



# Nanotechnology competence mapping in Finland

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[www.nanobusiness.fi](http://www.nanobusiness.fi)

# Nanotechnology cluster programme – the gateway to Finnish nanotech expertise

Ministry of Employment and Economy, 2007-13

Fostering the growth of Finnish nanotech based business and implementation of nanotechnology in Finnish industry

## Services to Finnish Companies:

### Promotions to selected industries

Partnering, Projects, Business skills

## Resources:

8 Centres of Expertise + Coordination

2 MEur Annually + projects

## Internationally:

Finnish partners to projects

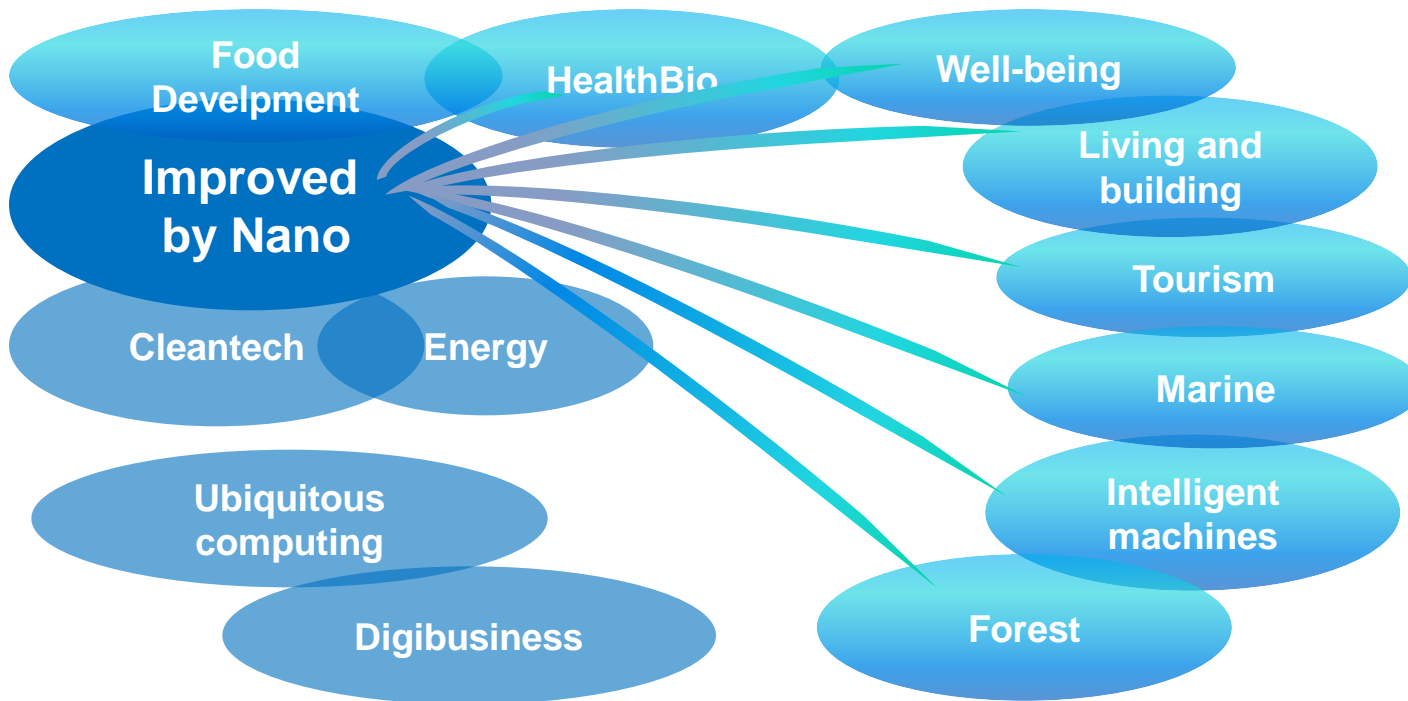
Finnish nanotech to global market



Nanocluster team reaches >90% of all Finnish nano and micro activities and stakeholders



# Promoting nanotech companies in collaboration with customer clusters



**For growth, you need understanding and contacts to customer sector  
Boosting innovation is about systematic work!**



## Nanocluster's toolkit to commercialize know-how

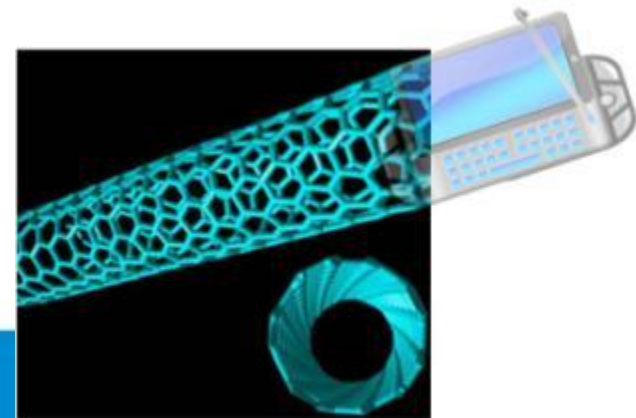
- 1. Promote the sources of new know-how**
  - **Identify, document, interpret, disseminate**
- 2. Educate to commercialize**
  - Enlarge the scientists' skill sets
- 3. Encourage to commercialize**
  - Prizes, honour, publicity, prospects
- 4. Promote the new business**
  - Look for and provide new business opportunities
- 5. Support growth**
  - Know the success factors
  - Educate in business skills
  - Nourish continuous renewal





# Competence mapping = Promote the sources of new know-how

- **Identify:** Competence mapping! Web based questionnaire
- **Document:**
  - Expertise of the group
  - Goal of the research
  - Most significant results
  - **Potential applications and users!**
- **Interpret:** Data in easy to understand form!
- **Disseminate:** Research results to the companies
  - Publication
  - wiki portal
  - Invest in support





## Available today: mapping of Helsinki Region

- Aalto University (5 schools with nanoresearch)
- University of Helsinki (3 campus areas with nanoresearch)
- VTT
- MIKES – Centre for Metrology and Accreditation
- Finnish Institute of Occupational Health (FIOH)
- Finnish Meteorological Institute (FMI)
- Finnish Environmental Institute (SYKE)



Application industry	Research expertise									
	Surfaces	Nanomaterials	Aerosols	Well-being	Built environments	MEMS, Optics, Electronics	Characterization	Fabrication	Theory	
Chemical	3	5	2	1	1	1	5	4	4	
Forest	6	5		1	1	2	4	2	2	
Food	4	3		1		1	4	1	2	
Medical	16	15	4	14	1	11	17	10	12	
Metal	9	8		3	1	3	8	8	3	
Building	3	5		1	3	1	3	4	1	
Energy	2	2	1	2	1	1	3	1	2	
ICT & Ele	17	21	2	6	3	20	25	18	19	
Sensors	13	12		9	1	12	13	12	10	
Research	11	10	2	6	2	11	15	12	9	
Safety	4	3	2	3	2	1	5	2	3	

**Total number of research groups with expertise and potential applications in given fields**

Classification of the groups by potential application areas of the research

	Life	Environment	Energy	Health	Manufacturing	Defense	Chemicals	Automotive	Other	Other	Other
Chemical industry	1, 3, 11, 13	5, 8, 11, 12	40, 40	6, 5, 11	11, 11	8, 11	1, 3, 11, 11	6, 6, 11, 40	1, 3, 11, 40		1, 11
Food industry	3, 11, 14	2, 11, 12, 13		11, 11	11	2, 11	2, 11, 11, 11	11, 11	11, 11, 11		
Textile industry	4, 11, 11, 11	4, 11, 11		11		4	4, 11, 11, 11	4	11, 11		
Pharmaceutical	1, 1, 4, 8, 11	1, 1, 4, 8, 11	11, 40, 11	1, 4, 8, 11, 14	11, 11	1, 4, 8, 11, 11	1, 1, 4, 8, 11	1, 4, 8, 11, 11	1, 4, 8, 11, 11	8, 11	11, 11, 11
Metal industry	5, 11, 11	5, 11, 11, 11		8, 11		11, 11	5, 11, 11	5, 11, 11	8, 11	8, 11	4
Building industry	1, 11, 11, 11	1, 11, 11, 11		11, 11	11, 11, 11, 11		1, 11, 11, 11	1, 11, 11, 11	11		11
Energy	1, 8	1, 11	11	8, 11	11	11	1, 8, 11	11	1, 8	8	1
ICT & Electronics	1, 4, 8, 11	1, 4, 8, 11	11, 40, 11	4, 11, 11	11, 11, 11, 11	1, 4, 11, 11	1, 4, 8, 11	4, 11, 11, 11	4, 11, 11, 11	8	11, 11
Textile & Confection	11, 11, 11	11, 11, 11, 11		11, 11, 11		11, 11, 11, 11	11, 11, 11, 11	11, 11, 11, 11	11, 11, 11, 11		
Automotive	8, 11, 11, 11	8, 11, 11, 11		8, 11, 11, 11		8, 11, 11, 11	11, 11, 11, 11	8, 11, 11, 11	11, 11, 11, 11	8, 11	11, 11
Research & Technology	1, 1, 4, 11, 11	1, 1, 4, 11, 11	40, 11, 11, 11	11, 11, 11	11	1, 4, 11, 11	1, 1, 4, 11	4, 11, 11, 11	1, 11, 11	11, 11	1, 11, 11
Total	11, 11, 11, 11	11, 11, 11, 11	40, 11, 11, 11	11, 11, 11, 11	11, 11	11, 11	11, 11, 11, 11	11, 11, 11, 11	11, 11, 11, 11	11, 11	11, 11, 11



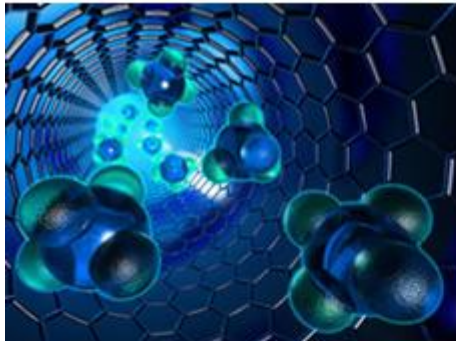


Group name	Classifications
Miniaturised instruments and neoteric techniques, MINT	1, 3, 4, 9
<b>Leader</b>	
Prof. Marja-Liisa Riekkola	
<b>Special know-how of the group:</b>	
<p><b>1)</b> Development of miniaturized versatile instrumental techniques applicable to nanodomain interaction studies  <b>2)</b> Coating of different surfaces with human materials <b>3)</b> Exploitation of complementary and multidisciplinary approaches, and simultaneous computational and experimental studies.</p>	
<b>Objectives of the research:</b>	
<p><b>1)</b> To develop novel/neoteric miniaturised instruments/instrumental techniques vital at nanoscale. <b>2)</b> To apply advanced computational and numerical approaches for deeper understanding of nanoscale bioprocesses at tomistic and molecular level.</p>	
<b>Most significant results during 2008-2009:</b>	
<p>Capillary electromigration techniques can be exploited, in addition to separation techniques, as biomimicking instrumental techniques applicable to studies on the understanding of the molecular properties of human surface nanodomains. In the studies, it has been shown that human microemulsions, and several lipoproteins can be employed as stationary phase in electrochromatography (CEC). CEC has also revealed to be an efficient tool for the isolation of apolipoprotein B-100 (apoB-100), the main protein of low density lipoprotein particles (LDL) that, as a coating, is then available for broad interaction studies. Proteoglycans (PGs) are the most abundant compounds of the extracellular matrix (ECM). It is evident that an organized, tight PG network, formed from glycosaminoglycans, has the potential to bind lipoproteins, and the atherogenicity of especially LDL particles is linked to their affinity towards the intimal proteoglycans, and in the interactions and entrapment at least chondroitin-6 sulfates play an important role. In the studies the coating procedures for human proteoglycans have been developed, and interactions of proteoglycan with carefully selected peptide fragments of apoB-100 (the major apoprotein of low-density lipoprotein) have been preliminary clarified. In addition, our studies were dedicated to the construction/parameterisation of a PROORG derived force field for chondroitin-6-sulfate polysaccharide allowing further glycosaminoglycan studies. Density probability analysis on extended dynamics simulations and the subsequent derived dihedral averages were found to be in a good agreement compared to experimental data. The availability of a force field for a polysaccharide chain of C6S enables other simulations related to C6S - apoB-100 interactions.</p>	
<b>Possible utilization of the results:</b>	
<p>The neoteric instrumental techniques developed will be beneficial in nanodomain studies. Combination of advanced chemical, molecular and computational concepts with novel instrumental microanalytical techniques will be helpful in the elucidation of nanoscale functions of lipoproteins. Computational studies carried out hand in hand with experimental ones will open new avenues for carbohydrate studies, and especially for the elucidation of diseases in which polysaccharides play an important role. The project will generate also a new knowledge useful in separation technology, and in modeling of modern miniaturized systems.</p>	
<b>Contact</b>	
<p>Prof. Marja-Liisa Riekkola (marja-liisa.riekkola@helsinki.fi)            www : <a href="http://www.helsinki.fi/namia/enalyytinen/research/index.html">http://www.helsinki.fi/namia/enalyytinen/research/index.html</a></p>	





## Nanocluster web page [www.nanobusiness.fi](http://www.nanobusiness.fi)



### Nanotechnology Cluster Programme

Gateway to Finnish nano expertise

Nanocluster's mission is to foster the growth of Finnish nanotechnology based business responsibly. Nanotechnology Cluster Programme is nationwide network reaching more than 90% of Finnish nano- and microtechnologies and future materials.



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### Latest nanotechnology news

#### Finland and Russia to improve the effective use of Nano laboratories



Saint Petersburg Electrotechnical University (LETI), TEKLAB Ltd. and Spinverse Ltd. to improve quality and cost-efficiency of training in nanomaterials world-wide. »

#### Picosun introduces next generation of PICOPLATFORM™ ALD Cluster Tool

Picosun Oy, Finland-based global manufacturer of state-of-the-art Atomic Layer Deposition (ALD) equipment, introduces renewed, next generation PICOPLATFORM™ ALD cluster tool for integrated circuits (IC) industry applications. »

#### Nanomateriaalien kierrätyksestä ja käsittelystä kysely yrityksille

Nanomateriaaleja ei vielä erityisesti huomioida jätelainsäädännössä, mutta lähitulevaisuudessa voimaan astuu uusia säädöksiä. »

[More News »](#)



### Events

Finnish nanotechnology in Russia and China 25.10.2011 - 29.10.2011

Hiukkasfoorumin syysseminaari - Fine Particle Forum Autumn Seminar 09.11.2011 - 10.11.2011

[More events »](#)



## *HelsinkiNano – Nanotechnology Research in Helsinki Region 2010*

Download your digital copy at : [www.nanobusiness.fi](http://www.nanobusiness.fi)





[www.Nanoresearch.fi](http://www.Nanoresearch.fi)

now nanoresearch in capital area, 03/2012 the whole country

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 In English  Suomeksi

## What's new?

Want to find information about latest research results?

Welcome to explore the high-class nanoscience and technology research network operating in Helsinki Region. Nanoresearch.fi illustrates the nanotechnology research conducted in the universities and in other public institutions in the capital area.



## Featured groups



search... 

## What is nano?

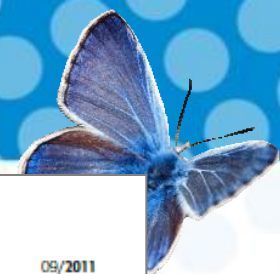
Nanotechnology (nano in Latin: small, in Greek: dwarf): is about things in

surface matter technology

physical protein soft

materials quantum polymer

optics molecular physics paper



	Substrates	Nano-materials	Analysis	Modelling	Multi-environments	Bioreactors	Characterization	Optimization	Theory	Safety	Other
Chemical industry	*	*	*	*	*	*	*	*	*	*	*
Energy	*	*	*	*	*	*	*	*	*	*	*
Research & metrology	*	*	*	*	*	*	*	*	*	*	*

## Catalytic nanomaterials for the production of fuels and chemicals

*We study and develop catalytic materials and applications for processes that are environmentally benign, efficient and important to the society.*

### We are best at

Studying catalytic materials and phenomena and modeling of catalytic reactions.

### Our results can be applied by

- Chemicals and fuel industry
- Scientific community

### Recent hot topics and results

In situ characterization of catalytic systems. New methods for extraction of information from temperature-programmed experiments. Biomass upgrading for production of fuels and chemicals.

### Goals for the future

- Fundamental knowledge on catalytic phenomena
- Special emphasis in the production of energy, chemicals and liquid fuels from biomass.



### Contact us!

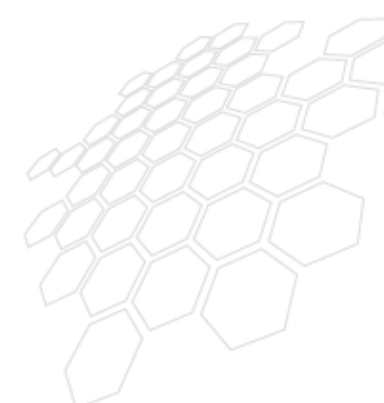
Prof. Outi Krause ([outi.krause@aalto.fi](mailto:outi.krause@aalto.fi))  
[http://chemtech.kkk.fi/en/research/industrial\\_chemistry/](http://chemtech.kkk.fi/en/research/industrial_chemistry/)



09/2011

## Aalto University

Aalto University is a new multidisciplinary science and art community in the fields of science, economics, and art and design. The new University is founded on Finnish strengths, and its goal is to develop as a unique entity to become one of the world's top universities. Aalto University's cornerstones are its strengths in education and research. At the new University, there are 20,000 basic degree and graduate students as well as a staff of 4,500 of which 300 are professors. The total budget for 2009 was close to EUR 368 million. In 2009, a total of 1,567 Master's Degrees and 180 Doctorates were completed at the three Schools. The number of alumni totals 75,000.



### Classification of the groups

by potential application areas of the research

	Substrates	Nano-materials	Analysis	Modelling	Multi-environments	Bioreactors	Characterization	Optimization	Theory	Safety	Other
<b>Chemical industry</b>	*	*	*	*	*	*	*	*	*	*	*
Forest industry	*	*	*	*	*	*	*	*	*	*	*
Food industry	*	*	*	*	*	*	*	*	*	*	*
Pharma/medical	*	*	*	*	*	*	*	*	*	*	*
Metal industry	*	*	*	*	*	*	*	*	*	*	*
Building industry	*	*	*	*	*	*	*	*	*	*	*
<b>Energy</b>	*	*	*	*	*	*	*	*	*	*	*
ICT, electronics & semiconductors	*	*	*	*	*	*	*	*	*	*	*
Services	*	*	*	*	*	*	*	*	*	*	*
<b>Research and metrology</b>	*	*	*	*	*	*	*	*	*	*	*
Safety	*	*	*	*	*	*	*	*	*	*	*





## The next steps

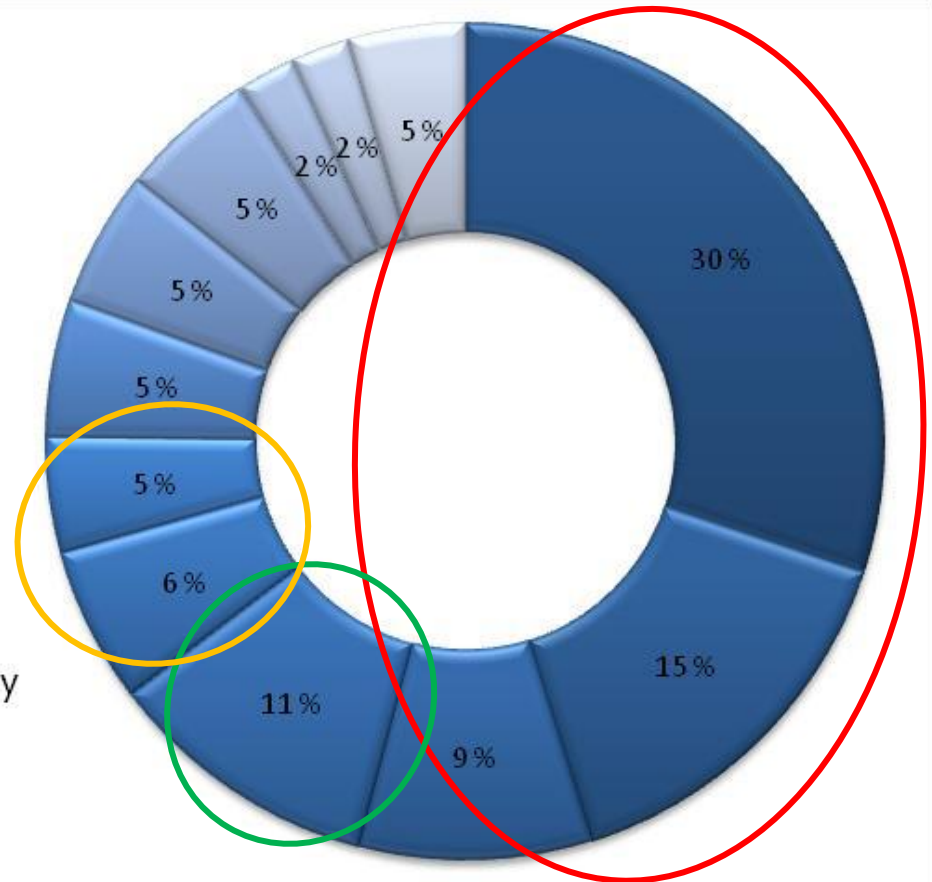
- **The mapping of the rest of the Finland running now!**
- 11.11.2011 status: 133 research groups
- Expected inputs in a few weeks: 10 from VTT , 10 from Kuopio
- Launch on 15.12.2011: The new version of the book
- Data uploaded in nanoresearch.fi within Q1/2012



# 11.11.2011 Status: Finnish Nano research

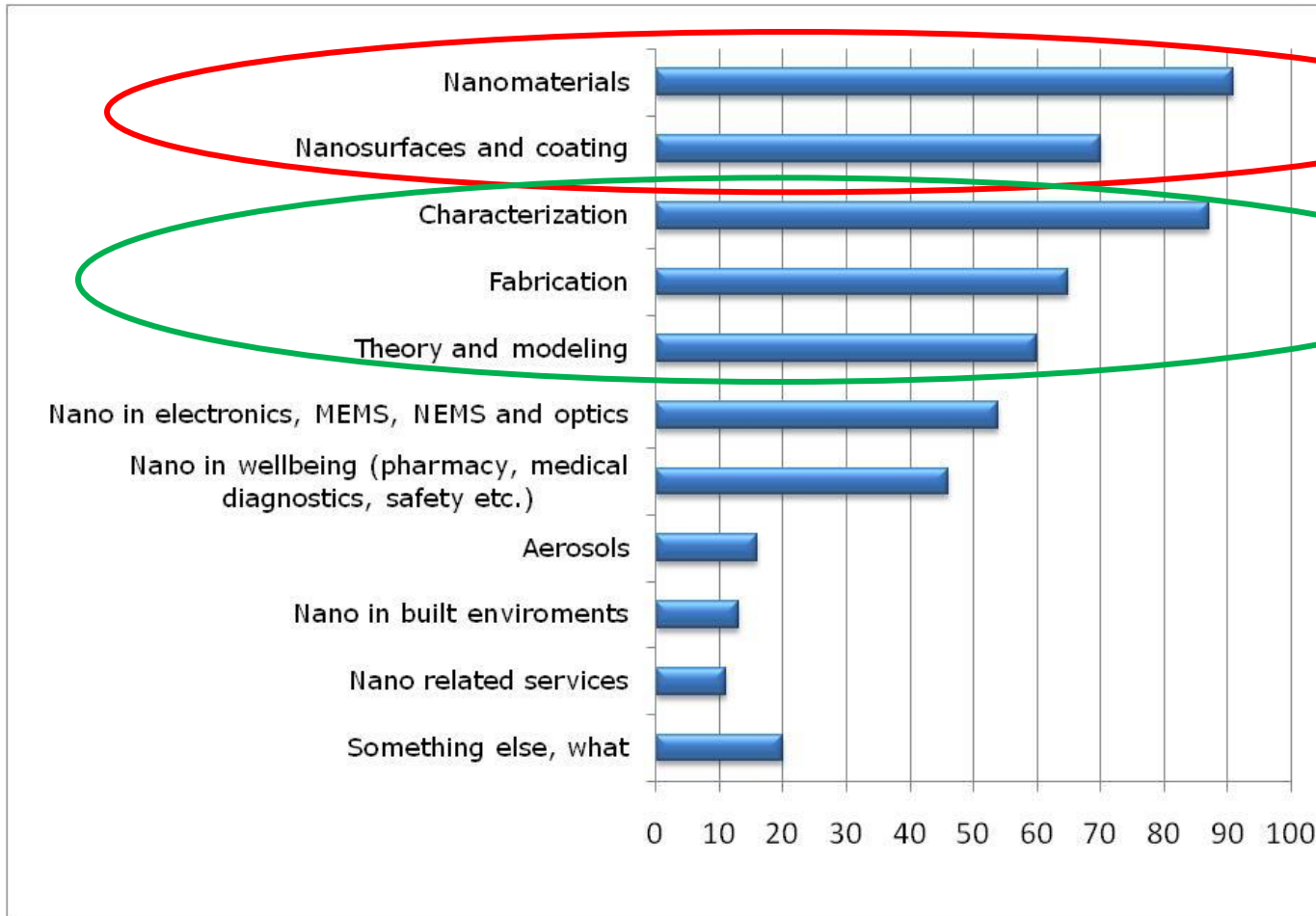
11.11.2011: 133 groups, 20-25 to go

- Aalto University
- University of Helsinki
- VTT
- Tampere University of Technology
- University of Turku
- Åbo Akademi
- University of Eastern Finland
- University of Jyväskylä
- University of Oulu
- Lappeenranta university of Technology
- MIKES
- Other





# 11.11.2011 Status: Finnish Nano research

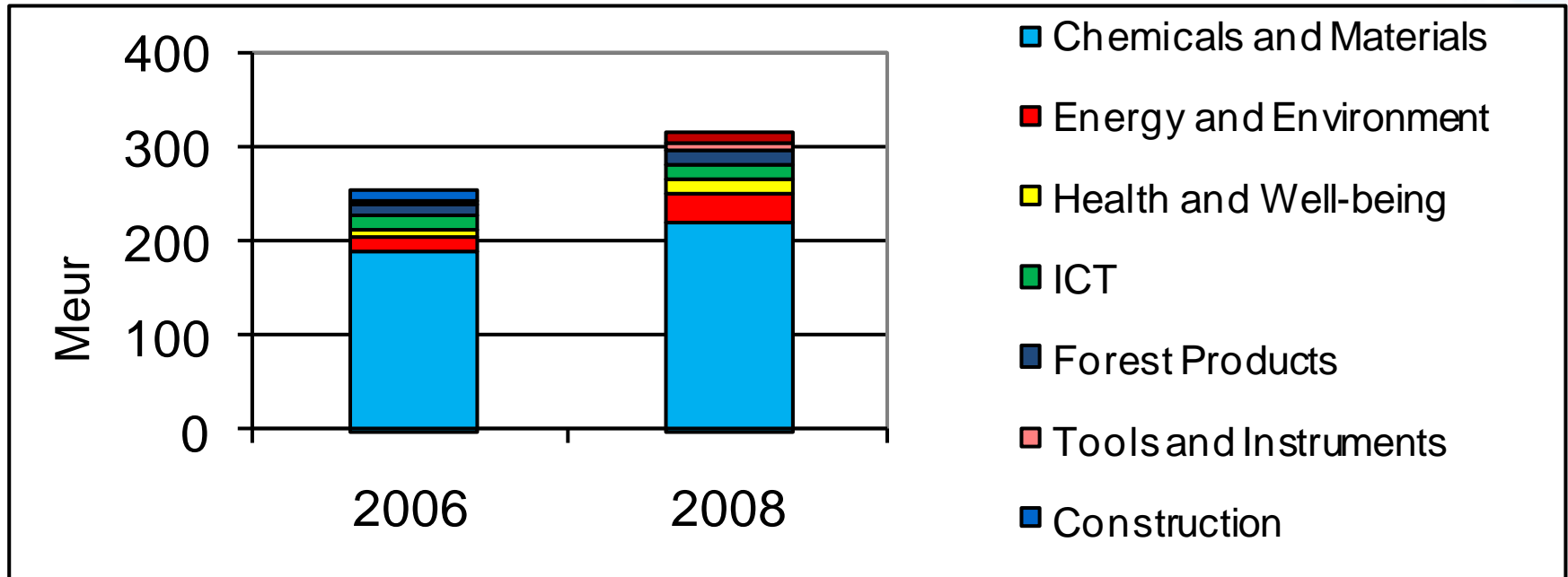






## Research vs industry?

- 12/2008 200 companies, sector size 317 Me - share of exports 60,4% - ca. 2900 professionals



Source: Spinverse Consulting/Tekes program FinNano survey 12/2008



# [www.findnano.fi](http://www.findnano.fi): nano research equipment in Finland

## FinDNano

Finnish Database for Nanotechnology Capabilities

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### Latest Expertise Uploads

25.11.2010

► Nanoindentation - Savonia University of Applied Sciences

15.10.2010

► Research area: Analysis - Remote monitoring - Lappeenranta University of Technology

15.10.2010

► Research area: Analysis - Electrochemical analysis - Lappeenranta University of Technology

36 items total

## Welcome to FinDNano

### Find the nano expertise and instruments in Finland

- **Instruments** at universities and other research organizations: tools for fabrication, measurements and modelling of nanoscale structures, materials and components
- **Expertise** in research of nanoscience and -technology

Browse the database easily using the Capability Classification:

1. Nanofabrication
2. Characterization
3. Computation, Modeling and Simulation
4. Other



### Latest Instrument Uploads

21.09.2011

► Focused Ion Beam (FIB) System - University of Oulu

14.09.2011

► Scanning Electron Microscope (SEM) - University of Oulu

14.09.2011

► Field Emission Scanning Electron Microscope (FESEM) - University of Oulu

298 items total

News



# Spearheading nanotechnology in Finland



## High class research & business

- Nanomaterials – the strongest industrial nano group
- Nanosurfaces ([www.nanosurfaces.fi](http://www.nanosurfaces.fi))
- Photonics ([www.orc.fi](http://www.orc.fi))
- Aerosols ([www.fineparticleforum.fi](http://www.fineparticleforum.fi))
- Microtechnology and MEMS
- Diagnostics, pharmaceuticals, medical

## High class research, to be commercialized

- Nanoelectronics
- Nanocellulose
- Printed Intelligence ([www.printocent.fi](http://www.printocent.fi))
- Safety and metrology
- Modelling and characterization



## The key success factors for nanotech companies?

- NanoCom: FP7 CSA project with 16 partners
- Web questionnaire >250 companies, 30 supporting interviews
- Quite a lot of statistical & qualitative analysis

### **The key success factors for nanotech companies are**

- 1. Focus in business point of view**
- 2. Organized in-house innovation activities**
- 3. Utilization of local support:**  
R&D facilities, incubators, tech centres, clusters, networks
- 4. Collaborations**
- 5. Focus in establishing the production**
- 6. Taking care of funding issues**
- 7. Getting prepared to tackle the insecurities**

60% of >250 companies: nanotechnology has HIGH impact in new product launch, new market entry and increase in sales revenue!



**Contact us:**  
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