Presentations

Business Lunch Talk about Future Topics 10th December 2012 in Brussels

Imprint

This proceeding was compiled by Projektträger Jülich as one of the organiser of the Business Lunch Talk. It provides the presentations and other information given at this meeting.

For further information about the FP6 Foresight Support Action **"SMART"** and its outcome **MaterialsEuroRoads**, please refer to **http://www.materialseuroroads.net** or send an email to ptj-smart-ssa@fz-juelich.de

If you wish to get more information or to be invited to the next Business Lunch Talk, please contact Dr. Gerd Schumacher, email: g.schumacher@fz-juelich.de

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March 2013

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Introduction and Summary

The Business Lunch Talk is a direct outcome of the FP6 Specific Support Action "SMART", a foresight activity in materials technology. Since the European strategic materials actions were felt to be fragmented, a networking platform "MaterialsEuroRoads" was set up after the SMART project to coordinate and accelerate efforts in this area. An annual meeting was also initiated to facilitate the dialogue between materials foresight activities / researchers and funding bodies in the Member States and in Europe as a whole.

After two meetings, the annual meeting of MaterialsEuroRoads (March 2007 in Paris and May 2008 in London) with fruitful discussion about the way forward in materials technology, the format of this meeting was improved by creating a more condensed version with respect to time frames and audience. This was the beginning of the "Business Lunch Talk", which first took place in Brussels in July 2008 and was followed by meetings in Brussels, in October 2009, February 2011 and December 2012.

The Business Lunch Talk 2012 was held on the 10th December 2012 in Brussels as a small meeting with an invited audience. In Horizon 2020, the upcoming European Framework Programme for Research and Innovation, research in Nanotechnology, Advanced Materials and Manufacturing are foreseen under the priority "Industrial Leadership". These topical fields are specified as Key Enabling Technologies in the approach "Leadership in Enabling and Industrial Technologies". The EuroRoads' Business Lunch Talk aimed to find technological answers to future challenges and to discuss appropriate funding instruments. The invited experts highlighted some research priorities.

As representative of the Unit "Added-value Materials" in the Research & Innovation Directorate-General, Erno Vandeweert outlined the conclusions of the 2nd Materials Summit held in September 2012. A chance of mind set from creating new materials to creating new solutions with a focus on "materials for something" rather than on materials per se was recommended. Concerning the implementation, "materials by design" and the importance of modelling were emphasized. While the traditional product design focuses on the production and use of materials, the socalled "eco-design" widened the whole chain including the aspects of raw materials and end of life considerations. The increase in the Technology Readiness Level (TRL) scale through a project will become a feature for (the financial dimension of) funding: In Horizon 2020, the projects to be funded generally have to aim for TRL 2 – 6.

Keeping in mind that a decision gap, a rules gap and a money gap are existing within the discussion of Horizon 2020, the implementation of Nanotechnology in Horizon 2020 was outlined by Christos Tokamanis, Head of Unit "Nanotechnology" in the DG Research & Innovation. A three-layer approach was shown with different TRLs. Starting with multi-application R&D (TRLs 1-4), project ideas & outcomes could be further developed specified for distinct applications within the "Cross KET application focus areas" (TRLs 5-8). The third layer would be "Nanotechnology innovation showcases" with TRLs 5-8 for larger-scale pilot lines and demonstrator projects.

The vision for the future of the Public Private Partnership (PPP) Energy-efficient Buildings (EeB) in Horizon 2020 was given by Michael Trousdell (ARUP), representative of the UK National Liaison Point. A new EeB roadmap for Horizon 2020 is developed by the members of the industrial association E2BA and of the European Technology Platform ECTP. In the research and innovation strategy of the roadmap, eight funding areas are suggested with the topics building envelope, energy equipment and performance monitoring & management as top priorities. Successful projects funded 2010 and 2011 are collected in an EeB PPP Project Review, which is available on the MaterialsEuroRoads Website.

Gilles Le Marois, representative of the French National Contact Point for NMP introduced the SPIRE initiative to be established as an European PPP. The aim of SPIRE is the reduction of the environmental footprint of processing industries, and therefore meets the commitment for a smart, sustainable and inclusive growth as stated in the EU 2020 strategy. The work programme proposed 6 key components covering the whole value chain including feed, process, applications and valorization of waste. Concerning the governance structure of the industrial association A.SPIRE, the establishment of a Member States mirror group was questioned.

Still under the impression of a German nanotechnology stakeholder meeting concerning nano-additives, Georg Reiners, head of the division 6.4 Nanomaterials Technology of the BAM in Germany, passed the stakeholders' message to highlight the application and the benefit of nanotechnology and not only to focus on their risks. Nevertheless, there is need for research on safety of nanotechnologies like standardization or high through-put-screening methods, although a lot of activities and FP7-projects are already running. The application of nanomaterials exemplified on rotor blades for wind mills impacts the safety of products. Another example is the use of nanotechnology in anti-counterfeiting technologies.

These proceedings collect the five presentations and additional expert statements given at the Business Lunch Talk on 10th December 2012. We would like to take this opportunity to thank the speakers for their stimulating presentations and also to Herbert Zeisel (Federal Ministry of Education and Research, Germany) for his skilful moderation of the event. We also express our gratitude to the attendees for their contributions to the discussion.

We hope you find the presentations interesting and informative.

The National Delegates / National Contact Points for NMP of France, Germany and the United Kingdom

March 2013

EurORoads

Agenda for Business Lunch Talk about Future Topics, 10th December 2012

Venue:	**Helmholtz Office, Rue du Trône 98, 1050 Brussels, Phone:** +32 02 5000970
Organization:	Joint Activity of the British, French and German Delegation of the PC NMP Forschungszentrum Jülich, PtJ, Phone: +49 (0) 2461-61-3545 (G. Schumacher)
12.00	Arrival of the participants, **lunch and coffee**
12.45	**Opening**
12.55	Head of Units ***Information by the Commission: NMP / KETs implementation status***
13.25	Michael Trousdell (ARUP) ***Presentation on the PPP EeB (provisional title)***
13.45	Gilles Le Marois (CEA-LITEN) ***Relevance of the SPIRE initiative***
14.05	Georg Reiners (BAM) ***From safety to security in nanotechnology: anticounterfeiting technologies***
14:25	Discussion • ***Which are the expected impact of these topics in nanotechnology and materials presented?*** • ***Do they have the potential to provide effective solutions for future challenges?*** • ***Which are the appropriate funding instruments?*** • ***How can topics be implemented in future work programmes in Horizon2020?***
15:00	End of the event; Coffee and possibility for informal discussions

SEVENTH FRAMEWORK PROGRAMME

Brainstorming on Materials R&D+I

Bruxelles/Brussels
10 December 2012

Erno Vandeweert
erno.vandeweert@ec.europa.eu

The Materials Summit
2nd Materials Summit

The second Materials Summit has been held on 10 September 2012

The Materials Summit 2012 brought together representatives of main industrial and research stakeholders to discuss a strategic and modern vision of optimal features for materials R&D&I.

The summit analysed and assessed the effectiveness of the support to materials research and innovation to date, and explored possible options for the future.

Some of the issues addressed were:

- how to maximise the return for the taxpayers' money invested.

- how to maximise the positive impact of the R&D&I support for the growth, competitiveness and sustainability of the EU industry,

- how to achieve a winning combination of scientific and industrial advances,

- the best way of consulting stakeholders in order to prioritise and elaborate yearly work-programmes,

- further structuring of the materials community,

Research and Innovation

Conclusions: General approach

The crisis highlighted the value of the role of researchers and innovators, scientists and industries are requested to be responsible and accountable in view of societal needs.

Change of mind set, from creating new materials to creating new solutions, with a focus on "materials for something" rather than on materials per se.

Research focus on areas where Europe has strengths, and where there is likelihood that industrial production will take place in Europe.

International cooperation to accelerate progress, but instrumental to enable "things to happen" in Europe.

Synergy found with other schemes such as structural funds, LIFE+ etc., and with activities supported by Member States.

Secure coherence, maximise impact and avoid gaps or duplications.

Support monitoring, assessment, benchmarking, road mapping, foresight, coordination, organisation of events, communication and optimisation of interventions.

Research and Innovation

Conclusions: Implementation

Focus on "materials by design" and the importance of modelling.

Include consideration of the end-of-life of the products/materials and all by-products (e.g. so-called waste or pollution).

The integration of novel materials into systems and support to prototyping should be included as far as possible.

Excellence in research must continue to be promoted.

Education and training should be part of the projects.

Projects should foster interactions between academia and industry.

Projects should develop a culture of understanding the importance of industrial/intellectual property rights (IPR) and innovation management.

Coordination with Member States' and Associated Countries' activities should be boosted.

Roadmaps and foresight studies should be developed when possible.

Support to multi-sectoral multi-application "horizontal" R&D&I projects should be secured.

The value of creativity-driven innovation, both in existing and new industries, was highlighted.

Conclusions: Financing and Management

Private funds follow commercial logic, and the strategic importance of public schemes is highlighted.

In order to be manageable, projects must be limited in time and deliverables, but follow-up activities should be foreseen.

Favour a transition from project-driven to programme-driven support.

Funding should be used to secure reliability and reduce the time to market of the new technologies by reducing the technological risk. Capital can be a means of bringing partners to a table for the negotiation of roles and rights.

The (financial) dimension of projects should be appropriate to the Technology Readiness Level and the ambition of the projects.

The EC should (test the) use of all the instruments foreseen in the Horizon 2020 tool box for supporting materials R&D&I, such as grants, prizes, public procurement, public-public and public-private partnerships.

Towards Horizon 2020

Some ideas that have emerged

Research and Innovation

All projects should address:

- EU policies
- stronger European industry's competitiveness
- sustainability and an integrated LCA approach

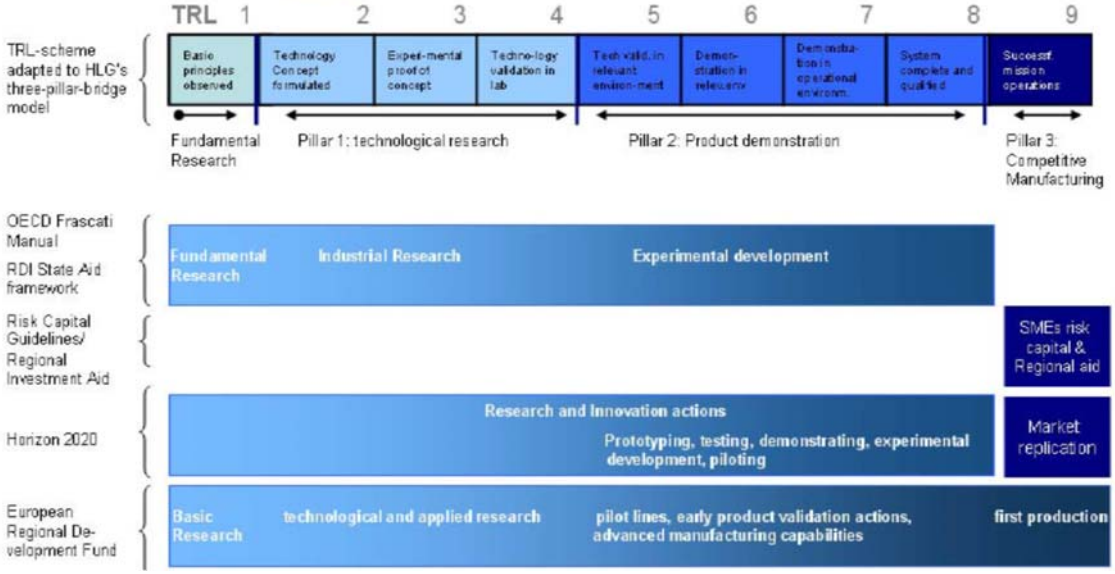
and be integrated with the rest of H2020 (FET…)

The increase in the TRL scale will be promoted, normally from 2 or 3 to 6

New business models will be developed for a socio-economic / socio-ecologic industrial society

European Commission

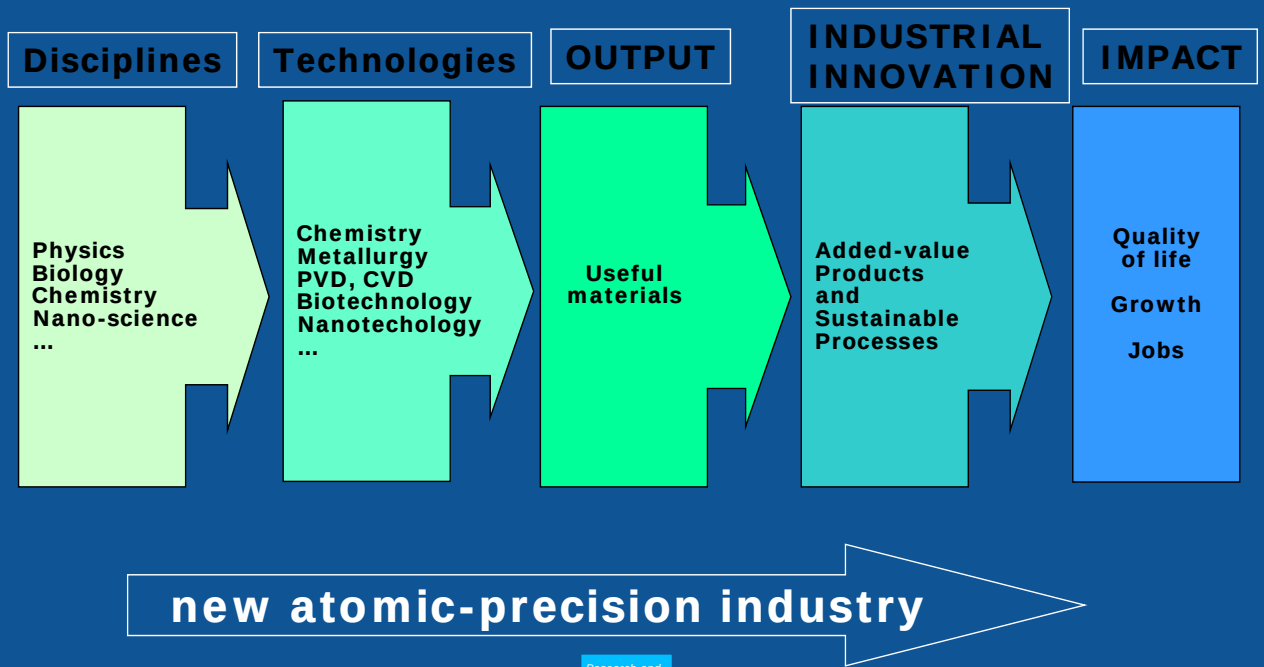
Technology Readiness Level



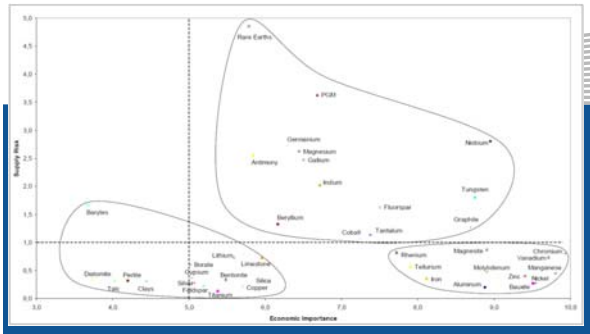
Research and Innovation

European Commission

Materials profit from all available technologies and approaches: converging technologies !



Research and Innovation



European Commission

Europe 2020

Innovation Union

KET

SME

Brussels, 10.10.2012
COM(2012) 582 final
COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

A Stronger European Industry for Growth and Economic Recovery Industrial Policy Communication Update

{SWD(2012) 297 final}
{SWD(2012) 298 final}
{SWD(2012) 299 final}

European Strategic Energy Technology Plan (SET-Plan) COM (2009) 519

COUNCIL OF
THE EUROPEAN UNION

Conclusions on Creating an innovative Europe

3016th COMPETITIVENESS Council meeting
Brussels, 26 May 2010

Research and Innovation

European Commission

Research and innovation priorities could be determined taking into account the framework programme / specific programme text for Horizon 2020 and the relevant EU policies, e.g.:

- The Commission's policy for the development and deployment of Key Enabling Technologies (KETs), including cross-cutting KET issues COM (2012) 341 final

- The SET-plan COM(2007) 723 final

- The raw materials initiative and the relevant European Innovation Partnership

- Climate change COM(2009) 147 final

- Creative industries COM (2012) 537 final

- Conservation and valorisation of the European cultural heritage (impact on tourism) COM(2007) 621 final

…the societal challenges:

- *Health, demographic change and wellbeing;*
- *Food security, sustainable agriculture, marine and maritime research and the bio-economy;*
- *Secure, clean and efficient energy;*
- *Smart, green and integrated transport;*
- *Climate action, resource efficiency and raw materials;*
- *Inclusive, innovative and secure societies.*

Research and Innovation

	The SET-plan	The raw materials initiative and the relevant European Innovation Partnerships	Conservation and valorisation of the European cultural heritage	Climate change	The priorities for existing or future PPPs	The concept of circular economy	Decarbonisation of the European Industry including energy and transport	To support European industry using KETs, leading to high quality jobs in a competitive European industry	Independence of supply for the European industrial economy	Adding Active Life to European Citizens	Reliable, safe, clean and creative "Made in Europe"	Studies, assesments and structuring measures addressing communities of European stakeholders
Health, demographic change and wellbeing			?							x		?
Food security, sustainable agriculture, marine and maritime research and the bio-economy				x							x	
Secure, clean and efficient energy	x	x		x	x		x					
Smart, green and integrated transport				x	x		x					
Climate action, resource efficiency and raw materials	x	x		x	x	x	x		x		x	
Inclusive, innovative and secure societies			x	x				x			x	?

Research and Innovation

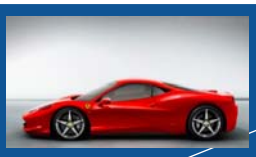
- as well as the following priorities and developments:

- The priorities defined by the High Level Groups of the existing or future Public-Private Partnerships (PPPs): Factories of the Future, Energy-efficient Buildings, Green Cars and the proposed Sustainable Processing

- Priorities arising from the relevant European Technology Platforms (ETPs) and "cross-ETP" or cluster activities, such as Alliance 4 Materials

- Priorities arising from dedicated studies or structuring measures such as the actions from MatVal (coordination action for the networking of main materials collective stakeholders in materials science and engineering)

- Priorities identified at the Materials Summits (26. October 2010 and 10. September 2012)

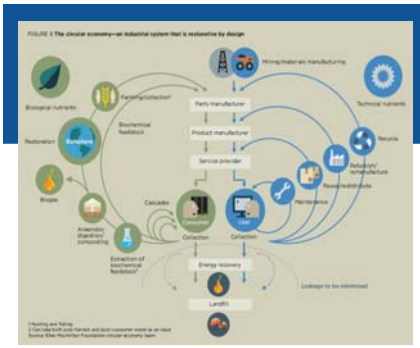


value

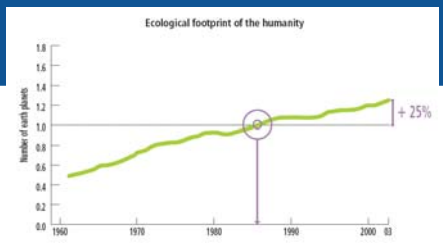
The broader these scissors the better for all stakeholders: industry, workers' wages, State, ...

cost

(... who are the costumers of high-added value products/services)



European Commission



The circular economy

Towards Circular Economy, Ellen Macarthur Foundation, 2012

'Eco-design: the systematic integration of environmental considerations into product and process design'
(NRC Canada, 2003)

Eco-design

Traditional design

Raw materials extraction and processing | **Production** | **Use** | **End of Life**

Research and Innovation

Calow P, Holloway L, Owen A., Ecodesign from the ground up, 2001

European Commission

Materials are there, just open the drawer ?

Materials are the problem ?

Materials are the solution !

Thank you for your attention!

Research and Innovation

Nanotechnologies in Horizon 2020 and other KETS

Context, Structure, Content

C.Tokamanis
DGRTD
G4

Research Innovation

Horizon2020 Structure and Nanotechnologies

Horizon 2020

- **Societal Challenges**
- **Industrial Leadership**
- **Excellence in science**
- **Non-nuclear direct actions of JRC**

Leadership in enabling and industrial technologies

- Key enabling Technologies (KET)
  - Nanoelectronics and rest of ICT
  - Photonics
  - Nanotechnologies
  - Advanced Materials
  - Biotechnologies
  - Advanced Manufacturing (Production)
- Space
  - **Cross-cutting actions combining several KETs**

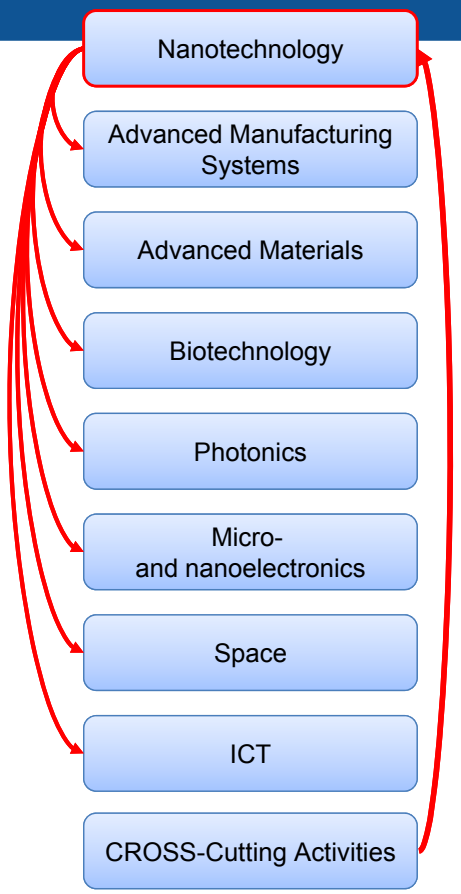
Facilitate access to risk finance

Support for innovation for SMEs

Research Innovation

Key EnablingTechnologies

- Nanotechnology is one of the identified six Key Enabling Technologies (KETs);
- An integrated approach to KETs has been proposed: cross-cutting activities that bring together and integrate various individual KETs will play an important role;
- Dedicated support will be provided for larger-scale pilot line and demonstrator projects;
- A dedicated governance structure and a joint work;
- Programme for cross-cutting KETs activities will be developed;



NANOTECHNOLOGY H2020 – Five building blocks

Next generation nanomaterials,-devices and-systems: Development and integration of knowledge at the cross-roads of different scientific disciplines, aiming at fundamentally new products enabling sustainable solutions in a wide range of sectors.

Synthesis and manufacturing: Focusing on new flexible, scalable and repeatable unit operations, smart integration of new and existing processes, as well as up-scaling to achieve mass production of products and multi-purpose plants that ensures the efficient transfer of knowledge into industrial innovation.

Safe development and application: Advancing scientific knowledge of their potential impact on health or on the environment for pro-active, science-based governance of nanotechnologies, and providing validated scientific tools and platforms for hazard, exposure and risk assessment and management along the entire life cycle of nanomaterials and nanosystems.

Capacity enhancing techniques: Focusing on the underpinning technologies, supporting the development and market introduction of complex nanomaterials and nanosystems, including characterising and manipulating matter at the nano-scale, modelling, computational design and advanced engineering at the atomic level.

Societal dimension: Addressing the human and physical infrastructure needs of nanotechnology deployment and focussing on governance of nanotechnology for societal benefit.

NANOTECHNOLOGY H2020: three-layered approach

Enabling Programme Components: multi-application R&D, TRLs 1-4

- Next generation nanomaterials, -devices and -systems
- Synthesis and manufacturing
- Capacity enhancing techniques
- Safe development and application
- Societal dimension

Cross KET application focus areas: Application specific R&D&I with important nanotechnology contribution, TRLs 5-8

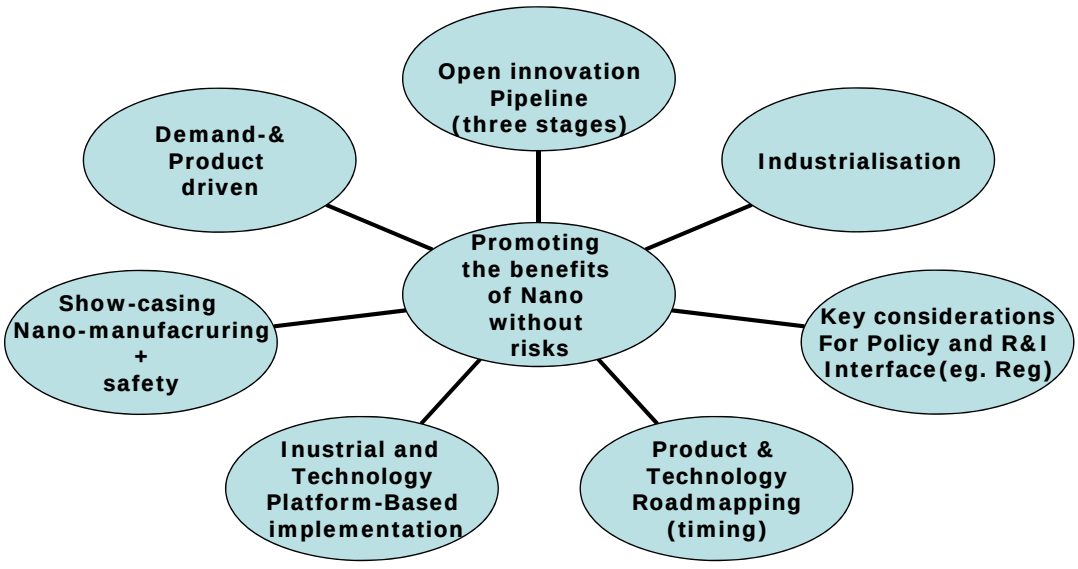
- Nanoenabled surfaces
- Nanostructures and composites
- ...

Nanotechnology innovation showcases: Applications uniquely enabled by nanotechnology, TRLs 5-8

- Opportunities in Nanomedicine?
- Opportunities in Environmental Technologies ?
- Nanomanufacturing Pilot infrastructure
- ...

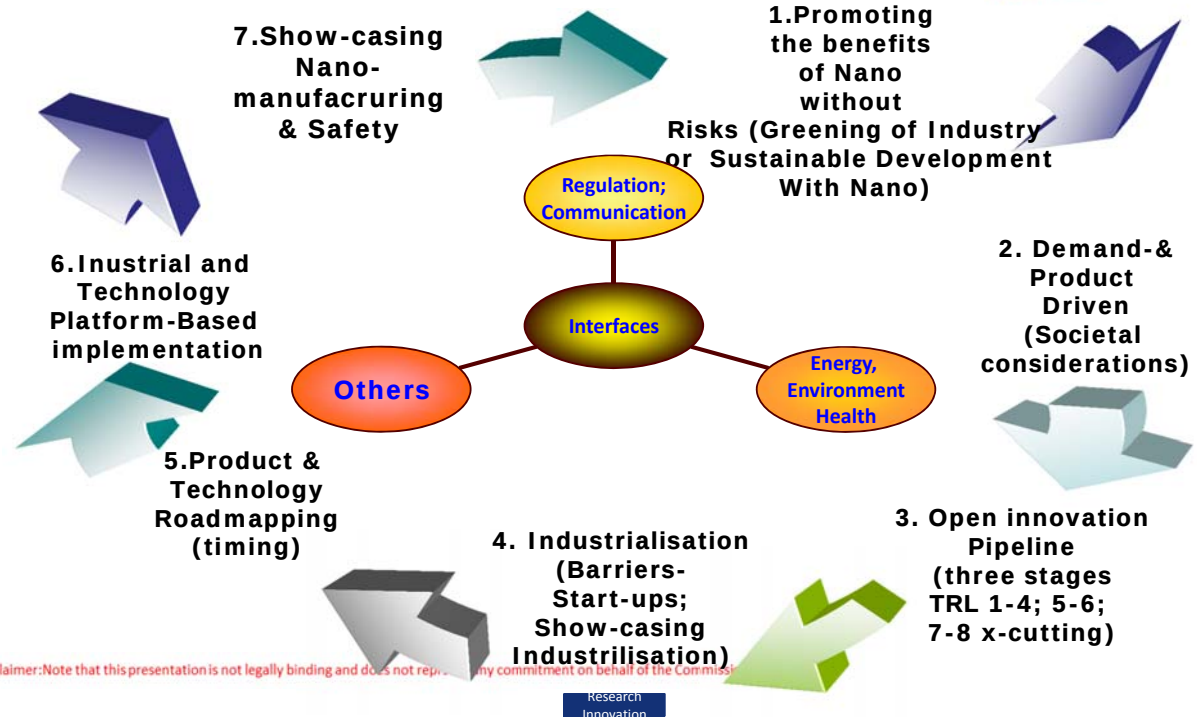
Structuring of input (version 1 –emphasis and focus)

Note: propose you own order or significance; according to KET



Structuring of input (version 2: Life cycle considerations)

Note: Detailing of work required; add or subtract according to KET

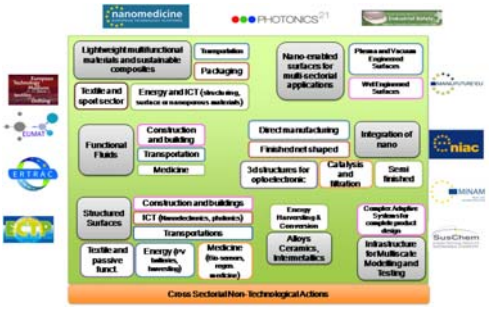


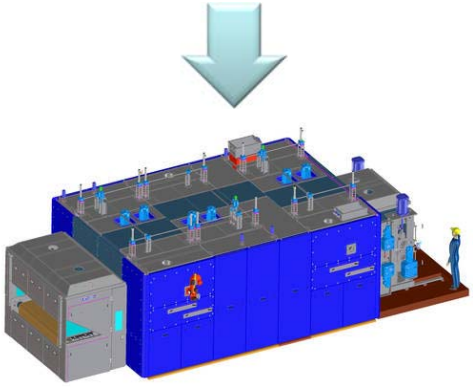
Open consultation "NANO*futures*" *Roadmap*

Open Consultation at www.nanofutures.eu "Roadmap" under Documents

(Nano) Future-Pilots

- **Innovation potential:**
  - Industrial Pilots are a way to integrate and implement the roadmap concepts to get evidence and evaluate the potential effect on the whole system both from technical and economical point of view
- **Industrial competitiveness:**
  - The vision of NANO*futures* shall be shared and transferred to industry, to foster the necessary committment





Summary: Nanotechnology H 2020 proposal

- Nanotechnology is included in the « Industrial Leadership » part of the H2020 proposal;
- Nanotechnology is one of the identified six Key Enabling Technologies (KETs);
- An integrated approach to KETs has been proposed: cross-cutting activities that bring together and integrate various individual KETs will play an important role;
- Dedicated support will be provided for larger-scale pilot line and demonstrator projects;
- A dedicated governance structure and a joint work programme for cross-cutting KETs activities will be developed;

The Future of the EeB PPP: the Horizon 2020 Roadmap

10th December 2012

Michael Trousdell
Arup
UK National Liason Point

michael.trousdell@arup.com

Agenda

- **EeB PPP Background**
- **Current Status FP7 2013**
- **FP 8 New Roadmap – Horizon 2020**
- **Future development**

Background to EeB PPP

Energy Efficient Buildings PPP

Shape

- EU-wide Public-Private-Partnership
- FP7 2010-2013: large scale research (80%) and demonstration (20%)
- Driven by the industry grouped in E2B Association
- Linked to specific Directorates-General (DG) within EC

Size

- Aspiration: €2.5 billion over 10 years
- EC Commitment FP7: €500m from 2010-2013
- Possible EC Commitment FP8: €2100m from 2014-2020

Remit

- Reduce energy consumption and CO2 emissions
- Improve EU energy independence

EeB Members

Industry engagement

Within the framework of ECTP, E2BA was established to engage into a long term partnership with EC, aiming at:

- Seeking and demonstrating industry engagement
- Coordinating research interests towards Public stakeholders
- Keeping close links with international initiatives
- Liaising with national/regional initiatives

Current Status FP7 2013

Results of EeB Calls

	July 2009	July 2010	July 2011
• **Success rate**:	**28 %**	**20 %**	**23 %**
	17 funded of 60	24 funded of 120	31 funded of 136
• **Share by Org. Type**:			
- Higher Education:	18%	15%	
- Private for Profit:	**48 %**	**53 %**	
- Research Org.:	26%	24%	
• **Share of Funding of SMEs**:	**24 %**	**30 %**	
• **Countries of funded partners**:	24	26	

Source: EC, AIAG meetings

Overview EeB calls 2013

Directorates general (DG)	Calls	Budget (M€)	Deadline
Research & Innovation (RTD) – Theme 4 NMP (Nanoscience, Nanotechnologies, Materials and New production)	6 calls	110	Dec 4
Environment (ENV)	1 call	6	Dec 4
Energy (ENER)	1 call	90	Dec 4
Information Society & Media (INFSO)	1 call	40	Dec 4

Successful Projects 2010-2011

EeB PPP Project Review

See previous successful projects, including consortia setup, descriptions and key facts

Contact:
michael.trousdell@arup.com
for a digital copy.

FP8 Horizon 2020 Roadmap

EeB Horizon 2020 Roadmap

- Horizon 2020 (FP8) European Research funding from 2014 to 2020.
- Estimate total budget of up to100 Billion €

(FP7 was 51Billion €, FP6 18 Billion €)

- EeB PPP final decision on approval expected early 2013
- EeB budget proposal could be about 2 Billion €
- EeB Roadmap final version expected early January 2013.

Roadmap Structure: Three Sections

- Part 1: Vision 2030 and Background
- Part 2: Research and Innovation Strategy
- Part 3: Expected Impacts

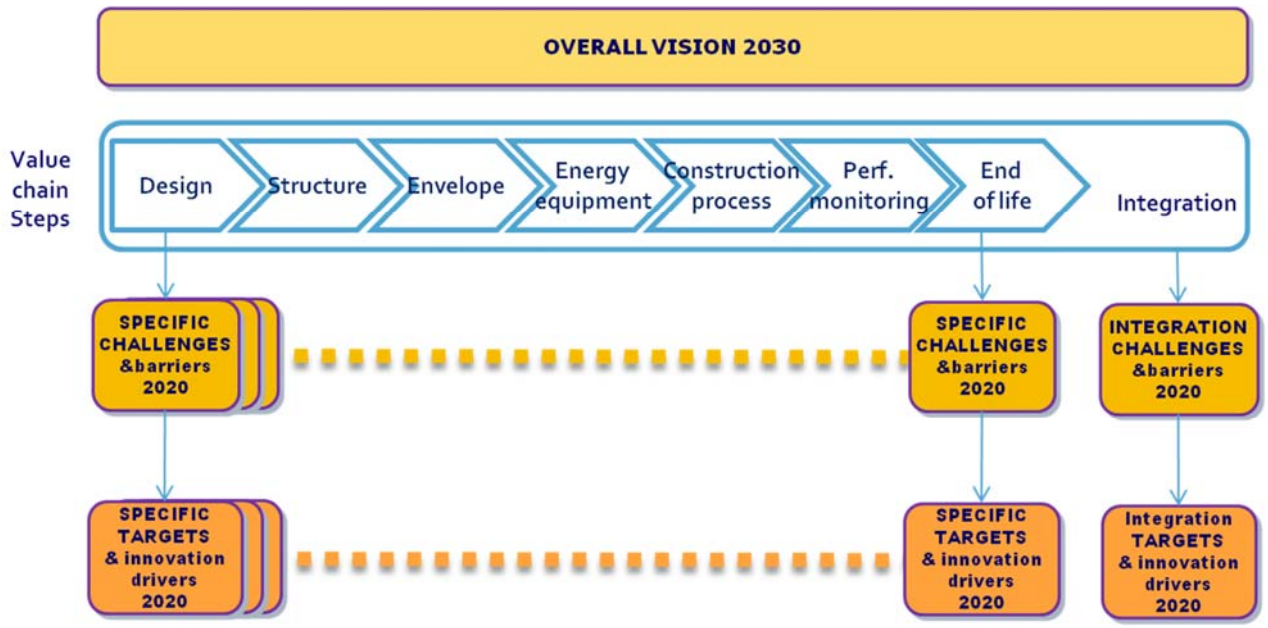
Part 1: Vision 2030

- Importance of the building sector for the European economy
- New economic, environmental and societal challenges for the EU Building Industry
  - The critical role of refurbishment
  - Avoiding the risk of a market failure
- Research and innovation to meet the eu decarbonisation goals
- Running EeB PPP and the need to extend its ambition beyond 2013
- Overall Vision till 2030 and strategic objectives

Part 2: Research & Innovation

1. Research and Innovation issues: a value chain perspective
2. Overview of the industrial needs: drivers to meet 2050 goals
3. Main Research and Innovation: challenges, barriers and targets
   - Design
   - Structure
   - Envelope
   - Energy Equipment
   - Construction process
   - Performance monitoring and management
   - Building's end of life
   - Cross-cutting challenges and targets along the whole building value chain
4. Priorities over 2014-2020: timeline, scale of resources and proposed investment distribution

Part 2: Research & Innovation



Part 3: Expected impacts

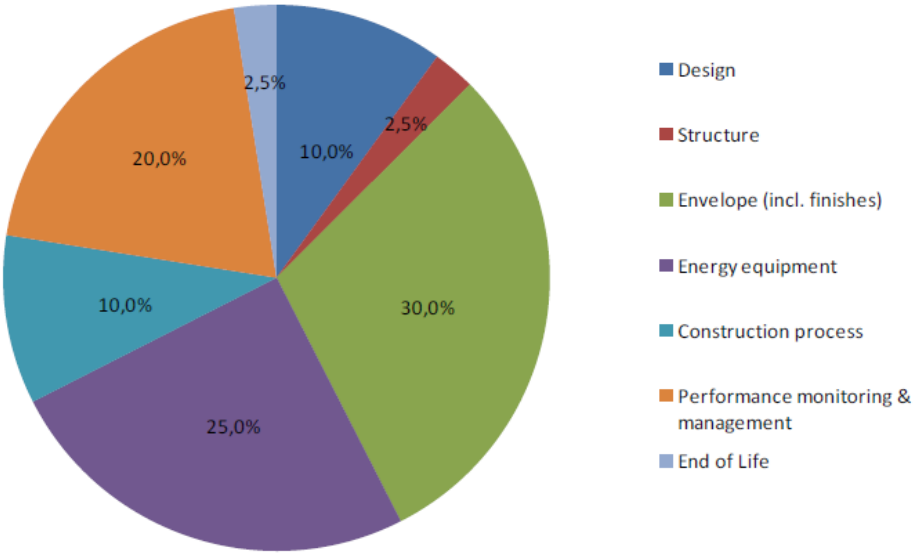
- Expected impacts on industry and society:
  - sector productivity and competitiveness,
  - growth,
  - job creation,
  - trade,
  - investment,
  - productivity,
  - accelerated application of new technology,
  - Creating business opportunities/ mitigating threats,
- Positive change to EU policy
- Compliance with Horizon 2020 ambitions
- Advantage of using PPP

Future Development

Priorisation and future calls

- Renovation of the existing stock;
- demand side reduction and the step towards a higher scale level of energy efficiency, i.e. a district level at least, fully integrating decentralised energy generation;
- the full exploitation of ICT as key enabler in all segments of the value chain.

Suggested Funding Prioritisation



Top priorities

The **building envelope**, with focus on:

1) energy and environmental (including embodied CO2) performance of the full envelope especially for cost effective application in existing building;
2) prefabrication, as a crucial step to guaranteed energy performance;
3) multifunctional and adaptive components, surfaces and finishes to create added energy functionality and durability;

Top priorities

· **Energy equipment** and systems, with focus on:

1) Advanced heating/cooling and domestic hot water solutions, including renewable energy sources, focusing on the sustainable generation and storage of hot water as well as on heat recovery.
2) Thermal storage (including both heat and cold) as a major breakthrough on building and district level, referring both to compactness as a main requirement for the existing stock, and the balance between different kinds of storage
3) Distributed/decentralised energy generation on a district level, addressing the key requirement of finding smart solutions for grid-system interactions on a large scale. ICT smart networks will form a key component in such solutions;

Top priorities

· **Performance monitoring and Management**, wherein ICT plays a dominant role, with particular focus on:

1) ICT interoperability, actually being a cross-cutting issue for all priority areas;
2) Smart Energy Management system, i.e. the portfolio of flexible actions aiming to reduce the gap between predicted and actual energy performance. This includes occupancy modeling, fast and reproducible assessment of designed or actual performance, and continuous monitoring and control during service life;
3) knowledge sharing, i.e. Open data standards allowing collaboration among stakeholders and interoperability among systems.

Links with EC

Established links to Directorates general (DGs)
Research & Innovation (RTD) – Theme 4 NMP (Nanoscience, Nanotechnologies, Materials and New production)
Environment (ENV)
Energy (ENER)
Information Society & Media (INFSO)

Possible connection with other DGs? Climate Action (CLIMA)?

EeB Next Steps

- Results from final FP7 2013 calls expected February 2013
- Ongoing discussions to define calls early 2013
- EC to decide on formalising EeB PPP in early 2013

Thank you

michael.trousdell@arup.com

Relevance of the SPIRE Initiative

Gilles Le Marois
NMP NCP

Relevance of the SPIRE initiative

Objectives

SPIRE aims to reduce the environmental footprint (energy and resources) of **processing industries** and to increase its competitiveness by "**doing more with less**"

It meets the **EU 2020** commitments
" smart, sustainable and inclusive growth"

Fully relevant

Relevance of the SPIRE initiative

Targets (1/2)

SPIRE targets **"traditional" processing industries**.

In EU MS, they:

- represent many jobs,
- are subject to strong competition from low-wage countries (generally no constraints in terms of energy costs),
- are fragile and particularly vulnerable in times of crisis,
- in addition they are large consumers in energy and resources.

To **remain competitive** these industries need financial support (through structuring programs) and **technical innovation**.

SPIRE bets on green and sustainable approach to improve the competitiveness of this processing industry in EU (Ulcos case) bdl1

Relevant, however…

*Business Lunch Talk about Future Topics, **10th December 2012**, Helmholtz Office, Brussels*

Folie 3

bdl1 je ne l' aurai pas dit comme ca " bets that only these EU industries"
bertrand.dl; 04.12.2012

Relevance of the SPIRE initiative

Targets (2/2)

Others “traditional” industries are also to be considered (**textile, paper, glass** …) where innovation (i.e. smart, flexible support for electronics, energy harvesting,…) should provide new market opportunities.

The proposed roadmap relies heavily on the development of **renewables** and others recycled resources, as well as **energy optimization** in the process of production.

Such processing industry (energy,…) have to be also considered and the relevant stakeholders might play a **major role** in SPIRE**.**

Targets to be completed

Relevance of the SPIRE initiative

Implementation

- SPIRE should be a EU public-private partnership (**PPP**), relying on a non-profit organization (**A.SPIRE**) in which industry should play a major role in setting priorities.
- Previous experience of this type of partnership (as Factories of the Future) have demonstrated, through a strong **involvement of industry** including SMEs, the relevance of the tool.
- **Outstanding issues**
  - Roles and articulation between EC, PC and A.SPIRE,
  - Budget: private contribution around 1,4B€, EC contribution?
  - Budget sharing between DGs (RTD, ENER, ENV, CNECT, ENTR,…) ?

Implementation to be clarified

Relevance of the SPIRE initiative

Work Programme

SPIRE proposes a rolling WP through 6 key components (KC)

KC feed: increased energy and resource efficiency

KC process: more efficient (intensified) processing

KC applications: sustainable materials and (their) market applications

KC waste2resource: valorisation of waste

+2 transverse KC

➢ ***it covers the whole value chain***

Outstanding issues

Possible **duplication** with others programmes/calls (Energy, FoF, EeB, GC)?

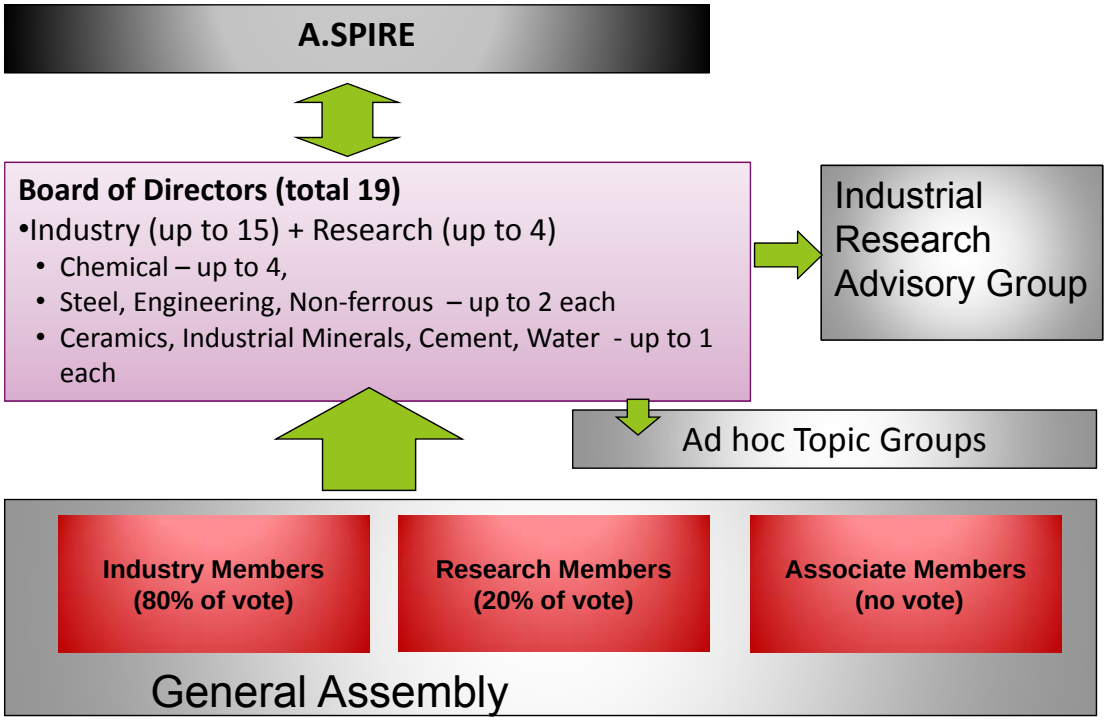
In these times of scarcity, it is important not to duplicate effort. One has to check if the proposed items are not already covered by others programmes, i.e.:

KC 1.4 on sustainable biomass/renewables, KC 2.1 on advanced energy systems, KC 2.2 on energy harvesting, storage and re-use,…

Relevant ?

Relevance of the SPIRE initiative

Governance of A.SPIRE (1/2)



Governance of A.SPIRE (2/2)

Others involvement?

- EC participation?
- Others sectors (energy,…) as already mentioned

Value chain

SPIRE aims to bring together all actors along the value chain:

The use of the TRL scale should help identify the **role of each entity** represented in the board and ensure that it adequately covers the **entire value chain**.

In others PPP (i.e. PPP Robotics), **academic** (research participants), **industrial** (manufacturing actor) and **RTO** (technological development actor) are clearly identified. Such nomenclature should be adopted.

Governance to be clarified

Thank you !

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From safety to security in nanotechnology: anti-counterfeiting technologies

Dr. Georg Reiners
Director & Professor
Head of Division 6.4 Nanomaterial Technologies
Head of BAM Nanotechnology Task Force

6.4 Nanomaterial Technologies

Safety of nanotechnologies

„the safe use of NT“ taking into account the impact on:

- human health
- animals & plants
- environment (water, air, soil)

Generating safety of products by reliable use of nanomaterials

Generating safety & security

e.g. anti-counterfeiting of products by NT:

- materials,
- pharmaceutics, diagnostics,
- packaging,
- components,
- …

distinguish between

- consumer in direct contact
  (consumer protection)
  (product liability)

- employees in direct contact
  (production and manufacturing)

- unintentional release

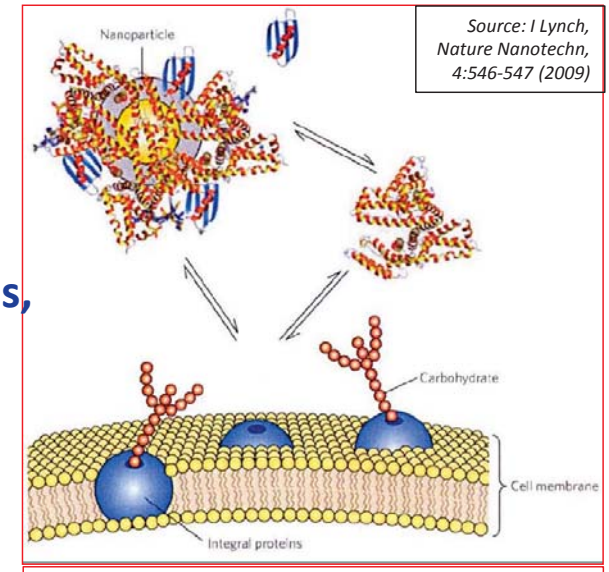
- end-of-life

The determination of the hazard potential is very complex !

at the nanoscale one has to determine

- **chemical composition & surface chemistry of NOAA***
- **concentration in fluids and bulk (number conc. vs mass conc. vs surface area)**
- **kinetics/mobility in human body/cells, in fluids, …**
- **solubility in water, blood, …**
- **long term stability**
- **state of agglomeration / aggregation**
- **…**
- **→ need for new/better test methods**

**** NOAA: nano-objects and their aggregates and agglomerates***



Source: I Lynch, Nature Nanotechn, 4:546-547 (2009)

Interaction of nanoparticle and biological cells is determined by protein coating

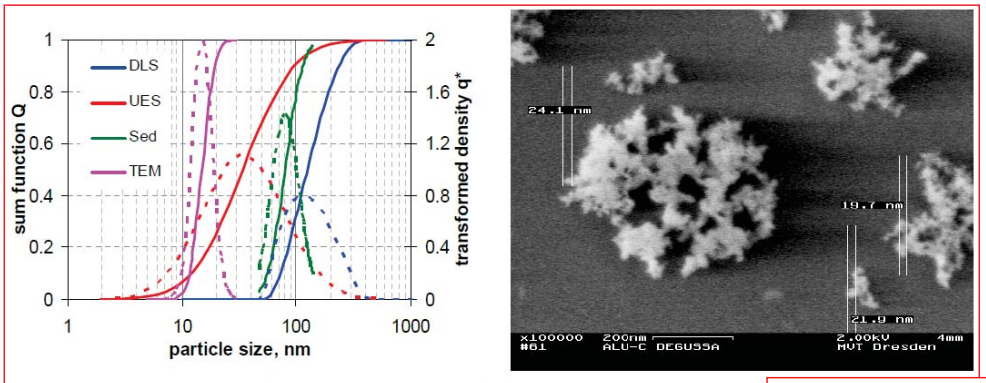
- **LCA (Life Cycle Analysis), i.e. risk, exposure assessment over LC, …**
- **assays for risk analysis**
- **occupational health, toxicological aspects i.e. „human biomonitoring“ & epidemiology**
- **toxicological high throughput screening methods**
- **dose–response relationship: on which base:**
  - individual particles/aggregates/agglomerates ?
  - mass of, surface of, number of particles ?
- **limits of „cell activation“**
- **„bio-stability“** *(material being stable in a given biological environment)*
- **biokinetic**
- **…**

Many FP7 call topics and collaborative projects on nanosafety

- **ERA-NET SIINN: FP7 ERA-NET on nanosafety and nanotoxicology**
  - First Call has resulted in three transnational nanosafety projects.
- **NANoREG: FP7 project on regulatory issues related to nanosafety**
  - Coordinated European research on risk and safety issues of nanotechnology for regulatory purposes
- **European NanoSafety Cluster**
  - DG RTD NMP initiative, maximise synergies between the existing FP6 and FP7 projects addressing all aspects of nanosafety
  - Participation is compulsory for nano-EHS projects started since April 2009
  - Proposal for a strategic research agenda on nanosafety, input to contribute to the preparation and implementation of Horizon 2020
- **NANOfutures, European Technology and Innovation Platform**
  - Integrated Research and Industrial Roadmap for European Nanotechnology including nanosafety aspects
- **High Level Group on Nanotechnology (Member & FP7 Associated States)**
  - Maximise synergy between EC and nationally funded research work

particle diameter distribution: need for standardization

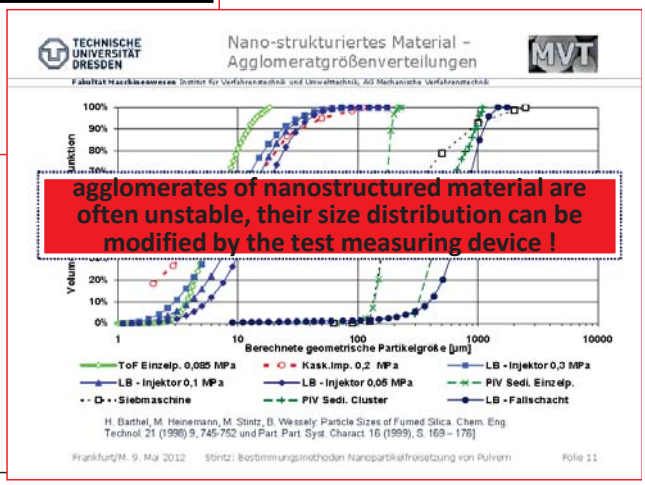
BAM 6.4 Nanomaterial Technologies



- DLS – Dynamische Lichtstreuung → x_{hyd}
- UES – Ultrasonischall-Extinktionsspektroskopie → x_{acPhor}
- Sed – Sedimentationsanalyse → x_{Stokes}
- TEM – Transmissions-Elektronenmikroskop → x_p

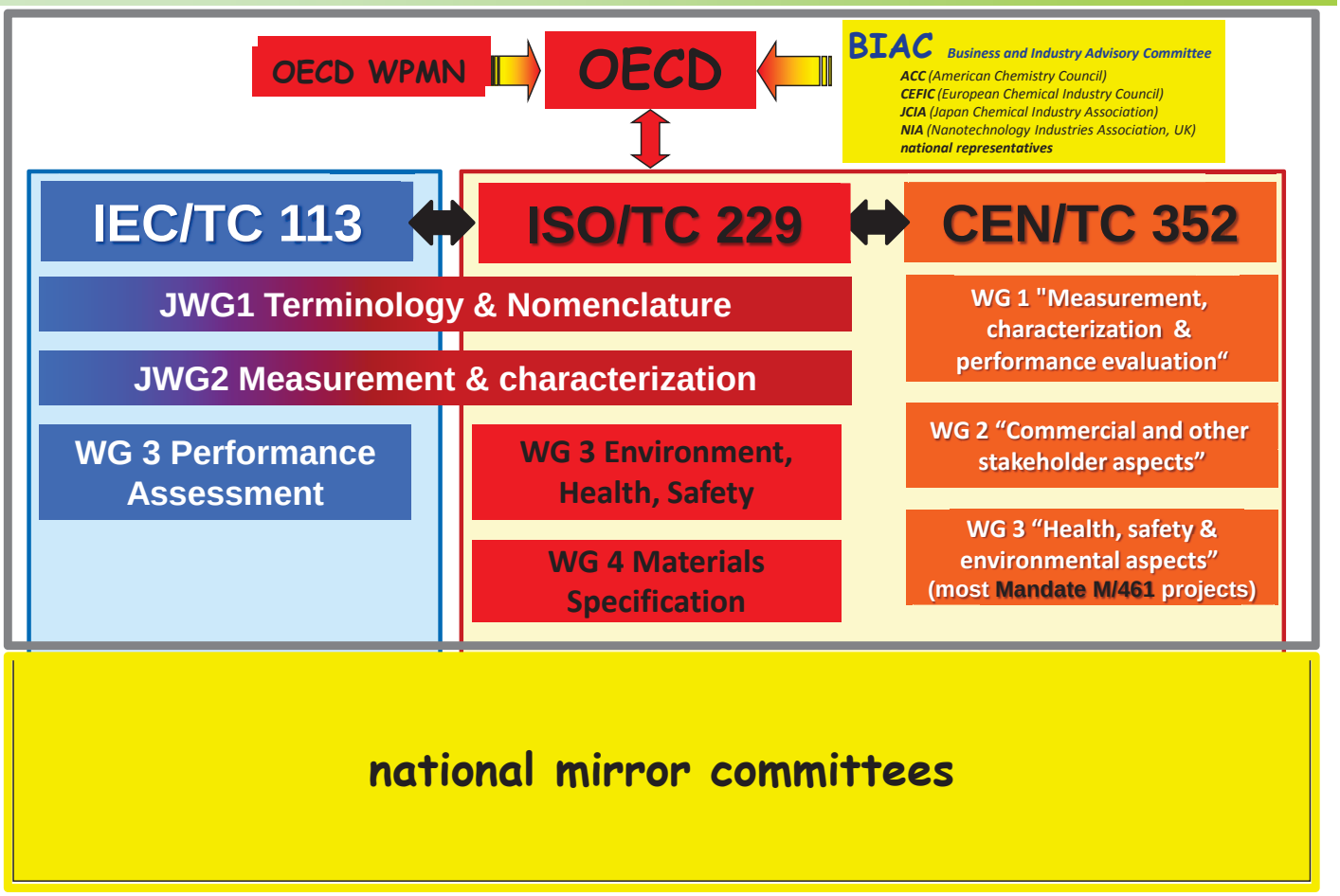
Different test methods provide different equivalent diameters

→ Standardization needed !!



source: Dr.-Ing. habil. Michael Stintz : TECHNISCHE UNIVERSITÄT DRESDEN Nano-Additive, 20. 11.2012, BAM Berlin Stintz: Qualitätssicherung und Standardisierung von Partikelmessmethoden

International organisation of "Nano" standardisation



Basics Definition Nanomaterial

Nanomatrial
ISO/TS 80004-1

external dimensions
IN THE NANOSCALE

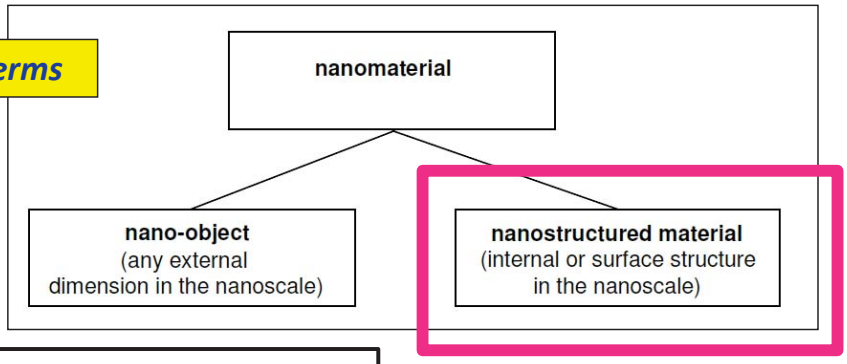
internal structure
or
surface structure
IN THE NANOSCALE

nano-object
ISO/TS 27687 (rev 80004-2)

nanostructured material
ISO/TS 80004-4

ISO/TC 229 Definition of Nanomaterial

ISO/TS 80004-1 Core Terms



DIN CEN ISO TS 27687 : 2008

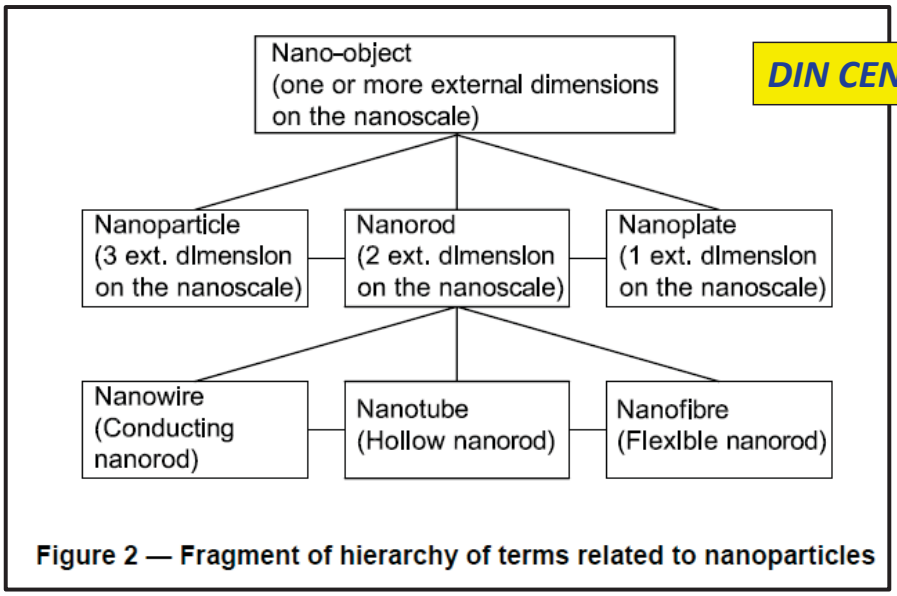
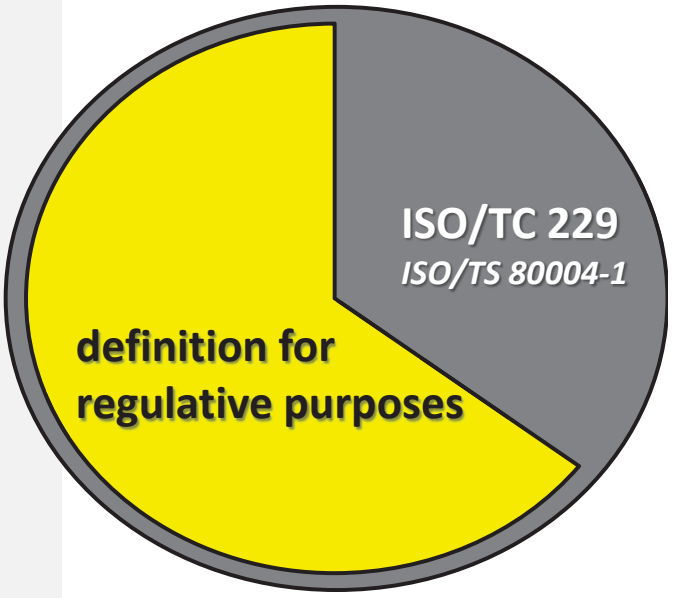


Figure 2 — Fragment of hierarchy of terms related to nanoparticles

Standards on Terminology, test methods, protocols

Example: Definition of „Nanomaterial“ for regulative purposes: in most cases only a subset of NM is addressed !!

- EC Recommendation on the def. of NM
- EU Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR)
- EU Scientific Committee on Consumer Products (SCCP)
- EU Cosmetic Products Regulation
- EU Recast of the Novel Foods Regulation
- Danish Ministry of the Environment
- UK (Royal Society & The Royal Academy of Engineering)
- American Chemistry Council
- Australia (NICNAS)
- Canada (Health Canada)
- US-Environment Protection Agency (EPA)



Nanoscaled Reference Materials

http://www.nano-refmat.bam.de/en/

BAM Federal Institute for Materials Research and Testing

Nanoscaled Reference Materials

Home

ISO/TC 229
IEC/TC 113
CEN/TC 352
DIN NA 062-08-17
COMAR

Cooperation with ISO/TC 229 Nanotechnologies

Nanoscaled Reference Materials

Reference materials are the key to guaranteeing realiability and correctness for results of chemical analyses and technical measurements.

List* of currently available nanoscaled reference materials

- Certified Reference Material (CRM)
- Quality Control Materials (QCM)
- Reference Material (RM**)

* List does not claim to be exhaustive
** RM = Reference material NOT specified as CRM or QCM

Categories

- Flatness
- Film thickness
- Single step , periodic step, step grating
- Lateral X-Y-axis, 1-dim
- Lateral X-Y-axis, +2-dim,
- critical dimensions
- 3-dimensional
- Nanoobjects/nanoparticles/nanomaterial
- Nanocrystallite materials
- Porosity
- Depth profiling resolution
- Others

If no information is available the data fields are blank

Category: Nanoobjects / nanoparticles / nanomaterials
24 entries (only 5 CRM's)

Information on this website

Part of the information on this website is based on information collected by G. Wilkening and L. Koenders (PTB)

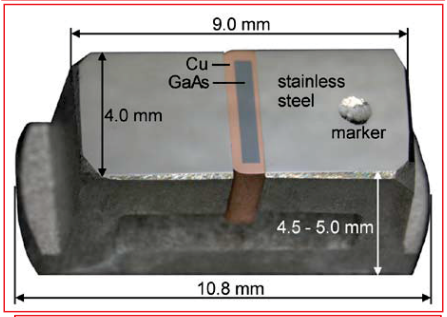
- L. Koenders and G. Wilkening, Review on available calibration artefacts, in: Proceedings of Nanoscale 2001, PTB-Berichte PTB-F-44, 2001
- L. Koenders, T. Dziomba, P. Thomson-Schmidt, and G. Wilkening, Standards for the Calibration of Instruments for Dimensional Nanometrology, in: Nanoscale Calibration Standards and Methods: Dimensional and Related Measurements in the Micro- and Nanometer Range, eds. G. Wilkening, L. Koenders, Wiley-VCH Weinheim, 2005, ISBN 3-527-40502-X, S. 245-258

Read more about reference materials

- Reference materials on the website of BAM Federal Institute for Materials Research and Testing
- COMAR - Search online for reference materials available worldwide.
- REMCO - REMCO is ISO's Committee for reference materials. Its task is the promotion and harmonization of international activities for the production and use of certified reference materials.
- European Reference Materials Website

BAM-L200 Nanoscaled Certified Reference Material

Polished cross section of an AlGaAs - InGaAs - GaAs layer stack



Calibration of

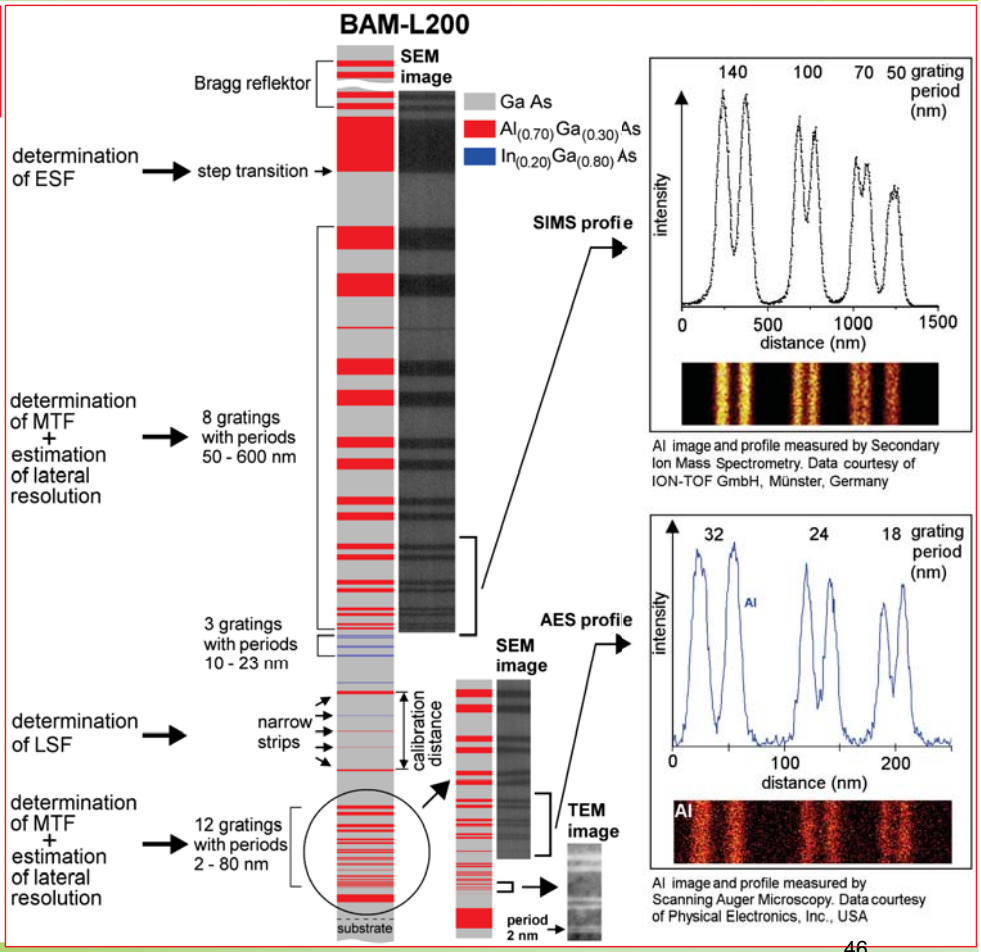
- **SIMS**

(regular instrument performance test – ISO 17025)

- **SEM**
- **AES**
- **(NanoESCA®, Omicron)**

Calibrated by TEM

Imaging surface analysis: Lateral resolution and its relation to contrast and noise
Senoner, Mathias et al., J. Anal. At. Spectrom., 25 , 2010, 1440-1452

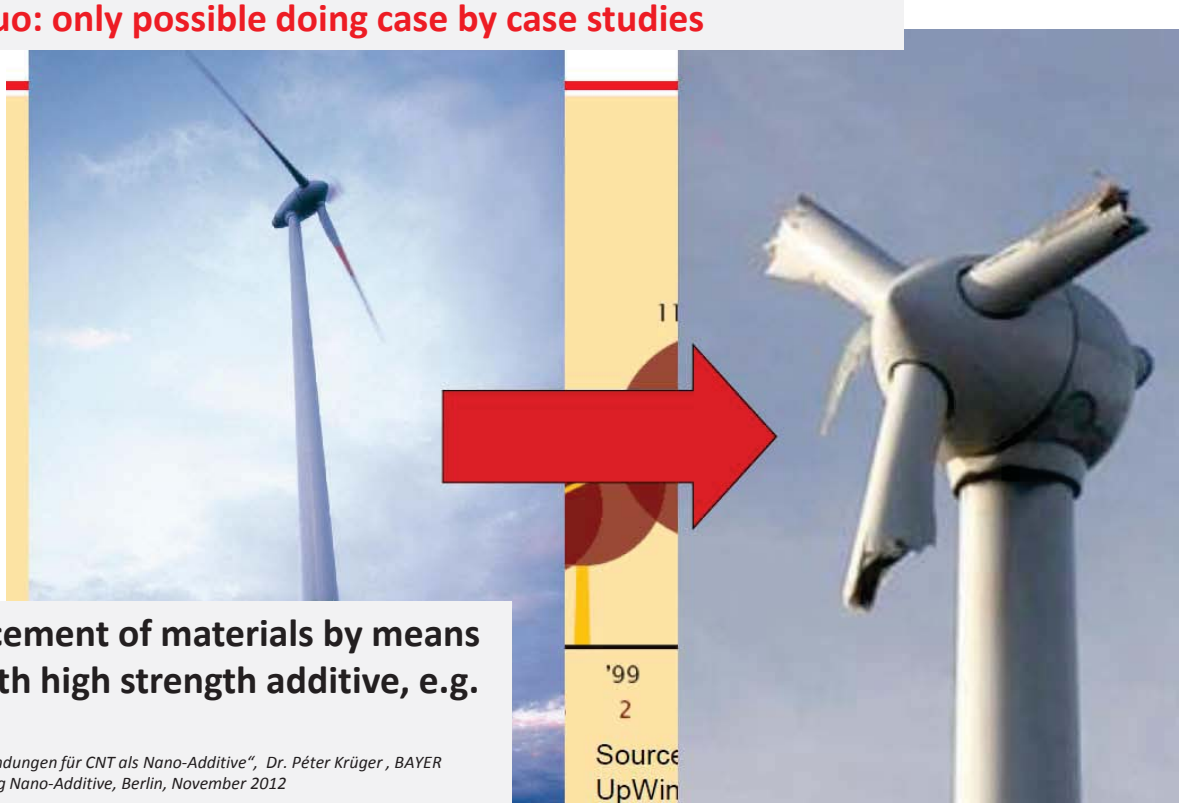


Al image and profile measured by Secondary Ion Mass Spectrometry. Data courtesy of ION-TOF GmbH, Münster, Germany

Al image and profile measured by Scanning Auger Microscopy. Data courtesy of Physical Electronics, Inc., USA

Research needed to study and to UNDERSTAND structure-activity-, structure-property-relationship

- **status quo: only possible doing case by case studies**



i.e.: Reinforcement of materials by means of mixing with high strength additive, e.g. such as CNT

Source: "Märkte und Anwendungen für CNT als Nano-Additive", Dr. Péter Krüger , BAYER MaterialScience, Fachtagung Nano-Additive, Berlin, November 2012

Technologies:

- **embedded nano-objects**
  quantum dots
  nano-scaled colour pigments
  nanoparticles with special optical and electrical properties
  …
- **nanocoatings**
  i.e. Fabry-Perot Layer Stacks
  …
- **nano-scale surface patterns**
- **…**

check authenticity by taking a photo without & with flash

Example see:

http://www.ara-authentic.de/Dateien/ARA_Auth_dt.pdf

or

http://www.ara-authentic.de/ARA-Authentic/Schichtentwicklung.html

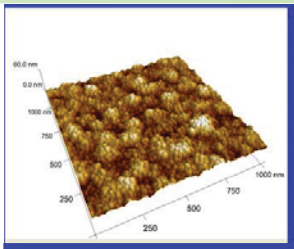
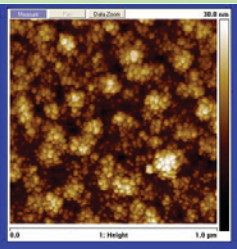
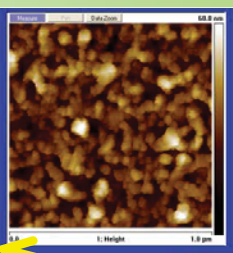
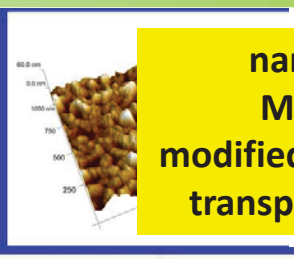
Public, hidden and forensic features either encoded or directly legible are used for authentication.

Fabry-Perot layer stacks as information carriers in connection with imaging ellipsometry as optical read-out system provide all-in-one anticounterfeiting capabilities.

uwe.beck@bam.de

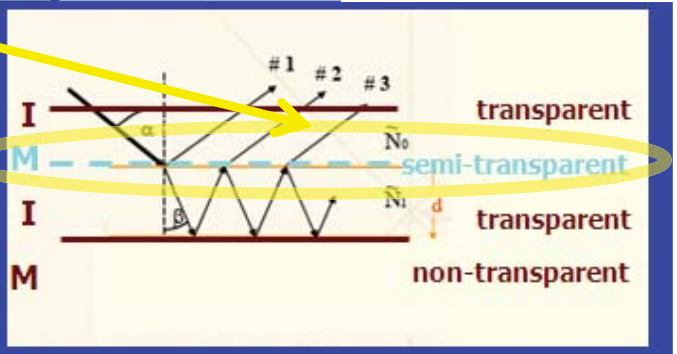
Ellipsometric Encoding & Fabry-Perot Layer Stacks with Public, Hidden, and Forensic Features for Product Authentication
D. Hönig1, S. Schneider1, 3, R. Domnick2, M. Belzner2, U. Beck3, A. Hertwig3, R. Stephanowitz3 , M. Weise3
1 Accurion GmbH, Stresemannstr. 30, D - 37079 Göttingen, Germany
2 Ara-Coatings GmbH & Co KG, Gundstr. 13, D - 91056 Erlangen, Germany
3 BAM (Federal Institute for Materials Research and Testing), Division 6.4 "Surface Technology", Unter den Eichen 87, D - 12205 Berlin, Germany
3rd Internationaler Kongress "Sichere Identität" , Berlin, 05. April 2011

Fabry-Perot layer stacks: all colours, angle-dependent or not

nano-structured M-layer can be modified by LASER through transparent top coating

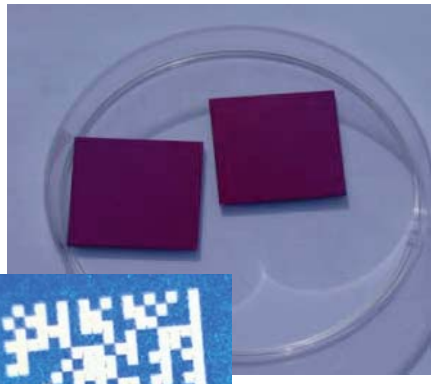
- Interference in a Fabry-Perot stack, tilt effect avoidable
- All colours including white and black, bright colours
- Effect dominated by semi-transparent film
- Colour & brightness due to thickness & morphology of layer M
- Ellipsometric analysis fails for physi-cally uncloneable functions (PUF)



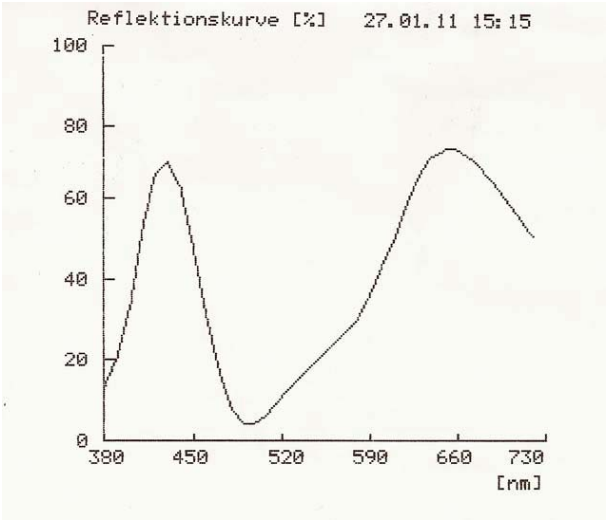

Level 2: Hidden Features

Level 2 – simple instruments:

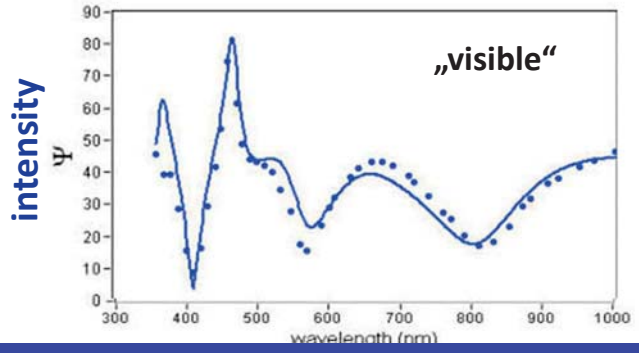
- **bar code reader &**
- **colour measurement (e.g. CIE-L*a*b*)**

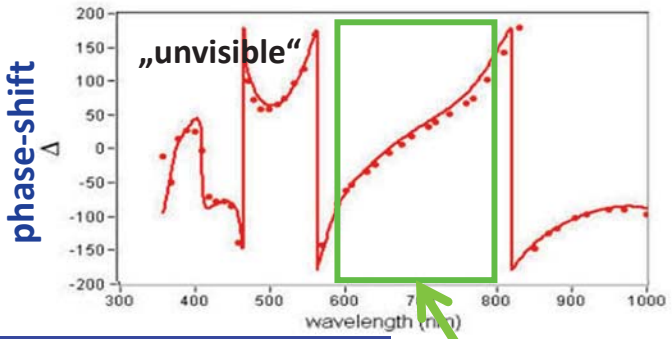


Level 3: Forensic Features sophisticated instruments



Ellipsometry: using polarized light, measure intensities AND phase shift





λ / nm	Δ / °	ID	λ / nm	Δ / °	ID	λ / nm	Δ / °	ID
615	-90	a	680	-25	n	745	40	1
620	-85	b	685	-20	o	750	45	2
625	-80	c	690	-15	p	755	50	3
630	-75	d	695	-10	q	760	55	4
635	-70	e	700	-5	r	765	60	5
640	-65	f	705	0	s	770	65	6
645	-60	g	710	5	t	775	70	7
650	-55	h	715	10	u	780	75	8
655	-50	i	720	15	v	785	80	9
660	-45	j	725	20	w	790	85	0
665	-40	k	730	25	x	795	90	space
670	-35	l	735	30	y			
675	-30	m	740	35	z			

External key: AOI, λ

75°, 620 nm
75°, 615 nm
75°, 675 nm

System response: Ψ, Δ

-85°,-90°, -30°

Information:

B, A, M

Δ easily provides 180° : 5 = 36 signs

Simplified Encoding Principle

Need for research

- **nano-objects/nanoparticles embedded in coatings** particularly incorporated in functional coatings without any loss of functionality
- intrinsic surface topography / morphology as finger print
- modify surface topography / morphology to use as finger print
- nano-scaled fluorescence marker
- …


Many thanks for your attention
Quelle: www.begann.de/

CONTRIBUTION GIVEN BY EXPERTS (1)

EADS Key priorities for R&T on composite materials in Horizon 2020

Point of contact : Jacques Cinquin (jacques.cinquin@eads.net)

Organic Composite Materials for Aeronautical Applications – Future needs.

Organic composite materials are involved at more than 50% of the weight of the structure in the last generation of civil aircrafts (Airbus A350). The weight saving is the main driver to introduce composite materials in structures. The advantage is fuel saving during all the life of the Aircraft with reduction of CO2 and NOx emission during aircraft operation. The industry is now mature with a complete well established supply chain from the raw materials to the manufactured composite parts. Global cost reduction is also an interest in some case with important reduction of the assembly cost by reduction of the number of sub elements to be joined together.

The future needs for structural application could be listed as follow :

Manufacturing cost reduction:

- Development of out-of-autoclave technologies and adapted materials to reduce recurrent and non-recurrent costs for structural part production.
- Development of high productivity processes of composite parts with reduced investment to produce next generation single aisle short range civil aircraft.

Environmental friendly composites:

- In case of REACH compliance problem in the supply chain of material ingredients, develop alternative ingredients with similar function to replace the incriminated ones to guaranty the long term utilization of qualified materials in the supply chain of composite parts production.
- Develop end of life recyclability of composite structure and propose solution to avoid environmental problems with the increasing volume of end of life composite parts in a long term future when aircraft with high content of composite structure will be retired.

Develop new applications for composite materials:

- Parts working continuously at high temperature (in the range 100°C to 300°C) needs new materials and development of durability concept and new qualification philosophy taking in account reliable accelerated ageing test.
- Electrical or thermal conductive composite needs to be developed to be applicable in specific parts of the structures such as new fuselage generation to avoid weight penalty with addition of conductive metallic substructure to make the electrical function.
- Development of new affordable composite structures and materials for 3D loaded application such as joining elements
- New Multifunctional composite structures (tuned acoustical properties, system integration, thermal management …).
- Health monitoring structure with sensor integration

Repair of composite structures:

- Development of structural repair process and materials (out-of-shop and in-shop repair)

CONTRIBUTION GIVEN BY EXPERTS (2)

Implication of the UPMC

Point of contact : Christophe Petit (christophe.petit@upmc.fr)

As a research-intensive university, UPMC develops advanced academic research in science and medicine. Under the Horizon 2020 program it is totally concerned with priority 1 (scientific excellence) following its involvement within the 7th Framework Program.

The Horizon 2020 will be organized around two others priorities for the collaboratives research:

P2 Primacy industrial
P3 Societal challenges

1-Concerning the place of the NMT and the implication of UPMC into the two priorities, **we defend fundamental research with a strong opening to the applications** (without necessarily an industrial partners as a project leader, i.e. in center of everything but in partnership with industry). This is to reinforce the central role of research (which is not necessarily innovation).

2-**Concerning the NMT** (but it could be also valuable in other scientific field) it is **necessary to provide skills center (pilot lines) where teams of industrial R & D and academic researchers can work together on common projects.** This would allow for cross-fertilization of areas of expertise among researchers and R & D engineers and therefore benefits can be faster in terms of innovation and applications

3-UPMC as a multidisciplinary **University strongly defends the Multi-Kets approach** (as for example Societal acceptance of nanotechnology, nanotoxicity...) not only inside P2 but also between P2 and P3.

4- in order to reinforce the participation of the maximum of researchers into the H2020 program (and thus to develop the scientific transfer from basic research toward application). **The Call must be as less bureaucratic as possible.**
A two-step procedure (letter of intent and detailed projects) is most likely to mobilize the maximum number of participants and thus ensure best return on investment by removing blockages resulting from too much complexity of the calls.

Short paper on EFFRA and FoF

Point of contact : Michel Carton (michel.carton@cetim.fr)

Presentation of the Factories of the Future PPP

Factories of the Future (FoF) is one of the three Public Private Partnerships (PPP) included in the European Commission's Economic Recovery Plan launched in November 2008 in response to the global economic crisis. This particular PPP aims at helping EU manufacturing enterprises, in particular SMEs, to adapt to global competitive pressures by improving the technological base of manufacturing across a broad range of sectors. During the last years of the Seventh Framework Programme (FP7), the FoF PPP consisted of a research programme of 0.6 billion Euros coming from EU to support the manufacturing industry in the development of new and sustainable technologies. The programme was financed jointly by the DG RTD (60 %) and the DG CONNECT (INFSO) (40 %) due to FoF PPP cross-thematic and cross sectorial addressing; it encompasses the Information and Communications Technologies (ICT) Theme and the Nanosciences, Nanotechnologies, Materials and New Production Technologies (NMP) Theme. On the PPP, the private side is represented by the European Factories of the Future Research Association (EFFRA) which is an industrial association (200 members). An EFFRA working group (Industrial Research Advisory Group, IRAG), had written the first multi annual roadmap used by the commission, which has been the basis of NMP-FoF calls for the years 2011, 2010, 2013. This EFFRA working group had just finished writing the second multi annual roadmap (2014-2020), this roadmap is up to now, in cooperation with the European Commission, at the ultimate phase of public validation (until 10 December).

Open Issues addressed to Committee Programme

There are several open issues that need to be addressed relating to Committee Programme (CP) and EFFRA such as :

- What are the interacting roles, and formal cross information needs for the various bodies (IRAG, AIAG, Committee Programme) in the NMP-FoF calls production ? The question, here, is relating to having more efficiency and synergies between these bodies.
- What is the more efficient formal schedule for this call production?
- What are the rules governing the two legitimacies :
    - Legitimacy of the members states (for the CP)
    - Legitimacy of the PPP association (i.e. industrials and R&D actors of the domain)
- How to manage the arrivals of new PPP ?
- How to take into account the comments, recommendations, remarks…of the CP within the updating multi annual roadmap process?
- …

Contributions of surface science to NMP tasks 2020

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Based on some discussion in Germany as well as on results of a workshop on the mentioned topic held in Düsseldorf last October I would like to draw out some considerations:

Essential keywords are closely related to the big societal challenges. These are:

a) Medicine/Pharmacy (Health)
b) Resource management (related to materials), and
c) Resource management (related to energy).

Regarding a); here the topics are “biocompatibility” subsuming all interactions of materials surfaces in contact with biological systems and “drug delivery” combining all approaches to trigger biological systems by controlled release of therapeutic meaningful substances from a materials reservoir. For both topics a lot of approaches are available at least on an university level. For application some properties like long-term stability and resistivity against mechanical demands (wear, stress etc.) have to be managed and are often still unsolved problems. Thus chemical degeneration and coating by unspecific adsorption have to be taken into account even if the use is not totally disabled it should be controlled. This has to be taken into account by encouraging projects in this area. Regarding “drug delivery” long-term kinetics are often inappropriate. Thus, encapsulated active ingredients are often not continuously released but in a short interval. Therefore here development is needed to come up with a well-controlled release under application oriented conditions. A second challenge is to release the effective compounds at the specific location. To do this, drugs have to be packaged in a way that the containment, e.g. a virus analog shell, finds its way to the appropriate site.

Regarding b); the aim is to generate properties with as less as possible amount of material. Thin film deposition and surface modification are therefore the favorable techniques. Thus bulk properties and surface properties of devices and components can be decoupled. Depending on the kind of surface techniques to be applied the amount of material varies significantly if liquid phase based processes or those from the gas phase are used, due to the fact that for the latter the density is three orders of magnitude lower and if finally vacuum processes are used again the density for typical vacuum processes again is three orders of magnitude less than for atmospheric pressure systems. In consequence problems with materials storage and waste management are marginal, meaning that running costs of such processes are also marginal but investment costs are higher than for liquid based processes. Final decision for liquid bases processes or gas phase bases ones has to take number of pieces or area to be treated into account. Thus, for high throughput vacuum processes are favorable. A second aspect of material efficiency is related to up- as well as to down-stream processes in chemical processing where materials flow has to be controlled. Here usual separation and concentration processes are dominated by interaction with interfaces e.g. membrane based separation processes, chromatographic processes and separation by floatation. Preparing such surfaces will be a growing activity for the next decades. Other traditional topics, where surfaces

techniques will contribute to material efficiency will be the tailoring of surfaces in static contact (adhesion/dehesion) or dynamic contact (reduction of wear and friction).

Regarding c); several contributions in the fields of resource management related to energy consumption are to be expected from surface technology. Here the development of new surfaces for heterogeneous catalysis as well as for the above mentioned surfaces for friction and wear reduction under dynamic contact of different phases have to be taken into consideration. Again membranes this time for energy storage (batteries and supercaps) and energy conversion (fuel cells) have to be transferred from the university level to application. An additional challenge, not only related to surface techniques, is the development of new materials with decoupled thermal and electrical conductivity for more effective thermoelectric modules. Here focus is to be laid on inner surfaces of composite materials.

Finally new de-iceing concepts are important for airplane wings, and wind turbines for more energy efficiency and security. Such concepts may be also transferred to overhead power lines and energy management by latent-heat storage systems.

Participant List

EuroRoads' Business Lunch Talk about Future Topics in Nanotechnologies, Materials and Production , 10th December 2012

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