

Zukünftige Technologien Consulting

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Material Design on the Nanoscale for Cross Section Innovations in the Mechanical Engineering Sector

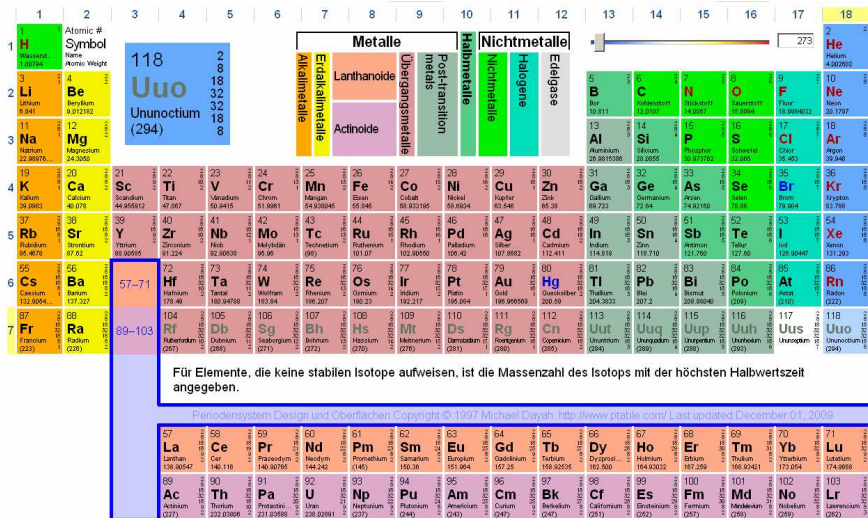
Forum: Innovations for Industry at MicroNanoTec

Dr. Wolfgang Luther

21. April 2010, HMI Hannover

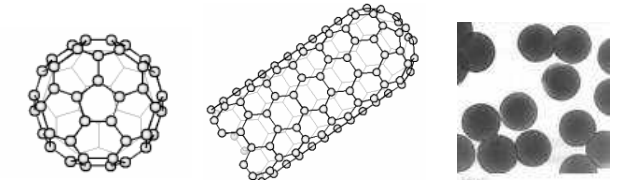
Chances by Materialdesign on the nanoscale

„classical“ materials/compounds

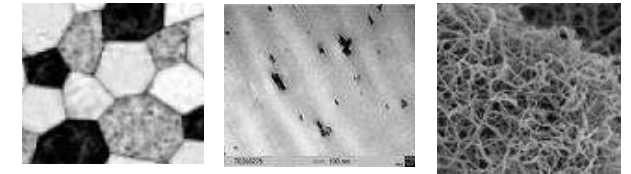


nanostructures/ -structuring

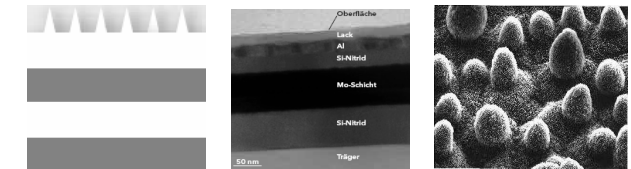
Nanoobjects



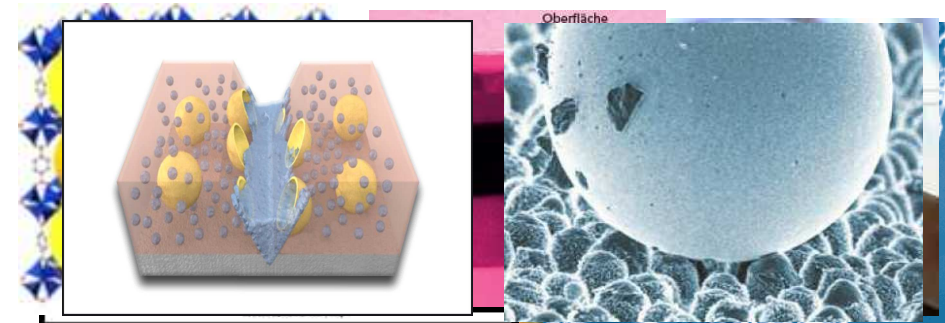
Nanostructured Materials



Nanostructured layers/surfaces



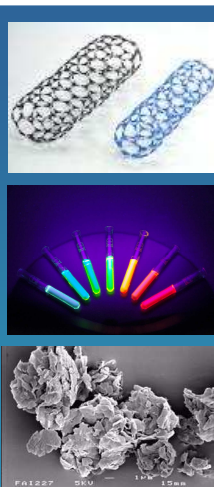
- Utilization of specific nanoeffects
- Multifunctional materials
- Learning from „nano-concepts“ of nature



combination of otherwise unfeasible material
 Biomedical effects, protein and cell recognition
 Chemical sensors, drug delivery, catalytic surfaces
 properties of the inorganic, organic, hybrid
 e.g. photocatalysis, diagnostics, separation
 materials, multifunctional coatings

Value added chain of nanotechnologies

Nanostructures/-materials




- CNT/Fullerens
- Metals/Alloys
- Silicates/Oxids
- Quantum Dots
- Nano wires
- Nanocomposites
- Nanoporous materials
- organic conductors/ semiconductors

Nano processes




- Surface functionalization
- Plasma processes
- PVD, CVD
- Sol-gel-processes ...
- Nanostructuring
- Lithography
- NanoImprint
- Processing of nanoparticles /powders
- Nanoanalytics
- SEM/TEM
- SXM-methods ...

Components and Systems



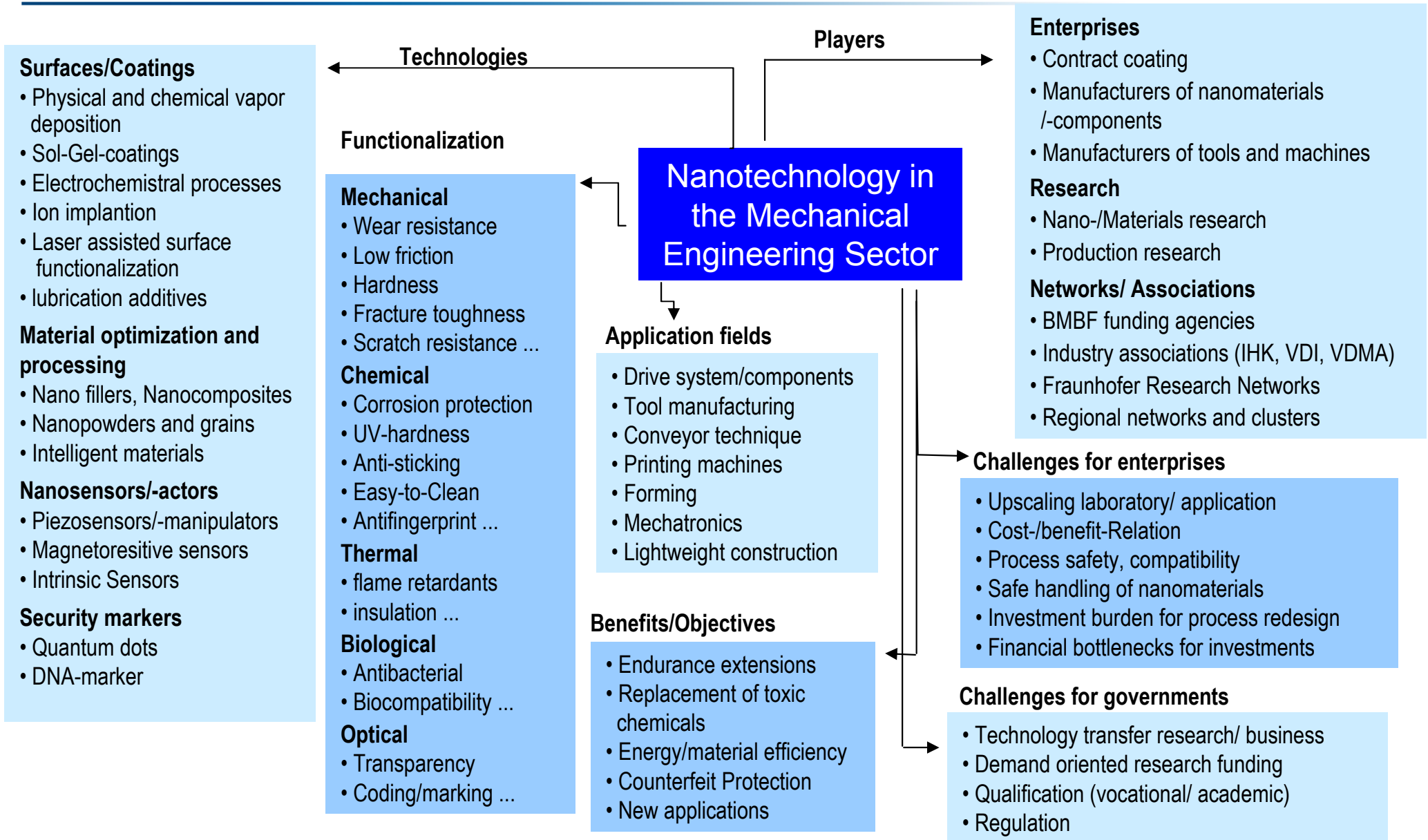
- Solar cells
- Organic
- thin film
- Fuel cells
- Batteries/Supercaps
- Thermal insulation
- Smart Windows
- OLED/FED-Displays
- Lighting
- Integrated Circuits
- Filtration membranes
- Sensors
- Functionalized surfaces ...

Application fields



- Elektronics
- Optics
- Medicine
- Automobile
- Engineering
- Energy
- Construction
- Textils
- Environmental
- Consumer

Mindmap NanoEngineering



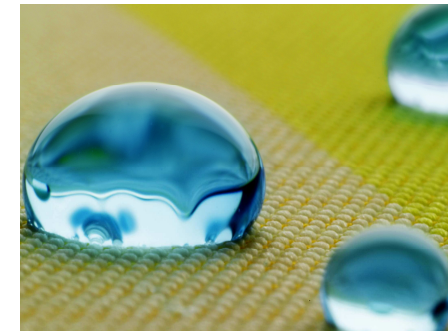
Application examples in mechanical engineering

Wear and abrasion protection



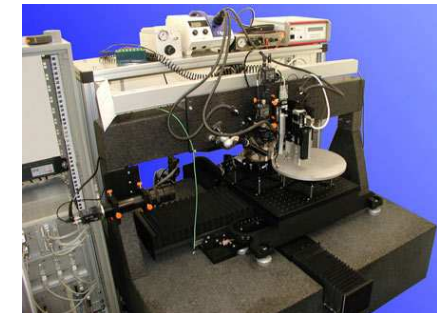
- Polymer Nanocomposites for conveyor belts
- Ultrahard Toolcoatings (nanocryst. ceramic, diamond)
- Dry lubrication coatings

Surface functionalization



- Corrosion protection
- Low energy surfaces/ Self cleaning surfaces

Product safety/ Mechatronics



- Nanomarkers for anticounterfeiting
- Nanosensors and actors for improved mechatronics

Nano-Surface functionalization for optimized material properties

Surface finishing	Chemical	(Super-)Hydrophoby	(Super-)Hydrophily	Ageing Resistance	Antifouling	Fire/Flame Protection	Corrosion Protection	Adhesion Promotion	Anti-Adhesion Properties	Catalytic Activities	Anti-Fingerprint	Optical	UV-Protection	Antireflection	Color Effects	Dielectric Properties	IR-Reflection	Electric/Electronic	Electric Conductivity	Electric Isolation	Antistatics	Electromagnetic Shielding	Electrochromics	Mechanical	Impact Strength	Diffusion Barrier	Scratch Resistance	Hardness/Abrasion Protection/Tribology	Biological	Antibacterial	Bio compatibility	Thermal	Thermochromy	Thermal Conductivity	Heat Storage Capacity	Heat Absorption Capacity/Emissivity
Glass	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange
Ceramics	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange
Plastics	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange
Wood	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange
Metal	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange
Textiles/Leather	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange
Mineral substances/ Concrete	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange

Orange: Nano-coating solution available on the market.

Internet Competency Map Nanotechnology www.nano-map.de



Kompetenzatlas Nanotechnologie in Deutschland

Startseite | English | Inhaltsverzeichnis | Impressum | Daten

Ideen zün

Suchfilter löschen

Deutschland Anzeigen

1466 Institutionen

In der aktuellen Ansicht suchen: Nach Institutionsname Suchen



- Institutionen**
- Netzwerke
 - Forschungsinstitute
 - Hochschulforschung
 - KMU
 - Großunternehmen
 - Behörden/Verbände
 - Finanzinstitutionen
 - Medien/Museen

- Anwendungsfelder**
- Bau
 - Chemie/ Werkstoffe
 - Dienstleistungen
 - Energie
 - Gesundheit/ Pharma
 - Information/ Kommunikation
 - Konsumer-Produkte
 - Maschinen-/ Gerätebau
 - Mobilität
 - Optik
 - Sicherheitstechnik
 - Textil
 - Umweltechnik

- Technologien**
- Begleitforschung
 - Nanoanalytik
 - Nanobeschichtungen
 - Nanobiotechnologie
 - Nanoelektronik

Technologien

- Begleitforschung
- Nanoanalytik
- Nanobeschichtungen
- Antireflexbeschichtung
- Antischmutz-/Antihafbeschichtung
- Biokompatibilität
- Dekorativ/ Farbeffekte
- Flüssigphasenbeschichtungen
- Gasphasen-/Vakuumbeschichtung
- Hartschichten/Tribologie
- Korrosionsschutz
- Photokatalytische Beschichtungen
- Self-Assembling Monolayers
- Sonstige Beschichtungsverfahren
- Sonstige Oberflächenfunktionalisierung
- Nanobiotechnologie
- Nanoelektronik
- Nanomaterialien



REGISTRIERUNG

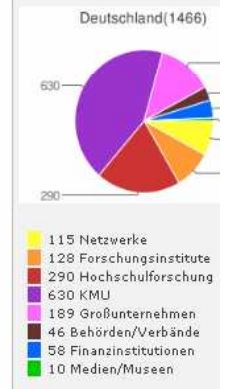
Wenn Ihre Institution im Bereich der Nanotechnologie in Deutschland aktiv ist, können Sie sich hier kostenlos in der Kompetenzkarte eintragen.

[eintragen](#)

Wenn Sie Ihren Eintrag in der Kompetenzkarte ändern wollen, können Sie sich hier einloggen.

[einloggen](#)

STATISTIK



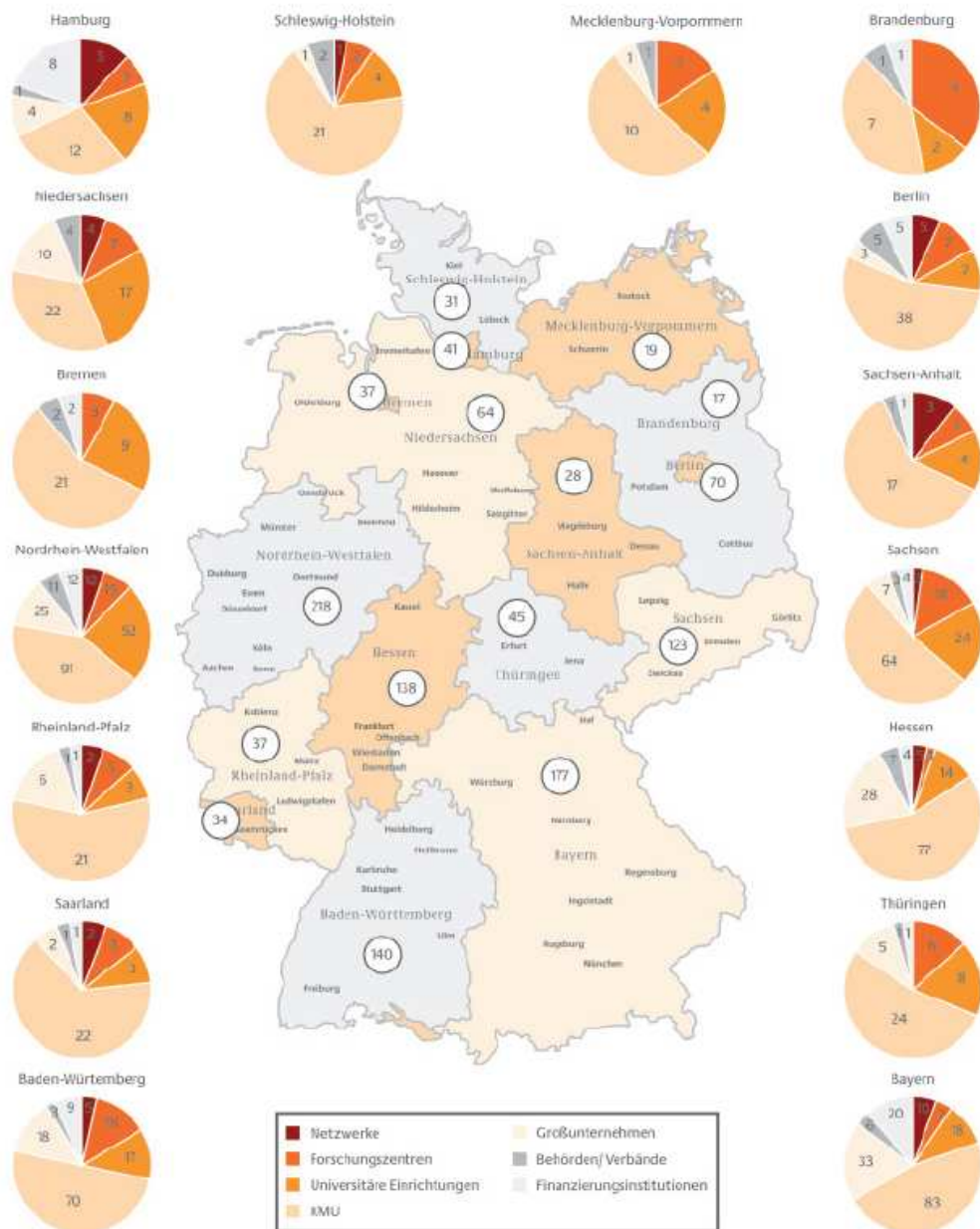
ÜBER NANO-MAP

Erläuterungen zur Nutzung des Kompetenzatlas erhalten Sie -> [hier](#)

LINKS

- [Nanotechnologieförderung des BMBF](#)
- [Nanobildungslandschaft](#)
- [Informationskampagne](#)

Nanotechnology in Germany



High engagement of industry

ca. 800 Nano-companies in Germany

- 80 % SME, data source VDI TZ

www.nano-map.de

Differentiated Research Landscape

- basic research (universities, HGF, DFG)

- application oriented (FH, FHG, AIF)

Extensive Networks/ Clusters

- Federal competency centers (AGENT)

- Clusters on state and regional level

Diversified Funding

- Key funding agency BMBF

- Other ressorts (BMWi, BMU, BMAS)

- State level funding (z.B. NRW, Bayern, Sachsen, Hessen)

- Institutional funding

- Foundations

Research Funding in Germany

Break Down of BMBF Funding Activities

Funding Means in m Euro	2006	2007	2008	2009 Target
Federal Departments				
BMBF	141	168	165	165
Further Departments	20	32	31.4	30.7
Total	161	200	196	195.7
Federal States				
Total	39.3	47.1	59.3	59.1
Institutional Funders				
DFG	70	80	80	80
WGL	25	25.1	25.1	25.1
HGF	36.1	37.3	38.8	40
MPG	15.6	15.9	16.2	17.3
FHG	14.6	13.4	15.9	16
Total	161.3	171.7	176	178.4
Others				
VW-Foundation	6	2	5	5
Caesar	4.1	3	3	3
Total	10.1	5	8	8
Total Germany	371.7	423.8	439.3	441.2

BMBF Nanotechnology Funding (in m Euro)	2007	2008	2009
Precautionary/Accompanying Measures	9.8	9.6	8.3
Nanomaterials/Nanochemistry	31.1	36.8	47.4
Production Technologies	7.1	5.5	4.2
Optical Technologies	30.5	34.5	33.1
Optical Technologies	10.6	7.3	3.4
Electronics and Communication Engineering	52.9	38.5	35.3
Nanobiotechnology	11.5	22.5	22.7
Energy Engineering	4.5	3	2.7
Others (International Innovation Projects New States, Nano4Woman, University Projects,...)	10	7.3	7.9
Total	168	165	165

BMBF activities in the area of nanotechnology for production

- Ongoing Funding programme "Nano goes production" – Upscaling and integration of nanotechnological processes
- Funding programme „KMU-innovativ“: Supporting the development of innovative technologies and business fields for SME, e. g. resource and energy efficiency
- Innovation alliances „Carbon nanotubes“, „Lithiumion batteries“ „Organic photovoltaics“ establishing of new technology platforms and added value chains
- BMBF Study „Production Research 2020“
- Technology transfer „Branchendialog NanoEngineering“

More information: BMBF Stand H29, hall 6

