3rd. Tri-national Workshop on Standards for Nanotechnologies

REPORT

The 3rd. Tri-national Workshop on Standards for Nanotechnologies was held on February 12, 2009, in the Centro Nacional de Metrología (CENAM) facilities in Querétaro, México, according to the Program (Annex A), with 18 lectures delivered by experts from 14 organizations, five lecturers from Canada, two from USA, one from Brazil, and ten from Mexico, including two affiliated to CENAM.

Of a total amount of 93 attendees, 61 are researchers from: 11 research and development Mexican organizations, 16 from CENAM and 5 from industry and other organizations; other 32 participants were students from 12 Mexican institutes. Annex B contains additional information about the audience. It should be highlighted the participation of a representative of the Embassy of Canada in Mexico.

There was also a number of people participating through videoconference in:

- Facultad de Estudios Superiores Cuautitlán, UNAM
- Universidad Católica de Santo Domingo, República Dominicana
- Instituto de Informática y Computación, Universidad Tecnológica Equinoccial, Ecuador
- Vitro Monterrey, S.A. de C.V.
- Instituto Tecnológico de Estudios Superiores de Monterrey, campus Monterrey
- Unidad Politecnica para la Educación Virtual, IPN
- Universidad Autónoma de Nuevo León

One of the lectures was received through this means from the Institute for National Measurement Standards – NRC - Canada.

The files with the presentation materials are posted to be downloaded freely in www.cenam.mx.

It is worth mentioning that:

- This 3rd. edition of the Trinational Workshop is organized by the Centro Nacional de Metrología within the celebrations for its 15th. Anniversary, in collaboration with the Institute for National Measurement Standards of the National Research Council of Canada and the National Institute of Standards and Technology of USA. This workshop brings in a contribution of INMETRO, the National Metrology Institute of Brazil.

- These workshops started on February 2007 by the initiative of the Institute for National Measurement Standards, and continued on February 2008 by the organization of the National Institute of Standards and Technology.

- The generosity of the institutions of affiliation of the lecturers for funding the traveling and accommodation expenses are greatly appreciated as well as the partial funding by the Consejo Estatal de Ciencia y Tecnología del Estado de Querétaro.

General conclusions

A summary of the conclusions obtained by Norma González, fully displayed in Annex C, is:

- The impact of nanotechnologies in the competitiveness and the quality of life shows accelerated advancements.
- Metrology plays an important role in nanotechnologies.
- The nanostructures, as arrangements of atoms and molecules, produce new forms whose understanding and characterization require new equipments, methods, standards and measurement standards, often quite distinct than those used in conventional materials.
- Recognizing the advancements on research on nanotechnologies, additional efforts are still needed to determine and understand the biological responses to nanomaterials, whose results may contribute to identify and prevent potential adverse effects on human health and environment.
- All of the interested parties (including governments, research centers, academy, industry) shall communicate each other and make joint efforts to more precisely address this field.

Remarks

- The Canadian and USA delegations renew the invitation to the Mexican community for collaborations in standardization activities.

- El INMS – Canada announcement to organize the 4th. Edition of the Workshop in Canada in 2010.

- It seems convenient to extend the benefits from the Workshop to students in different levels: for the undergraduate students to grasp a general idea about nanotechnologies, and for graduate students the Workshop facilitated the first-hand learning of experiences from the experts and of course it provided the opportunity to a more effective approximation.

- The output of the Workshop assessment by the on-site participants is, using a scale of 1 (the worst) to 5 (excelent):

  Contents of lectures: 4.64
  Coverage of the expectations: 4.46
  Overall assessment: 4.70

  Other aspects assessed:
  Registration process: 4.64
  Interpretation: 4.39
  Cafeteria: 4.57
  Meals: 4.54

  Some suggestions were expressed to include more interactive activities, and to extend the Workshop to two days.

The coordination of the Workshop is pleased to recognize the help and contributions of Dr. Jennifer Decker and Dr. Ron Dixson, to the lecturers, the personnel in charge of video in INMS-NRC, and to all CENAM personnel without their work this Workshop had not been possible.

Querétaro, México, February 26, 2009.

Rubén J. Lazos Martínez

ANNEX A. PROGRAM

8h30 Chairperson: Norma González (CENAM - México)

- Capabilities and activities of the National Nanotechnology Laboratory in Chihuahua, Mexico.
  Jesús González, Centro de Investigación en Materiales Avanzados – México.

- Enabling Standards for Nanomaterial Characterization: Findings and Summary of the Recent NIST Workshop
  Vince Hackley, National Institute of Standards and Technology – USA.

- Nanometrology at INMETRO
  Carlos Achete, INMETRO – Brazil

- Documentary standards
  Ron Dixson, National Institute of Standards and Technology – USA

- Recent Developments in Canadian Nanotechnology Measurement Science and ISO Standards Initiatives
  Jennifer Decker, NRC-Institute for National Measurement Standards – Canada

10h20 DISCUSSION

10h50 BREAK

11h00 Chairperson: Shan Zou (SIMS-NRC- Canadá)

- Status and trends of nanometrology at CENAM
  Rubén Lazos, CENAM – México

- Nanoscience and Nanotechnology at the Instituto Politécnico Nacional.
  Gerardo Cabañas, Instituto Politécnico Nacional – México

- Environmental measuring for the regulation and control of chemicals and nanomaterials
  Jimena Ramos, Instituto Nacional de Ecología – México

- Measurements on nanomaterials and nanoproducts in industry
  Sergio Castañeda, Centro de Investigación y Desarrollo CARSO – México

12h20 DISCUSSION

12h40 LUNCH

14h00 Chairperson: Ron Dixson (NIST - EUA)

- Setting standards in nanotube science
  Mauricio Terrones, Instituto Potosino de Investigación Científica y Tecnológica – México.

- Single Protein Unfolding and AFM-based Force Mapping.
  Shan Zou, NRC- Steacie Institute for Molecular Sciences – Canada

- Instrumentation Errors in Nano-Indentation
  David Muñoz-Paniagua, National Institute for Nanotechnology – Canada

- Construction of Functional Electrodes by means of Nanosized Oxide Semiconductors for Photovoltaics and Photoelectrocatalysis Applications
  Juan Manríquez, Centro de Investigación y Desarrollo Tecnológico en Electroquímica - México

15h20 DISCUSSION

15h40 BREAK

16h00 Chairperson: Carlos Achete (INMETRO - Brasil)

- A new quantum candela metrology facility at NRC
  Charles Bamber, NRC-Institute for National Measurement Standards – Canada

- Gas adsorption characterization of SWNT and other nanomaterials: beyond BET
  Zygmunt Jakubek, NRC- Steacie Institute for Molecular Sciences – Canada

- Nano-pharmaceutics: from principles to applications
  Víctor Castaño, Centro de Física Aplicada y Tecnología Avanzada – México

- Diffraction-grids calibration at CENAM
  Miguel Viliesid, CENAM – Mexico

- Nanotechnology: Scientific or Ethical Revolution?
  Sergio Alcocer and Víctor Castaño, Universidad Nacional Autónoma de México – México.

17h40 DISCUSSION

18h10 OVERALL CONCLUSIONS. Norma González (CENAM - México)

18h30 CLOSING

ANNEX B. ATTENDEES. In-site participants.

TOTAL	**93**
Visitors	29
Lecturers	16
CENAM attendees	16
Students	32

Affiliations of visitors

Academy, research and development institutions:

- Centro de Investigación en Ciencia Aplicada y Tecnología Avanzada-QRO
- Centro de Ingeniería y Desarrollo Industrial
- Centro de Investigación y Desarrollo Tecnológico en Electroquímica
- Centro de Investigación y Estudios Avanzados
- Centro de Física Aplicada y Tecnología Avanzada
- Instituto Potosino de Investigación Científica y Tecnológica
- Instituto Tecnológico y de Estudios Superiores de Monterrey - Campus Monterrey
- Universidad de Guanajuato
- Universidad Politécnica de Querétaro
- Universidad Nacional Autónoma de México
- Universidad de la Sierra Sur

Other organizations

- ABN Labs SA de CV
- Embajada de Canadá
- Grupo México
- Instituto Mexicano de Normalización y Certificación
- Mitutoyo Mexico

Affiliation of students:

- Centro de Investigación en Ciencia Aplicada y Tecnología Avanzada-QRO
- Centro de Investigación y Desarrollo Tecnológico en Electroquímica
- Centro de Física Aplicada y Tecnología Avanzada
- Instituto Politécnico Nacional
- Instituto Potosino de Investigación Científica y Tecnológica
- Instituto Tecnológico de Oaxaca
- Instituto Tecnológico de Zacatepec
- Instituto Tecnológico Regional de Querétaro
- Universidad Autónoma de Querétaro
- Universidad Nacional Autónoma de México
- Universidad Politécnica de Querétaro
- Universidad Veracruzana

ANNEX C. GENERAL CONCLUSIONS. Dr. Norma González-Riojano.

Nanotechnology provides an important potential for boosting quality of life and industrial competitiveness in the entire world. Nanotechnology is already a large sector of industry and is expected to continue to grow at very fast rate.

Metrology plays an important role in this field. Precise control of dimensions of objects is the key issue of nanotechnology and the science of nano-objects. We can state that Nanometrology must be seen as indispensable part of all kinds of nanotechnology.

The measurement techniques developed for conventional materials in many cases cannot be simply applied to nanostructures. Special protocols for nanostructures and nanomaterials must be developed. Disregarding this could lead to severe mistakes in evaluating results.
Nanostructures, interpreted as arrangement of atoms of particles, produce new sometimes quite exotic forms. New equipment is necessary, so methodology must be developed (or improving the existing one). In addition, the development of such equipment also allows the production of reproducible nanostructures and is a requirement for understanding their properties.

Standards have to be developed to match technology advances and support the increasing applications of nanomaterials. There is a need of further development of standards for nanometrology methods aimed to physical and chemical properties evaluation. Such standards are required to define the material, its suitability for given applications, and product consistency. Calibration standards (reference samples) are also needed as crucial elements in any measuring techniques.

Even the increasing research on nanomaterials, additional work is needed to determine the biological response to engineered nanoscale materials and their by-products, whose the results may contribute to identify potential adverse health effects in human.

It is also important research focused to identify, understand and control the potential effects of engineered nanoscale materials on both relevant ecological receptors and ecosystems.
For this wide emerging field, it is necessary to have collaboration programs between national and international institutions. In the coming years, activities should be consolidated building up on the existing momentum, and paying special attention to the development of interdisciplinary infrastructures; appropriate conditions for the safe and effective use of nanotechnology; and a shared understanding of the responsibility of researchers within and ethical framework.

Considering the infrastructure and all efforts presented in the Workshop , we can state that all actors (governments, research centres, industry, academy , etc.) and other interested parties should work together, sharing information, regularly consulting one another and join efforts aimed at attend this field as well as work more closely as partners within the international arena.

As Dr. Castaño said: Future is here, there is no time for planning.