in transactions related to the nanomaterials. By a uniform description system (a set of inclusive descriptors) is meant agreed upon categories of information needed to identify nanomaterials accurately.

### **Background**

Workshop attendees agreed that premature standardization or regulation, or both, could significantly delay the use of nanomaterials in new products and processes affecting new technologies and economic growth. Further, they pointed out that nanomaterials are already ubiquitous in nature, occurring in foods, fuel, structural materials, geological materials, and living organisms. They pointed out applications over the centuries have used manufactured nanomaterials in foods and medicine without negative results. Consequently, regulation of nanomaterials should be done based on specific test results and not simply on the basis of size.

The Workshop also pointed out that much of the standardization work on materials at the nanoscale is directed at environmental, health, and safety issues, with particular emphasis on safety. It was noted that many different scientific and technical (S&T) disciplines and user communities have important requirements for describing nanomaterials that are not related to safety issues and are not being addressed.

As the result of Workshop discussions, attendees strongly endorsed a pre-standardization program to develop and apply scientific knowledge to generate results upon which meaningful standards and regulations may be based. The highest priority should be on understanding and defining the requirements for a uniform description system for nanomaterials taking into account as many S&T disciplines and user communities as possible. From this full set of requirements, the second step would be to develop the

minimal set of information necessary to describe accurately important classes or types of materials on the nanoscale.

### **The Project**

In response, CODATA, at its Executive Committee meeting in April 2012, approved a working group consisting of nanomaterials experts and information scientists, with representation from international scientific unions interested in nanomaterials. CODATA has joined with VAMAS, the Versailles Project on Advanced Materials and Standards, to create a Joint Working Group that adds VAMAS's long experience with pre-standardization work on materials and materials data to CODATA's expertise on data system requirements.

The goal of the project is to produce an in-depth, pre-standardization white paper defining the ***requirements for a uniform description system for materials at the nanoscale*** taking into account as many S&T disciplines and user communities as possible. From this full set of requirements, a second step would develop ***a minimum set of information necessary to describe accurately important classes and types of materials on the nanoscale***. The audience for the white paper includes ISO and IEC Committees related to nanotechnology (e.g., ISO TC229 on Nanotechnology and IEC 113 on Nanotechnology standardization for electrical and electronic products and systems), other national and international standards development organizations, and government regulators.

The 18-month (approximately) project would consist of two phases. Phase I would develop a list of requirements that meets the needs of different scientific disciplines (See attachment A for scientific disciplines as well as the corresponding international union) as well as the needs of the user communities (Attachment B) that are involved in the different stages of the life cycle of materials. Phase II would then develop a base set of information needed to meet the requirements that could form a broad basis for international standards. In addition, different disciplines and user communities could use the base set of information and add additional specific information to meet their specialized needs. A proposed work plan is given in Attachment C. The proposed schedule is approximate and depends on the availability of funding.

The combination of CODATA and VAMAS brings extra strength to the working group. CODATA has excellent access to the international unions and information and data scientists. VAMAS has excellent access to nanomaterials experts throughout the world.

### **Working Group**

The CVJWG will be headed by Clayton Teague, a researcher engaged in international nanotechnology standardization efforts for many years, Steve Freiman, representing VAMAS, and John Rumble, representing CODATA. In addition, the Group will select an international Core Drafting Team drawn from the international nanomaterials community. CODATA will solicit representatives from international scientific unions (see Attachment A), and VAMAS will solicit nanomaterials experts from its member countries.

### **Document prepared by**

The CODATA-VAMAS Joint Working Group on the Description of Nanomaterials

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## Attachment A

### International Unions Representing Scientific Disciplines Interested Nanomaterials

Scientific Disciplines Interested Nanomaterials	
Disciplines	International Scientific Union
Chemistry	Pure and Applied Chemistry
Materials Science	Materials Research Societies
Food	Food Science and Technology
Nutrition	Nutritional Sciences
Physics	Pure and Applied Physics
Crystallography	Crystallography
Biology	Biological Sciences
Biochemistry and Molecular Biology	Biochemistry and Molecular Biology
Toxicology	Toxicology
Microbiology	Microbiological Societies
Sciences in Support of Medicine	Physical and Engineering Sciences in Medicine
Pharmacology	Basic and Clinical Pharmacology
Physiological Sciences	Physiological Sciences
Medicine	Tbd
Mathematics	Mathematics
Health care	Tbd
Environmental science	Conservation of Nature
Ecology	Tbd

## Attachment B

### User Communities Interested in Nanomaterial Description

User Communities Interested in Nanomaterial Description	
Life Cycle Activity	Major User Communities
Initial evaluation of properties	R&D
Interactions with other materials	R&D, Industry, Government, consumer
Product design	Industry
Materials selection	Industry
Materials performance prediction	Industry, Government, consumer
Materials development	Industry
Materials safety	Industry, Government, consumer
Production engineering	Industry
Product information systems	Industry , Government, consumer
Material purchase and sale	Industry, Government, consumer
Material use	Industry, Government, consumer
Material disposal and recycling	Industry, Government, consumer

Note 1: In Table 2, the term “Industry” includes all types of industry, from pharmaceutical companies to electronic manufacturers to food industry to the health care and more.

## Attachment C

### Proposed Work Plan for Producing White Paper on Description of Materials on the Nanoscale

A three-phase working plan is proposed. In Phase 1, a core set of international experts will meet to determine an initial set of suggested requirements. The core group will then review the suggested requirements and produce an integrated set of requirements that will be reviewed by the entire WG group. Based on that review, the core group will produce a draft version of the integrated requirements.

In Phase 2, three workshops will be held, one each in North America, Europe, and Asia, to review the draft set of integrated requirements and select the minimal set of information categories that should be included in the description of a specific nanomaterial. Following the workshops, the Core Group will draft a White Paper containing the approved full set of integrated requirements plus the minimal set of information categories.

Phase 3 includes the final review and approval of the White Paper and its transmittal to various standards development organizations and other groups for action.

A timeline of activities is given below.

<b>Draft Work Plan</b>			
<b>Month</b>	<b>Activity</b>	<b>Group</b>	<b>Type Meeting</b>
	<b>Phase 0</b>		
1-2	Establish Working Group	CODATA and VAMAS	
	<b>Phase 1</b>		
3-6	Draft set of requirements	Core Group	Face-to-Face
6-10	Review draft requirements	Entire Working Group	Virtual
	Change draft as needed to produce integrated requirements	Core Group	Virtual
	<b>Phase 2</b>		
10-12	Write draft recommended minimal set of information categories	Entire Working Group	Three workshops held in North America, Europe, and Asia
13-14	Review draft recommended minimal set of information categories	Entire Working Group and others	Virtual
	Produce draft White Paper (integrated requirements plus minimal set of information categories)	Core Group	Face-to-Face
14-15	Review draft White Paper	Entire Working Group plus outside experts as desired	Virtual
	<b>Phase 3</b>		
15-18	Finalize and submit White Paper to CODATA and VAMAS for final approval	Core Group	
18	Transmit White Paper to various standards development organizations and regulators for their use	CODATA and VAMAS	