

# International and European standardization of Nanomaterials

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ICSU-CODATA workshop, Paris, 23-24/02/2012

## What about standardization of nanotechnologies?

Lyphazome

CdSe

How to characterize?

How to evaluate performance?

Benefits vs Risks

Identification and measurement?

HSE

PERFORMANCE DRIVER

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## Retrospect



CEN/BT/WG 166 Nanotechnologies was established in March 2004 to develop a strategy for European standardization in the area of nanotechnologies.

In June 2005 CEN/BT/WG 166 recommends that CEN/BT establishes forthwith a new Technical Committee in the area of Nanotechnologies; Title, scope and structure were addressed.

In parallel same recommendation was addressed by BSI- UK to ISO TMB with a draft proposal for title, scope and structure for a new Technical Committee.



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## Retrospect : ISO TC 229 1st meeting



The inaugural meeting of ISO TC 229 took place on 9-11 November 2005 in London-UK

The scope was amended and approved as follows:

Standardization in the field of nanotechnologies that includes either or both of the following:

- ➔ 1. Understanding and control of matter and processes at the nanoscale, typically, but not exclusively, below 100 nanometres in one or more dimensions where the onset of size-dependent phenomena usually enables novel applications,
- ➔ 2. Utilizing the properties of nanoscale materials that differ from the properties of individual atoms, molecules, and bulk matter, to create improved materials, devices, and systems that exploit these new properties.

Specific tasks include developing standards for: terminology and nomenclature; metrology and instrumentation, including specifications for reference materials; test methodologies; modelling and simulations; and science-based health, safety, and environmental practices.



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## Retrospect : CEN /TC 352 1st meeting



The inaugural meeting of CEN/TC 352 took place on 5 April 2006 at CEN Management Centre in Bruxelles-Belgium

The scope was amended and approved as follows:

Standardization in the field of nanotechnologies that includes either or both of the following:

- i) understanding and control of matter and processes at the nanoscale, typically, but not exclusively below 100 nanometres in one or more dimensions, where the onset of size dependent phenomena usually enables novel applications;
- ii) utilizing the properties of nanoscale materials that differ from the properties of individual atoms, molecules or bulk matter, to create improved materials, devices and systems that exploit these new properties.



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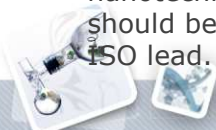
## CEN TC 352 Title and Scope



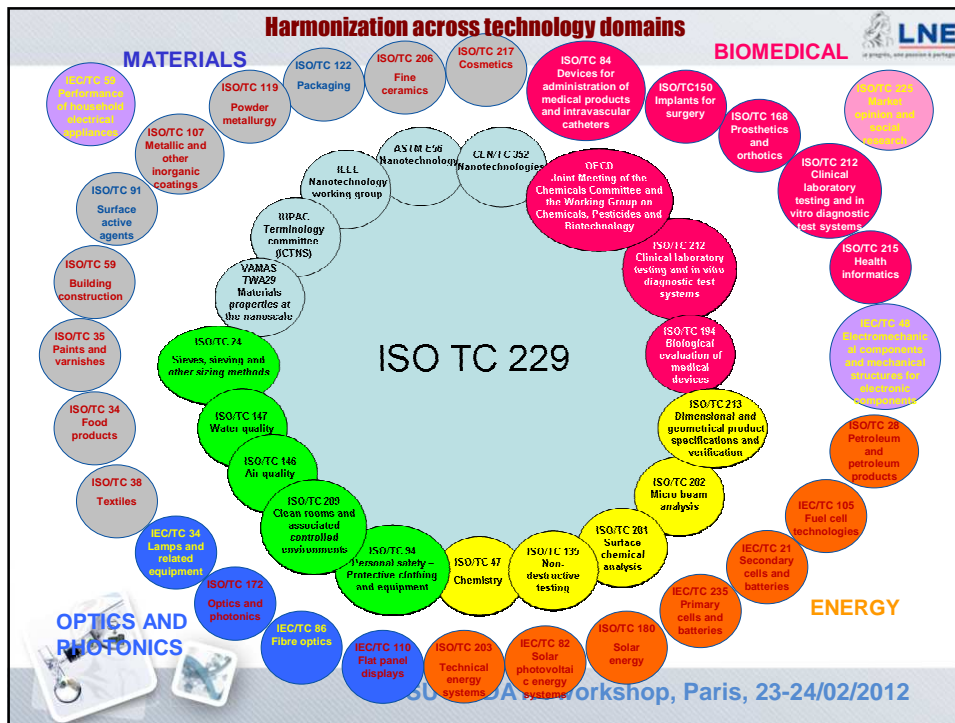
.../...

Specific tasks include developing standards for: classification, terminology and nomenclature; metrology and instrumentation, including specifications for reference materials; test methodologies; modelling and simulation; science-based health, safety and environmental practices ; and nanotechnology products and processes. Standards in each of these areas could be specific to a product, process or industry.

Liaison will be ensured with relevant national, regional and international standardization organizations and with other relevant bodies, organizations and groupings worldwide. For topics of mutual interest to ISO (ISO/TC 229 nanotechnologies) and CEN, it is expected that work should be carried out under the Vienna Agreement with ISO lead.



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## ISO TC 229 Business Plan (excerpt)

### ISO TC 229 Nanotechnologies : Business Plan

International standardization will play a critical role in ensuring that the full potential of nanotechnology is realised and that nanotechnology is safely integrated into society. Standards will help create a smooth transition from the laboratory to the marketplace, promote progress along the nanotechnology value chain – from nanoscale materials that form the building blocks for components and devices to the integration of these devices into functional systems – and facilitate global trade.

Four categories of standards are being developed; [terminology and nomenclature](#) standards provide a common language for scientific, technical, commercial and regulatory processes; [measurement and characterisation](#) standards provide an internationally accepted basis for quantitative scientific, commercial and regulatory activities; [health, safety and environmental](#) standards will improve occupational safety, and consumer and environmental protection, and promote good practice in the production, use and disposal of nano-materials, nanotechnology products and nanotechnology-enabled systems and products; and [materials specification](#) standards will specify the relevant characteristics of manufactured nanoscale materials for use in specific applications.

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### **CEN/TC 352 Nanotechnologies : Business Plan**

CEN/TC 352 will engage in standardization in the field of nanotechnologies. This will include the preparation of standards for: [classification, terminology and nomenclature](#); [metrology, measurement and characterization](#) (including procedures for calibration); [health, safety and environmental issues](#); and [nanotechnology products and processes](#).

Standards in each of the above areas could be specific to a product, process or industry. CEN/TC 352 will seek to prepare standards that are as generic as possible and thereby applicable to as wide a range of industries as possible.



From 2005 up to the end of 2011, ISO TC 229 published 22 ISO documentary standards, drafted and addressed by four working groups.

JWG 1 (together with IEC 113) Terminology and Nomenclature is the most productive WG, when JWG 2 Measurement and Characterization is mainly focussed on SWCNT and MWCNT instrumental characterization and WG 3 on control banding and health and safety practices in occupational settings.

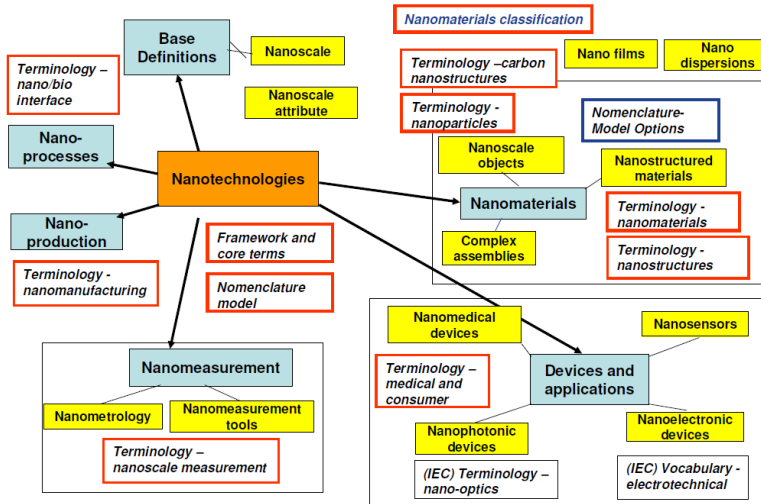




# Terminology roadmap by ISO TC 229 JWG1



## Terminology Roadmap

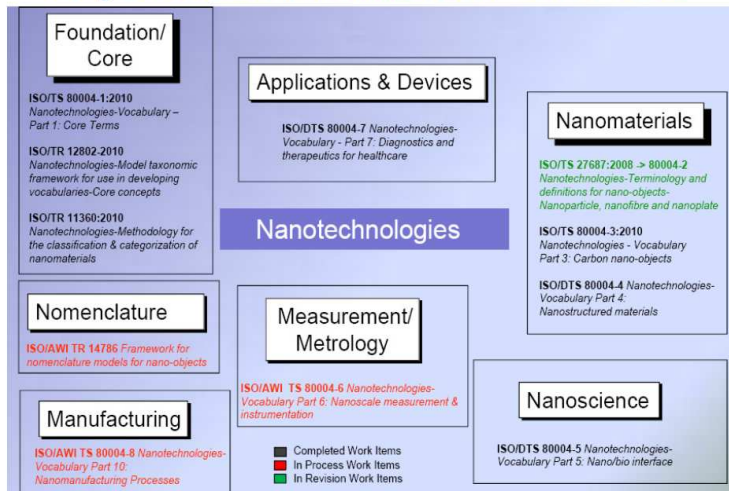


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# Documentary standards issued by ISO TC 229 JWG1



## Progress to date for JWG1 work: 2006 - 2011



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## Starting concepts... and then the first definitions

**nanoscale:** size range from approximately 1 nm to 100 nm

**Note 1:** Properties that are not extrapolations from a larger size will typically, but not exclusively, be exhibited in this size range. For such properties the size limits are considered approximate.

**Note 2:** The lower limit in this definition (approximately 1 nm) is introduced to avoid single and small groups of atoms from being designated as nano-objects or elements of nanostructures, which might be implied by the absence of a lower limit.

**nano-object :** material with one, two or three external dimensions in the nanoscale

**Note:** Generic term for all discrete nanoscale objects.

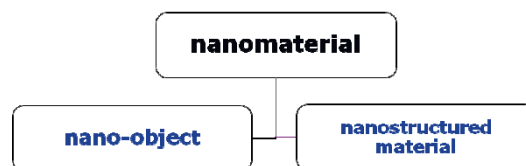
**First appeared in:** ISO/TS 27867:2008, *Nanotechnologies — Terminology and definitions for nano-objects — Nanoparticle, nanofibre and nanoplate*

**Re-affirmed as core terms in:** ISO/IEC TS 80004-1:2010, *Vocabulary – Core Terms*



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## Vocabulary framework for “nanomaterial”



**nanomaterial :** material with any external dimension in the nanoscale or having internal structure or surface structure in the nanoscale

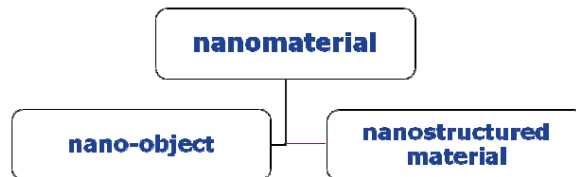
**nano-object :** material with one, two or three external dimensions in the nanoscale

**nanostructured material:** material having internal or surface structure in the nanoscale

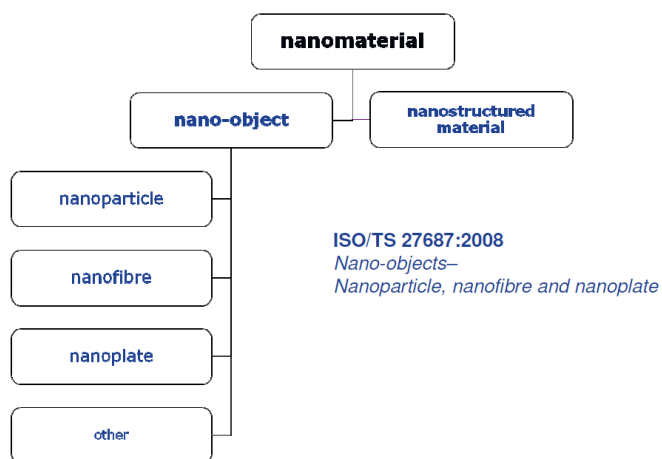


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## Vocabulary framework for "nanomaterial"

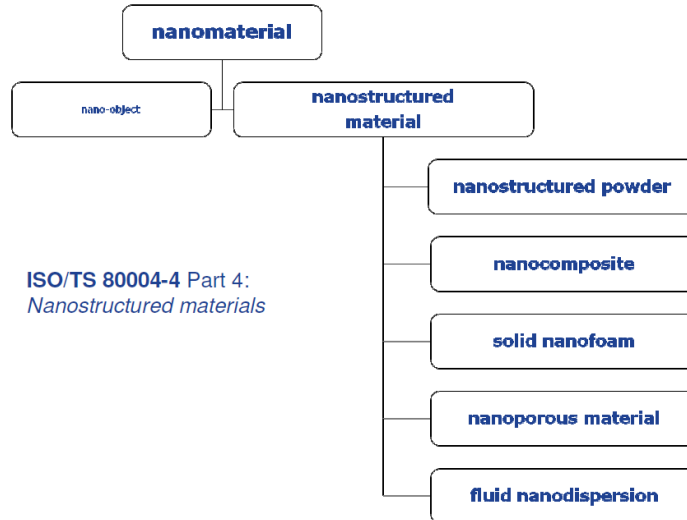


## The "nano-object" side





### The "nanostructured material" side



### ISO/IEC 80004 Nanotechnologies — Vocabulary series

- Part 1:** Core terms — *published 2010*
- Part 2:** Nano-objects—Nanoparticle, nanofibre and nanoplate -*published 2008*
- Part 3:** Carbon nano-objects — *published 2010*
- Part 4:** Nanostructured materials — *publishing 2011*
- Part 5:** Nano/bio interface — *publishing 2011*
- Part 6:** Nanoscale measurement and instrumentation - *underway*
- Part 7:** Diagnostics and therapeutics for healthcare — *published 2011*
- Part 8:** Nanomanufacturing processes - *underway*
- Part 9:** Electrotechnical products and systems — *pre-work item - beginning*
- Part 10:** Photonics components and systems — *pre-work item - beginning*
- and others ...

## Documentary standards issued by ISO TC 229 JWG1

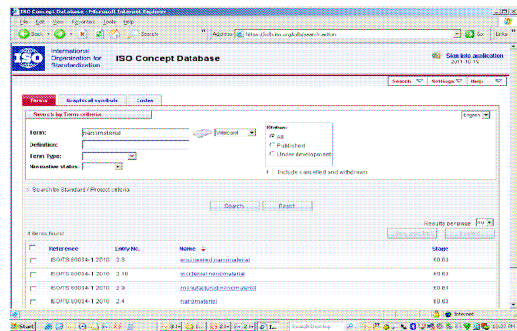


ISO/IEC 80004 Nanotechnologies — Vocabulary series:

### Accessing the ISO Concept Database

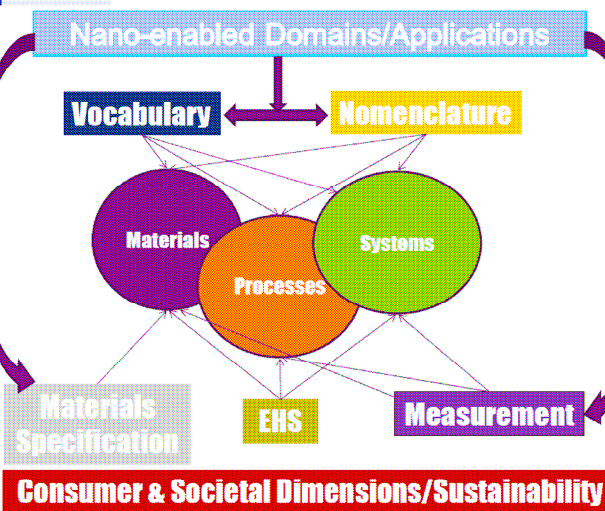
Individual published terms and their definitions  
can be accessed at

[cdb.iso.org](http://cdb.iso.org)



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## Documentary standards issued by ISO TC 229 JWG1



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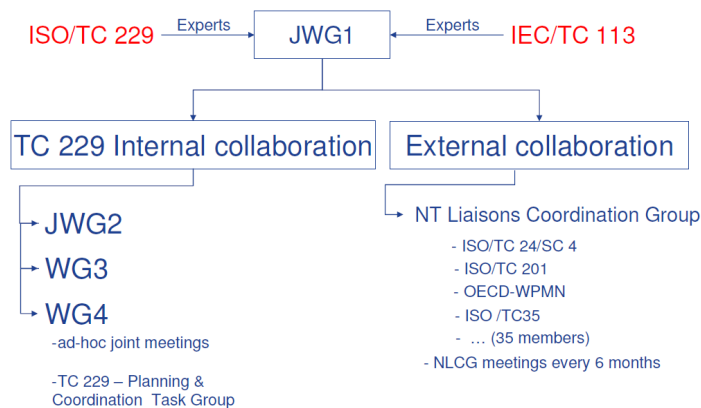
### Excellent Start-Next Challenges



- Unique or emergent properties, or solely geometry?
- How can science-based vocabulary assist regulators/legislators meet their requirements?
  - collections-nano-objects, aggregates & agglomerates
  - Size limits for a nanomaterial
  - Size distributions of nano-objects
- Naturally nanostructured materials?
  - Nanocellulose
- Transition to domain/application focus (e.g., joint development with other TCs possible)



### Collaboration with/by JWG1



### JWG 1 - PG 11

Project Group 11 is preparing a Technical Report on *Establishing a Framework for Developing Chemical Nomenclature for Selected Nano-objects*.

- This activity included a priority exercise to identify chemical substances that are being used in nanotechnology applications.
- Project Group 11 will make recommendations on specific nomenclature development needs.



### PG 11 Preliminary list of nano-objects of interest

ALL DATABASES	NO.	W/ NANOWERK	WITHOUT	NO.
SWCNT	1	CALCIUM CARBONATE	NANOCELLULOSE	13
MWCNT	2	ALUMINUM OXIDE	ALUMINUM OXIDE	14
TITANIUM DIOXIDE	3	NICKEL	QUANTUM DOTS	15
SILVER	4	QUANTUM DOTS	CARBON BLACK	16
FULLERENES	5	COPPER OXIDE	NANO CLAYS	17
SILICON DIOXIDE/SILICA	6	MAGNESIUM OXIDE	ZERO VALENT IRON	18
GOLD	7	ALUMINUM	NICKEL	19
IRON OXIDE	8	ZIRCONIUM OXIDE	MAGNESIUM OXIDE	20
CERIUM OXIDE	9			
COPPER	10			
ZINC OXIDE	11			
NANO DIAMOND	12			



### PG 11 Preliminary findings

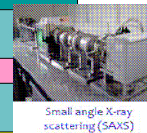
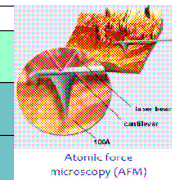
The PG 11 project had identified **carbon nanotubes** as a high priority for nomenclature development based on commercial and regulatory interest and the absence of any agreed upon system of naming.

- Difficulties with expressing physical chemical characteristics such as solubility, particle size, size range, and particle shape.
- Areas lending themselves to nomenclature development include surface functionalisation and chirality.
- Methods to address unique properties to lessen the current emphasis on size need to be considered



### Summary of current PG status; ISO TC229 JWG2

PG			Status	Expected date of finish
1	TS10797	TEM	Waiting final document for printing	Aug. 30, 2011
2	TS10798	SEM	Printing process (Sep 10, 2010)	
3	TS10668	UV-Vis-NIR	Printing process (Aug 28, 2010)	
4	TS10667	NIR-PL	Published	Done (Sep 15, 2010)
5	TR10929	MWCNT	Waiting final document for printing	May 31, 2011
6	TS11251	EGA-GCMS	Published	Done (Nov 22, 2010)
7	TS11308	TGA	Printing process (May 11, 2011)	
8	TS10812	Raman	WD	
9	TS11888	Shape Factor	Printing process (April 21, 2011)	
10	IS12025	Particle release	Preparation for FDIS	FDIS ballot after South Africa meeting
11	TS13126	Grating	Preparation for 2 <sup>nd</sup> CD ballot	Feb. 2012
12	TS13278	ICP-MS	Waiting final document for printing	Aug. 31, 2011
13	TS16195	Test Materials	WD	Mar. 2012



## The ISO TC 229 Chairman's survey



In 2006 the Chairman of ISO TC 229 has conducted a survey in identifying and prioritizing items for standardization.

In 2011 he conducted a new survey with the same format to revise and update the first one as published in 2006.

It addresses many categories of topics, of which the followings are identified of high priority:

### 2011 Survey Results

Topics for which 25 members identified as high priority

Items identified as 'high priority' in 2011 which had also been identified as such in 2006

#### Nano-objects – Generic standards

- nomenclature
- sampling methods for characterization
- characterization protocols for
  - size
  - size distribution
  - specific area
  - dispersability
  - shape
  - degree of agglomeration /aggregation
  - chemical structure
  - core composition
  - chemical functionality
  - chemical purity
  - strength of agglomerates /aggregates

#### Nano-objects and other nanoscale materials - Health Safety and Environment Standards

- Standard Methods for Toxicological Screening of Nanomaterials
- Standard Methods for Determining Relative Toxicity/Hazard Potential of Nanomaterials
- Standard Methods to Determine Environmental Toxicity of Nanomaterials
- Standard Guide for Controlling Occupational Exposures to Nano-objects
- Standard Methods for Measuring Personal Exposure to Nanomaterials in Occupational Settings
- Standard Template for Material Safety Data Sheet (MSDS) for Products Containing Nanomaterials
- Standard Method for Reporting Toxicity of Nanomaterials in Consumer Products

ISO Method to Establish Occupational Limits for Nanomaterials

ISO Method for Selection of Personal Protective Equipment (PPE) for Use with Nano-

ISO Safety Standards for Consumer Products Containing Nanomaterials

ISO Method to Assess Product Release and Release of Nanomaterials from Products

ISO Method to Develop Nanomaterial Safety Labels

ISO Methods to Assess Exposure to Nano-objects During Consumer Product Use

ISO Material Product Information For Labeling Health & Safety Precautions

Methods for the Disposal of

Methods to Determine Exposure in Food

Method for Performing Risk Use of Nanomaterials

Method to Assess Emissions Machining of Nanomaterials

Method of Life Cycle Analysis for Nano-objects Containing Nanomaterials

Methods for determining nano-objects in air and water

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## European Commission Mandate M461



In February 2010, CEN received M/461 Standardization Mandate to CEN, CENLEC and ETSI for standardisation activities regarding nanotechnologies and nanomaterials.

CEN BT decided to:

- accept in principle M/461 'Standardization Mandate to CEN, CENLEC and ETSI for standardisation activities regarding nanotechnologies and nanomaterials';
- ask CEN/TC 352 'Nanotechnologies' to take the leadership for the coordination in the execution of M/461 and to contact the relevant Technical Committees and interested stakeholders as appropriate.

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## European Commission Mandate M461



M/461 requests CEN, CENELEC and ETSI to develop the standardization deliverables avoiding any duplication of work with other organizations and listed in Annexes I and II of the mandate, and in particular:

Annex I - Characterisation of and exposure from nanomaterials  
The ESO's are invited to develop:

- a. As interim output: a roadmap for the development of the deliverables requested as well as Technical Specifications;
- b. As final output: European Standards for:
  - i. methodologies for characterisation of nanomaterials in the manufactured form and prior toxicity and ecotoxicity testing,
  - ii. sampling and measurement of workplace, consumer and environmental exposure to nanomaterials,
  - iii. methods to simulate exposures to nanomaterials.

Annex II - Health, Safety, and Environment

The ESO's are requested to develop guidance documents and protocols in relation to occupational handling and exposure as identified in the response to M/409.



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## Annexes of EC M461



45 items are identified that are relevant to 12 different CEN, ISO or IEC technical committees. A consultation to those TCs was sent to identify interest and possible development of the work program.

An annual appointment with EC - DG Enterprise was organized in April 2011 with the Chairman, Secretariat and CEN representative to maintain a good level of communication on M461 and the CEN TC 352 work program.



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## Mandate M461 Roadmap



A roadmap outlining how the mandate is addressed was sent to EC. The tentative timetable for its execution is continuously updated.

5 CEN TCs, 6 ISO TCs and 1 IEC TC (including ISO TC 229 and CEN TC 352) are identified to be involved and concerned under the mandate; CEN TC 352 has taken the lead for the coordination and circulation of relevant information to CEN BT and concerned ISO and CEN TCs.



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## Execution of mandate M/461



### **Report to CEN BT TCMG**

### **Execution of mandate M/461 – Final roadmap and timetable**

**Submitted by CEN/TC 352, July 2011**



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# Report to CEN BT TCMG



**afixor** **ünmz**

**Executive Summary**  
 CEN TC 352  
 N 180  
 2011-09-12  
 Draft report to CEN BT TCMG  
 Submitted by CEN TC 352, September 2011

**Results of the roadmap consultation for possible New Work Item Proposals under TCs Execution of mandate M/461**

**FOLLOW UP**  
 CEN TC 352 members for discussion of the next CEN/TC352 meeting on 10 September 2011

**COMMENTS**  
 According to an analysis concerning the execution of mandates, it was concluded that the following technical committees (TCs) are the most suitable regarding their composition to handle these Work Items. Further work should be done in the coming weeks to document CEN TC 352's decision from ISO/TC 352.

**DISCUSSION**  
 CEN TC 352 members for discussion of the decision should be invited to give an opinion for M/461 Annex 1, Annex 2 and Annex 3 and the next CEN TC 352 meeting.

**CONCLUSION**  
 An Afixor 180 nanotechnology's development should be considered for inclusion of a new work item in the CEN/TC 352's discussion and execution of the next CEN/TC 352 meeting on 20/09/2011 (see page 13) in consultation to CEN/TC 352 for the approval.

**ANNEXES**  
 1. Afixor 180 nanotechnology's development (page 2 annex 1)

**Source**  
 CEN/TC352 workshop

afixor.com and ünmez.com

**Draft report to CEN BT TCMG**  
 Submitted by CEN TC 352, September 2011

**Introduction**  
 Mandate M/461 specifies four areas for research development:

- Investigation for operational development of the following tasks from a pure technical and scientific point of view:
  - Sampling and measurement of ambient CO2 in the environment
  - Research to develop accurate measurement
  - CO2 in the health sector and the environment

The list of work items under M/461 and the report M/461 of the CEN/TC 352 members for discussion of the decision should be invited to give an opinion for M/461 Annex 1, Annex 2 and Annex 3 and the next CEN/TC 352 meeting on 20/09/2011 (see page 13) in consultation to CEN/TC 352 for the approval.

**Execution of mandate M/461**

**List of involved Technical Committees :**

- CEN TC 137: Assessment of workplace exposure to chemical and biological agents
- CEN TC 139: Non-destructive testing
- CEN TC 142: Personal lighting including hand and arm protection and lighthouses
- CEN TC 146: Air filters for general air cleaning
- CEN TC 155: Nanotechnology
- CEN TC 352: Nanotechnology
- ISO/TC 363/44: Particle characterization\*
- ISO/TC 142: Cleaning equipment for air and liquid gases
- ISO/TC 249: Biomedical analysis of medical devices
- ISO/TC 248: General chemical analysis
- ISO/TC 252: Measurement analysis
- ISO/TC 228: Nanotechnology
- ISO/TC 113: Nanotechnology standards for electrical and electronic products and systems

**Synthesis of the replies received (TCs / WI numbers of master list):**

**TCs**

- CEN TC 137: 15, 17, 20, 22, 26, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000.

ICSU-CODATA workshop, Paris, 23-24/02/2012

# Nowadays...



- 4 ISO standards have been published as ISO EN standards
  - Endotoxin test on nanomaterial samples for in vitro systems – Limulus amoebocyte lysate (LAL) test (ISO 29701:2010)
  - Generation of metal nanoparticles for inhalation toxicity testing using the evaporation/condensation method (ISO 10801:2010)
  - Characterization of nanoparticles in inhalation exposure chambers for inhalation toxicity testing (ISO 10808:2010)
  - Terminology and definitions for nanoobjects - Nanoparticle, nanofibre and nanoplate (ISO/TS 27687:2008)
- 2 draft standards under Vienna agreement are still going on
  - Guidance on methods for nanotribology measurements (ISO/DTR 11811:2010)
  - Guidance on the labelling of manufactured nano-objects and products containing manufactured nano-objects (ISO/TS 13830:2011)
- 4 new work items were endorsed in September 2011 and are about to start
  - Nano- responsible development : integration of risk and benefit assessment in the production, marketing and use of nanotechnologies, nanomaterials and/or products incorporating nanomaterials

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*Thank you for your kind attention...*

